WOOL: FROM STRAW TO GOLD

An ecological assessment of the lifecycle of wool from cradle to grave and beyond resulting in yarns composed of 100% post consumer waste

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WOOL: FROM STRAW TO GOLD

ABSTRACT

The objective of this research is to document the complex journey of wool from cradle to grave and beyond and to analyze the ethical and environmental cost of production from the farm to the knitwear factory, to retail and finally as post-consumer waste. The research findings make a contribution to the growing commercial and consumer in debate in this area. Under the spotlight is wool growing including genetic and chemical manipulation and environmental degradation. Human exploitation at manufacturing sites, in some of the poorest countries of the world is discussed. Finally, the involvement of government, charitable and commercial institutions in the business of textile waste disposal which currently takes the form of landfill, incineration and Third World dumping is highlighted.

Experiments have been undertaken to produce a small range of knitwear yarns and garments composed of a blend of wool, cotton and polyester, regenerated from 100% post consumer waste originally in the form of wool garments, jeans and drinking bottles.

This has involved an innovative collaboration with the local Authority, community groups, a national charity, a textile reclamation company, spinner and commercial knitter. The aim of the research both theoretical and practical is to demonstrate that there are practical ways to 'close the loop' and to flag up the need for design in the 21st Century to focus on post-consumer issues and the manufacture of aesthetic, commercially viable products made from non-virgin materials.
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ACKNOWLEDGEMENTS

This thesis and supporting design project is the result of the equivalent of 5 years-part time personal research and collaboration into the assessment of the lifecycle of wool, resulting in a small range of textile products composed of post-consumer waste, which is the basis for future development.

The research came about as a result of 'the need to know more detail' relating to ecological issues in the international fibre, textile and fashion industry, in which I am a knowledgeable design consultant for retail in yarn and knitwear design.

My approach was to invite comment on my findings and subsequent theories, from a range of specialists from Private and Public companies, Organisations, Institutions and Authorities which had involvement in the wool production and waste disposal chain.

Out of the many people consulted (in the UK and Europe) throughout the research, which covers numerous areas, there are twelve who have made a significant contribution to the body of knowledge either practically or philosophically.

They are: Lawrence Barry, LMB Ltd; Mark Barthel, BSI; Marie Yvette Cleli; Mervyn Davies Marks and Spencer, PLC; Ronaldo Galli, Nanni Filati Srl; William Gardiner, London Borough of Enfield; Susannah Handley, PhD RCA; Mark Lightowler of Lightowlers Yarns; Vicky Longdon, Charnos PLC; Anton Luiken, TNO; John Parkinson, J.P. Textiles (Evergreen); Andrew Stockwell, Oxfam Wastesaver.

However of these, three have played a central and continuing role, shaping the argument, contributing ideas and providing invaluable practical advice, they are: Mervyn Davies, Specialist Technologist in Hosiery and Knitwear at Marks and Spencer PLC, William Gardiner, Waste Reduction Officer for the London Borough of Enfield and John Parkinson, J.P. Textiles Ltd. (Evergreen) Shoddy and Yarn manufacturer.

Finally thanks to Felix, Ruaidhri, Harriet and Michael for their endurance and Susannah and Frances for their continuous support.
AUTHORS DECLARATION

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OUT OF THE BOBBLE HAT AND INTO THE BOARDROOM

CHAPTER 1
CHAPTER 1

Introduction

It is important to understand the history of wool textile manufacturing in its global context in order to assess the social and environmental cost of wool knitwear production from ‘cradle to grave’ and beyond. In this case ‘cradle to grave’ or Life Cycle Analysis (LCA) describes the changes which take place in the life of a wool fibre and discusses the ecological impact associated with that production. To draw a conclusion the many links in the wool-fibre knitwear chain, consisting of growers, processors, manufacturers and retailers on the one hand and consumers, disposal agencies and governments on the other will be analysed.

This investigation has come at a time when there is a dramatic decline in the wool knitwear industry in the UK. which is attributable by trade and industry authorities too traditional, even archaic, production methods coupled with the quintessentially conservative, complacent attitudes within the textile industry. This is compounded by the downturn in consumption of wool brought about by climatic changes, consumer preference, foreign clothing imports and late investment in textile technology. We are now witnessing the end of one of Britain’s greatest industries, from which an analogy should be drawn with the rapid and unstoppable decline of the UK mining industry in the late 1970s. Yet it is also true to say that in some countries e.g. India, where wool knitwear manufacturing has changed little since the Industrial Revolution, knitwear production as a cottage industry continues to grow, driving economic prosperity. Paradoxically in First World countries, even with heavy investment in technology and R&D, the industry is struggling for survival. These factors are directly linked to labour costs in each country, which are low and very high respectively. The future survival of the Wool industry in Europe relies upon investment in product development in fibres and fabrics and niche marketing. This increasingly goes hand in hand with growing public expectations of business integrity including sensitive environmental and ethical policies exemplified

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3 Lowtech knitwear production, made on simple flatbed machinery and by hand, accounted for more than 16 million kilos of knitwear manufactured in 1990 in India alone. 60% of this production was for export to Europe. To achieve these figures, production is highly labour intensive, employing more than 400,000 workers who are based in the Ludhiana region. Interestingly there are no official figures for the number of machines in use or where they are housed, let alone who or how old are their operators. Ibid.
Fig 1 The Co-operative bank customer care literature. Fig 2 Children work for sports labels

As part of its Partnership Approach The Co-operative Bank strive to deliver value and to operate in a socially responsible and environmentally sustainable manner.

If you would like to read our Partnership Report you can browse through it at your leisure by visiting our website at http://www.co-operativebank.co.uk Alternatively, we would be happy to send you a copy.
You can request one by calling 0800 435906

Fig 3 Child workers are bonded slaves
by the Co-operative Bank UK4. The Co-operative Bank produces an annual Partnership Report and regular customer care literature (fig 1), which is an independent assessment of the bank's social and ecological approach to investments and sponsorship. Bad publicity in ecological5 matters means that consumers vote with their feet, taking their custom elsewhere, confirming that negative coverage in relation to the production of goods creates customer alienation, which can wipe out share values at a stroke6. Pictures of rivers coloured by contamination from dye-house effluent or those of children (figs 2 & 3)7 and poorly paid workers at machines making products for UK retailers are not good for business. Such images tend to remain in the public psyche and their association with that company lingers. Corporations reluctantly acknowledge that these days their ecological profile has direct links with customer confidence and loyalty.

As the transition takes place into the twenty-first century, it is not fanciful to state that ecology has finally come out of the bobble hat and into the boardroom.

The thesis chapters contain the following:

Chapter 1, OUT OF THE BOBBLE HAT describes key environmental disasters which have taken place since 1986 and the Eco-labels and organisations which sprang up alongside these catastrophes.

Chapter 2, WOOL FROM THE CRADLE gives a brief historical background to the wool industry and discusses contemporary processing and its associated environmental issues.

Chapter 3, THE GLOBAL FACTORY focuses on knitwear manufacture where by ecological issues associated with wool at this point in the life cycle become focused on human/ethical rather than material/environmental resources.

Chapter 4, TO THE GRAVE AND BEYOND documents disposal options of wool post consumer as a landfill component, incineration, or as an export to impoverished countries of the world.

Chapter 5, THE THROW AWAY SOCIETY details current statistics globally and locally related to post consumer waste and the situation of textiles as a consequence, also the benefits and processes of recycling and the current research under way.

Chapter 6, WOOL FROM STRAW TO GOLD: DESIGN PRACTICE documents an innovative collaboration of partners to produce a range of yarns and garments from 100% post consumer waste.


7 80% of footballs are made in Pakistan, many by child workers for labels such as Reebok, Nike and Adidas. It is estimated that there are 250,000,000 child workers in the world, 7,500,000 of whom are bonded slaves.
1989 - Exxon Valdez Alaskan oil spill, sensitive marine ecosystem destroyed (fig4).

1:1 THE CUSTOMER TURNS GREEN

Some environmental events that have taken place in the last two decades are described in this chapter. These have been instrumental in contributing to a subliminal sense of inevitable environmental doom and contextualise this investigation into the wool industry. They are:

1986 - Chernobyl nuclear fallout, parts of the UK still irradiated.
1987 - CFC reduction agreement, to prevent destruction of the ozone layer.
1989 - BSE beef crisis, animal protein fed to herbivores, CJD attempted cover up of evidence.
1989 - Exxon Valdez Alaskan oil spill, sensitive marine ecosystem destroyed (fig4).
1991 - Bhopal cotton pesticide chemical fallout, densely populated Indian city contaminated.
1993 - Aral Sea environmental assistance programme, to stop the death of the fourth largest lake in the world.
197/98 - El Nino, weather system catastrophe.
1999 - GM foods, genetic manipulation of foods, without appropriate testing.

Also briefly mentioned are the plethora of 'Eco' labels and organisations which emerged in tandem and as a reaction to the catastrophes of the mid 1980s and 1990s. These labels accredited 'green' products and ideologies and were introduced to assuage customer concern, In fact they added to public confusion and ultimately scepticism. Finally there will be a discussion of the ecological consumer movement and the few ethical retailers who have implemented environmental policy in their businesses, motivated by customer demand. The case studies are Body Shop, Esprit, Marks and Spencer and Out of this World.

During the 1980s there was a global economic boom, which led to an increase in global consumerism. In the First World there was a general “feel good” factor and in business the shareholder concept was of paramount importance. However this euphoria was contrasted with an underlying sense of the Apocalypse emerging from the environmental situation. First World business and government leaders employed a cavalier approach to the environment, which contributed to a series of near catastrophes. Consequently, the media kept environmental issues to the forefront of the press which resulted in increased public awareness and the emergence of environmental pressure groups such as Green Peace and Friends of the Earth. The ‘Green’ movement was raising the profile of environmental issues, but it embodied a much broader set of values, ecological and social which were outlined by Jonathan Porrit, president of Friends of the Earth, in his 1984 inaugural mission statement. A synopsis of his key points is as follows;

The minimum criteria for being green would run roughly as follows:

• a reverence for the Earth and for all its creatures
• a willingness to share the world’s wealth among all its people
• prosperity to be achieved through sustainable alternatives to the rat race of economic growth
• lasting security to be achieved through non-nuclear defence strategies and considerably reduced arms spending
• a rejection of materialism and the destructive values of industrialism
• a recognition of the rights of future generations in our use of all resources

• an emphasis on socially useful, personally rewarding work enhanced by human scale technology
• protection of the environment as a precondition of a healthy society
• an emphasis on personal growth and spiritual development
• respect for the gentler side of human nature
• open, participatory democracy at every level of society
• recognition of the crucial importance of significant reduction in population levels
• harmony between people of every race, colour and creed
• a non-nuclear, low energy strategy, based on conservation, greater efficiency and renewable resources
• an emphasis on self-reliance and decentralised communities

Unsurprisingly the environmental bandwagon began inexorably to roll and gain momentum.

CHERNOBYL
It was during this period, one could argue, that the world realised for the first time that environmental hazards knew no national boundaries. In April 1986 an explosion in the former Union of Soviet Socialist Republics in Chernobyl sent a radioactive cloud into the atmosphere, Caesium 137 was carried on the prevailing winds to the West. The rain dumped the radioactive isotope throughout Scandinavia and over the high areas in the British Isles causing a public outcry due to severe vegetation and livestock contamination.

In Britain, MAFF's guidelines (drawn up internationally for exactly such a situation) restricted the movement of sheep out of the contaminated zones and from the outset the sheep could not be sold for human consumption.9

Mike Hubberstey of the Minister of Agriculture, responsible for radioactivity monitoring said,

"The animals were glowing; it is impossible to say how long the contamination will remain, considering the half-life formula of radioactivity. Also the high peaky soils lack plants and minerals which would immobilise the contamination in other areas. Hot spots of contamination remain in Wales, the Lake District and Scotland. In England even now there is extensive monitoring with teams turning up at an abattoir to spot check that animal's meat could not be sold for human consumption, but as far as I know there wasn't any restrictions put upon the sale of wool from these sheep. The fleece went straight into the textile industry as usual".10

This was arguably one of the major ecological disasters (such as that of the Torrey Canyon oil spill in the 1970s) which reminded people that each nation was dependent upon its neighbours for ecological

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put upon the sale of wool from these sheep. The fleece went straight into the textile industry as usual”.

This was arguably one of the major ecological disasters (such as that of the Tory Canyon oil spill in the 1970s) which reminded people that each nation was dependent upon its neighbours for ecological health. Chernobyl propelled environmental discussion to the forefront of public conscience and First World politics.

OZONE DEPLETION

Industrial discharges and car exhaust emissions (fig 5)

The mid 1980s saw another significant crisis emerging concerning the use of chlorofluorocarbons which had been invented in 1928 and had been heralded as perfect, stable, non-toxic, non-

10 Hubbersty, M. Senior Monitor Ministry of Agriculture. Telephone Interview October 21 1996
inflammable and chemically inert. Ironically it was this inertia which gave chlorofluorocarbons the ability to remain in the atmosphere, (collecting mainly over the Antarctic) causing ozone thinning and leading to the ‘Greenhouse’ effect and global warming.

The economic boom and increase in consumerism unwittingly accelerated the depletion of the earth’s protective shell because CFCs were found in aerosols, fridge’s, air conditioning plants, dry cleaning solvents, plastic foam, food packaging, furniture stuffing and insulation products to name but a few. Recognition of the apocalyptic environmental situation galvanised the USA, EEC and 23 other countries to sign the Montreal protocol agreement cutting drastically the use of CFCs, which had been proved to destroy the ozone molecules, which protect the earth from UV radiation. This happened in 1987, less than eighteen months after findings, which connected CFCs to ozone thinning, were released. The rate at which some cosmetic companies came out of CFC propellants took their slower competitors totally by surprise and cosmetic companies like Mannen, Clairol and Alberto-Culver were quick to exploit the ‘ozone friendliness’ of their products in major advertising campaigns resulting in an increase in market share.

“Ozone smog’s were first noted in California (which are not yet common-place in Europe) during hot dry weather when industrial discharges and car exhaust emissions (fig5) still fill the lower atmosphere with nitrogen and sulphur dioxide which react with sunlight to form photo-oxidants, ozone being the most dangerous. Current activities will lead to further doubling of ozone in the air in the next century. If this happens it will have a “greenhouse” effect rather as carbon dioxide does, absorbing radiation from the sun and acting as a thermal blanket warming the surface of the earth”

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ARAL SEA DISASTER

1986 brought the scale of the Aral Sea disaster to the world’s attention, even though the catastrophe began in 1966 due directly to the constant irrigation and irresponsible use of pesticides in cotton farming. (Fig 6).

"It takes one pound of chemical fertilisers and pesticides to conventionally grow the three pounds of cotton needed to make a T-shirt and a pair of jeans. Every year, according to the United States Department of Agriculture, conventional farmers apply some 53 million pounds of toxic pesticides to U.S. conventional cotton fields. Though their costs can be higher, organic farmers are demonstrating that there are better ways to grow cotton. Go organic".  

Fig 6 Satellite view of the Aral Sea destruction

In thirty years 70% of the water had been lost with the shoreline receding over 80 kilometres in places. The Aral basin provided 95% of cotton grown in the former USSR and as a consequence 56 cubic kilometres of water out of 58 was diverted from the Aral Sea to feeder rivers in the area to satisfy cotton farming needs.

13 Sustainable Cotton Project, California 1999. www.sustainablecotton.org
The situation was worsened by the huge amount of pesticide, defoliants and fertiliser, which was applied to local cotton crops. These chemicals drained back to the rivers used for drinking water, which put public health at risk with an increase in infectious diseases and contamination with chemical pesticides. Infant mortality was three times the national average in the USSR and showed a higher rate of birth deformities. These findings, which also included general levels of sickness showed an increased with proximity to the sea.

![Fig 7](image)

**Fig 7  A fishing boat stranded in the desert**

The Aral Sea once supported a flourishing fishing industry, which has gone (fig 7) and eleven of the 25 Amudarya Delta lakes are dry. Now the forests are less than 20% of their original size and the entire marsh area used for harvesting reeds and which supported 1,173 species of birds has gone. (Although the Aral had been in decline since 1966 the seriousness of the situation only became widely known in late 1986 due to the “glasnost” policy which meant Russian secrecy laws were virtually abolished.)

The last six years, since the break up of the Soviet Socialist Republic, have seen a snowballing of foreign investment in Uzbekistan, which is one of the 5 independent states which borders the shores of the Aral sea. Investment has focused upon industrial partnerships to mine for precious minerals including gold and to develop a basic textile industry.

In November 1996 there was a conference in London encouraging British investments in the newly independent State of Uzbekistan. The extensive survey commissioned by the Observer newspaper for
a 60-page magazine advertising the conference and the region contained information on the area’s history and industrial developments since independence in the summer of 1991. It was interesting to note that out of a 20 thousand word magazine, there was a two line reference to the environment of the area playing down what could be termed one of the worst man-made environmental disasters of modern times.

“But the Soviets also turned over much of the land to cotton cultivation, which has contributed to the slow death of the Aral Sea”.

Textile production is mentioned only in relation to the re-equipping of the industries with high technology state of the art machines and charting the increase in wool production. It is also worth noting that as the cotton cash crop has declined in size due to environmental problems in what could be described as a textile manufacturing area, wool production has grown from zero tonnes in 1991 to 2,114 tons in 1995. There are plans for further expansion in the hope of replacing the diminished cotton industry in spite of a world recession in the wool market causing stock piling of wool by international growers elsewhere. Wool prices have been on a downward spiral since 1994 due to poor demand world wide, and a national stockpile in Australia.

BSE & GM FOOD

BSE was first diagnosed in UK cattle in 1987, caused by feeding ruminants infected processed animal proteins. A cavalier approach to banning certain contaminating abattoir practices and delay in culling infected animals which went into the food chain, led to fears of a BSE epidemic and the alleged development of CJD in humans. Exports of beef to the EU were banned and only certain cuts of UK beef were allowed for the home market. However the Government continued to sanction the exportation of BMB (British meat and bone meal) made from possibly infected stock and when sanctions were imposed to stop exports to Europe, exports to Third World countries and others outside the 15 European Union member states continued.

Consumer confidence in the British food industry has been severely damaged by the mishandling of the beef crisis, the effects of which are still being felt. Beef farmers continue and are continuing to go into liquidation due to lack of sales, and on another level, in March 2000, a six-month old baby was diagnosed with CJD having contracted the disease from its infected mother during pregnancy.

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14 Images Worlds Ltd. Uzbekistan taking the challenge of the New World Order. Observer Perspectives, 3rd November 1996.
15 Ibid.
16 Figures for June 1999 show that there were 1,000,000 bales of wool still stockpiled in Australia. Wool Record 2000
17 Moynihan, T. Recalling cattle feed was not possible, BSE probe told.-http://www.cyberdyne.com/~4om/nov99_mid_news.html
Mistrust now exists between the British public and food producers and the government. Many activists have moved away from occupying trees and tunnels at proposed road building sites, now the Eco-warriors concentrate on fields of experimental GM crops (fig 8). Such action has forced the debate on the lack of long-term assessment of modified foods for human consumption and the moral issue of ownership of food genes by a hand-full of Agri-businesses based in the United States. As a consequence in 1999, the British Government made a complete 'U' turn in its fast-track policies to develop GM food farms, proposing more laboratory research, which has been followed by the withdrawal from supermarket shelves of produce known to contain genetically modified ingredients by the big UK food retailers.

Fig 8  Eco warriors attack fields of experimental GM crops

EL NINO

El Nina is a periodical catastrophic weather system which (unexpectedly) last ran its course between February 1997 and May 1998 and was thought to be the cause of numerous global, climate-related disasters. These included the failure of the Asian Monsoon, exceptionally heavy rainfall in Australasia, severe drought in South America, floods in Brazil, Chile, Peru and California. Catastrophic climatic conditions caused deaths and affected food production leading to famine in some regions and billions of dollars worth of damage. Significant sea surface changes have been a factor of El Nino leading to the loss of fishing fields in its path. El Nino has been blamed for these global catastrophes but the increasing impact of this weather mass is attributed to the effects of rapid global warming.  

18 Glantz, M. Climate, Environment, and Disaster: The Case of El Nino, Harvard University Asia Center- http://www.fas.harvard.edu/~asiactr/fs_glantz2.htm
In tandem with the increase in environmental catastrophes and consumer criticism, emerged a plethora of eco type labels in the EEC as manufacturers rushed to join the 'Green' bandwagon. Consequently the eco phenomenon has given birth to so many different labels in the 1990s that the situation is now complex and confused (fig 9).

It was in 1992 that the O.T.I. and Howenstein Institute in Austria developed the Oko-Tex series of labels, which could be awarded to raw fibre and garment manufacturer's products. The system was based on results from testing laboratories in the UK and Europe which, ensured products were free from pesticides. Later, the German Textile Confederation (leaders in the ecological textile campaign) developed the M.S.T. label for finished fabrics and clothing, also the M.U.T. label for commercial production cycles, amalgamating with the Oko-Tex label in 1994.

However, since 1995 the European Commission has been investigating the introduction of an international eco label, which would be appropriate for all fibres including wool: it is the DG11 project with Headquarters in Brussels. The fibre assessment will be judged on Life Cycle Analysis (LCA).

Initially, the Eco Label Award Scheme was given to goods, that reduced impact on the environment and were manufactured only in the EEC, but the label focussed on waste reduction rather than ecological or environmental criteria. It is hoped that this will become recognised by the consumer as a trustworthy seal of approval, such as the British Standard 'kite mark', to help them in choosing more 'environmentally friendly' products. However manufacturers in the detergent, toiletries and paper industries in both the EU and the US have been hostile to the scheme, suggesting it will be a barrier to free trade. As with the BSI accreditation, manufactures will pay a fee to apply for the label, plus a charge based on 0.15% of annual sales. So far, however, the scheme has been applied to only two product categories, washing machines and dishwashers because of the complexity of the lifecycle analysis of components and the manufacturing processes. Therefore it is not surprising that the Commission has run into difficulties in the criteria for assessing textiles, considering it can be global from cradle to grave with different problems country to country.

In addition to those labels already mentioned there exists the ECO-TEX scheme, which allows self-certification on production of fabric or garments, which are 'environmentally friendly'. The ECO-
Fig 9  Eco-label phenomenon

Tested for harmful substances according to Öko-Tex Standard 100
Test-No  BTTG Manchester

BTTG

CONFI DENCE IN TEXTILES
 Tested for harmful substances according to Öko-Tex Standard 100
 Test-No BTTG Manchester

Carpet contaminant-tested

Tested for harmful substances according to Öko-Tex Standard 100
Test-No BTTG Manchester

B. Burdett, Paper given at the 'Science and the Environment Conference'
B.T.T.G. date unknown 1996.
TEX label was a joint venture between TDG Textile Design Group of Milan and Scotdic of Cologne. The problem is that it is a self-certification scheme, allowing manufacturers to follow a set of guidelines according to their particular product. Once these have been implemented and adhered to the manufacturer earns the right to use the ECO-TEX label on the finished product. The ECO-TEX system demands that all substances used during the production of the fabric or garments are given the product label as well as the usual fibre content, part of the ECO-TEX manifesto is based on the importance of the “less is more” concept. It claims that;

“All ECO-TEX procedures and concepts are based on the principles of saving, substituting, reducing and recycling. Companies and firms participating in the ECO-TEX programme would hope to be ecological leaders, accepting direct responsibility for their products and ensuring environmental benefits”.23

In addition to these labels, various fibre companies have their own labelling systems advertising positive messages about their own products e.g. Courtaulds Tencel and Foxfibre “coloured by nature” IWS “pure new wool”.

In 1987 the IWS first referred to the growing importance of environmental issues in relation to their future plans and that year, a small study examined the possible consequences for wool, advising on R&D requirements arising from problems which the wool industry might face in the future. (It is interesting to note that as recently as the late 1980s the growing importance of environmental issues, was not accepted and management questioned the need even for such a survey. In 1987, most people believed that environmentalism was a fad, which would pass in a year or two).24 The specially formed IWS Environmental Technology Group investigated where improvements to wool’s environmental performance could be made. Such was the public pressure on various industries to clean up their acts that in 1990 R&D development into environmental issues in wool processing was the subject for a conference paper given by Trevor Shaw who said,

"Environmental issues have assumed great importance throughout most of the world during the past few years. This is particularly so in Western Europe, where great changes in political and social attitudes have occurred, especially during the last 12 - 18

Jacks, P. Senior scientific officer UK Eco Labeling Board. Telephone Interview 1998.

months....Customers are increasingly concerned with the environmentally friendly face of the products they buy". 24

He went on to refer to the growing concern about environmental and associated matters, e.g. occupational health and consumer product safety, which had grown rapidly in Europe and North America. The rate of change in social and political attitudes had been unprecedented, affected by a scientific consensus (between 1986 and 1990), agreeing that the causes of acid rain and ozone depletion were man-made.

"Only a short time ago, the so called greens were widely regarded as cranky, leftist and above all impractical. Now, it is estimated that about 50% of consumers in Western Europe make purchasing decisions based on environmental criteria, 25% are consciously green and about 10% feel strongly enough to vote for a Green ideology". 26

On top of this list and primarily for textile and fashion companies who cannot afford to appoint an environmental officer or pay expensive registration fees, there is the UK Government information and assistance scheme. Now small companies can benefit from advice, given by the Department of the Environment with its Environmental Technology (ETBPP) best practice programme. 27 This scheme has a ‘helpline’ to improve environmental performance and conform to Eco legislation. It aims for ‘Good practice’ which highlights proven cost effective techniques. Companies which participate are entitled to payments of up to £10,000. In addition, there is also the ‘New Practice’ accreditation, which profiles the first commercial applications of innovative measures, giving grants of up to £50,000 and ‘Future Practice’, which supports work that advances innovative practices with grants of up to 49% of the Research and Development costs.

Other ‘Eco’ players are the Textile Environmental Network, (TEN) and the European Textile Network (ETN). It is not surprising that the variety of Eco-labels and organisations in the market place has caused deep scepticism in consumers and those manufacturers who would wish to use such labels.

"Cynics claim that the labelling system is nothing short of a clever marketing device, implemented by manufacturers with one eye on the environment and the other on their sales figures". 28

It could be argued that as a consequence of the lack of cohesive environmental and ethical legislation in manufacturing, the textile sector has been slow to adopt voluntary policies and tends to be reactive rather than proactive. The truth is such controls are too restrictive as they directly affect profits and it

25 ibid p. 9
26 ibid p. 9
is cheaper to be just one step ahead of the legislators, begging the question is the concept of a voluntary ethical PLC possible?

One of the first significant developments in the British Government's approach to environmental issues came in September 1988 when Prime Minister and former scientist Margaret Thatcher made a turning point speech to the Royal Society, accepting that environmental problems demanded action, even accepting that the environment was at risk.

“For generations, we have assumed that the efforts of mankind would leave the fundamental equilibrium of the world’s systems and atmosphere stable. But it is possible that with all the enormous changes (population, agricultural, use of fossil fuels) concentrated into such a short period of time, we have unwittingly began a massive experiment with the system of this planet itself.”

In the same period, the United Kingdom Green vote was 14.5% in the European Parliament elections in June 1989. Had proportional representation been in place, the UK would have added 12 or 15 more MPs to the 27 Green members from elsewhere in Europe. At the British general election later in the year, the Conservative government retained power, fighting the election on a 'greenish' ticket. It could be said that the green activists, despite the initial scepticism of governments and the general public won a battle for credibility. Green or, in other words environmental issues were forced onto the agenda of industry and governments by consumer public pressure.

Less than a decade later the power of the consumer is now acknowledged and at the TEN conference in 1996 in Birmingham, Mike Press, the Professor of Research at Sheffield Hallam University said

“Business is about profit. In Britain companies have a responsibility to maximise return for the shareholders. That is enshrined in company law. But let's not forget that all gains in health and safety, also gains in working conditions, also gains in ethical responsibility by capitalist management have been struggled for, by people over centuries, by unions, the Church and consumer campaigners.”

CASE STUDY 1: BODY SHOP

The first high street Company to try to embrace a responsible idealistic approach to retailing but keep its eye on sales figures was the Body Shop, established in 1976, which was so successful that it was floated on the Stock Exchange in 1984. Anita and Gordon Roddick, who were the first to establish their philosophy of environmental awareness and anti-animal cruelty, conceived the Body Shop.

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25 ibid
26 Science and Public Affairs No. 4, 3-9, Royal Society, 1989.
The Body Shop, once a handmade business of shampoo, brown labels and string in Brighton’s Lanes is now a multinational corporation. Its philosophy has moved out of the bobble hat and into the boardroom. It is ironic that, by marketing an ecological ideology. The Body Shop has created a massive new market for consumable appealing particularly to idealistic teenagers.

US journalist John Entine’s investigation and expose of the Body Shop ethos forced the company into producing a 60 page social statement. This was to deflect the mounting criticism against Body Shop’s alleged double standards, such as paying fair prices for Third World goods (but they were not) and advertising the fact that their products were not tested on animals (but some were), Body Shop was using these idealistic (untrue) marketing levers to encourage outside investment in its operations the USA.32 The Body Shops’ ‘Trade not Aid campaign’ (developed along the Traid Craft lines with techniques used by the New Economics Foundation, NEF) was very successful in maintaining loyalty and broadening the customer base.

Fig 10 How we Give campaign

![Fig 10 How we Give campaign](image)

The way forward at the Body Shop is not to give more, but to give more effectively. And that means more than money. The key to our approach to giving is staff involvement.

However, Entine reported that in real terms the amount of moneys given directly to its Third World ‘partners’ was minute, a tiny sum of £183,521 paid directly to its fair-trade partners, which was just

2.1% of its total raw material purchases. This was a paltry sum, considering the marketing kudos gained from the 'Trade not Aid' and subsequent 'How we Give' campaigns (fig 10).

The media findings not only fuelled the debate about the Body Shop's ethical performance, but highlighted the controversy over the difficulty of managing an activist morality alongside commercial realities, especially where complex developmental rules were concerned such as those in Amazonia (Fig 11).

The Body Shop empire was built in ten years. It could be argued that it was ahead of its time in recognising that having a public ethical mission statement and practice had a positive effect on sales. Body Shop capitalised on its position as the one ethical 'Light' in the corporate business darkness and the public swallowed that idea hook line and sinker. However Body Shop has paid the price with regard to its untrue statements about animal testing and the 'Trade not Aid' campaign. The Body Shop has been an excellent and instructive case study for the fashion industry to follow. On the one hand it has attracted a particularly loyal customer and on the other the company has created a market increasing its share phenomenally by appearing to follow a strict idealistic philosophy. Body shop was also the first to have an ethical sourcing department, which C&A have mirrored late in 1996 after the Oxfam challenge to the big five retailers33.

Body Shop has also illustrated that businesses, which take the moral high ground, are constantly under a level of public and media scrutiny, which few businesses would relish. American business consultant Professor Kirk Hanson from Stanford University, in an independent assessment of Body Shop Company ethics reported,

"A company which makes socially responsible claims a key element in its marketing will be scrutinised to a much greater extent and will be held to a higher standard than a company which does not. The company must demonstrate extraordinary transparency and a willingness to hear and act on criticism of any dimension of its behaviour". 34

CASE STUDY 2: ESPRIT

Where as the Body Shop was first to promote itself as animal and Eco-friendly in the beauty products area, it was the Ecollection from Esprit in Spring 1991 which was the first fashion answer (fig 12). Thorston Bruxmier, Esprit's Eco manager said, "the main goal with Ecollection was to produce garments which were as environmentally sound as possible". 35 The range gave a focus for research and development into damage limitation in production and consisted of a 940 garment, womenswear range using organically grown cotton, unbleached and undyed. Fortunately this fell into a major fashion trend at the time where a natural and white statement was also a fashion statement.

34 Cowe, R. Is beauty more than skin deep? Guardian Finance, January 20th 1996, p 40.
Esprit began to ride the crest of the Eco wave. From the small numbers of pieces involved at the outset grew a business of hundreds of thousands of pieces.

Esprit initially used a small cotton producer in 1992 for the first collections. However the successes of the line and massive consumer demands forced Esprit to trawl for new growers in Egypt, Greece, India and Africa, establishing ‘partnership’ farms. However it could be argued that prime agricultural land should not be used in these countries, simply to grow a fashion fibre and that the land could be put to better use e.g. growing food. In 1995 Esprit had a stockpile of 700 metric tons of spun organic cotton grown mainly in developing countries, which enabled them to absorb the Ecollection into their main range of 50 million pieces.

Production has affected the company philosophy, so much so, that 100% of the main range collection was Eco sound. It is interesting to note that Esprit really has tried to wrestle with environmental damage limitation since 1992. Then there was little marketing to trumpet the Eco range, and in 1995 when the Ecollection became part of the main range, no significant marketing took place.

Fig 12  Ecollection from Esprit in Spring 1991

1991

Esprit dedicates an in-house design and research team to work on more environmentally and socially responsible ways of manufacturing apparel. The team’s accomplishments and continuing work materialize as the “Ecollection.”

CASE STUDY 3: MARKS AND SPENCER

"at the end of the day, the price of perfection is bankruptcy"

The UK’s largest quality retailer, Marks and Spencer, was the first to appoint an Environmental Manager in 1992, even though the business believed that their customer was ‘passively’ as opposed to ‘actively’ interested in ‘Green’ issues. The Environmental Manager’s role was to pre-empt any incident, which may have affected public confidence in the business. Initially the job focused on satisfying new legislation from Europe about packaging. Damage limitation was the order of the day with an eye firmly focused on the profit margin. This was achieved by working with the whole supply chain bringing knowledge and financial support when necessary to resolve any problems, which could backfire on M&S in negative publicity. At that time it was easier to supervise the supply chain, because 80% of M&S clothing was manufactured in the UK. At present the figure is 50:50, which represents £2 billion of annual imports. In future 70% of goods will come from Overseas.

“Mr J Rowe, Director of Clothing at M&S said, “to retain our market lead and compete with the worlds best retailers we have to offer outstanding quality combined with lower prices.”

At a time when other retailers were jumping on the ‘Green’ bandwagon often with bogus claims about ecological products, Marks and Spencer tried through good business practice to incorporate environmental issues into the housekeeping of the business. This strategy avoided the situation highlighted by Kirk Hanson, when the Body Shop successfully marketed itself on a whiter than white ticket, with the result that the company suffered under the microscope. A business as large as M&S would not and, has not subsequently stood such close scrutiny. For instance, in 1996, a Granada television documentary investigated an M&S supply route, from Morocco, via the Northern Irish clothing company Desmonds of garments destined for M&S stores. The factory was grade A listed (factories are listed A-E) and had a manufacturing contract for over 1,000,000 garments, but labour laws were being flouted. Children and young teenagers were working 10 hours a day and ½ a day Saturday, without overtime, for £11.54 a week. There was a public outcry after the documentary, not least because during this period the annual profit for M&S was £6,023,000,000.

However Marks and Spencer did try an Eco clothing range in 1993 which failed, perhaps because it was more expensive and did not look any different from the main range. This was also the fate of the organic food range, which was a disaster when first launched in 1994 (but is now a growing success). Once bitten twice shy meant that Marks and Spencer were reluctant to take up an Eco

37 Author unknown. M&S to buy less from Britain. Wool Record, December 1999, p4
39 There is an organic food revolution at present with more farmers markets planned in London and an expansion of the two organic food chains, Planet Organic and Juniper Natural Foods. The UK business is
label and market it as such. Anticipating environmental legislation, which will affect M&S profitability in the UK affects the Marks and Spencer production strategy. Therefore high environmental and ethical standards are set for suppliers to thus earning M&S their reputation as the toughest retailer to work for.

Work goes on in the field and there is no doubt that marks and Spencer is out in front on environmental issues in the multiple sector, with the next biggest group only 1/3rd of its size. The other retailers lack the experience and resources that Marks and Spencer have with 250 garment technologists specifically aware of dyeing and finishing processes alone and once owned its own testing laboratories. 40

M&S have representatives on various boards and quangos, advising Government in the early stages, of legislation. Randall said “The company has an overview of the law around the world: from those countries where there is no law or it is 'cheerfully ignored' to those such as Germany which have strict ecological legislation. The company has to consider where M&S trades, in terms of buying or selling, and where it wants to trade. For instance, it is uneconomic to manufacture separately in a country, which has different specifications to the UK; it’s better to incorporate these standards across the board.”41

Such issues overlaid M&S’s code of practice on dyeing and finishing, which go out to suppliers periodically. There are two basic criteria, as there are with all its environmental initiatives. Firstly, M&S ask the question: What is reasonable in terms of customer requirement? What can be done to avoid skin allergies through specification on formaldehyde, for example? Then this is set against what the company considers could be done practically because “at the end of the day, the price of perfection is bankruptcy”.

As far back as 1996, Randall acknowledged that a fundamental change in public attitudes had already taken place. 42 He saw a more questioning approach to institutions such as M&S where customers generally expect M&S to do the right thing and the underlying faith in the company is still solid, it was not the unquestioning faith it used to be; people today think for themselves.

“We live in a different world. More people challenge us today and we have to be ready to meet that challenge. So whereas 15 years ago the allegations made in last month’s World in worth £540 million with a 40% annual increase, most organic food is imported into the UK. Blomfield, R. Organic food revolution. Time Out, October 27 1999, p. 12.


42 ibid
Action programme would probably have been met with silence from M&S, the response in today's climate was to issue a writ. And as M&S's customers have been until recently the most loyal on the high street the company needs to double its efforts to be ahead of any negative publicity. After the Marks and Spencer expose by World in Action on unethical working practices in Morocco, there was a glut of newspaper articles about clothing suppliers and an deluge of returned scorecards combined with a brief drop in share prices. The loyal M&S customers voted with their feet and moved elsewhere, a situation, which has been accelerating ever since.

CASE STUDY 4: OUT OF THIS WORLD

"We have no choice about being consumers but we can make practical, ethical choices about where we shop and what we buy; we can become part of the solution instead of adding to the problem". This statement forms part of the 1996 advertising campaign for a new concept in British shopping. Out of this World (fig 13) opened its first shop at Christmas 1995 targeting customers with a social and environmental conscience. Today there are three shops in Newcastle, Nottingham and Cheltenham, selling fairly traded and organic produce, responsibly grown food, household goods and clothing.

Their intention is to appeal to the socially responsive consumer (donate £5 and you get 5 shares and you have a say in the business you are part of). The concept is the brainchild of Richard Adams, ex Christian Aid, Traidcraft and New Consumer Magazine. The shops may or may not succeed but what is notable is that Adams feels ready to pursue a venture like this in the British high street. A profit making venture with an ethical mission.

Fig 13 A new concept in British shopping Out of this world

43 ibid.
44 Out of This World, The Creative Consumer Co-Operative Ltd., Promotional Literature Summer 1996.
Conclusion

Over the decades, the media has been a major force raising awareness of ecological issues, although often enough for the wrong reasons. Scaremongering has been an effective way of winning audiences as prophecies of doom make gripping headlines. However, the irresponsible presentation of environmental issues seen in the 1980s seems to have run its course. Newspapers and television are now more likely to attempt a balanced and logical story because to do otherwise is to risk losing credibility. Similarly, the so-called 'Green Con' used by manufacturers to sell products with false or exaggerated claims shows signs of becoming thoroughly discredited and will probably die out even before the official and scientifically based environmental labelling schemes presently proposed come into widespread use.

The cumulative effect of negative environmental press in relation to corporations has resulted in Western businesses coming under the spotlight in relation to the media and pressure groups such as Greenpeace, Friends of the Earth and Oxfam. They are being called to account for not only their own operations but also for those connected further down the line, in other countries. The environment has been somewhat "on the back-burner" while the public has been more concerned with mortgages and job security, and the recession. When the boom times return ecological matters may move back into public consciousness, although attitudes will be less radical.

However, business has had to come to terms with demands for better corporate governance, improved environmental performance and a recognition of other stakeholder groups besides its shareholders. It would seem that Body Shop and Esprit seem to embrace the notion of the stakeholder, the new concept of the 1990s and Marks and Spencer still holds the shareholder philosophy of the 1980s. In effect, we are all stakeholders, employees, suppliers, customers, citizens. Your success is my success, your failure my failure. The business 'buzzword' is partnership and an acknowledgement that partners are dependent upon each other in a local and global sense, but that ultimately there must be producer responsibility.

The food retailer Waitrose has information at the check out desk flagging up the fact that food retailers are responsible for annually giving away enough plastic bags to cover the city of London with 600 layers (fig14). Waitrose alone gave away enough carrier bags to circle the world 2.5 times, the equivalent in oil to power 57,000 car journeys between London and Glasgow. Producer responsibility in this case, is trying to encourage customers to re-use a better quality bag, making less waste for landfill and acknowledging their part in the depletion of a finite resource.
Conclusion

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However business has had to come to terms with demands for better corporate governance, improved environmental performance and a recognition of other stakeholder groups besides its shareholders implementing global sourcing policies such as SA8000 to kerb exploitation of workers.

It would seem that Body Shop and Esprit seem to embrace the notion of the stakeholder, the new concept of the 1990s and Marks and Spencer still holds the shareholder philosophy of the 1980s. In effect we are all stakeholders, employees, suppliers, customers, citizens. Your success is my success, your failure my failure. The business ‘buzzword’ is partnership and an acknowledgement that partners are dependent upon each other in a local and global sense, but that ultimately there must be producer responsibility where by the grower, manufacturer and/or retailer no longer adopts a ‘profit at any price’ philosophy.

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Help Save Waste

Free carrier bags are a wasteful way of carrying shopping home.

Each year British food retailers give away enough carriers to cover the City of London with over 600 layers of bags.
Waitrose gave away over 150 million carrier bags last year. That is enough bags to stretch around the World 2\(\frac{1}{2}\) times.
Production of these bags uses the same amount of oil as 57,000 cars driving from London to Glasgow.

Nearly all free carriers end up in landfill tips.

How can you help?

You can help by using and reusing the Bag for Life. The Bag for Life should last for at least 10 trips which saves 20 free carriers. The bags are then recycled.

We make an initial charge of 10p for the Bag for Life to encourage reuse, but when the first bag is worn out we will replace it free.

So please:
Buy the Bag for Life
Remember to bring them with you each time you shop
Encourage others to do the same!

Thank you

WAITROSE
food shops of the John Lewis Partnership
WOOL FROM THE CRADLE

CHAPTER 2
WOOL FROM THE CRADLE

CHAPTER 2

Introduction

This chapter begins with a brief outline of the historical, geographical, and commercial beginnings of the wool fibre industry followed by a discussion about the business in the present day. I have focussed on the farming, scouring, dying and finishing of the fibre, highlighting the ecological problems associated with the processes, mentioning other substrates to contextualize the problems of wool where appropriate. I will try to show that the consumer and retailer’s perception of wool as a natural, environmentally friendly fibre, better and more wholesome than man-made products, is a misconception. In this chapter I will not discuss garment production, or post consumer issues.

I have included primary research material from conferences. I have referred to a variety of wool specific literature, trade journals, International Wool Secretariat literature (now known as the Woolmark Company but throughout this thesis it will continue to be referred to as the IWS), Department of Trade and Industry papers and other material, including archaeological textile sources.

2:1 ORIGINS OF THE WOOL INDUSTRY IN BRIEF

It is commonly acknowledged that sheep were the first animals to be domesticated by man, primarily for their milk, wool and hides. Early breeds were small and hairy with a soft short down next to the skin which moulted naturally in the spring producing long wool roveings perfect for spinning (fig 15).

Fig 15 Early sheep breed Fig 16 Jesus is the good shepherd

nothing like the thick-coated sheep of today. Evidence of sheep raising (in Greece) dates back to prehistoric times, with the first inhabitants leading settled lives as shepherds, not nomads. The
subject of wool is threaded through literature for example Homer and Aristotle mention sheep in their works, and a prominence in myth exists through Jason and the Golden Fleece and Penelope unravelling her knitting nightly to delay suitors until the return of Odysseus.

The Bible is scattered with references to wool and sheep, which have a high religious value as symbols of Christianity, i.e. Jesus is the good shepherd (fig 16) lambs are symbols of innocence and Archbishops carry shepherd's crooks (the Old Testament alone makes more than 300 references to wool). Interestingly, wool is mentioned in other contexts too, for instance in collecting water. 'And it was so: for he rose up early on the morrow, and thrust the fleece together and wringed the dew out of the fleece, a bowl full of water'. Jacob a master sheep breeder, gave his son Joseph his famous coat of many colours (probably multi-fleece shades with natural dyes). Evidence exists from excavated cities in Iran showing intricate elaborate 'seal' systems, indicating personal ownership of wool and sheep flocks, carbon dated at 4,200 BC.

It was from Central Asia that the original fine wool breeds were traded and transported, radially to different localities by the Phoenicians, and it is thought that the Carthaginians brought animals to Spain 1000 years BC. With the gradual introduction of other flocks via the Greeks and Romans, bloodlines fused creating what was to become known as the Spanish Merino, ancestor of the finest wool-bearing sheep of today. Subsequently, Spain became renowned for the excellence of its woollen cloth.

However, by the 10th century, England had begun to rival Spain in wool production by supplying many grades and varities of cloth from fleece of different microns or widths and geographical origins, and by the 13th century Britain was the greatest wool producing country of the world. Even so, British wool fibre remained coarse in comparison to that of Spain and Italy and by the 16th Century British wool was loosing its export markets. Consequently wool production exceeded demand and a century later under Charles 11, the English authorities in desperation had created legislation to force domestic consumption of wool, e.g. demanding that all corpses be buried in woollen shrouds. However legislation was insufficient and it was soon clear markets could not be regained. British

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4 Between 1400 and 1700 AD, Spain developed the Merino breed, which was so valuable that; it was an offence punishable by death to take a live animal out of the kingdom. However by the 18th century enough stock had been smuggled out of Spain to set the foundation of the great woollen flocks of the world.
English authorities under Charles II, in desperation created legislation to force domestic consumption of wool, e.g. demanding that all corpses be buried in woollen shrouds. However legislation was insufficient and it was soon clear markets could not be regained. British fleece was not adaptable enough for the developing technology of the Industrial Revolution and the subsequent public demand at home and abroad for more sophisticated cloth.

In a failed attempt to add quality to the flocks Merino sheep were introduced to Britain in 1791 but because of the colder, wetter climate, the fine quality of the fleece could not be maintained (fibre width or micron thickens in cold wet conditions). Existing British breeds were not producing suitable fleece for cloth and even if the Merino had been successful in the UK, it was never the less unsuitable for meat. (In the 1800's in Britain, with the rise in population came an increased demand for mutton so a crossbreed was developed to suit both purposes, yarn and meat). Through cross breeding, indigenous Lincoln (fig 17)
and Leicester breeds with Merino, a quality fibre staple length of 4 to 6 inches, as opposed to 1 to 3 inches, suitable for worsted cloth was produced with high quality long fibres to suit various end uses resulting in a half-blood animal with a mutton carcass. The early 1800s saw the first tailor made animals in Britain for the food and textile industry, which are the forerunners of today's modern breeds.

Hardy crossbreed sheep for meat not wool arrived in Australia in 1750 from the Cape, whereupon the fleece immediately improved in the warm climate. In 1788 the first Spanish Merino sheep arrived which were crossbred to produce the Australian Merino, known throughout the world today for its superb quality fibre yielding 6-10 kilos of wool instead of 2-3 kilos from its Soay cousin (fig 18).

Fig 18  Australian Merino ram

Quickly the great Australian flocks developed and by 1890 there were 100 million sheep in Australia compared with 190 million today.

This was a cash crop which needed little farm labour to tend it and the raw material; fleece could stand the long sea voyages from the Southern Hemisphere to the markets in England and Europe. The vessels used convicts and settlers amongst other things as ballast for the return journey.

Discovery of gold in 1851 changed the pastoral system irreversibly. Until that time one shepherd tended between 400 to 1000 sheep, but the gold-rush led to flocks being unattended whereupon, surprisingly they did well without supervision. With the increased freedom the animals and their fleece improved. Anon, *The History of The Wool Industry No 2*. IWS Melbourne. September 1994.

K.G. Pointing in his book *The Wool Trade Past and Present* said “Because of the Merino, Australia, in less than one hundred years passed from being a disposal ground for English convicts, to one of the most important members of the British Commonwealth.”
During the middle ages, along with Britain, Florence and Venice became centres of woollen textile excellence and one of the earliest visual records depicting the Madonna hand knitting was painted in that period (fig 19).

Fig 19  The Buxtehude Madonna by Bettram 1390-1400

Today Italy is still producing some of the world’s most exquisite and innovative fabrics both knitted and woven from virgin and reprocessed wool particularly in the Prato region.7 (Florence is a key destination on the international exhibition circuit for seasonal yarn and fashion shows e.g. Pit Uomo and Pitti Filati).

For centuries production of a woollen thread in its most simple form has remained the same. Wool is collected from sheep, which were originally plucked or fibres simply fell in heavy clumps and cords in the spring moult,8 combed into line, drawn onto a weighted spindle (fig20), and rotated to produce a thread of varying thickness. The simple thread could then be hand knitted on two bones or sticks.

7 Balestri, A. Georgetti, G. Prato Moda Operandi, Unione Industriale Pratese 1994
8 The wild Soay sheep living in a feral state on the uninhabited island of St Kilda in the Scottish Hebrides, are unchanged since prehistoric times.
Fig 20  Weighted spindle

Surprisingly these ancient and basic methods of yarn and fabric production are still practised in some textile producing areas today such as China and India. In the Middle Ages the knitters, who were often men, worked in groups in their own homes or in the sheds of their customers. During the 15-century woollen-finishing techniques began to develop creating a more technical fabric. The fuller devised felting and shrinking recipes, he then became the dyer and enabled customer's specific requirements to be met. Specialisation of the craft resulted in separation of the woollen production chain. In the 16th Century, long before the Industrial Revolution cloth

India for example, has an industry with modern sophisticated textile skills and technology, right through to hand spinners and hand flat knitters at cottage level. The Indian organised sector has worsted and woollen spinning mills, combing units and mechanised knitwear manufacturing. On the other hand the decentralised sector comprises mostly of small hosiery units, hand knit and hand flat knitwear, competing with, handmade carpets, small printers, dyers and finishers. Grupta, S. Printing and Dyeing of Wool in The Indian Textile Journal, April 1991.
manufacture was almost mechanised in Britain and Europe (fig 21).

Fig 21 early mechanised cloth manufacture
Wool idioms have been part of British culture from Elizabethan times. They have even been the focus of nursery rhymes such as 'little boy blue, little bo peep and ba ba black sheep.'

Fig 22 'Little Bo Peep has lost her sheep'

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Little Boy-Blue',

Fig 23 'Ba Ba Black Sheep, have you any wool?'

and 'Mary had a little lamb, it's fleece was white as snow'.

It was about this time in 1589 that a mechanical, hand cranked stocking machine was invented by the Reverend William Lee which produced 600 knitted stitches per minute in contrast to the 100 stitches per minute of the knitter with needles (fig 24).¹¹

¹¹ This machine design is still used in factories today for small sampling purposes i.e. British Crepe supplier and spinner to M&S.
This invention was the first of many British industrial mechanical developments for the textile industry such as those of Daniel Bourne, Richard Arkwright and James Hargreaves. By the late 1700s, early 1800s the industrialisation of woollen fabric production in the UK was complete and so successful that the industry was able to supply the home and European market and 85% of the wool imports into the USA.  

WOOL IN THE 21ST CENTURY

The large wool growing regions of the world, which were established early in the 19th century still remain. Most of the world’s sheep are kept on large ranches on land suitable for grazing i.e. in Australia, New Zealand, South Africa, South America and parts of the USA. (European sheep are kept on farms, which have diversified and are far fewer in number). The world’s major woolgrowers joined forces in 1939 forming what was to become known world-wide as the International Wool Secretariat (IWS). The three original players the Australian, New Zealand and South African Parliaments, introduced a levy based on the amount of wool sold by each nation. This levy provided revenue to finance and promote the end use and usefulness of wool. The IWS was then funded by the

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woolgrowers in Australia, South Africa and Uruguay and was set-up as a non-profit making organisation, sponsoring research into wool and associated technology, awarding grants and Fellowships to institutions and in addition promoting wool by advertising, publicity and education. The organisation (now known as the Woolmark Company and now solely funded by Australia) still has offices and representatives all over the world, in Australia, Austria, Germany, Belgium, Canada, Greater China, France, India, Italy, Japan, Korea, Mauritius, Netherlands, Portugal and Spain, Sweden, Taiwan, Turkey, UK and the USA. The international network of branches was supported by what was a state of the art Development Centre at Ilkley in Yorkshire and Wool House in London, UK. The department covered wool processes and products and developed technical services for industry and environmental technology. (During the late 1980's the UK was the largest consumer of wool in the world consuming 8,000,000 kg per annum, the combined volume of Germany and Japan).

This operation closed down in 1997, retaining a London design, marketing and trend-forecasting studio. The Ilkley and London divisions of the IWS were the biggest single partner to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) division of wool technology, with an essential objective to increase the demand for Australian wool world-wide. (The Australian wool industry is worth $2.8 billion, and supplies one third of the world's raw wool and half of the world's Merino quality). Globally the IWS is powerful and influential due to an international network of growers and contacts with the world's manufacturers and retailers. It is instrumental in controlling world wool prices and its intelligence is sensitive to customer demands and trends.

Raw wool is traded on the International markets like any other commodity, i.e. oil or gold. Similar to oil or gold, its failure as a commodity can de-stabilise the economies of the countries that grow and/or manufacture it, and because of the global factory, the ripple effect is far-reaching. Wool prices have been on a downward spiral for some years since the removal of the Australian government's price guarantee scheme in 1991 due to poor demand world-wide, for a variety of reasons. For example, the withdrawal of China from the international marketplace accounted for the loss of 21% or 700 million kilos of wool exports in 1994/95, from Australia's total production of $4.2 billion. This was because China battened down the hatches on imports from the West when world pressure came to bear on its exports of clothing, after the Tienamen Square massacre. Also, demand from Europe and

In Australia growers held back their wool stocks whilst prices were low hoping for the market to improve which it never did. Then, Australia had a huge national stockpile of four million bales of wool.\textsuperscript{16}

Even though the wool industry lacked confidence, the intensive growing of wool continued, despite the fact that the crop was expensive to harvest and world prices were falling. However, the flocks are now being reduced in line with demand as sheep farmers diversify into grain and cotton growing which now has a value of almost half that of wool which has annual exports of $1.7 billion.\textsuperscript{17} The delicate Australian ecosystem has suffered tremendously due to the overgrazing of sheep and deforestation (fig 25) and now serious problems are arising because of the farming of cotton and the increasing in salinity of the soil.

\textbf{Fig 25 desert caused by over grazing}

\textsuperscript{16} ibid
\textsuperscript{17} CSIRO Home Page. Cottoning On. \url{http://www.csiro.au/promos/billiondind/contents/spinning.htm} 11/02/99
A massive investment programme is under way supporting major areas of scientific research into wool technology to keep sales alive and keep the product ahead of its competitors. A key feature of the research and development implementation programme is the involvement of research partners to broaden the expertise base, minimise duplication of effort and maximise the effectiveness of available funds.

Most IWS grower funded wool research and development is now carried out by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australian government departments of Agriculture and universities. This is done by conducting targeted basic and applied wool-specific research, such as reducing pollution during wool scouring, eliminating loss of performance in tops (long lengths of parallel fibres) because of poor transportation, developing sensors to remove plastic and vegetable matter from ecru yarns and further developing laser technology to measure wool fibre diameter. These results are then transferred to the industry, monitoring the impact of the technology throughout their lifetime. The aim of this and associated research is also to anticipate legislation on environmental grounds i.e. in dyeing and finishing, and to fine tune the growing methods and wool production.

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18 CSIRO has 7000 employees, 3000 of who are scientists and the division of wool technology is one of 22 divisions.
2:2 WOOL PRODUCTION

WOOL THE FIBRE

Sheep fleece is a combination of tough hair and soft, dense under fur to insulate against low temperatures, wind and water or to protect against the direct burning and heating effect of the sun's rays.

Wool is an extremely complex protein (fig 26) which is so resilient and elastic that it can be bent 30,000 times without danger of breaking or damage. Each fibre has a natural wave or crimp giving a natural elasticity, enabling it to stretch by one third and spring back. Its complex cellular tiled structure enables it to absorb moisture vapour to the core but repel liquid from its scaly surface. Wool is difficult to ignite, burns slowly and is easily extinguished giving a characteristic warning smell and fragile ash.

Wool is a most versatile, durable fibre, which can be spun to super fine and macro counts on wool and worsted systems. It can be knitted, woven and felted into superior qualities. It dyes easily and can be blended and twisted with other natural and man-made fibres (which are incredibly simple in
many would say that the potential of wool in relation to R&D technology has not even begun to be realised.

GROWING

The consumer is familiar with Wool advertising, which often feature fat sheep and lambs, in green rolling meadows or rugged grassy foothills, utopian conditions for sheep husbandry (fig 27).
Wool is marketed as the perfect, organic, wholesome fibre to make user friendly, natural cloth (fig 28).

The reality is somewhat different.
To keep the animals well, large amounts of vaccines and pesticides are applied to sheep to prevent illness and infestation by parasitic mites and ticks. Without such treatment, these highly bred, low resistant animals die. Some illnesses and their causes are listed as an example:  

- pregnancy Toxaemia - associated with underfeeding, close proximity or environmental changes
- abortion - from the Zeprio organism common in ranges of flocks resulting in heavy losses from year to year
- lamb dysentery - caused by unsanitary conditions at lambing time
- tetanus - caused by infection of the navel cord, castrating wound (fig 29) and once-over douching (now outlawed)
- mastitis or blue-bag - can be fatal affecting ewes with suckling lambs
- enteroxosemia - overeating disease tends to attack the larger most rapidly growing lambs
- ecelhieyma-soremouth
- foot rot
- blue tongue - coided fly
- scrapie - fatal. Affected and exposed animals are slaughtered, long incubation periods, two year's, difficult to detect

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• foot and mouth disease
• anthrax - fatal to sheep, but very dangerous to the wool handlers also, used to be known as the "wool handlers disease". The sheep develop weak legs and breathing difficulties, they fall to the ground can be dead in minutes.

Fig 29 castrating sheep by mouth

Historically, organochlorine pesticides (OCs) were used internationally for their cheapness and effectiveness. Enlightened wool growing countries banned their use, however lindane and toxaphen continued to be used. Even in countries where these chemicals were outlawed traces show in data. The main classes of pesticides in the 1990s used on sheep are the organophosphates (OPs) and synthetic pyrethroids (SPs). Organophosphate compound was first synthesised in 1854, it was during the 1930s that its potential as a powerful chemical nerve gas was realised and later OPs formed the
basis of the West's second generation of nerve gases, the V agents, after the Second World War.\textsuperscript{21} Both these classes are an improvement on the OCs in relation to mammalian (sheep and human) toxicity but even small doses of OPs can cause irrevocable damage to the central and peripheral nervous systems. These pesticides have down stream consequences and research work is in progress aiming to reduce the amount of pesticides in wool at the time of shearing, and on the occupational hazards of handling pesticide contaminated raw wool on the farm and in the early processing stages.

**SHEARING**

The ultimate solution to prevent exposure of the shearers to pesticides is to develop the self-shearing sheep (fig 30). A Russian worker before the Second World War found that the administration of thallium to sheep would cause hair loss. Later in 1968 it was discovered that an anti-cancer drug used to stop cell division would stop hair growth in sheep also.\textsuperscript{22}

**Fig 30 the self shearing sheep shorn by cyclophosphamide**

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{shear.png}
\caption{The self shearing sheep shorn by cyclophosphamide}
\end{figure}


\textsuperscript{22} A constriction is caused in the wool fibre which moves up the follicle as the fibre grows so that about one week later it is level with the skins surface. At this point the wool breaks, so that the fleece can easily be pulled away. Since no machinery or skill is required it was claimed that the drug would cut out the costly process of sheep shearing which costs about $1 per sheep. Ryder, L.M. The Production and Properties of Wool and Other Animal Fibres in Textile Progress. Vol7 No3 1975, p.8.
Almost thirty years later the science is still being perfected as described at the ETN conference in 1995.

"Sheep, goats. A host of developments in sheep and goat genetics are being carried out to produce more efficient feeding methods, greater insect and pest resistance, softer and finer fibres and even a technique for biological wool harvesting. Injection of a special protein temporarily interrupts the growth of hair and after four to six weeks a natural break appears at the base of the fibre.

**Fig 31 drawing of the treated hair follicle**

The fleece can then be peeled off the sheep, allowing an increase in daily shearing output from 120 to 300 fleeces per team. The technology is already proven but has thrown up some unforeseen problems; the removal of wool is so effective that the sheep become susceptible to sunburn; some concern also exists over levels of abortions in ewes. Finally, Australian sheep
shearers have already had their first strike in protest at the employment implications of the new methods" (fig 31).

This type of technology is even more amazing when you consider that since 1909, the only change in sheep shearing methods has been the introduction of power to shearers.

Fig 32 notes and drawings from the sheep-shearing manual ‘Golden Hoof’

- 1. Shear on a large smooth floor or platform to keep wool clean.
- 2. Never shear when wool is damp or wet.

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• 3. Hold sheep off feed overnight. If they are running on wet pasture hold them in the barn on dry feed the day before.
• 4. Take belly-wool off separately.
• 5. Shear in such a manner that the fleece is unbroken and all parts in their natural position, one half on each side of the wool that grows along the backbone.
• 6. Remove all tags, dung and heavy sweat locks and pack separately.
• 7. Tie each fleece with paper twine and pack into a sack.
• 8. Pack sweepings and crutchings separately.
• 9. Pack all black wool separately from white wool.

It is a sobering thought that wool could be harvested chemically - tripling the productivity with far fewer workers. The development of peeling sheep by hand, altering the structure of the growing fleece has ethical ramifications. This technology will enable specific flocks to be 'peeled' at the convenience of the farmer/wool buyer rather than wait for the periods when traditionally the sheep are sheared (modern breeds do not have a moultng period as sheep hair grows continuously). This method will also result in an even spread of shearing work, rather than the usual seasonal congestion and shortage of skilled workers.

WOOL SCOURING
The processing of natural fibres and in this case wool, cause great ecological concern and is insufficiently documented. For instance, after the shearing stage, processing takes place and it is at this point that pollutants within the fibre are removed leaving the problem of effluent and its disposal.

24 When they (pesticides) are applied to sheep, they become strongly associated with the wool grease, which means they are almost totally removed from the fibre, along with the grease, during the scouring process. From the wool product viewpoint, this is good, because it means there can be no reasonable suspicion that the very small pesticide concentration remaining in wool textiles could possibly be harmful to consumers. However, it does bring problems for the scourer, who can be harmed at the processing stage coming into direct contact with the new wool, causing severe dermatitis and other skin complaints.24 Wool grease is a valuable by-product of the scouring process and it is normally recovered for sale. Centrifugal recovery is the most commonly used method, but is capable of extracting only about 40% of the total grease present in scour liquors. Acid cracking can recover about 90% but produces poorer quality grease, and is not widely used. All this means that, there may be problems in discharging scouring effluent to municipal sewers, which is the only choice in

24 op cit. p. 7
some countries (notably the UK) and the grease may be an unsuitable raw material for the preparation of cosmetic or pharmaceutical grade lanolin. Although lanolin refiners have developed and introduced techniques for reducing total pesticide levels to 1 part per million or less; improvements are still required to meet German specifications for baby-care products. The effect of pollutants from processing discharges has had low key attention so far, although it would be just a matter of time before tough measures could be forced the industry. 26

Sheep fleece accumulate much vegetable matter in the course of feeding which must be removed from the wool before processing into yarns because severe rejection problems can occur during wool spinning and dyeing if residue from burrs, seeds, twigs, leaves and straw are left in the fibre after scouring. There are three main methods of removing this debris; mechanical methods; chemical methods and biological methods.

The most popular method world-wide is the chemical method - also known as wool carbonising. The fleece is treated with diluted sulphuric acid and then heated at a high temperature. The organic residue, which has been baked, can be broken and beaten out of the wool because the acid affects the vegetable matter, which is cellulosic and has a less detrimental effect on the wool, which is protein-based.


26 Code of Practice on Dyeing and Finishing *Marks & Spencer* September 1996.
The classical carbonising process consists of acidizing, moisture mechanical removal, drying and baking the vegetable matter, burr crushing, dedusting, neutralising and drying. Usually damage occurs to the fibre (fig 33) during the drying process and often leaves a sulphuric acid residue after the water has evaporated. There is also the problem of disposal of the sulphuric acid residue which has been emptied into waterways. This problem is being addressed with new techniques of wool carbonising in a radio frequency electromagnetic field, discussed at the University of Huddersfield’s ‘World Textile Congress on Natural and Natural-Polymer Fibres’ 9,10,11 July 1997 in a paper given by Dr I. Baltina and Dr I. Brakch.
CLEANING BY SOLVENT

Wooltech are the inventors and sole patentees of a pioneering wool cleaning and processing system that is set to revolutionise the wool industry worldwide.

In 1998, Wooltech Ltd., pioneered a wool cleaning system using an ICI Solvent which was the brainchild of Doctor Peter Hopkins, an Australian Scientist at CSIRO. Raw wool contains approximately 13% grease of which 50% is recovered in a water-based emulsion. This emulsion and its associated insecticides, detergents and alkalis are discharged into the sewerage system along with the other main contaminants, dirt. The sludge, which remains after drying creates waste disposal and stench problems.

27 Cleaning by Solvent, Wooltech in Textile Horizons, December/January 1997, p. 34.
Water scours demand large amounts of fresh water, roughly 10 litres a kilo of wool (hence these industries have predominated in the Northern Hemisphere where water is plentiful). The significance of solvent cleaning at the start of pipe is that wool processing can be carried out in dry/desert regions at the growing and manufacturing bases e.g. Australia and India etc. Solvent cleaning is gentler on the fibre causing less entanglement and stretching, resulting in a higher quality fibre with longer (unbroken) staple, which can be spun to previously impossible fine counts. This new solvent cleaning system ‘Wooltech’ (fig34) has been in development since 1989 with a non-polluting brief in mind. Outputs of the new system are raw wool grease, which is recovered to the extent of 99%, dry powdered dirt and cleaned wool. The new system has produced a wool product of superior quality, which is cost effective and environmentally friendly, eliminating the effluent associated with water scours.

"In developing the process, Wooltech screened a vast range of organic agents and it soon became apparent that a simple chemical engineering process was the major objective. The process needed to be able to dissolve wool grease using standard distillation technology and simultaneously, leaving the dirt undisolved in the cleaning medium to allow for filtration and simple drying. An ICI solvent Triwool, was finally selected as the cleaning agent. It is non-flammable, does not deplete ozone nor produce greenhouse gases and is not a known carcinogenic. More importantly, the solvent enhances the strength and elasticity of wool fibre producing a softer handle that is apparent at all down stream processing". 28

The theory is also that wool yarns will be produced at a much lower cost than can presently be achieved. Wool fibres need chemicals such as caustic soda, hydrogen peroxide and stabilisers to clean them. This liquor is then allowed to seep into the land, or in the UK, discharged into the waste water system. Large users of wool for clothing are very aware of the environmental problems surrounding wool processing and Marks and Spencer continue to issue environmental guidelines to their supply chain.

CARDING
After scouring and carbonising to remove the vegetable matter, burrs etc, the wool fleece is carded, which traditionally involves passing the fibres between sets of rollers which produces a mixed veil or web of wool. This web is then rolled or rubbed into strips to form a slubbing, which is wound on to condenser bobbins ready for spinning.

SPINNING
When the slubbing or roving has been made it is drawn and the clean sliver of wool top of

28 ibid.
which the micron (or measured width of each individual hair) is the most important characteristic affecting handle and price, is drawn into a specific thickness of yarn.

**DYEING**

The wool dyeing process has numerous environmental problems due to visible and invisible pollution, which is usually caused by water-soluble dyes, pesticides and chemicals used to process wool. These give at least coloured effluent at the end of the process, but can kill bacteria and fish and cause skin complaints when released into the local drainage or waterways system or worn next to the skin. When it comes to dye stuffs, there are 36 dermatological and toxicological tests across products and components used by clothing retailers. At Marks and Spencer, the dyes must preferably be supplied through the Ecological, Toxicological Association of Dyes and Organic Pigments Manufacturers (ETAD) to which many major dye stuff manufacturers belong.

On the dermatological front, it is well known that over the years certain dyestuffs have been associated with some skin complaints and there is enough medical support to say that this is definitely the case.

“There have been an increasing number of incidents due to skin irritation. Numbers are small but nevertheless they are increasing. Gone are the days when we (M&S) could reply to a customer’s complaints with a high degree of confidence saying that we have found no substance in the product or processing that would cause the irritation. Gone are the days where the local store manager would contact the woman, invite her in for tea and give her a compensation gift voucher. Today people want much more searching questions answered and we see a trend where people are expecting more and more compensation”. 29

There are hundreds of dye manufacturers in the world and in the Indian continent, there are about 200 companies producing no more than 10 tons each per year. However, most are producing dyestuffs based on Benzadrine chemistry, which is a well-known carcinogen, the production of which was banned in 1968. Even though production and manufacture may have been banned, the importation and use of these dyes in products has not. Also Azo dyes have been excluded from use in the production of merchandise for Marks and Spencers, since July 1994, but can be used for other retailers. 7% of all dyes in the world are based on Azo, many of which are carcinogenic.

Ideally wastewater should be treated or recycled before entering the system. Each developed country has its own pollution standards for controlling coloured waste and a sliding scale of penalty charges if the standards are not met. These penalties in the UK are severe, particularly since the water industry was privatised. Considerable R&D has taken place in effluent disposal since privatisation e.g. in 1996
Courtaulds dye house installed an effluent processing plant which reused its own water. The investment paid back is a very short time when it is considered that:

"The costs of removing colour from the dye house wastewater are often prohibitive. It has been estimated that the cost is around £2,300 per cubic metre in UK and on average each finishing company uses 500 cubic metres daily." 30

In response to environmental legislation in the 1990s, other technologies have been rapidly developed such as reed bed systems to recycle polluted water as an alternative to effluent dumping into waterways and save on the rising costs of using pure water. 31

Additional polluters are biocides, which are used to prevent bacteria forming on the yarn when it is spun and dyed or vice versa (these substances are similar to PCPs on cotton) which in finishing are released and contaminate waterways.

"Years ago we banned the use of PCPs and their derivatives (biocides) which are not acceptable in any circumstance. There doesn't seem to be an advantage in importing into this country other people's problems. You can eliminate the problem at source by saying 'I do not want PCPs in my product.

In the NW of England fabrics and yarns have been used from abroad and PCPs have been found in effluent discharges. Levels currently stand at 20 parts per billion for PCPs. That is the equivalent of 1 second in 19 months. So why risk your own business through prosecution by the NW Rivers Authority?

As far as the fabrics are concerned 99.9% of all our fabrics are peroxide bleached. I have to say we still unfortunately use chlorine, as it is part of our shrink resist process. But as we are the largest retailers of wool in the world we have to get it right. So we are looking for alternatives to peroxide bleaching and chlorine." 32

Market led developments are on the increase, specifically designed with an environmental advantage and ultimately cost reduction such as the long-term collaboration of the IWS with CSIRO to develop non-chlorine-based shrink proofing processes. New technologies such as Sirolan-LTD and Basolan AS involve new wool dyeing processes, which were developed by the IWS and CSIRO from original research by CSIRO. Sirolan-LTD was designed for low temperature and limited time dyeing therefore

31 Reed Bed Systems for the treatment of Industrial wastewater's and sludge's. ECO Technologies International promotional literature, Wales, UK 1997.
saving on energy and production costs. It made possible high quality solid dyeing with right-first-time reproducibility, suitable for dyeing wool in the form of loose fibre, top, yarn, hank, package or piece. Excellent results proved that a major breakthrough had taken place, improving the effectiveness of fabric piece dyeing, resulting in new market opportunities for innovative wool fabrics.

Basolan AS uses anti-setting technology to halt wool fibre damages during dyeing, inhibiting permanent change to the shape of the wool fibre though an anti-setting dye bath additive. The giant chemicals company BASF is marketing Basolan AS, (trials took place in some 30 wool textile mills around world) and it is now used commercially in Europe, Japan, Taiwan and Korea. A significant consumer benefit is that it also helps wool garments retain their original shape by inhibiting the seam pucker, which can occur when tailored wool garments are exposed to extreme changes in humidity.

Fig 35 machine washable wool advert

Indeed, adding value for consumers is imperative for all wool development programmes in the future. The IWS works closely with manufactures, garment finishers, chemical suppliers and major retailers to ensure that consumer demands, in terms of end product performance such as machine washable wools are met (fig 35). For example, because consumers and in their wake retailers, are developing a tacit concern about the environment, the IWS is helping manufactures and retailers to develop alternative routes to the manufacture of wool products by modifying existing technologies but the business is still reactive. The ‘Right first time’ philosophy has made vast improvements and savings in energy and water, which improved effectiveness in the use of dyes.

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McKelvey stated that the UK dyers were world leaders now that they were using fewer chemicals, less water, less energy. Many of these suppliers are claiming 97-98% right first time, putting sweaters in one end and they come out exactly the correct colour time after time. Some are achieving 100% success rates at times.

If then the synthetic dyeing of wool causes physical and environmental damage, could the solution be to use natural dyestuffs? Natural dyes have been promoted by the Eco-textile industry in the past as an alternative. However, enormous amounts of dye materials are needed to dye comparatively small weights of natural fibres, unlike synthetic dyestuffs which have an 80-90% take up rate.

Glover and Pierce in their paper 'Are Natural Colourants Good for your Health?' discuss at some length the pros and cons of natural versus manmade in the textile dyeing industry paraphrased below.

For example:

- To dye 1kg cotton = 20gms of reactive dye.
- To dye 1kg cotton = 5/10 kilos of freshly picked leaves.
- To make 1kg of red natural dye = 150,000 dried cochineal insects.
- To make 1Kg of Tyrean purple natural dye = 8,571,428 rare Mediterranean molluscs, murex r. brandaris.

If we assume that the use of colorants derived from dead animals is not acceptable, then the only other resource of the 'natural' lobby would be to make dyes from vegetable sources. There is already some interest in this in the craft industries for wool dyeing.

Taking the annual production for wool per annum as 2 million tonnes and the average depth of shade applied using a synthetic dye is probably about 1.7%. then the total synthetic dye consumption would be approximately 34,000 tonnes. To match that synthetic dye depth of shade of 1.7%, but using a natural dyestuff, would require 120,240 g of dry dye plant or the equivalent of 500/1000 g of fresh dye plants. (This is because the vast majority of the fresh dye plant is in fact water.)

If we assume on average that 750 g of fresh plant will be required to produce enough dried dyestuff to provide a 1.7% depth of shade, then it is possible to calculate that 1 g of synthetic dye is equivalent to 440 g of fresh dye plant. In other words the weight of fresh dye plant needed to replace 34,000 tonnes of synthetic dye is 34 000 x 440, or 15 million tonnes.

It is interesting to compare these figures to those for cotton dyeing which are even more dramatic.

Cotton production each year is some 20 million tonnes, and an average depth of shade using synthetic dyes can be taken as 2%; therefore the total synthetic dye use is some 400,000 tonnes. Using the same

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factor as for wool, the weight of fresh dye plant needed to replace synthetic dyes would be 176 million tonnes. Furthermore, once the dye was extracted from the dye plant it would leave some 170 million tonnes of waste plant that would need disposal.

Think also of the vast amount of land needed for dyestuff plantations, land perhaps better used for growing food. Added to this is the mordent problem. These are used for fixing natural dyes and can contain tin, lead, copper and iron, which are all toxic polluters when released into waterways. We must conclude that it would be impractical (as in fibre production) to rely on natural sources alone to satisfy the world demand.

The alternative to dyeing could be to offer textile fibres naturally coloured. For example un-dyed yarns on the animal fibre side have been blended successfully for centuries, by blending natural fleece shades. Today, Laidlaw and Fairgreve offer a large palette of naturally coloured and blended wool shades. However, it is a niche market because consumers and manufacturers need a palette which contains ever more choice.

However, a remarkable success has been the US production by Fox fibres of coloured cotton. This is naturally coloured organic cotton, which is grown in shades of yellow, green and brown. Growing coloured cotton (a technique used in ancient Egypt, which involves selective cross-pollination) and farming cotton organically is possible, however, that is just the apex of the fibre production pyramid. "Green cotton" exists, which is grown organically in Denmark without pesticides, herbicides, chemical fertilisers or defoliants and has achieved the European Environmental Award, however, the yield is too small in relation to market demands.

The customer's perception is that cotton is 'natural and therefore good'. Most consumers would be surprised to learn that cotton which accounts for 50% of the world fibre consumption, uses 25% of the world's pesticides and fertilisers in its production and needs constant irrigation. The same misconception exists in relation to wool.

Wool fibre dyes well, because the protein core of the wool fibre is strongly reactive. It soaks up and combines well with a wide variety of dyes. Dying wool can be carried out at various times, either on the scoured fibre, at top stage, (top dyeing) yarn stage ( package dyeing), and at garment stage (piece dyeing). However most dying of wool for knitwear occurs at the yarn stage. In package dying the yarn is wound around perforated cylinders or packages and placed on vertical spindles in a round dying vat. Dyed solution is forced from the outside to the inside and back again. With this method the dye reaches the core of the fibre and is less liable to run than in piece dyeing.

35 op cit p. 18.
Knitting is the action of forming fabrics by the inter-meshing of loops, and is a method of constructing fabrics using a set or sets of needles. Knitting produces cloth at a much greater rate than weaving, and it is no coincidence that newly industrialised countries like Mauritius and Turkey have developed a knitwear rather than a woven textile industry because they can produce many more garments profitably for the same or less capital investment.

The loops in comparison to the warp and weft in a woven cloth are called whales (an intermeshed row of loops running from end to end of a weft knitted fabric, in machine knitting it is the product of one needle) and courses (a row of loops essentially formed from one or very few threads running from side to side of a weft knitted fabric, in machine knitting it is the product of one knitted cycle).

The basic machine type used by woollen knitwear manufacturers outside the First World is the flat bed knitting machine, which is operated by hand (hand flat knitting machine, a V-bed, flat bed or single bed latch needle knitting machine designed to be powered by hand. Such machines are used industrially where labour is cheap and where the product competes favourably with the powered machine. Very quick response and very short production runs are possible).

Garments from the hand flat machines made in large quantities, fall into two categories, on the one hand they can be simple, five gauge, fully fashioned pieces with 'designed' details e.g. fashioning marks along a saddle raglan sleeve giving the appearance of a quality, value for money garment, or they are very complicated structures or textures, for example a 12 gauge multi-cable rib, which is very expensive to knit automatically because of the time, it takes transferring all needles twice in the cabling course. A dextrous operator can be quicker.

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transferring by hand. Fabrics produced are flat just as they were originally in William Lee's product, although they are capable of producing 3D shapes through wale shaping using loop transfer techniques.

Essentially the flat pieces of knitted cloth are cut and then sewn together to make a garment.

Supporting the hand flat industry is the use of automatic knitting machines such as the Japanese Shima Seiki.

These machines are relative newcomers, considering how little knitwear technology has changed since the sixteenth century. New automated knitwear machines have created production and design changes since the early 1970s are which have been dramatic. Basically this machine has dozens of needles (1600 plus) arranged in a straight line, or lines, sections of which are controlled by a computer. These machines have between 8 to 48 cones of yarn, feeding 213 meters of yarn a minute into the fabric. Flat bed machines are capable of producing 1 meter of fabric a minute. They can drop or add stitches automatically to increase or decrease fabric at certain points, can cast off neatly with a finished edge at any given point and can be programmed to knit complicated patterns in many colours and textures in the same course.

These new technological machines have a great productive capacity and need only the attention of a technician. It is usual to see factories full of these machines in the UK and Far East with usually very few male operators attending to them. However in developing countries and newly industrialised countries traditional labour-intensive knitwear production is still practised because of the low manpower costs.

Conclusion:

'natural versus manmade'

There is a public misconception that natural fibres are ecologically sound and it is interesting to note that Next and the Burton Group (now Debenams and the Arcadia Group) still pursue a 'natural is best' marketing philosophy when it comes to textiles and in particular knitwear. This philosophy is customer led and has become apparent after regular market research.

The big natural fibre producers and their representative's i.e. IWS and the Cotton Council of America have also encouraged this idea, through their seductive marketing campaigns.

But even the natural fibre producers do not miss an opportunity to score points off each other in the propaganda war, as pointed out by Trevor Shaw in his speech at the International Wool Textile Research Conference.

"The use of pesticides and fertilisers in wool growing is a fraction of their use in the production of cotton. Sheep for wool production are seldom grazed on land that could be used for food crops, for the simple reason that sheep are quite viable on poor pasture and in hilly country. Finally, wool is a renewable resource and is biodegradable. These facts and other quantitative data presently being collected should be enough to confirm that wool is environmentally friendly".

The marketing of wool products has continued to dupe the public into thinking that it is a wholesome and ecologically sound fibre. Paradoxically the reputation of synthetic and manmade fibres has suffered since the 1970s, as has that of the chemical industry generally. The fact that it would be impossible to satisfy the world’s fabric needs in natural fibres alone (an estimated 30 million tonnes per annum, with the wool component a mere 4%) seems to be ignored.

So far, under scrutiny has been the history of and production of virgin wool to date. Virgin wool production is one link in the wool chain from cradle to grave. Reprocessed wool and reused wool will be discussed in the final chapter with associated environmental problems.

- Virgin wool, new wool: definition: fibre from fleece or a sheep or lamb that has not previously spun into yarn or felted, nor previously been incorporated into product.
- Reprocessed wool definition: when wool has been reprocessed, the fibre results from felt without ever having been utilised by the ultimate consumer and is returned to its fibre state.
- Reused wool - recovered wool definition: Post consumer wool rags and manufactured waste, torn up and into fibres again, and used for producing shoddy.

On the one hand it is an irony that the largest producers of yarns and fabrics made from reprocessed and reused fibres are in the developed world. On the other hand the irony is that much of the world’s most expensive virgin wool is made into yarns in the world’s poorest countries.
THE GLOBAL FACTORY

CHAPTER 3

Introduction

Already discussed are the farming and fibre processes of wool, this chapter discusses the 'wool fibre into knitted fabric' part of the life cycle of wool in the global production chain. Here LCA incorporates both ethical and environmental issues. The journey is global, from the Southern Hemisphere, via the tropics and on to the Northern Hemisphere. The focus is upon wool produced in the principal growing countries, Australia and New Zealand whose combined market share was 46% of world production with sheep numbers of 120 and 49 million respectively in 1996.¹

Antipodean wool is exported to all the garment producing regions of the world, many of which have a long-established history of knitwear production. The discussion will begin with wool knitwear made in Mauritius, which is a major knitwear producing country and one of the centres which the author has primary knowledge. The first knitwear company in Mauritius was established less than three decades ago in 1971 which became the catalyst for dramatic economic change. This newly industrialised country (NIC) quickly replaced a sugarcane economy on the back of Floreal Knitwear Ltd., which at the time of writing, is the second largest user of the Woolmark accreditation in the world after Benetton², and is my case study.

The company exports millions of knitted garments to retailers throughout the world but the principal destination is Europe and it is in the United Kingdom, with the British retailer and consumer that the second part of the life cycle of wool is focused. It is at this point that wool fibres are transformed into knitted garments and shipped on to the UK retailers and the British consumer. The reasons why the UK retailers use manufacturing bases thousands of miles away and the mechanisms which make that possible and necessary will be briefly explained. The research confirms the fact that ecological issues associated with wool at this stage in the lifecycle are becoming focused on human, rather than material, resources.

¹ Author Unknown World wool review to the year 2000 in Knitting International issue no 1225, April 1996 p. 10.
² Floreal has Mauritian owners, unlike most other textile/clothing companies on the Island which are owned by foreigners. The company has gone from strength to strength since the early 1970s, unlike most of its competitors, many of which have now closed. It must be said that Floreal's success is due
The most important element in this section is the partnership of the retailer and the manufacturer who build a working relationship for mutual maximum profit, arguably at the expense of their employees. Reference will be made to The Burton Group (known after de-merger in 1997 as Debenhams and the Arcadia Group which include Top Man, Top Shop, Principles, Dorothy Perkins, Burton Menswear, Evans and Racing Green), Next, British Home Stores, C&A and Marks and Spencer who are the major wool retailers in the UK and are known through the Oxfam challenge\(^3\) as the ‘Big Five’.

Labour ‘less’ and labour ‘intensive’ knitwear manufacturing, its geography and working practices are discussed.

References are drawn mainly from primary research using observations, interviews and anecdotal material collected in Mauritius, whilst working as a consultant for the UK’s second largest retailing group then known as The Burton Group, supplemented by press articles, wool specific, technical and socio-economic literature.

\section*{3:1 THE HUMAN FACTOR}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{mauritius.png}
\caption{Mauritius the Pearl of the Indian Ocean}
\end{figure}

Mauritius (fig 37) is known to its population as the Pearl of the Indian Ocean. It is a beautiful tropical island less than 90 by 110 kilometres in area. The population is one million and the official language is English, French is still extensively used but Creole is the most common medium of communication. The currency is the Mauritian rupee.\(^4\) The capital city, Port Louis, is compact and in part to its intrinsic understanding of its own work force. The remaining knitwear and jersey firms, are owned by businesses in Hong Kong/China.

\(^3\) Oxfam challenged the UK’s big retailers to prove that their manufacturing chains were free from child labour. Oxfam demanded that their representatives should be able to visit any supplier’s factory unannounced to check that this was the case. Author Unknown \textit{Clothes Code Campaign, Oxfam promotional literature}, 16 April 1997.

decaying, outside of which, architecture consists mainly of colourful breeze block shacks and home-made single story dwellings which are exotically picturesque.

The Mauritian people have always been used to hard simple living and the associated relative poverty of ‘non first world’ conditions, which is surprising because the population has an educated multicultural background, of Asian, African, Chinese, and European decent. This poor but educated country has been and continues to be an attractive proposition for investors from Europe, Asia, and Hong Kong. However foreign investment and exploitation are not new to the Mauritians with records showing that the Dutch first colonised the Island in 1598 (leading to the rapid extinction of the Dodo which has made the Island famous) and exploiting the ancient coastal forests of ebony now, like the Dodo, extinct. The Dutch left in 1710 and were superseded in 1715 by the French, whose brief was,

"...to enrich the Kingdom of France with that place at the World’s End. His Majesty having been informed that the island of Mauritius is totally uninhabited, orders you to take possession of it in his name, if the island is not occupied by a foreign power and to draw a deed in due form which you will send on your return. You will name the place Isle de France, and when you take possession of the island you will follow the instructions which the East India Company will transmit to you". 

The French brought the sugar cane and Indigo industries upon which the Mauritian economy was built. They left the island in 1810 to be replaced by the British, who ruled until 1968. In 1968 Mauritius was granted independence, although it remained a member of the British Commonwealth. The ‘manyana’ mentality has given the country its easy tranquil atmosphere which is sought after by tourists, but which frustrates employers who must compete on an international level where speed and efficiency are essential to economic success. It is optimistic for foreign investors to expect such a work force can rapidly adjust from an agricultural background to work to First World factory working practices and quality, without a manufacturing culture, but they do. The Mauritians have been quick to learn, but compensate for long factory hours with free time at the beach and a reluctance to work any overtime.

Since the ending of British rule in 1968 there have been rapid, spectacular changes to the wealth and development of the nation, with many fundamental improvements, not least the installation of running water and electricity to most homes described by Mrs Cleli, the aunt of a Floreal knitter,

"People were poor then, a lot poorer than now.. It was all petrol lamps. We got water from the public tap in the square. We got electricity in our village in the 1960s. After

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5 Author Unknown *Islander Air Mauritius*, promotional literature Port Louis Mauritius 1996, p. 70.
Independence the changes were for the benefit of the people. There was a state pension for the children (child allowance) and old people”. 6

The main thrust of the Mauritian Government has been to encourage other industries to develop along side sugar production. These other industries manufacture higher value products, or are more mechanised and less labour intensive thus creating better working conditions for the people and often paying better wages.

One of the newest industries is tourism, which became more important as the Island became, a fashionable honeymoon and water sport destination in the 1990s. The International hotels are of Five Star quality, luxurious, and equipped with modern communications such as fax machines, e-mail, computer and video links, which are essential for international business guests. Such services are taken for granted in the West but are a fantastic achievement in Mauritius. These hotels are heavily guarded and screened from the local population many of whom resent the economic contrast. The internal transportation system is by road few of which are motorway quality, they are congested, chaotic and severely hamper development.

Fig 38 Hong Kong once the export gateway to the West

As mentioned in the introduction, the most important industry to be established after independence was in the textiles and clothing and in particular in the woollen knitwear sector. Before that, the textile industry was non-existent in Mauritius. This fantastic success can largely be attributed to the financial investments and expertise from foreign countries such as France and the United Kingdom because of the historical connection. The business has, however been dominated by a handful of large foreign groups from Hong Kong (fig38) which was once the export gateway to the West, owned by the Chinese, who made direct foreign investments in the knitwear and clothing industry, principally during the 1980s. Since that time the industry has suffered numerous closures largely attributable to acute labour shortages (the labour exists but workers do not want to work in the textile factories).

6 Cleli, M. Mother and Aunt of workers at Floreal Knitwear Ltd. Interview in Mauritius May 20 1996. (Appendix 1)
Both local and foreign firms have been affected by these shortages, but the foreign firms have accounted for the majority of job losses in the industry.

Foreign investors in Mauritius are attracted by privileged trade access to the EC markets, with no "cat" restrictions. Economists suggest that success for the future of the Mauritian textile/clothing industry will depend upon how quickly these businesses adopt capital intensive technologies, modernise production processes, and introduce innovations and design new products. A few local and foreign owned firms have taken up the challenge, whilst most others have been very slow to take the necessary action. The majority of firms in the industry must progress rapidly to a more sophisticated level of production if they are to survive; the transition period will be slow and painful but vital for an economy which faces acute labour shortages and a skills gap.

One of the most authoritative business reports about Mauritius was written in 1992. Many of the specific financial details used in this section are taken from that analysis which, although somewhat out of date, gives a good account of the economic situation at the time and the subsequent development of the knitwear industry.

In the early 1990s, 16% of all foreign investment in Mauritius was in the clothing sector, which amounted to 7035 million rupees. The single largest source of foreign investment in the textile and clothing industry was from Hong Kong between 1986 and 1989, when 1,735 million rupees was invested in the Export Processing Zones (EPZ).

Fig 39 Harvesting sugar cane

It was during early 1980 that the textile and clothing industry emerged as potentially the largest sector in the growing economy in terms of employment and exports, way above that of sugar (fig 39) upon which the Mauritian economy had been built.7

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7 The term 'cat' is short for 'category', used in the clothing industry in relation to restrictions placed upon textiles and clothing imports into the EU from non-EU countries. International 'cat' quotas are set for manufactured items and must be adhered to by each exporting and importing country.


9 Sugarcane plantations stretch as far as the eye can see, from one end of the island to the other, over a distance of 100 kilometres. Sugar is grown and harvested in the traditional way, by hand. It is slow, back breaking and labour intensive work where fields are dotted with teams of men and women in colourful clothes cutting the cane with machetes. It is slow, and very poorly paid work (between 40 to
The government realised that it was essential to attract direct foreign investment and a generous package of incentives was provided to foreign investors in the EPZ sector in 1983. Under this scheme investors agreed to export the bulk of the products manufactured in Mauritius. In exchange they would get a tax holiday of 10 to 20 years and their dividends would be free of tax for five years. Also their imports of raw materials and machinery were duty free. Benefits included:

- low interest on loans
- industrial buildings rented cheaply
- electricity and water supplied at cost

Current government policy remains firmly geared towards making Mauritius a free market economy. Investors are allowed to repatriate their capital gains and capital without payment of the usual 15 percent capital transfer tax and without prior approval of the Bank of Mauritius. The free movement of money has attracted capital into all sectors of the economy. The government also maintains a policy of encouraging foreign investment in the pioneer status industries, such as electronics, information technology and printing.

Also there are ranges of measures in place to make Mauritius a haven for foreign investors, for example an offshore financial and business centre has been created. The island however faces severe infrastructure constraints, needing massive investment to reduce transport congestion on the roads, extend the telecommunications network and improve cargo-handling facilities. The latest figures show that 155 foreign firms operate in textiles and fashion in Mauritius, that is 42% of the total number of firms in the industry. Joint ventures involving foreign and local firms account for over 55 percent of total employment. The UK is the third largest foreign investor after Hong Kong and China accounting, for a total of 17 firms operating in the industry. Seven are involved in joint ventures with local partners whilst a further eight are involved in joint ventures with a partner from another country.

50 rupees a day). At the outset in order to make the plantations, the land had first to be cleared of the millions of volcanic cubes, which litter the island. These black rocks vary in size from half metre upwards and have been piled high in 'Mayan-like' structures or gathered into long lines in the fields, similar to the broad structure of the Great Wall of China. This feat is tremendous in itself, considering most of the land was cleared well before mechanisation. Personal visits 1995/96.
CASE STUDY 1: FLOREAL KNITWEAR LIMITED

As mentioned earlier, Floreal Knitwear Ltd, was a pioneer in the Mauritian knitted textile industry and Floreal's business was built upon woollen spun yarn qualities, which have prevailed over worsted spun qualities for knitwear, exported to the UK. 10

UK retailers prefer to use Mauritius for economic reasons. The woollen system uses coarser short staple fibres, which are often cheaper than those of the worsted family because the better, longer fibres are removed for a superior quality. These coarser Shetland fibres produce hairier, bulkier products and are much more suited to use on hand-powered, flat knitwear production because the woollen yarn knits very quickly, shrink and bulk well, hiding mistakes and flaws characteristic of hand framed garments.

Since 1971, Floreal has continued to make its principal product of knitted woollen spun goods in its vertical operation, not restricting itself to Shetland, but carries Merino Lambswool and noble fibre blends in its portfolio. Floreal imports Australian and New Zealand clean wool tops in the main, processes the fibre in its own mill, blends, twists, spins, dyes and knits, makes and finishes the product in-house, which means that Floreal has 100% control right down the line, from fibre through to garment. The largest season is winter with approximately two thirds of annual sales and less business generated during the summer period where fibre quality concentrates on cotton and cotton blends.

The data from the Floreal factories (Appendix 2), show it is possible to produce wool for men’s and ladies' knitwear in great volumes on hand-powered machines with a production capacity of 358 thousand pieces per month and over 4 million pieces annually, that is knitting, linking, washing, pressing and packing. 11 The minimum order is 1000 pieces, with a production lead time of two months after designation of orders and size breakdown.

Principal exports are to the UK at 25%, France 45%, Germany 15%, Italy 5% and USA 10%.

The factory premises are partly owned across various sites on the island, nineteen in all, with the main knitting and linking factory located in Curepipe and the only finishing plant for washing, dyeing and packing located in Vacoas. The factory has raw material storage of 100

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10 The Mauritian knitwear industry began with its woollen Shetland qualities in the early nineteen seventies, an event which heralded the end of the UK’s Shetland knitting industry. Quote from Mervyn Davis Marks and Spencer business specialist in knitwear and hosiery 1999.

thousand square feet, the knitting department is also 100 thousand square feet, linking is 50 thousand square feet, finished goods storage has 300 thousand square feet a total operating space of 550 thousand square feet. The goods have to travel by road great distances from one site to the next. This is an unusual situation in the knitwear industry, even in First World countries where processes are segmented.12

The Benettons find owning sheep has brought insight, writes Sarah Bagnall

Floreal’s production base comprises of four units for knitting, 14 units for knitting and linking, one solely for linking. In addition they have their own laboratory and woollen yarn spinning mill called Ferney Spinning Mills Ltd. where approximately 90% of all Floreal’s yarn requirements are produced from virgin wool tops.

The factories are well managed with a friendly atmosphere and relatively good conditions in relation to other knitwear factories. The business is so fragmented in order to suit the needs of the local

Fig 40 Benetton own shops, factories and sheep

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12 This system is even bettered by Benetton, who spin, dye and knit the garments, then sell them in their 7000 shops in 120 countries, partly under a franchising scheme. However, in 1989 they began to buy ranches in Argentina and Patagonia and now own huge numbers of sheep (fig 40) in order to develop and supply the best wool possible for the Benetton Knitwear. This is a truly vertical system
population, who expect to work close to their homes because of an inefficient transport system. Pay in the textile factories is about six hundred rupees a week (£15 in 1997). At the Mauritian Traders Fair in London in March 1997, Floreal's Marketing Manager Maurice Vigier de Latour said, "we are the second biggest 'Wool Mark' knitwear manufacturer in the world. We are vertically integrated, with a spinner who produces around 2005 tonnes per year". 13

The article (footnote 13) described Floreal's current product, which consisted of Shetland and Lambs wool sweaters and cardigans in basic and fancy styles. The company's client list includes all major European retail organisations including Next, Debenhams, La Redoute, Galleries Lafayette, La Rinascente, Coin, Karstadt and Kaufhof. Also Floreal has its own brand name called Harris Wilson, based in Paris which is sold in Europe, having five shops each in France and Japan.

The factory has a variety of knitwear machinery from 2.5 to 10 gauges across 3,560 knitting machines, of which just 461 are mechanised or part mechanised. Quality control inspection is on line and random, covering 25% of all products with primary and secondary light inspection mending, which picks up on tiny fabric and making-up flaws.

3:2 FIBRE TO FABRIC

Chapter two mentions that knitting produces cloth at a much greater rate than weaving and it is no coincidence that newly industrialised countries like Turkey and Mauritius have developed knitwear and jersey production rather than a woven textile industry. Garments can be produced quicker and make more profit for the same or less capital investment than that of the woven industry.

Flat garment pieces in wool are produced on Floreal's machines, although they are capable of producing 3D shapes through whale shaping using loop transfer techniques. Essentially the flat pieces of fully-fashioned knitted cloth are sewn together to make a garment. Supporting the hand flat industry is the use of automatic knitting machines such as the Japanese Stoll and Matsuya. These machines are relative newcomers to the knitwear industry, in view of the fact that knitwear technology has changed little since the sixteenth century and it has taken time for the technology to be embedded in the knitwear business globally. In the West, new automated knitwear machines have created dramatic production and design changes since the early 1970s but because of the massive

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14 Perhaps this is also true because Shima machines must knit a garment in less than eighteen minutes to be cost effective, as the machine has an hourly cost of sixty pounds. A hand knitter works for £80.00 a day in the UK and a fraction of that in Mauritius, they can be infinitely more flexibly creative for a tiny proportion of the
investment needed to equip a factory (with each unit costing £150,000) their use in newly industrialising countries is minimal. 14

Fabric production involves knitting courses by hand and is a predominantly female task. Factory workers stand for most of the nine hour shift, because it is impossible to sit whilst working, especially in the knitting and pressing rooms. The women employees are mostly young between 16 and 25. The fact that the health of the knitwear workers was affected by factory conditions was the topic of much anecdotal material, for instance that of one of the maids at the Sofitel hotel. She remembered her previous job and said,

"I used to work at Floreal on the hand-flat intarsia machines. Because I stood for five or six days a week, I had terrible backache. It was very hot. We girls all know who has worked at Floreal, because we all have varicose veins."

She laughed and said how lucky she was to have a job now, in such a beautiful hotel and for the same money. It is understandable that women prefer to work as hotel staff etc. in the luxurious surroundings of the international hotels, for the same pay, plus tips, bonuses and perks such as food from the kitchens. The health of the workers was also a concern of Mrs Clelie, who said that her niece and colleagues suffered constantly from being breathless, they said it was due to the ‘fly’ or wool fibre particles in the air. 15

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Fig 41 Inspection and packing rooms

There is no air-conditioning in the factory areas except for the rooms with sensitive computerised equipment, managers offices or the showrooms for foreign buyers. Temperatures in the factory often

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same daily rate. Quote from Angus. J, Course Director BA Textiles, University of Derby February 2000.

15 A type of emphysema called ‘black lung’ has been discovered in textile workers in the UK. -PhD abstracts British library SRIS London, referred to in Clelie interview.
exceed 30 degrees and 90% humidity. In areas of the business for example in the dying and finishing or pressing rooms the working conditions are very difficult (fig41) due to the heat generated by the machinery.

The Floreal work force is mainly women, which is traditional world wide in the clothing industry where 90% of workers are female. Also in Mauritius women are often the principal earners in the family working five days a week, with two weeks holiday at Christmas. The workers are reluctant to travel to the factories because public transport is painfully slow which can add two or more hours to their nine shift. Part-time employment is scarce, therefore because of the demanding conditions in the clothing industries coupled with the strong competition from other new industries, there is a severe female labour shortage employers pay females less than men although it is assumed that they are easier to manage and are more dextrous. In general the men feel that working in clothing factories, especially on non mechanised lines, is demeaning employment, preferring to work in the more ‘macho’ sugar factories, or not work at all, but stay at home to attend to children.

"Some men do work in Knitwear. They will do it because there is no other job, if they have no qualifications from school. They would rather work in the factory. For instance, the Indian origin peoples would traditionally have a small holding with cows etc. Now their women don’t want to bring food for the cows. If the men can’t get jobs they stay at home whilst their wives go to the factory and they look after the children. ...Everyone has a television.... Dallas very good... They (Mauritians) would like to live like that but what can they do? It is just like a dream".

Fig 42 Chinese workers on three year contracts

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17 op cit interview Cleli
Because of the severe and escalating labour shortage in the knitted textile industry in Mauritius, female workers have been recruited from mainland China since the late 1980s. They are issued with three year contracts to work in a specified factory in the textile industry (fig 42). The girls are housed on or near the factory site, in compounds, sleep in dormitories and work long hours enabling them to send as much money as possible home. The girls experience little of the Mauritian culture during their stay and the agreement is that, if they become pregnant whilst in Mauritius under contract, they are sent back to China.

The Floreal Chinese workers are treated better than most, they are paid piecework rates and extra for overtime, which is an obvious requirement in the West but not necessarily elsewhere. The employment of migrant girls who will work to any contract and in any conditions is a sore subject for the indigenous Mauritain workforce, which feels that better and more flexible employment opportunities, in line with European practices are being undermined. Mauritians consider that First World working conditions are unachievable whilst overseas contractors are prepared to work for very long hours on very fine knitwear machinery, hand transferring stitches for fully fashioned knitwear in dimly lit, humid conditions. These days the Mauritians do not want to work on those machines at all, especially when the workers know that in European factories such processes are automated. It is surprising these days to see such fine gauge, beautifully contemporary garments being produced in such primitive conditions. What is not surprising is that the workers are ‘burned out’ or at least have severe eye strain after their three year contract is over. When concern for the well being of workers such as these is voiced, the stock reply is that the girls would rather be ‘here’ (in Mauritius) than making money as prostitutes on the streets in Shanghai.

Floreal Knitwear Ltd, realised that a rapidly developing economy coupled with growth in communications i.e. mobile phones and satellite TV, were bringing irreversible changes to the expectations of its labour force, who were demanding better pay and conditions. The company’s soaring expenses could not be absorbed indefinitely a without substantial impact on Floreal’s profits. Some small costs could be passed on to their retail customers but that was a short-term solution because orders would fall as the retailers sourced other cheaper suppliers, in the eternal search for better margins.

The long-term solution for Floreal was to look offshore for a cheaper manufacturing base with an abundant and inexpensive workforce. Consequently, in 1989 they opened a huge knitwear factory on the next Island of Madagascar (noted as the third poorest country in the world), with extremely competitive labour costs (fig 43). Floreal then opened a second factory in Madagascar which is located in Antananarivo to keep costs to a minimum.
Fig 43 One of the largest knitwear factories in the world is in Madagascar

The first offshore factory is one of the largest knitwear factories in the world, equipped with hand flat machines which seem to stretch as far as the eye can see, it can be 90 degrees farenheight and 90 degrees humidity on the factory floor. Like its Mauritain parent company the knitwear produced includes Shetland, lambs wool, Angora, wool blends, cotton blends and blends with silk. The garment types are men’s and women’s wear with a production capacity of 150,000 pieces per month extra to their Maurititan factory, including knitting, linking, washing, pressing and packing. The business has a minimum quantity per order of one thousand pieces and, as in the parent company, production lead-time is two months after designation of colours and size breakdown.

The factories have raw material storage, knitting department, linking department, plus finished goods storage with approximate total operating space of 200,000 square feet. Line inspections are similar to the parent factory. However, here equipment is totally powered by hand, there are no automatic machines other than washing and drying.

Unsurprisingly the equipment at Floreal’s factories was in good condition and well maintained, due to their well-developed housekeeping and management systems, essential for knitwear production. This is the case in the majority of knitwear factories, machines have quality care often at the expense of their operatives because the manufacturer shoulders the cost of faulty goods caused by damaged needles, oil marks dirt etc. Such defective stock results in the problem of what to do with very large amounts of knitwear returned to the manufacturer (RTM) in an important client’s exclusive design. This is solved, as elsewhere by exportation to the Third World, incineration and land fill. This factory has proved instrumental in keeping overall costs down as it produces the most basic, but labour intensive, fully fashioned knitwear garment parts, adding a further 1.8 million pieces to the manufacturing capacity.

Floreal Ltd., eager to keep its customer base, is now researching other new manufacturing bases in East Africa and southern India, simply because production costs at home are becoming less competitive and unworkable. It is an that Mauritius less than 30 years ago Mauritius was a poor, developing country (DC). Now, because of its rapid economic growth, due principally to the knitwear industry, that industry is being forced to investigate and invest in production sites offshore in lesser developed developing countries (LDDC). In so doing, it is supporting the theory that the
development of some poor countries has been due to the West's insatiable knitwear and clothing production demands.

There is a realisation that the only future for Floreal, with regard to manufacturing in Mauritius is to expand by adding new technology to its portfolio (confirmed by the mid 90s take-over of Tropic Knits Mauritius, which is a Jersey manufacturer). Investment in new technology goes hand in hand with a long-term reduction in costs but also a reduction in the labour force. This reduction in labour, due to state of the art technology is seen in the West as an achievement, but a reduction in labour and subsequent unemployment is at odds with the total-employment concept in a developed country. As a manufacturing base, Mauritius is still a low cost competitor to European sources, but that margin is rapidly narrowing.

Towards the end of the 1980s the newly industrialised countries (NICs), (for example Mauritius, Hong Kong, Taiwan and South Korea) which had been responsible for much early import penetration of Western markets, started to find themselves being displaced by a further generation of developing countries (DCs). These NICs have also began to suffer from acute internal labour shortages. To keep the costs down they are also having to re-equip with new machinery to give added value to products and take onboard sophisticated working practices on the factory floor, such as teamwork systems and total quality management practices. What is also significant is that these NICs, themselves are developing knitwear manufacturing bases in poorer countries, causing a cascading effect in development, e.g. Hong Kong in China, Taiwan in Vietnam, South Korea in Cambodia and, as already mentioned, Mauritius in Madagascar. Now the newly industrialised countries are forced to replace the clothing industry with more lucrative businesses, to continue their economic development, for example in information technology in Taiwan, tourism and banking in Mauritius.

To an extent, Floreal can remain competitive due to the development of these offshore manufacturing bases and by the reduction in overall costs by acquiring new clothing technology. The technology itself has become more accessible not just to large but to medium and small sized firms too. This re-equipping mentality now runs parallel with the traditional labour intensive production methods still employed in the same factory. Quick response is being forced upon manufacturers like Floreal by such customers as the Gap, Next, Zara, and The Burton Group.
As a consequence of developments in information and communications technologies for example, faxes, telephone, and E-mail, the factory in Mauritius can become an extension of the London, New York or Madrid design studio. Decisions can now be made and implemented immediately, the only difficulty is the time difference and transportation.

However not even the problem of shipping to Europe, making a minimum two-month lead-time, is affected. The growth of global sourcing has led to a revolution in the use of air transport for the speedy delivery of relatively high volume garments from virtually any location in the world. Further reductions in the cost of air transport (with a new generation of massive jumbo jets already on the drawing board) and economies of scale, are likely to make air cargo an almost universal means of distribution in future for all but the most basic products. Further progress will be needed in packaging and storage technologies, such as vacuum packing, to reduce volume and long-distance freight costs, ensuring that goods are delivered in optimum condition. Packaging is also a key issue for environmentalists, with EU legislation requiring suppliers to take full responsibility for its return and disposal after use. Marks and Spencer has encouraged the development and use of packaging that can be recycled, making minor changes e.g. insisting that there are no metal staples in the cartons, or plastic binders.
3.3 GARMENTS OR THE HUMAN FACTOR

The primary reason that the five major British retailers: the Burton Group (now Debenhams and the Arcadia group), Next, BHS, C&A, and more recently Marks and Spencer source the majority of wool garments from manufacturers outside of the UK is price, quantity and design flexibility.

It is crucial for the retailers to achieve the lowest possible unit cost for a piece of knitwear because they are under pressure from two stakeholders. Pressure is applied by the shareholders who demand that the company maintains and increases profits (in 1996 the Burton Group worked on a 60% intake margin which was lower than other high street retailers at the time). Secondly pressure is applied from the customers, who have become accustomed to expect ever-changing, fashionable quality goods at the cheapest possible prices.

Knitwear forms approximately 20% of total UK garment sales, therefore production and retailing costs are under constant scrutiny. Repeatedly, retailers find that the largest economies can be achieved by squeezing suppliers18 at the manufacturing base.

"I reassessed the quality of garments, which the manufacturer delivered to us monitoring what was going on hold. I worked with the buyers looking at on-time deliveries, correct sizing, had the manufacturer followed the specification on quality. On top of that I visited the factories. That analysis showed which supplier was worth continuing with and which was not. For example, if you take deliveries which were constantly a problem, poor quality, miss measured, ... differences, etc., and you visit the factories invariably, I found they were chaotic, they didn't know what they were doing. There was no control and they were inefficient. That means their mistakes were costing us money and that their cost prices for successful garments were costing us money - otherwise they wouldn't make any profit".19

This factor has encouraged the growth of knitwear imports, into the UK, since the 1970s from developing countries where manufacturing and labour costs are low.20 As imports increased during the 1970s the UK textile industry began to diminish. For instance, in 1970, the clothing industry employed more than one million people in the UK, today that figure is closer to 150,000 and still falling.21

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20 The 100% wool knitwear industry, which was thriving in the UK, has now largely been replaced by wool blend/acrylic business using state of the art spinning and knitting machinery and fast response piece-dye systems. The profit margins are tight but still possible on long runs but consequently design variability, which is a demand of today's market, is limited.
21 Rushe, D. *On the rack at Marks*, *The Sunday Times*, November 8th, 1998 p.3
Obviously, knitwear producers in the newly industrialised countries have an advantage over British competitors in price alone. However this advantage has been further enhanced with the development of Designated Free-trade Zones (FTZs). Mentioned earlier in the chapter, in relation to Mauritius, within these zones permission was granted for foreign ownership, exemption from paying municipal and provincial taxes, export taxes, duty free importation of raw materials, machinery and equipment. Although British retailers did not invest directly in these FTZs they began to source knitwear from suppliers who had directly invested and immediately began to reap the benefits of greater profit margins. The Burton Group manufactures much of its knitwear in FTZ such as Mauritius, the Dominican Republic, and Hong Kong/China where labour costs are very low. The small item unit costs enable the retailers to achieve their company profits and customers to reap the benefits also.

Ironically, another factor which encouraged British retailers to increase their overseas sourcing policy was the adoption of the Multi Fibre Agreement (MFA) (Appendix 3), instigated by the world's industrialised countries in 1977, to control and suppress the growth of imports from low cost exporting countries. The MFA (soon to be phased out) was put in place to give First World countries time to cushion themselves, whilst they re-structured to compete against an influx of cheaper goods from the rest of the world. The agreement was made to keep these imports to a minimum. Now it is argued that the MFA has helped the West to profit unfairly by giving an advantage in price negotiation. For example the West could only take a certain number of knitwear pieces, so the pressure became fierce for countries and companies to produce the product cheaper than their competitors. Consequently, there is a seasonal scramble amongst suppliers to win the substantial British business. Also establishing quotas, which were, and are, considerably below the manufacturing capabilities of the NICs, suppressed the economic development of those countries. In 1968, UK Retailers began tentative sourcing textile and clothing in low wage countries. It was the large vertically integrated textile/clothing firms i.e. Courtaulds and Coats Viyella which, were amongst the first to invest directly in overseas markets, in a bid to remain competitive with foreign imports but also to broaden their technical portfolios. This process still continues. For instance, in spring 1997, the knitwear company Charnos PLC and yarn agents Gaddum & Wood Holdings completed an overseas information-gathering trip to eleven countries.

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22 The NIC zones often curtailed workers rights, for example long hours, few holidays, no unions, and impossible piece-rate quotas. These conditions enabled the factories to be even more competitive. E. Wield, D. Heyzer, N. Third world Studies in Open University Press 1985.


24 McMurray. Stitching up a Fortune, (Company share perks enabled Burton Group Finance director, Andrew Higginson to bag over £1,000,000 in shares at a knockdown price today) in The Daily Mirror, July 1997, p.26.
Far Eastern and Eastern Bloc countries visiting knitwear factories with a view to establishing partnerships for their production into Marks and Spencer. Charnos PLC are one of the last UK knitwear suppliers to M&S who have not as yet responded to encouragement from M&S to take a Far East partner.25

Now, because of the volume of overseas business, most large retailers and their manufacturers have an office and/or agent(s) abroad, and in particular in Hong Kong. Until 1962 Hong Kong was the only significant exporter of clothing to Europe amongst the developing countries.26 As a member of the British Commonwealth, Hong Kong enjoyed preferential import tariff arrangements, which encouraged even cheaper knitwear into the UK. (It did not matter to the retailers that goods out of Hong Kong had in fact been manufactured offshore, a process known as ‘submarining’. Hong Kong businesses were relocating production to even cheaper countries, using outward processing, in Macao and China, making cheaper knitwear and more profits for themselves and their clients).

The majority of Far Eastern knitwear is usually made from higher quality wool or cotton yarns where expensive raw materials are offset by low labour costs. Imported knitwear often has some form of added value, for instance multi-colour patterns, handwork, fashioning details, and heavier weights or includes noble fibres. These knitwear pieces are usually excellent quality for the price. Similar products can be produced in Britain but at a much greater cost (at least four or five times more). UK production would have to be knitted on state of the art machinery in large volumes and have high production costs built into the unit price, for example, power, labour and machine costs.

### HOW THE SYSTEM WORKS

All the large UK retailers work in similar ways this is due to the rapid interchange of information about systems and working practices but also of personnel at all levels. In the clothing industry, senior managers, buyers, merchandisers, and designers have usually worked for the other large retailers and suppliers either full time, or freelance. In fact with the exception of M&S, moving every few years is encouraged. Working on the previous season’s analysis of winter knitwear sales and in conjunction with profit targets for the next season laid down by the board of directors and shareholders, merchandisers calculate the amount of knitwear pieces which need to be sold to reach the company’s projected targets. In simple terms, the number of knitwear pieces are then divided to create different collections, which are placed into stores at various times throughout the season.

In a typical winter season, where the bulk of wool sales lie, there may be three collections phased into stores beginning in July, and ending in December, with a fourth special ‘Christmas’ or ‘Holiday’ collection, which is often the most profitable, to top the winter season sales. This multiple phasing of

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25 Interview with Mr Colin Gee director of Gaddum & Wood Holdings, June 1997.
26 Keesing and Wolf 1980: 13
merchandise is relatively new to the British market and was adapted from the American retail system in the 1970s. Since then it has been gathering momentum exemplified by the Gap retail chain aims for a six-week turn around of stock.

In Britain in the 1970s and 80s, one large order was placed for the whole season, a season was broken into Autumn/Winter merchandise or Spring/Summer. Four collections were produced in one year. Now, the current situation is of four collections a season, with the addition of small, changing, trial packages on top. A trial package constitutes a small range of between 3 and 6 styles which are often presented in colours from the following season’s palette in order to obtain some indication of how popular those colours will be. The styles may be higher fashion using new sub-strates and sales of these items will give the company confidence to place much larger orders for the following year. This multiple phasing is very complex logistically but it has proved to be very successful, exemplified by the GAP which has a ‘by it, sell it and don’t replace it’ philosophy. The buy to sell out method, ensures that the customer is always hungry for newness and will buy an item there and then rather than risk being disappointed in a few days time, when it may be sold out. It is also suggested that this system is now programming the customer to ‘buy now rather than later’ because the customer suspects that the item will soon be out of stock and not repeated. The constant changing of knitwear and other goods on the shop floor certainly offers customers variety and choice. Multiple phasing also means that complex manufacturing, shipping, warehousing and distribution systems need to be in place to deal with ever-changing merchandise.

Now the production of smaller design capsules are ‘called off’ from the factory on a regular basis. Also the launch of these small collections must happen simultaneously in stores country-wide. This is in contrast to the past when the whole process was relatively simple. Then two collections for the whole season were bought, knitted and shipped to the retailers’ warehouse, where they were stored for months and released by the retailer when the new season began. It became obvious to the retailers that they were shouldering the huge production and warehousing costs of thousands of pieces of knitwear, months in advance of the goods appearing in stores. As part of the ceaseless effort to reduce costs and increase profits very little warehousing now takes place at the expense of the retailer, it is the manufacturer who releases stock via the ‘drip feed’ system and pays for materials, labour and storage first. The retailer is saving costs by applying pressure to the knitwear manufacturers who make savings where possible.

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27 M&S have realised the benefits of the Gap retailing system and like others look to that chain as a benchmark. In February 2000 M&S launched a similar concept ‘Autograph’ which amongst other characteristics carried a limited stock of varied well-designed pieces. The concept was so successful that the merchandise was sold out at the Marble Arch store by mid-day of the first day.
"... if you place a lot of business with one supplier, you are important to them. Their factory is full of your product and they in theory tune in to your way of thinking. Things become streamlined and more efficient and then the cost prices should be driven down". 28

Multiple phasing and constant customer choice have proved to increase sales with customers possibly buying three pieces per season instead of one. The positive aspect of the increase in turnover has meant more business for the manufacturers but the negative element is that they must invest in a much more complicated production and shipping infrastructure. Each small, new collection can mean a new colour palette, new yarns, new textiles, new silhouette and different machine production all to be ready for a series of guaranteed delivery dates.

The five biggest retailers in the UK have again returned to ‘in house’ design studios, which became unfashionable in the 1980s when most retail design studios were closed. At that time input on styling, colour and fabric was contracted because it was far cheaper to use outside studios and consultancies for information. The retailers soon realised that outsiders, however competent, did not understand the cultural minutiae of individual retail organisations. After a short honeymoon period, huge contracts worth thousands of pounds were ended.

Today the retailers’ design studios are used as an in house service, which funnels information on trends from international designers and world markets in colour, styling and fabric into the business. Designers act as information gatherers and filter information to their opposite numbers, in the buying or merchandising departments. These designers are expected to act upon diverse information for example on company strategy, sales history or quality problems, which may ultimately affect the design decisions they make in producing the knitwear range. Each company develops a critical path based on ideal timings for ‘merchandise into store’, working approximately 18 months ahead. This can be reduced to a matter of weeks depending on range requirements.

The retail design team has direct input into a general seasonal colour palette, then the knitwear palette is finalised to stand alone or to compliment the main season’s message, the palettes may then be broken down further into phases for separate smaller collections. The colour palette must take into account previous success in sales by adding new versions and up-dating company classics for example classic red, classic navy, and classic camel. The knitwear palette is used visually to tie the sales floor together and is a colour vehicle, which instigates newness. Usually the colour palette is released early to suppliers so that they can begin to dye and source yarns which, takes a minimum of six weeks.

Apart from colour, it is normal for a design team to produce ‘live’ information, which they launch to management, buyers, merchandisers and suppliers at the start of each season in a major presentation. This information may take the form of life-size boards, slides, even videos supported with books, or

28 Op cit Miller interview p.83.
files of the reproduced information which can been used in the field. All layers of the business, right down to the shop managers, have access to the same information, which should mean that the whole company is ‘singing from the same hymn sheet’ and is co-ordinated.

After the new season’s presentations are made and approved the design room concentrates on building the collection for individual product lines. Often one or two designers concentrate on one or more product areas, but the relationship between the designers and buyers should mean that each item should work with its neighbours, for example, knitwear with trousers and so on.

The knitwear design package begins with an account of best and worst sales history from the buyer. There is an assessment of the supplier base, for example who can be relied upon with quality and delivery dates, which countries have quota and yarn, and most importantly whose manufacturing costs have not increased. From that baseline volume production business is booked with key suppliers. Often lines are just re-coloured, tweaked for size or given added value, which can be small detail or weight changes.

On top of the volume lines such as two to three thousand pieces of one style, knitwear layers are built with more fashionable pieces that are inevitably smaller collections. On top of the pyramid is the ‘high fashion range’, which is the icing on the cake and may be bought in low hundreds. When the knitwear design package including styling and fabric proposals is complete, it is faxed initially to the manufacturer and later a hard copy is taken to the factory by courier.

All technical documentation on yarn, fabric, and silhouette specifications need to be as informative as possible. English is kept as simple as possible and universal technical knitwear terms are used with the addition of drawings and garment diagrams. Also in the supporting information pack may be magazine cuttings, garment pieces and yarn swatches, anything in fact, which will give the factory a clearer understanding of the designs and design concept. Faxes, e-mail and video conferencing makes communication easier and relatively instant. Within a few days, knitted textile samples can be courriered to the UK and in four to six weeks a collection of first sample knitted garments can be assembled in Britain or the Far East office from various suppliers throughout the world to begin selection.

It is usual for the designer to go and work in the factories at the start or during the sample-making period. It is necessary to work with the designers and technicians at the supply base, solving design problems, adjusting garments and sometimes adding to the collection from the factories own sample collection to enhance the range.

Knitwear first samples are returned to the retailer where a first sample collection for selection purposes can consist of two to three hundred knitted garments. The range is built, in phases, by the
designer, buyer and merchandiser from the bottom volume lines upwards in a pyramid shape, taking into account the store level, colour, style and price.

To a certain degree the role of the designer becomes less important at this point. When the range is aesthetically balanced, other factors of quality, quantities, costs and delivery dates become more important to the business and its profits. The merchandising and distribution teams organise delivery schedules. Quality control takes place at the factory or distribution warehouse and the team ensures that the correct goods reach the stores at the correct time so that the shop window displays are orchestrated to coincide with the season’s advertising campaigns and marketing strategy.

**CAUSE AND EFFECT**

**Fig 45 The Woolmark logo**

The top ten wool producing countries are: Australia, New Zealand, the former USSR, China, Uruguay, Argentina, South Africa, UK, United States of America and Spain. These countries account for 92% of world apparel wool production. The expectation is that by the year 2001 global wool production will have reached 16 hundred million kilos.

Even though wool forms just 4% of the world fibre production, the wool business is worth millions to individual countries and businesses who focus on it. For example, the annual income in 1997 of the

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IWS was estimated at 110 million Australian dollars, or £55,000,000, 20% of which has been generated by the licensing of the Woolmark\(^{30}\) and Woolrich brands. The Woolmark (fig 45) is the best known textile symbol in the world, recognised by more than half a billion people and applied to over 300 million garments annually\(^{31}\). Until the launch of the pure wool logo in the 1960s products were simply branded as wool (with virgin and/or recycled content). The Pure New Wool advertising campaign was a complete success encouraging customers to look for the logo and inferring that anything else was inferior. This point marked the beginning of the end of wool recycling in the UK and Europe. In the UK each manufacturer who applies for and receives permission to use the IWS Woolmark pays £5,000 each per annum.\(^{32}\) Originally there was no charge to use the logo, but it has become such a well-known symbol, synonymous with quality for the consumer, that manufacturers pay a licensee fee to use it. The production of wool knitwear falls into just two categories,

- “labour intensive” production
- “labour less” production

These extreme methods of garment manufacturing are rarely apparent to the consumer unless the garment carries a “made by hand” label or there is hand crochet, embroidery, or beading etc. In men’s knitwear it is much more difficult to know if, or how much of, the garment has been made by labour intensive methods.

“Clothes are a part of everyday life. We rarely stop to think how they are produced. The label tells us very little except a country of origin. It tells us nothing about who makes the clothes and under what conditions.... does buying clothes labelled “Made in Britain” mean that they are produced with good working conditions?”\(^{33}\)

Surprising also is the geography of these different production methods when the assumption is that labour intensive belongs to the developing world and labour less production belongs to the first world. However, both methods sit side-by-side and often within kilometres of each other. Today the high street customer demands that woollen garments should be machine washable, keep their shape, be colourfast. In addition the garments should be of good quality and fashionable. These are minimum requirements across fibres from discerning customers who want to buy clothing that gives them what they want and the retailers are perfectly aware of this.

\(^{30}\) The Woolmark company has commissioned American ‘futurologist’ business consultant Kirt Salmon to give their assessment of wool until 2005 and beyond, published in 2000, highlighting specialist markets, performance blends, sportswear and wool as a value added fibre.

\(^{31}\) Woolmark promotional literature

\(^{32}\) Author Unknown IWS moves further down the commercial path in Wool Record June 1997 p.17.

\(^{33}\) Proceedings from World Trade is Women’s Issue. The Labour behind the Label. Women Working World-wide Conference, Manchester, April 20\(^{th}\) – 21\(^{st}\) 1996.
“Successfully meeting consumer demands for comfort, easy care and high levels of performance in wear, is not achieved by chance. It is the result of well-targeted and carefully managed R&D, directed at critical stages of the manufacturing chain and ultimately adopted by clothing manufacturers and retailers whose main priority is to supply, at a profit, what they think their customers want”.  

The retailers’ “cause” is to give discerning customers what they demand whilst maintaining/increasing company profits. The “effect” is that to achieve this production centres throughout the world are ‘fluid’, and the continuing success of each production centre is based on development and unit costs, which will be significantly affected by labour costs. 

Garment manufacturing is traditionally a labour intensive and poorly paid industry wherever the activity takes place. There have been massive job losses in the UK during the last 20 years in the textiles and clothing industries. In 1996 clothing was still the fifth largest source of employment in Britain with over four hundred thousand people registered as employed in clothing manufacture and many more worked invisibly at home and in sweat shops. This meant that one in ten of all workers in manufacturing industries were involved in textile/garment production. 

Bad pay and conditions for textile workers is well documented, but some pertinent instances of exploitation by the West will be discussed later in this chapter. It still comes as a surprise to consumers when these exploitative situations occur on our doorstep and it is particularly unpalatable when large reputable companies are involved. The Transport and General Workers Union magazine “Textile Record” autumn 96, led with a complimentary editorial by Mike Penteiow entitled the ‘fabric of success’. The article focuses on a subsidiary company of Coats Viyella and compares the Dorma factory to its textile competitors.

“...the factory in Burnley - is highly unionised and has the best pay rates in the area, coupled with humane working conditions. Several of the predominantly female workforce have worked in other non-union textile factories doing similar work and have experienced much worse pay and conditions. One of these was Maureen Holt ‘there was a set wage of £100 to £110 a week after deductions, with no piecework. There were no tea breaks at the other place and we were not allowed to talk to our workmates at all’.”

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34 Author Unknown Hoechst Trevira New technology keeps wool competitive Textile Technology International 1997.
36 bid
In the West, the knitwear clothing industries have been transformed since the 1970s when Europe and the USA lost about one million jobs as retailers placed ever more business with manufacturers mushrooming throughout the Third World, mostly in Asia and the Far East. In the UK and elsewhere, larger textile companies re-equipped with state of the art technology to remain competitive to supply to the high street retailers. This re-equipping and investment dramatically increased productivity, quality and consistency but greatly reduced the labour force.

"No longer can quality vary from operator to operator or there be any need for the re-processing of inferior garments for example. In production terms, output achieved per person can be 3/5 times greater than traditional methods, put it another way, one machine can claim to save the cost of 2/4 people."

With labour less manufacture, it is easier to control the production chain. This type of production can accredit suppliers because of their environmental and human rights standards, track the garment life cycle after the farm, through processing to the knitwear manufacturer, into high street stores and to the consumer. More difficult but not impossible to assess is the ecological impact when the garments are eventually disposed of, post consumer. For example we assume that it is always better to recycle unwanted knitwear. But should it be for profit, sold to the developing world, leading to an erosion of the country's own textile and garment industry?

The notion of re-usable textiles ending up in landfill sights is abhorrent when they can be readily made into yarns of slightly different quality to those made from virgin fibres for knitting and weaving or used in household and motor vehicle upholstery, or broken down for compost and soil conditioners. At the heart of the Third World push to economic prosperity are the textile and apparel industries.

The rationale for popularising this industry is the theory of comparative advantage, namely the developing countries' vast pool of low cost hard working, adaptable and, to an extent, disposable workers. In some of the garment manufacturing regions, i.e. Asia and the Far East or even the eastern bloc/Baltic regions, there is a strong tradition of textiles. But even here in developing regions the textile and clothing industries are, without question, in the midst of a fundamental transformation with regard to technology and western working practices, which cannot be reversed.

"Textiles in particular are a useful basis for expanding manufacturing capacity. The range of simple and complex processes provides avenues towards more complex or specialised production systems. More important, most if not all, (developing) countries already have long experience of the basic processes of textile and clothing production. Even if this is

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38 Author Unknown, Programmable Knitwear Finishing, Knitting International March 1997, p.56.
largely of hand methods, the basic processing techniques are already familiar and improved skills can be quickly learnt". 39

LABOUR RIGHTS

Chapter one discussed increased environmental degradation during the late 1980s and 1990s due to a series of catastrophes. Now ecological issues are to the fore. Most types of media and at various levels, such as television documentaries, broad sheet newspapers, tabloid press and radio regularly discuss a variety of social issues including rich versus poor, homelessness, and the demise of the National Health service, poor educational standards and GMO issues. Politicians capitalised on the changing mood and seemingly increased public consciousness, these socialist philosophies were new to public debate after 18 years of right wing conservatism, a situation which won a crushing victory for the Labour Party against the Tories.

"Almost every hotel group rips off its workers while generously rewarding shareholders and senior executives. Fast food joints make a fortune but are very good at ensuring that very little of it gets into the pockets of staff. Likewise with some major clothing manufacturers and many well-known chain stores. Official figures show that half the adult workforce, 10 million people can earn less than the Council of Europe's decency threshold of £6.03 pence per hour. Simplistically, because these people earn so little, executives and shareholders get rich. Now that is a moral issue. One does not have to be a Marxist to make the claim. It is what the Catholic Church said last week; it is why our EU partners signed up for the social contract; it is why in 1909 that well known firebrand Winston Churchill introduce wage councils to ensure that employers paid half decent wages. One solution may be to use the boycott tactic, which has a long and impressive pedigree. Barclays Bank suffered badly because of its South African links and Body Shop have made a fortune out of the boycott of products tested on animals, there is also the concept of boycott in reverse - using a firm because of its good record". 40

During 1995/6 a plethora of articles and documentaries in the UK dealt with the subject of exploitation by Nike, Reebok and Adidas by the industry giants and their suppliers in the clothing industry. The expose of exploitation within the luxury training shoe industry who sold shoes for £100 a pair, whilst paying Indonesian workers £1.07 a pair to make, led to outrage. At the same time US training shoe advertising campaigns cost in excess of 187 million pounds per annum. 41 Soon after, public outrage in the UK led to the irony of the Oxfam Challenge and a deluge of media coverage (fig 46).

39 (I L O, 1973, p.63)
Oxfam is to challenge five leading high street fashion retailers to prove they have no connections with child labour. The charity is asking Marks and Spencer, the Burton Group, C&A, Next and Sears to state where their clothes are made as part of its campaign against the use of illegal labour.

42 Marshall, J. High street names to face child Labour quiz in Drapers Record, 11 May 1996.
"Tony Blair has indicated a minimum wage of between £3 and £4.10 which, if you take £2.80 as the average current rate of pay means a 40% increase in costs, consumers won’t like that and for retailers the temptation is to go elsewhere. Manufacturing has become a movable feast as exemplified by the Ronson factory’s move from South Korea to South Wales chiefly because the Welsh offer a cheaper labour force, £8,000 a year compared to £12,000 pounds. It will be just as easy to move back again if the situation reverses." 

It is possible to identify five areas; industrial cleaning, healthcare, hairdressing and textiles as well as catering, where there is a high incidence of low pay. In almost all cases, it is women who are particularly likely to be earning below £3.80. With the exception of textiles and clothing where machinists can earn as little £1.00, the main low pay industries are in the service sector. In textiles, it is an important consideration that the price at which a manufacturer can sell a garment is determined by the price of an imported equivalent from Macao or China. Those rock bottom prices have to be matched. If wages were to be forced up in an East London sweat shop the wholesale price would rise. Either the employer would have to swallow the increased costs in the form of reduced profits or, if that were impossible, the company would have to choose between closing down or finding a more profitable line of business.

Moving to a minimum wage reflected Churchill’s thinking when he set the Wages Councils in 1909: that in an industry virtually without any trade unions, statutory protection is necessary otherwise the good employer is undercut by the bad, and the bad is simply undercut by the worst. 

In October 1996 the Evening Standard’s investigative journalists visited another London factory posing as buyers from a design house in Lille.

"Above all, we marvelled at how cheaply the clothes were put together by the rag-tag army of labourers, wedged between the garment racks and bundles of clothes on the Dickensian factory floor. The factory was busy. Very busy. Making dozens and dozens of luxury Wool and Kashmir blend winter coats for a company we can name, British Home Stores. Today you might wander out into the high streets and buy one for £80 pounds probably without realising it costs only £1.70 for a semi-skilled Turkish cutter to make in only a few hours in Hackney". 

Later on the 12th of November 1996 the Guardian’s headline ran, ‘Child workers number 250 million’, this article published the latest figures from the International Labour Organisation (ILO).

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44 Lawrence, B. Free the £3.50-an-hour wage slaves in The Observer Business, 30th June 1996, p.4.

showing a child of three, stitching leather footballs by hand in India for export to Western markets. The World in Action expose about Marks and Spencer selling garments, which were manufactured via sub-contractors working for Desmonds Ltd, (who are one of the largest, longest serving and most reputable suppliers to Marks and Spencer) allegedly using child labour in Morocco did considerable damage to the reputation of Marks and Spencer.

In July 1997, Newsnight for BBC2 ran a documentary about the Burton Group manufacturing in Indonesia via factories run by the Military Government, and so the coverage went on. There is no doubt that the launch of the Oxfam clothes code campaign challenge made the large retailers nervous because, now more than ever, bad publicity would be bad for business. Surprisingly, most retailers on the high street, large and small, could not guarantee that environmental and ecological standards were being met in the manufacturing chain. The fact that the public questioned clothing-manufacturing practices at all was a relatively recent phenomenon. Marks and Spencer was one of the first to instigate a preferred suppliers list, years ahead of this challenge, establishing a vetting system for their manufacturers down the line. Even so, they did receive a great deal of damaging publicity over the Desmonds affair, the truth of which is still an unknown as the much publicised court case threat never materialised after Marks and Spencer issued the World in Action team with a writ. These exposes highlighted the fact that it is much easier to vet production processes and make recommendations for improvements at the beginning of the chain, i.e. farming, spinning, dyeing etc. where the controls are essentially quantitative. At the point where people become involved, dubious practices and humanitarian issues take over. These links in the chain are more difficult to police because in the garment making processes ‘good’ and ‘bad’ conditions become subjective as moral issues which have to be measured against company profits and consumer demands.

**Conclusion**

On the back of the Fashion industry some countries are developing at an astonishing pace and Knitwear manufacturing alone has driven industrialisation throughout regions in the developing world. On the one hand, the whole industry is investing in new technology, e.g. machines and methods, research and development, computer aided design (CAD) and manufacturing (CAM) and is using technology to improve raw materials, such as wool, which are being genetically and biologically engineered, as discussed in chapter two.

On the other hand, running parallel to these new developments, workers can stand for ten hours a day, transferring fine woollen loops by hand from needles which they can hardly see, in dimly lit rooms, in 90 degrees Celsius and 90% humidity. Then they are bussed to migrant worker camps, where they live almost as prisoners and are paid a few rupees a day. 47

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47 Personal visits 1995/96
This practice maintains the profit margins necessary to satisfy the shareholders of such as Arcadia and Marks and Spencer. Moreover, this system enables the British public to continue to buy more and more clothing which it does not need,\textsuperscript{48} at unrealistically low prices. This profit is at the expense of the workers who make the products and without the deduction of costs of the environmental destruction in the production process and garment disposal post consumer. The situation is driven by retailers and factory owners who relentlessly push for higher margins to increase or maintain their profits, in an industry which has serious production over-capacity in relation to the number of items it produces for the UK market. It could be argued that the Fashion industry as we know it is in terminal decline.

This decline is noticeable in Mauritius, where four local families own, or partly own nearly all the main industries, some of which are partnerships with investors from other countries, as mentioned earlier. They live in the affluent north of the island in breathtaking luxury with servants and private planes etc. Before they owned `sugar', then `textiles and clothing', but now are focusing on `tourism' and the `financial' sector because they realise that future prosperity hinges on Mauritius moving out of labour intensive, low intrinsic value products to become a new off-shore and regional financial centre.\textsuperscript{49} On the back of the wool knitwear industry, in three short decades, Mauritius is leaving the clothing industry behind and is fast becoming the hub of the Pacific-rim wheel and a communications fast track into India and Africa. New employment prospects will begin to meet the increasing expectations of the Mauritain people, who no longer wish to be exploited and who are hoping for a level playing field when involved in world trade.

There is no doubt that the arguments for and against the use of cheap labour for manufacturing knitwear in the developing world are complex. Is it correct to impose our `well intentioned' European working practices on impoverished economies? In these countries long working hours, child labour and poor conditions are a part of working life, we should also remember that our own Industrial Revolution took two centuries to convert the horrors of the early nineteenth century into the more or less civilised society of today. It could be argued that each small child who attends and assists the working adult learns a trade for the future, and in some countries, for instance in parts of Africa, this work may be the only education the child will ever have. Unacceptable conditions found in garment manufacturing in poorer parts of the world which were and highlighted once again in the late 1990s are a symptom of a developing nation’s rush to become industrialised. (figs 47,48,49).

\textsuperscript{48} Evidenced by the annual volume of garments thrown away to be discussed fully in chapter 4.
\textsuperscript{49} Mauritius is the only zero tax centre in the world with a tax treaty network. This has encouraged the UK, Germany, India and Scandinavia to invest and already the results are evident. The island’s is now a favoured route for investment into and out of India, with Investment funds such as Morgan
What is true is that the exploitation of this situation becomes more acutely unacceptable as the powerful retailers connect with manufacturers, which have established themselves where labour can be bought for very little money.

Stanley, Martin Curries, Merrill Lynch and many others (twenty one in all) adding value to the islands growing reputation as a financial centre of excellence.
These employers have few social responsibilities to their work force, i.e. no sick or holiday pay, no leave for pregnancy, no pensions and no environmental controls. Ironically the General Agreement on Tariffs and Trade (GATT) which was put in place to make world trade easier, has made the situation worse for these workers. The agreement allows anything to be made anywhere, without protection or proper payment for the labour force, and then to be exported and imported anywhere. Without restrictions, multi-national firms tend to establish themselves where labour is cheap and profits high. Developing countries have no alternative but to compete with Europe by condoning miserable labour standards enabling them to offer lower wages. The issue should not be to try to impose European standards throughout the developing world or to set some global minimum wage, with restriction in imports from countries which do not comply, once again creating a western protectionism via the back door. Also it must be realised by the West that these economies locally are often very fragile in the manufacturing sector. When conditions do not conform to our Western ideals, the immediate response may be to withdraw our business, which may cause more suffering and upheaval in the short and long term.

50 Responsible retailers and suppliers do have sourcing policies to try to stop exploitation but these do not go far enough an example of such is in Appendix 4.
However Jacques Chirac, the President of France, described the ideological scenario to strive for when building future working relationships with the developing world at the G7 Summit in 1996.

"What the French government is calling for is recognition that there are certain core Human Rights that need to be encouraged and enforced. These are the freedom to join trade unions and the freedom for these unions to bargain collectively, as well as their support in the abolition of forced labour and the exploitation of child labour. They are basic requirements, whatever a country's level of development or average wages are. Polarisation and liberalisation is not just a North/South issue. Some of the fiercest competition now, goes on within the South, as the more advanced Asian tigers like South Korea and Taiwan find themselves losing jobs to workers in countries such as the Philippines and Malaysia. Behind them down on the Labour scale come China, Vietnam and Indonesia. Internationally agreed social clauses would help to ensure that competition is not based on unfair or degrading conditions".

TO THE GRAVE AND BEYOND

CHAPTER 4

Introduction

Fashion is a transient industry in relation both to manufacturing bases, which come and go and to the product, which, quickly becomes unfashionable and therefore unwearable. A knitwear piece may be worn once and thrown away, long before it is worn out. Currently, collections are not designed with 'investment dressing' in mind, perhaps with the exception of fashion labels such as Prada, Hermes and Gucci. Usually fashion garments are cheap, disposable, seasonal and with a life span measured in weeks not years, typical of high street labels such as French Connection or Miss Selfridge. However knitwear and particularly Winter knitwear has a longer life span than most lines, due to the fact that they are often 'key' pieces, maintaining the co-ordination of the rest of the merchandise, acting as a colour or pattern vehicle. Also, knitwear is manufactured vertically with both fabric and garment produced in house. It is relatively more expensive to buy than simple cut and sew items and is designed to be time durable. Nevertheless, because the Fashion industry is the epitome of consumerism, the notion that quality would equate with longevity is absurd. Why are fashion garments made to last, possibly for years, from the finest often finite virgin materials, only to be used a few times, given to charity bound for the third world or land fill? Surely the life span of the garment should dictate the appropriate substrate and using fibre two or three times in such products should be mandatory.

Unlike in farming, food, and the petrochemical sectors, the 'Green' movement of the early nineteen nineties made little impact on the fashion industry. Economics and legislation rather than altruism or a concern for human and environmental issues has instigated ecological change. Also the public still attaches the "worthy" tag to the environmental issues. It is still thought that Green pressure groups are composed of students, middle class and female protesters, Churchmen, New Age travellers, and gay rights activists and are not to be taken too seriously, but indulged. Why it is not desirable or 'cool' to be Green, except in Germany, Scandinavia or the Netherlands?

The least discussed environmental catastrophe is that of waste disposal which may be the crisis to affect us all. Progressive European countries such as Germany recognised the looming crisis of waste disposal and forced a change initially the packaging laws across the EU. This forced the retailers to apply pressure on their manufacturing and sourcing chains to reduce and reuse packaging where possible. The law also enables the customer to leave product packaging at the point of sale where disposal becomes the financial problem of the retailer.
This chapter will discuss the disposal of a wool sweater post consumer and its journey beyond the grave. The case studies are L. M. Barry and Savannah Rags, Evergreen and Oxfam Wastesaver, all textile recyclers, who profit by closing the textile loop in various ways. Information is gleaned from primary research interviews, Government and Recycling Association data and trade publications.

WHO CARES?

Fig 50

Designers should be urged to consider reduction/ reuse/ recycle or the 3Rs as much as they do creation because they create the plethora of new items, which in turn lead to the generation of new markets. It could be argued that the designer is central to and instrumental in creating new goods, which are fuelling the flames of the post consumer catastrophe. However, post consumer issues are normally never a concern of designers, either as students or as practitioners in the fashion or textile field because basically the industry exists on consumption.

In general designers have a tacit yearning for beauty which they covet, this is at a complete tangent to the dirty and unglamorous world of the 3Rs. However designers do unconsciously recycle and reuse continuously on an intellectual level with concepts, design philosophies and historical references.

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1 People are familiar with the 3Rs concept, reduction, reuse and recycle (fig50) but there is a fourth equally important concept missing which is that of repair. The concept should be the 4Rs.
A discussion document commissioned by the Environmental Technology Best Practice Programme\(^2\), which tried to assess designers environmental knowledge and their potential to influence the supply chain and tried to identify opportunities for designers to consider the environmental consequences of their designs.

What the survey did not establish at the outset was whether the designers cared about ecological issues and if that was a reflection of their knowledge or lack of it? In fact there were peaks and troughs throughout the discussion document but, interestingly, it concluded that environmental concerns were those of middle and senior management and not that of the blue-collar workers and that the least common environmental measure taken by companies was the development of cleaner products. The document concluded.

"Generally, designers have little knowledge of environmental legislation; company directors tended to possess the most knowledge in this area although at a level of only 33%. However, designers at all levels were found to have a very good awareness of the Eco collections available in the market today, with 75% aware of Eco textile products".\(^3\)

This conclusion is a surprise not least because there are so few Eco textile products on the market but it confirms the idea that designers do retain environmental information if it is presented in their own language as product. Post-consumer issues in relation to reuse were not mentioned.

To a certain extent post consumer issues are explored in fine art where it is normal to create a philosophical or provoking statement. Fine artists have created inspiring solutions to the 3Rs (reduce, recycle, reuse) question, however, the ideas are works of art to be viewed in galleries or books. In the introductory notes from the Craft Space Touring exhibition "Recycling"\(^4\), in 1996, lecturer and architect David Green discussed the concept of recycling and economics. He said that recycling should not be the reconciliation between guilt and over-consumption, characterised by a Sunday morning trip to the supermarket’s recycling bank. He went on to point out that we all recycle in one way or another, on a literal level encompassing matters as diverse as social relationships and design ideas.

In textiles there are examples of successful recycling and subsequent metamorphosis, for example in the art of quilt-making is the concept of alchemy, scraps of waste fabric into products, base metal into gold. This metamorphosing process in fashion is exemplified by cutting edge designers (fig 51), Martin Margiela, Jessica Ogden and Noki, who deconstruct, customise and reconstruct. The works of John Galliano and Stella McCartney combine old and new fabrics and garments as

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\(^{3}\) ibid

does the niche retailer Voyage and reuse is an important theme in the concept design group Droog.\(^5\)

\[\text{Fig 51}\]

The integration of old garments or garment parts into fashion means that there is an extra element integrated into the piece, that of ‘time’. The garment can take on an infinite number of identities over its life span and can increase rather than decrease its value as it does so. The garment’s intrinsic value moves it outside ‘trends’ and the traditional concepts of seasonal renewal (where clothing is worthless) are no longer relevant.

**4:1 OVER CONSUMPTION**

During the last decade environmental issues have given way to ethical concerns in the clothing manufacturing industries and the problem of ‘over consumption’.

Over consumption is not being dealt with because both successful and unsuccessful economies need consumers to buy more goods which will increase the demand for manufacturing, which means more employment, which in turn leads to more cash and more cash for people to purchase more goods. It is a vicious circle and it would take a brave government to begin to legislate against this trend for mere ecological reasons. Instead of beginning to confront the fundamental problem of over consumption, which mean more goods equals more waste, instead there is to be an increase in reclamation on a global scale. Global reclamation, it could be argued, will justify over consumption. World leaders reached this agreement at the Earth Summit in Rio de Janeiro, Brazil in 1992 and called it Agenda 21\(^6\).

This ambitious plan was aimed at protecting the environment with a variety of 115 specific clean up programmes. The enormous costs were calculated at 625 billion dollars per annum, most of that coming from the Southern Hemisphere where it was perceived that the major problems lay.


\(^6\) Dudley, N. *Earth Summit* Helicon Publishing Ltd 1996.
The high ideals and fine words needed money to back the rhetoric, which was not forthcoming from the richer nations in the north. However what has happened is that in Europe the Earth’s Summit’s policy principles have trickled down to a local level which is now known as Local Agenda 21. Of course reclamation is a global issue in terms of resources and, increasingly, disposal. In the next 20 years the world's population will have risen by about 2 billion people, and much of that increase will have taken place in the developing world where cultures are aspiring increasingly towards Western consumer lifestyles. Obviously that consumption will escalate at a massive speed as will the problem of waste disposal.

The fashion industry positively promotes over consumption and thus far has expressed little interest in slowing down production or in waste recovery. Simply there are too many interested parties focused on profit throughout the life cycle of a garment. Similarities lie between the attitudes of designers, retailers and customers who, if they are aware of over consumption issues care little of the cause and effect scenario. That weekly trip to the recycling bank or seasonal charity shop trip just is not enough. Sustainability i.e. the amount or degree to which the earth’s resources may be exploited without deleterious effects, should be the answer, but it is not any good buying sustainably developed clothing (if there is such a thing) if you buy as many or more items than before. Perhaps the answer to over consumption is a return to 'investment dressing', buying something of a better quality to use longer even if it is more expensive, or extending the selling seasons, or ignoring the seasons completely, having rolling stock with small 'buy to sell out' ranges. Of course this conflicts with the commercial reality of the Fashion and Textile industry where new clothes are designed and marketed to be desired seasonally and new collections mean new profits for shareholders. These ever-changing trends keep the business alive, they sustain the 'buy and throw away' culture which is the root cause of the problem.

Current figures show that the proportion of domestic textiles thrown away in the average household dustbin vary between 2.4% and 15% of the total waste depending on which references are used. In 1996 it was estimated that 5 hundred million kilos of items were burned or buried in landfill sites, 95% of which is reusable or recyclable. Unsorted domestic refuse is left for collection and is burned or buried by Local Authorities. On average it costs £35 pounds a tonne to dispose of the textiles in this way but the costs would be

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9 Cleli interview Appendix 1 refers to the fact that the favourite Mauritian soap oprea is the American series Dallas that depicts the lives of rich Texan cattle ranchers.
11 i.e. The Department of the Environment, Friends of the Earth or Textile Merchant trade figures.
<table>
<thead>
<tr>
<th>Material</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper/Cardboard</td>
<td>33%</td>
</tr>
<tr>
<td>Glass</td>
<td>10%</td>
</tr>
<tr>
<td>Plastic</td>
<td>7%</td>
</tr>
<tr>
<td>Ferrous Metal</td>
<td>7%</td>
</tr>
<tr>
<td>Textiles</td>
<td>4%</td>
</tr>
<tr>
<td>Aluminium Cans &amp; Foil</td>
<td>1%</td>
</tr>
<tr>
<td>Compostable Material, Ash &amp; Dust</td>
<td>38%</td>
</tr>
</tbody>
</table>

Fig 52 Figures vary and are unreliable

Every time you put old clothes out for the destitute or collect or throw old shoes and football boots into the dustbin, it adds to the vast amount of household refuse that has to be either burnt or buried by the Local Authority. This is not only damaging environmentally because of the atmospheric pollution caused by burning but the long-term effects on the natural world are alarming. Creating large areas of rubbish filled land - so called landfill sites - is something that will scar our countryside for years to come, leaving an increasing problem for future generations.

There is an alternative - and that's to use your Local Authority Textile Bank. It's no different from a bottle bank or paper bank and it works the same way except that by taking your unwanted household textiles, clothes and shoes along, you'll be giving to people as well as the environment.

Fig 53 Reclamation Association Figures
This amount of discarded textile waste if compressed into half ton bales and built into a solid tower, 65 metres by 65 metres for one year, could build a structure three times the height of Britain’s tallest building, Canary Wharf Tower (fig54). It was estimated in 1995 that if textiles continued to be discarded in this country at this rate the tower would be over four miles high with a permanent ice cap by the end of the year 2000. 13

The recycling industry in Britain began in the West Riding of Yorkshire 180 years ago with a new product called shoddy, developing into a huge export business providing material to all manufacturing areas of the world. The supply body was called the ‘rag trade’. In 1813 Benjamin Law ground worn out garments through a water powered pulling machine, reducing them to a fibre state which could be respun back into yarn and re-used. Dewsbury and Batley (the home of Evergreen Yarns), grew up because of this developing industry in which in 1858 over 7,500 tons of shoddy were being produced in Batley alone. The value of the shoddy industry was calculated
to be £375,000, with a price per ton of £50. This was a considerable sum considering that the wages of a rag sorter were six shillings and 6 pence a week. In 1862 there were 500 people sorting mixed rags, supplying to 130 shoddy manufacturers in Yorkshire alone. The growth of Yorkshire industrial towns and the proliferation of the huge woolen mills occurred because of the wool textile recycling industry which needed a plentiful supply of workers, who in turn helped to supply the raw material for shoddy. The decline in the demand for woollen tweed and duffel fabrics in the last 60 years is well documented but the corresponding disappearence of the shoddy manufacturers, wool stocking sorters, the marine stores, and the rag merchants was never noticed. Often old family firms quietly closed their doors, leading to the virtual extinction of the textile recycling industry in Great Britain.

DUBIOUS CHARITY
Textile recycling in this country is small scale (half a million tonnes) in comparison to that paper (23 million tonnes). The industry consists of about 50 textile reclamation companies (rag merchants) who are involved in the grading and sorting of discarded textiles. Most of these companies are members of the Reclamation Association. The industry is run on very simple labour-intensive lines. Discarded textiles reach the grader's factory by means such as charity shops, or kerb side collections, textile banks. Then the material is put onto a conveyor belt and carefully inspected by female sorters who separate the clothing into various material fibre types. Good, valuable sorters have years of experience and can detect a fibre by touch alone without reference to the garment label. Once sorted into various categories according to their fabric content i.e. cotton, acrylic, wool the materials are sifted for fashion such as denim, sheets, and leather. In the next stage of the recycling process the textiles are sorted for quality, for example, No.1 jumpers are the top quality, No.2 may have a small mark or fault on them and so on. Grades are from 1 to 5. The lower grades of textiles are used in traditional end use areas, for example, cotton as industrial wiping cloths for oil spills, acrylics for filling materials for mattresses, sound proofing in the automotive industry, wool shoddy for yarn and felts. Encouragingly, there are new areas of research into textile recycling, such as non-wovens for agricultural seed carriers, biodegradable thread for geo-textile netting for flood zones, the inclusion of fibre in the construction industry to prevent concrete splitting, recycled textiles into

14 Murray, R. Creating wealth from waste. in Demos 1999, p.50-57
fibre for building insulation and as textile filters (in wool) for cleaning up after marine disasters and to pre-treat waste water.  

The easiest and most lucrative area for recycling higher grades of material is, however, the sale and exportation of clothing to impoverished regions of the World, including Africa, Asia and the Eastern bloc countries such as Slovakia and Rumania where it is sold in markets and second hand clothing shops by entrepreneurs. The main sources of supply to the textile recycling industry in this country are from charity shops, jumble sales and, more recently and growing in importance, textile banks.

Fig 55

Textile banks are a comparatively new method of getting domestic textiles for recycling (fig55). They enable the textile merchant to be independent of the charity shops and collect directly from the consumer, usually paying a fee for the rent of the site and a figure to the council per ton collected. In 1999 L.M. Barry paid £7,500 for a one year contract with the London Borough of Enfield for tonnes of textiles.

A textile bank is capable of holding 750 kilos of textiles. Recyclers, who collect, enter five-year contracts with local authorities and the collection containers are free on loan. Clearance and prices are guaranteed in line with the scheme established under the auspices of The Reclamation Association. Because the textile banks are not secure, they are increasingly a target for theft. For instance the charity Scope has suffered thefts from textile banks where clothing has been sold on to textile merchants or resold at car boot sales. They estimate that a loss of just 2 tonnes a week equates to a loss for the charity of £22,000 over a one-year period. Scope has 24 textile banks in the Borough of Westminster, recovering 70 tonnes of clothing a year. Unusually for charities most of the material is sorted and sold into Scope shops up and down the UK and proceeds directly help people with cerebral palsy. Merchants recycle some remaining material.

There are numerous charities in this country and Europe that have shops on the high street dealing mainly in second-hand clothing. The largest and best known is Oxfam but Barnardos, Imperial Cancer Research, Age Concern and Scope are also large charity chains. In addition to this are the many small charities, for example Humana (now Traid), Family Welfare, Relief

17 Author Unknown Textiles Stolen in Materials Recycling Week June 6 1997, p.6.
Fund for Romania, Kith and Kids, Gingerbread and the many animal welfare charities e.g. RSPCA. There is no doubt that charities make the bulk of their income from the donations of second-hand goods which are mainly clothing. For the most part, the donor believes that their good quality, but out of date or ill-fitting garments will be re-sold by the charity in their shops for profit. However, in reality just 5% of these goods are re-sold over the counter because the vast majority of textile donations are sold by weight once or twice a week to textile merchants, for various end uses.

It would come as a surprise to the public that 70% of clothing collected by donations is funnelled through textile merchants to Third World destinations such as India, Pakistan, Ghana, Tanzania and Zambia and the Eastern Bloc (fig56).

**Fig 56 Containers bound for impoverished countries twice a week from Sheerness**

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18 Humana UK re branded themselves in 1999 with new livery, graphics and name TRAID= Textile Recycling for Aid and International Development. Designer Wayne Hemmingway from Red or Dead created a catwalk show with students from the Royal College Of Art for the marketing campaign. 200 tonnes of textiles are collected country wide the majority of which is exported to the third world. *Charity Changes Name To Traid*  Traid press release July 9 1999.- http://www.traid.org.uk
The ‘giver’ assumes that it is the revenue gained from ‘over the counter sales’ of donated clothing which is used by the charities in these poor countries, or the actual discarded clothing itself is given as aid. But the reality is that these second hand garments are sold to the highest bidder whereby the process is purely entrepreneurial rather than philanthropic/ altruistic. The public’s charitable clothing donations effectively line the pockets, firstly of the textile merchants and secondly the entrepreneurs who come to the UK to buy the merchandise (fig57).

The merchant’s containers are packed with half ton bales of second-hand clothing, there are 230 bales per container weighing 57 kilos per bale, the most valuable contents are bales containing ladies underwear garments containing hundreds or thousands of items (fig58).
With vast volumes of second-hand clothing being exported from Europe to developing countries, it has been suggested that the charities are indirectly assisting in the erosion of these countries' indigenous clothing industries. The variety of Western clothing in second hand shops or on street markets is infinitely more desirable than local labels. The result of this dumping is seen repeatedly in television documentaries featuring vanishing tribes, people in various parts of the world, wearing western "T" shirts, jacquard knits and football shorts. European fashions are found in the most remote regions of the world via this trade, which is fed by the charities. An irony that exists is Oxfam and Christian Aid etc. generating funds through such exports and taking the moral high ground, issuing the big five retailers an ethical challenge on production. (See chapter 3).

Surely the charities are guilty of double standards. They are businesses in their own right, run by salaried managers maximising profit from the fashion industry and at the same time critical of it. In reality the more fashion clothing is thrown away the more the charities benefit. Profits are calculated in pounds per tonne for donated textiles. The charities sell to the highest bidder; there is no insistence that the clothing is disposed of in a specific manner. When the textiles have left the shop premises the responsibility of the charity is over, as is that of the big five retailers at the point of sale, who at the outset generated the product.

It seemed that the practice of selling goods donated to charities in the UK which are then re-sold to businessmen from the developing/impoverished countries in the world was coming under some control. However Reclamation Associations in partnership with the Charities successfully lobby against new laws concerning the export of European waste which should have come into force in 1998 via the European Parliament.

British textile recyclers and the charities were worried that their profits, which rely heavily on the export of clothing to third world destinations, might be jeopardised because of a new ruling from the European Union, which would see an end to the exports of textiles to certain non OECD states. M E Ps voted in June 1997 to ban all green listed wastes from the EU countries until the purchasing countries have replied to a questionnaire concerning frontier shipments of waste. 21

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19 EU publishes legislation to ban or control exports of secondary materials to certain non OECD countries - the impact of the Basel Convention. Bureau of International Recycling, BIR, the world federation of recycling industries update July 1999.
20 op cit L.M. Barry interview p.7
21 EU publishes legislation to ban or control exports of secondary materials to certain non OECD countries - the impact of the Basel Convention. Bureau of International Recycling, BIR the world federation of recycling industries February 1997. These countries are Afghanistan, Algeria, Angola, Antigua and Barbuda, Armenia, Azeabaijan, Bahrain, Bangladesh, Brunei, Cambodia, Cameroon, Central African Republic, Congo, Cote d' Ivoire, Democratic Republic of Congo, Dominican Republic, Ecuador, Elsalvador, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Guatemala, Guinea, Haiti, Honduras, Kenya, Kyrgyzzistan, Laos, Lesotho, Mali, Mauritania,
Briefly the EU questionnaire asked countries whether they were happy to receive waste shipments as part of normal trade or whether they would prefer red list controls. A non-reply meant a lack of interest in receiving these shipments which moved the EU to make the ban effective from January 1998.

Numerous African countries including Ethiopia, Kenya and the Congo were on their lists in addition to other important post consumer textile markets in South America and Eastern Europe.

The President of the Textile Recycling Association, Lawrence Barry, said,

"We could quite possibly be near to a situation where the Rag Trade will cease to exist from the beginning of next year".  

With ever increasing tonnage of clothing being generated in the UK and ethical questions about dumping at knockdown prices it is astonishing that more effort is not being directed at finding solutions through the 3Rs.

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Morocco, Namibia, Nepal, Oman, Panama, Quatar, Rwanda, Solomon Islands, Sudan, Swaziland, Syrian Arab Republic, Tajikistan, Tonga, Turkmenistan, Uzbekistan, Venezuela, Vietnam, Yemen and Zimbabwe.

22 author Unknown EU ban threatens textiles in Materials recycling week 25 July 1997.

23 Conservative MEP Dr Caroline Jackson insisted that each country must reply to the questionnaire. We are not saying that countries may not import the material we are simply trying to bring the trade out into the open, so that those importing the material can realise what business is going on. Trade can continue on the basis of obtaining permission for each individual shipment. It may well be a cumbersome procedure but all their companies have to do is to get the countries concerned to buy a stamp and respond ". At least one country, Uganda, complained that the European legislation was paternalistic. Non reply is seen as a negative response which means that countries like Uganda which have not replied would be in a position, where textiles exported to the country will be red listed and severely restricted. On his return to Britain from Uganda, Lawrence Barry said "I explained the situation and they (the Ugandan government) said it was paternalism. They take the matter very seriously and cannot see why if it has taken the EU three to four years to debate the situation, that they are expected to sign such a document without passing it through their own parliament" He added, "I just can not see how this delay in legislation can benefit anyone. Who will be the winners out of this?" Uganda attacks the EU export legislation Materials recycling week October 3rd 1997.
CASE STUDY 1: EVERGREEN

The company Evergreen (fig 59) began trading in 1990 and ceased in 1997, it was owned and run by John Parkinson, producing blends, yarns, fabrics and finished products, which used recycled fibres in various proportions. Evergreen's aim was to produce attractive yarns, fabrics and garments with reduced environmental impact by using a high proportion of recycled fibres. Initially all products used recycled wool fibres, which in the UK is regarded as the bottom end of the trade.

"Evergreen is attempting to reverse this attitude by manufacturing high quality, fashionable garments which not only require much less energy than their new wool equivalents, but cause less pollution and make use of a waste product which might otherwise go to landfill sites." 24

Evergreen operated a system whereby it retained ownership of its products throughout the manufacturing steps although some of these processes were sub-contracted. Raw material was collected by Evergreen from charity outlets from rag merchants and from spinning and knitting factories. This is called post consumer and post-industrial waste. Evergreen's recycling system followed the usual method:

- collection and sorting which categorises textiles into fibre types and then into colour and yarn families
- then the sorted clothing, fibre and rags are put through a rag pulling machine which has spiked rollers which counter-rotate, these tear the rags into their fibre state known as shoddy, such machines can process 80 kilos of material per hour
- the third and fourth stage is blending and then carding which disentangles the fibres, cleaning and mixing to make a web of continuous parallel fibres

after carding the web is fed through a machine called a condenser, which produces untwisted ropes of parallel fibres called ‘tops’
spinning then takes place, which involves thinning out the fibres and inserting a twist to produce a specific yarn count, or thickness, these yarns can be twisted together to make a stronger product
after spinning, woven or knitted cloth can be produced the final part of the manufacturing process is to make up specific garments before the final finishing process
In Evergreen’s advertising literature the benefits of using recycled fibre compared with textile manufacturers using 100% virgin fibres is pointed up.

Fig 60
By using post consumer fibres none of the most polluting resource greedy processes are needed, as raw wool scouring and dying are avoided because the fibre has already undergone these processes and a wide colour palette can be achieved (fig60). In addition textile waste can be used which would otherwise go to land fill or incineration.
According to the DTI the benefits of a business such as Evergreen include, 
• Good quality

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25 ibid
• competitive prices
• creates revenue for charities
• reduces landfill
• reduces demand for chemicals/dye stuffs and the problems caused in their manufacture
• reduces demand for new fibre production, much of which comes from non-renewable sources
• reduces demand for water
• reduces demand on treatment plants and management of residues
• reduces demand on energy
• reduced pollution both water and airborne
• reduced transport and journey times
• reduced packaging needed before, during and after dyeing and other processes on fibre
• creates jobs (sorting is labour intensive)
• raises people's awareness of environmental issues
• recycleability (there is no limit to how many times fibres can be recovered)

It would seem that the major objection by spinners, knitters and retailers to the idea of recycled base yarns is lack of quality and continuity. Also recycling wool fibre reduces its elasticity meaning knitting time is increased and there is a noticeable difference in handle of the final garment. However, quality can be guaranteed from batch to batch either in top or yarn form and the other problems are disputed by Nanni Filati, one of the best wool recyclers for yarn in Europe.

Evergreen improved elasticity by including some virgin organically grown wool fibres in spinning which helped in terms of strength. However testing procedures such as rubbing trials are so exhaustive within the retail area that quality is difficult to maintain. Colour continuity is also a specialist scientific operation. Evergreen states that there is a price advantage to businesses manufacturing from recycled materials, however it concedes that after sorting, recycling costs and those of running machines at slower speeds often mean that processing costs then become much closer to new fibre items. There would be a huge difference if collection and disposal costs were included in the kilo price per yarn, which stands at £35 per tonne.

26 Evergreen: Energy Efficiency Office Department of the Environment Best Practice Programme.

It is worth noting that the DTIs set philosophy which drives waste reduction and recycling information programme is profit motivated and its Environmental Technology Best Practice Programme literature leads with the slogan, "Good practice: Proven technology and techniques for profitable environmental improvement."

Case Study 181 assessed Evergreen in relation to savings in energy arising from the use of recycled fibre in the manufacturing of knitting yarns, fabric and/or garments. The report
CLOSING THE RECYCLING LOOP

At the National Recycling Forum in June 1997 Jan Mc Harris discussed the idea of closing the recycling loop. She explained that this meant increasing the recovery of materials for recycling, encouraging manufactures to use recycled material in their products and persuading the public to buy those products. The speech was general but so appropriate for wool knitwear. She talked about an ever-increasing range of functional recycled products on the market, because of new technologies and operational practice. However in the area of textiles there are barriers that lie in that significant environmental benefits could be achieved because many of the processes (for instance scouring and dying) are not repeated. This meant that less effluent was produced, less fresh water used and not least, good use was made of old garments destined for landfill sites.

The study estimated that Evergreen made energy savings of £21,000 pounds a year alone and additional savings on raw material and processing worth £276,000 pounds a year.

"In 1992 evergreen produced about 127 tonnes/year of re-claimed fibre, equivalent to about 114 tons of finished fabric (assuming 10% wastage during processing) half of this output was 100% wool content fabric and half is wool/acrylic mixtures. On this basis the annual energy savings was 6,500 G J/ tonne worth about £22,000 pounds."

Additional cost savings result from the lower price paid and reduced processing required for recycled fibre in comparison with new fibre. This is particularly true for wool and for animal hairs such as cashmere. The report made a comparison using evergreen's figures on costing of 100% woollen jacketing fabric made from recycled fibre and 100% new wool. It concluded that the cost of recycled wool fabric would be £4.86 pence per kilo, of which £0.83 was raw material (rags into Tops) as opposed to £7.88 pence per kilo for new wool fabric of which £3.85 was wool Tops. Interesting to note that these figures do not include actual transportation costs in either product i.e. from a local merchant or from the Southern Hemisphere.
increasing public awareness to encourage a greater acceptance of recycled materials in the specification, tendering and purchasing process.

Cost, is of course, the driving factor for many organisations that would use recycled materials as components in their products, however if virgin substrates are close in price they will be used. This is because manufacturers believe they produce a better product. This may be true in some cases, but as with the paper industry problems such as ink bleeding on, or the aged appearance of recycled paper has been removed using design and technology. Increasingly, the production cost of an item should be equated with the product’s overall impact from cradle to grave. Gradually a hand full of companies such as Patagonia and the Body Shop are finding it could pay to switch to alternative environmentally preferable products and heavily market that philosophy.

Business values have been shifting to include factors such as 'producer responsibility' to deflect the rise of public criticism and suggest ecological performance. Consequently, the success of environmental purchasing set within the context of sustainability will depend upon a shared responsibility to communicate and raise awareness across all disciplines. Some obstacles in the Wool textile industry include discrimination against reused/ recycled products. It would make sense for all companies to have an environmental purchasing policy with a key objective to increase recycled material across product substrates. However, this needs legislation as businesses will not do this unless they have to, as it is easier to buy virgin products from the big suppliers with guarantees of performance and financial come-back if there are manufacturing problems with their products.

CASE STUDY 2: L. M. BARRY, TEXTILE RECLAIMER

LMB Ltd. is a London based textile merchant who began trading in 1985, taking over from his father who is a well-known 'rag man' in the British recycling industry, Lawrence Barry JR said, „What a hard graft! Then our business was a lot harder then than it is now. We didn’t do second-hand clothing to the African markets as we do now. The business was built supplying secondary fibres. You had to learn about all the grades of fibres, wool, cashmere, cotton, polly-cotton we sorted for secondary fibres and industrial wipes“.

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LMB Ltd. has a large, purpose built factory on the Cody business estate in London's Docklands (fig 62) which cost over £1,250,000 to set up. It is from here that the company's own fleet of 20 wagons and vans make 4,000 collections a week from charity shops (who sell to the highest bidder) and council bank sites country wide and deliver the textiles back to the site to be processed (fig 63).
"When you have put a few pounds on or taken them off, when the clothes are out of fashion or you are tired of them after a holiday and they are a bit faded, you fold them up, bag them and take them to a charity shop. The women sort through them and they decide what they can sell. The rest they put into a rag-bag and they sell to us. We get that and it comes back here. Our biggest problem at the moment is that we can move forward with new ventures like the one in Africa - but the problem is that the charities have to develop a social conscience. They hold us to ransom! We put a professional image together to show them what we can do and how we can do it properly employing people at the right rates, etc. A few years ago the ethnic minorities that were supplying us who didn’t know about fibres or self colours just about shipping to Africa though ‘hey, we can do this ourselves’. They’d go round to the local charity shops and say we’ll give you ‘X’ for a bag of rags and we were giving them ‘Y’ and if ‘X’ is more the charities don’t look to see how those people run their businesses. It could be child labour. Now that has put our prices up. I think I’m a fair employer, paying about £4 per hour. We start them on £3. They stay on that for about 4 weeks. Then build up to over £4 per hour. Compared to the ethnic minorities who are paying £1.80 an hour. Recently someone got ‘done’ employing school kids. The factory was closed all day and only opened when the kids came home. The charities were supplying him! This was in Birmingham. The major charities have no values. If the guy will give them 20p more they will sell to him. I would say to them ‘look at his business in comparison’. We pay the Charities £1.60 a bag.”

30 Teasdale, S. City firm is fined £400 for using child labour in The Birmingham Post, January 20 1995, p.4.
31 ibid
The factory is light, well planned and relatively modern by British standards and is for instance equipped with one of the largest Italian textile bailing machines in Europe, which can condense one tonne of textiles into a 1.95 meter cube (fig 64).

Fig 64

The company employs about 125 people, mainly female; who sort various components, garments, household fabrics and shoes from conveyor belts, into chutes which fill hoppers below. The textiles are cut and or bailed into their various qualities to be sold on as industrial wipers for the automotive and engineering industry, as car sound proofing fibre, industrial linings, upholstery and mattress stuffing or for shoddy manufacturing. However this business is a tiny percentage of the whole which is fashion export to impoverished countries.

"Yes, we have contacts all over the world. If we relied on British trade we would be bankrupt. Most of our business is for export. We do 5 or 6 packed containers a week. 60% of our products is exported directly and another 10% to 15% indirectly through bedding manufacturers, etc. This is predominantly clothing. As I said before we supply self shades to a company in Yorkshire which then produces coloured fibre which is then sold to a Moroccan company. We have our own place in Africa. We export to Togo. We export to Hungary, Eastern Europe, Poland, East Africa, Central Africa.

In 1991 Lawrence Barry estimated that about 25% to 30% of clothing collected by his company, mainly from charity shops was exported. By 1997, six years later that figure had rocketed to 70%.

"I’ve spent a lot of time over there (in Uganda) and it works exactly the same way as it does here. Same as if in the East End stuff is imported from Greece. It is stored in the in African warehouse and they sell it onto individual shops who market it out. We sell it to

32 Lawrence Barry’s clothing trade partnership with an African chief has brought prosperity, water and electricity to his village (figs 66, 67).
our man over there. He’s got 3 big warehouses who’ll take our contingents and store them there. Then the local market boys will come (fig 65). There’ll be one who deals in shirts. One in shorts, etc. 34

Fig 65 Clothes for the market

LMB Ltd has been at the forefront of establishing the textile ‘bank’ movement in this country through Recyclatex, which is a subsidiary of the UK Reclamation Association, which was originally established in 1913. 35 The Reclamation organisation has been instrumental in the successful lobbying of the European parliament to try to rescind the ruling on the tightening of laws on textile waste exports from Europe. 36

Today LMB Ltd., is one of the top three textile recyclers in the UK who’s business expansion earned owner Lawrence Barry the Queen’s Award for export in April 1997 (fig65). This prestigious award was given in recognition of the company's success in developing profitable overseas markets (in other words the exportation of second hand clothing to the 3rd world) and

33 ibid
34 ibid
35 Author unknown. Recyclatex - how textiles are recycled in Lawrence M. Barry and Co Promotional Literature London. Undated.
36 EU publishes legislation to ban or control exports of secondary materials to certain non-OECD countries - the impact of the Basel Convention. Bureau of International Recycling, BIR, the world federation of recycling industries update July 1999.- http://www.bir.org/biruk/keyissues.htm
was among a list of 110 firms, which included heavyweights such as British Steel.  

**Queen’s praise for textile firm**

Fig 66

**Queen’s praise for textile firm**

Fig 67

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37 Author Unknown Queen’s Praise for Textile Firm in Materials Recycling Week April 25 1997, p.11.
CASE STUDY 3: SAVANNAH RAGS TEXTILE RECLAIMER

Savannah Rags began trading in October 1994, initially buying second hand clothing and textiles to export to third world countries having previously sold new clothes to Africa. Mansfield Council assisted the business by the aid of Departments of Trade and Industry grant. The company started from scratch but in an area of high unemployment it was not difficult to find 27 employees to sort about 20 tons of clothing a week.

The raw material comes directly from Oxfam, Red Cross and Scope with clothing banks in Nottinghamshire and Lincolnshire. Between 60/70 tons of material is processed each week of which five tons is collected for the wipers market, 30 tonnes is sent for shredding and the rest exported to Tanzania in Kenya, Pakistan and Afghanistan.

The secret of the success to the business is prudent purchasing and keeping production costs to a minimum. Lighter weight goods are sold to Africa, heavier clothing to Pakistan and Afghanistan.

The owner Mr Suleman is aware of criticisms that have been made that secondary exports from the UK harm the indigenous industry in Africa. But he points to imports of new clothing, from China and South East Asia for example, which have wiped out the British manufacturing industry and said,

“The clothing and shoes industry in the UK has almost disappeared in the face of overseas competition and the same could happen in Africa.”

A second hand shirt would cost the equivalent of one US dollar from our exports whilst from a local supplier it would cost between 5/10 US dollars. The owners involved in running the company, were born in Central Africa. Suleman’s African outlets have a supply chain which

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extends to the remotest villages in Zambia, Kenya, Uganda, Mozambique, Malawi, Togo, Ghana, Tanzania, Zaire, Pakistan and Bangladesh, with demand growing,
"basically the companies we are dealing with now are embarking on extending their operations in these countries said Mr Suleman."39

CASE STUDY 4: OXFAM WASTESAVER

Oxfam Wastesaver was established in 1947 and was set up to dispose of surplus textiles from the then 860 Oxfam shops in the UK. This is an integral and highly profitable part of the Oxfam Trading division, based in Huddersfield Yorkshire and today is one of the largest collectors of re-usable clothing in the UK. Oxfam is the only charity to own its own textile sorting and processing facility operating as do other textile merchants in the commercial sector. Oxfam estimate that the unit processes in excess of 16 million garments per year which are all hand sorted into over 160 grades and exported via entrepreneurs into 30 impoverished countries world-wide. (This is over 2,500 black sacks of textiles and shoes a day). Approximately 50% of Oxfam donations are heavy garments, which were recycled into fibre until the 1990s. Now with the apparent collapse of the shoddy industry in the UK, new markets for sheepskins, overcoats and usable knitwear are to be found in 'eastern bloc' countries and regions behind the old 'iron curtain'.

But as the lucrative worldwide market for European secondhand clothing continues to expand, the rag merchants constantly look for new sources of supply and charity shop clothing has proved to be a great provider of that raw material. This has led to a mutually beneficial partnership between the charities, the commercial textile merchant sector and ironically the clothing retailers, without whom the vast volumes of products would not be manufactured, and the trade would collapse. The charity shops collect and dispose of approximately 40,000 tonnes of clothing each year (of which a tiny 10% to 15% is re-sold over the counter) 40. This trade is worth over 4.5 billion pounds in income to the top 500 fund raising charities sector in Britain.

"Oxfam waste savers estimates that there are over 120,000 tonnes of surplus clothing in the UK from various sources which is the equivalent of 250 million garments, or approximately 5 garments per head of population discarded each year (an under estimation of 367,080 tonnes, according to figures from the Creating Wealth from Waste project41). There are over 350,000 tonnes of readily recyclable textiles thrown away in the UK every year and the country is recycling only about one-third (an over estimation) of the volume available the rest is disposed of via land fill and incineration".42

39 ibid
41 Op cit Creating wealth from waste p12.
Oxfam was one of the first charities to employ a limited door to door collection and are also involved in kerbside collections in conjunction with some councils but they are finding increased competition difficult, not just from officially registered charities but from cowboy operators. These operators falsely claim to represent a charity or worse still use a recognised charity name to which they give a tiny donation, a fraction of the true value of the goods they collect. Nothing donated to Oxfam is wasted, sheep skin coats go to Afghanistan, men's suits to Jordan, dresses and skirts go to Uganda, underwear and nightwear go to the Gold Coast.

Usually cotton clothing is still turned into industrial wiping or polishing cloths, as are old towels or flannels sheets cut into squares. Oxfam does have particular contracts such as that of supplying quilts and pillows to the London Feather Company from which they reclaim the feathers to stuff new duvets. Harris Tweed jackets are sent to a German customer who has a chain of shops that specialise in the English country gentleman look. Oxfam also has teams of dedicated knitters producing huge quantities of knitted blankets and jumpers accounting to over 25,000 volunteers producing over 20,000 garments annually.

Saudi Arabia buys much used clothing, even though it is one of the world's richest countries. This is used to clothe the imported labour from Bangladesh, Pakistan and the Philippines. However Oxfam are acknowledging that there is conflicting thinking in respect of the morality of the benefits of selling secondhand clothing to developing countries, wondering if they are putting textile manufacturers and garment makers out of business by destroying jobs in the local economy. However, Oxfam believe that very few cases of damage exists particularly in the east and West African countries to which there have been large quantities of clothing exports, and that in fact the trade in used clothing has brought many jobs to these regions in wholesaling, retailing and repairing the clothing before sale for the markets. Also local economies have felt the benefit of the distribution of import taxes levied on secondhand clothing.

"It must be remembered that people who buy secondhand clothing are only doing so because they cannot afford the price of a new garment. And to people who have very little money they are delighted to buy good quality clothing at very cheap prices, even if it comes from the throwaway societies in the developed West."^{44}

Oxfam is the largest charity in the UK ahead of the National Trust and the Royal National Lifeboat Institute, earning £89,000,000 an increase of 21%.^{45} To help raise this money the trading division, which comprises shops and Wastesaver has a turnover of £70,000,000 and makes a profit of £17,000,000 which is achieved due to their dedicated workforce of over 21,000

^{43} ibid

^{44} Stockwell, A. Managing Director. Oxfam Wastesaver. Interview Huddersfield, June & November 98.
volunteers who give 110,000 hours a week of their time for free and unknowingly line the pockets of rag merchants and overseas entrepreneurs.

"The textile recycling industry has developed and changed into what is now a huge international multimillion pound export market in second hand clothing. This has not happened because of the charities involvement, but with the charities as the provider of the raw material. We in the charity sector have a great future in partnership with commercial industry that continues to provide charities' with the greatly needed funds to continue the work we do. It is a mutually beneficial partnership." The textile recycling industry has developed and changed into what is now a huge international multimillion pound export market in second hand clothing. This has not happened because of the charities involvement, but with the charities as the provider of the raw material. We in the charity sector have a great future in partnership with commercial industry that continues to provide charities' with the greatly needed funds to continue the work we do. It is a mutually beneficial partnership.

The charity shop sector is growing annually and is relatively uncontrolled. Any high street can have as many as six or seven charity shops and the forecast is that by the end of the year 2000 there will be 4,500 nation-wide. Oxfam is the UK's fifth largest retailer, paying minimum business rates, for long and short-term lets and are exempt from VAT. It is now acknowledged that these shops are in direct competition with commercial clothing outlets and are accelerating the decline of high street shopping, in tandem with the 'one stop shop' superstores and out-of-town retail parks and shopping centres.

However, it will come as a relief to those who give clothing to Oxfam that some of the donations, however small, are used to supply refugee camps round the world such as those created by the conflict in the former Yugoslavia for example. Oxfam is currently recognised as the leading European supplier of emergency relief clothing. Field workers in desperate refugee conditions such as war torn regions of Mozambique, Angola and Rwanda are extremely grateful to receive shipments of clothing, which can restore dignity to people who have suffered.

The Europeans have a more principled human system based less on pure capitalism. Firstly there are very few charity shops for clothing (although there are commercially run 'second time around' shops) and those which do exists support locally based well known charities such as local hospices or care centres etc. Local monies are used for local projects. Therefore high profile charities have developed a very successful scheme whereby a town is targeted and by involving the local community in conjunction with local businesses, the charities quickly collect huge volumes of textiles which are sold to commercial rag merchants for a pre-agreed sum per tonne. The profit is then shared between the local community and the charity. Schemes like this in Germany and France collect approximately 200,000 tonness a year and there are equally well established systems in Holland, Belgium and Scandinavia. In Germany, where recycling is part of

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48 ibid
49 Personal visit Fact finding tour of NL October 1998.
the culture, this method is ensuring that as much as 65% of surplus textiles are isolated from waste streams for recycling.

But there is no doubt that the textile recycling industry is much smaller than in the past and is shrinking. The parts which have survived, namely export to impoverished countries, which is a simple lucrative process, is flourishing. Has the innovative reuse of cloth and fibres within the recycling industry disappeared, fortunately to be replaced by the exportation of second hand clothing from the UK? Or has the recycling industry and the innovative use of cloth and fibres in products disappeared because of the exportation of secondhand clothing from the UK?

Conclusion
A range of pressures is coming to bear in the private sector to improve environmental performances at the wool growing and processing stages, discussed in chapter 2 'wool from the cradle'. What is relatively new is that the supply chain has now become a critical part of that process of looking at an organisation's overall environmental impact. This is critical for retail as the average corporation spends half of its turnover on buying in goods and services. It is essential that the Wool textile industry looks at the work already done in this area by other businesses in different industries to avoid reinventing the wheel.

Ideas can be disseminated and applied to textiles and wool in particular:

- the first priority is to demonstrate that there would be clear cost benefits to using recycled fibres for example in opening price point (a term used for the lowest priced merchandise in each product range) or 'back to school ' knitwear
- secondly, all employees should understand their own company's likely environmental impact in the lifecycle of its products, so that continuous assessment can be made of best practice throughout that lifecycle and employee's awareness raised

However, the 'bottom line' is that recycling will only work if an end market exists for the collected material and the material can be collected and processed at commercially realistic cost against the costs of virgin materials.

At present it is unrealistic to expect that spinners and knitters should use 100% reprocessed/ recycled fibres in their yarns and other textile products wherever possible. Why should they? There can be technical and performance difficulties when using recycled fibres for inappropriate products and there is the perception that such products could be viewed as inferior and even secondhand, or 'unclean' from a marketing angle.

The solution, significantly reducing these volumes of textile waste, could come from a concerted effort on the part of the Government in partnership with research institutions in industry and education to create products using recycled fibre, and improve the performance, design and marketing strategy of reclaimed materials. This would create stronger competition with new fibres, which have considerable R&D backing in the form of funding from the big producers.
The retail industry should be prepared for the day when it may be held partly responsible for the vast volumes of textiles generated annually, which is discarded as clothing at a rate of 487,080 tonnes a year\(^{50}\). Just as it has been held accountable for generating and recovering packaging waste,\(^{51}\) which if targets are not met incur penalties. R&D should ensure that knitwear is designed to be recycled and priced to make it desirable, regardless or indeed inspite of its recycled content to enable the concept of closing the recycling loop. Otherwise the perfect solution to eliminate the growing textile mountain, which would throw the Fashion industry into panic, would be, as Lawrence Barry put it, to\(^{52}\)

"Stop the rubbish at the start of the chain. They have attacked the problem at the wrong end".

\(^{50}\)Op cit *Creating wealth from waste* p.12.

\(^{51}\) New packaging laws were introduced in the EU in March 1994 with targets for each member state to recover between 50% and 65% by June 2001. *Wise UP TO Waste Waste Watch* London, information pack. Undated.

\(^{52}\)Barry, L.M. *Chairman and Owner* of L.M. Barry Textile Merchant. Interview London June 17 1996. *Appendix 1*. 
THE THROW-AWAY SOCIETY

CHAPTER 5

Introduction

This chapter sets out current statistics globally and locally related to post-consumer waste and the situation of textiles as a consequence. Under discussion are the benefits and processes of recycling and the extent of the research, which is under way to transform this out-dated industry.

Subsequent short case studies will discuss the Italian recycler Nanni Filati, the TNO industries of the Netherlands and the London Borough of Enfield, which is a member of The London Recycling Officers Group (LROG). This will complete the background research leading to the final project, Wool: From Straw to Gold and the development of yarns made from 100% post consumer waste.

5:1 WHY RECYCLE?

The developed and developing world consists to a greater or lesser extent of throwaway and recycling societies. Recycling is not always the answer and, often, virgin materials can be better ecologically, as is the case in India where recycling has been taken to the extremes and the rag trade has a thriving business in soiled hospital waste. Rag pickers sort through bloody plastic bags, bandages and human tissue before it goes to landfill, salvaging fabrics which are primitively washed and sold to make rugs and cloth shoes.

In this country we generate 435 million tonnes of waste annually, or the equivalent of filling Lake Windermere every nine months. Each household throws away one tonne of waste per year of which over 95% could be recycled and only between 2.5% to 4.5% is. Glass, plastics, metals, organic waste, textiles and paper are transported and buried in landfill sites further and further from high-density cities where the waste is generated. There are 4,000 controlled landfill sites in England, which until recently was the cheapest option for 90% of waste disposal. However, this method has created serious pollution problems such as gas and toxic liquid seepage, which has at times contaminated the water table and the soil.

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1 Germany has an excellent 'Green' profile in research and legislation but Britain has one of the poorest track records environmentally, and is branded 'The Dirty Man of Europe'. Between 1985 and 1989 the amount of household waste produced per capita increased by 5% but in some countries including Norway the production of waste per capita fell. 'What a lot of rubbish' Independence, Cambridge, volume 14 ISBN 1-86168-022-8 1997.

2 Kumar, S. Deadly Trade in Delhi's Hospitals in New Scientist, May 11th 1996, p.4.

3 Don't throw it all away Friends of the Earth London p5

4 The London borough of Enfield sends a proportion of its waste by road and rail for landfill to the county of Lincolnshire, a distance of over 200 miles.
At present the remaining waste, approximately 10%, are sent to incineration (fig 69). This is only part of the solution because the ash residue after incineration can be as much 25% to 30% of the original volume, which often contains toxic chemicals and heavy metals and still has to be disposed of in landfill sites, also there are toxic emissions from incinerators (Appendix 5) which create serious health risks.⁵

**Fig 69**

![Incineration Plant](image)

Post consumer textiles along with other household waste is incinerated. The North London Waste Authority incinerator in Edmonton in 1996 released into the air 376,000 kg of carbon monoxide, 1,070,000 kg of hydrogen chloride, 418,000 kg of nitrogen oxides, 250,000 kg of sulphur oxides and 14,300 kg of particulates burning untreated refuse much of which is recoverable.

There seems little likelihood of a reduction in consumption of goods in the UK so waste disposal problems is set to multiply. In the case of clothing, until a few years ago a call for a reduction in seasonal purchasing to ease the situation would have had a serious effect on the UK manufacturing industry, which in the mid 1990s employed more than 1,000,000 people. Now there are so few employed in the industry (less than 150,000) that a reduction in clothing purchases would have a minimal effect on employment but a maximum effect on the retailer and shareholder's profits. To reduce the impact of waste on the environment, one solution is to buy carefully not cheaply, thinking about the longevity of a product. For instance presently, the components in clothes, such as yarns and fasteners are manufactured to last years, not a few months, and the impact of disposal of these products with such longevity, is rarely considered by the manufacturer or the customer. Should the fashion industry be advising the customer via labelling or swing tags about safe disposal after use of

⁵ Recycling Now! Waste watch. May 1997
the garment they have manufactured to re-create a recycling culture amongst textile merchants, which thrived until the 1960s. For instance "this garment is made from 100% wool which contains no pesticide residue or carcinogenic dyes and can be shredded to be safely integrated into your compost heap".

In 1990, recognising the looming crisis of disposal, the UK Government set an agreed target to recycle 25% of household waste by the year 2000. This was followed in 1992 at the World Earth Summit in Rio de Janeiro, by a declaration aimed at achieving an eventual waste free society which was encapsulated in 'Agenda 21' (Appendix 6). That philosophy has percolated down, and has become Local Agenda 21 throughout the UK, resulting in the Association for London Government aiming for a 75% reduction in waste by 2020.6 The Environmental Protection Act 1990 required all councils to submit plans outlining their intentions to recycle more to achieve such figures and it was the responsibility of Local Authorities to ensure that this reduction of waste happened.

Local Councils are using limited and inadequate methods of recycling, hampered by elected and inexperienced council officers who are driven by costs (either the scheme which is the cheapest, i.e. landfill, or the scheme which earns the most revenue i.e. third world textile dumping wins). Local council efforts consist of textile, aluminium, paper and glass bank schemes and occasionally kerbside or door-to-door collections from each household. Even though door-to-door schemes are more expensive to set up, comparisons show that a far better quality of raw material is collected and a higher proportion of uncontaminated material is sent for recycling. In the longer term, door-to-door collections may also lead to financial savings.

Recycle; to pass again through a series of changes or treatments, to remake into something different.10 It is widely accepted that recycling is the good thing to do, this is because there are environmental advantages such as saving energy in the processing of virgin raw materials resulting in less pollution. Many virgin materials have to be imported across the globe, therefore there is an economic saving, which finally reduces the amount of waste which needs to be disposed of. However, recycling itself uses energy, it may cause pollution and will never fully replace the need for virgin materials. Also, being involved with recycling, such as the seasonal trip to the textile bank and charity shop, may help people to feel they are doing their 'bit' for the environment and therefore avoid the central issue of creating too much waste in the first place.11

6 Impossible to achieve as current figures are between 6% and 8% Gardiner, W. interview Waste Reduction Officer Enfield, 2000.
7 The Womens Environmental Network.
8 Personal contribution made to the consultation document for Enfield's 5-year waste reduction plans.
More and more it is apparent that effective recycling requires the combined efforts of different bodies such as government, industry, and individuals. The waste management industry has significant and far-reaching cascading effects, especially in the Netherlands, Germany, Scandinavia and where it has become a major employer, dealing with a variety of waste management activities other than landfill. In addition, many companies are realising that by improving their own waste management there are cost savings to be made in implementing waste reduction and recycling schemes on their premises.

Taking into account the considerable increase in consumption of textiles, it is ironic that the amount being recycled has decreased over the last decades as discussed in chapter four. This is also due in part to the unrealistically low prices of virgin fibres, in particular wool and cotton and a cavalier approach to recycling ensuing from prosperity and consumerism.

The theory of sustainability as well as producer responsibility is relatively new concepts, which requires more than idealism to succeed. The solution to sustainability and producer responsibility is

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12 Liukon, H. *TNO Institute of Industrial Technology*. Interview Enschede the Netherlands October 1998. (Appendix 1)
found in the concept of Integrated Resource Management or IRM. This system demands that an increase of textile waste recycling should be carried out in an ecologically and economically sound way. In order to reach these goals innovative design, research and technological developments are required.

For instance it is acknowledged that properly identifying and sorting textile waste streams in a limited number of well-defined materials is the key to producing high quality recycled fibres making the most of the intrinsic value and subsequently generating realistic market opportunities for new products. However it is only automated technologies, based on rapid and clear identification of textile materials, which will be able to meet today's stringent requirements on costs, quality and quantity.

5.2 TEXTILE CONSUMPTION

The consumption of textiles and clothing is increasing with global textile fibre consumption per person at 7.5 kg annually, estimated to increase by 1 kg per person by 2025. However, in the EU countries textile consumption is far higher at between 15 and 20 kg per person. This implies that in the countries of the EU about 5 million tons of textiles and clothing will be discarded every year. German Government figures estimate that in Europe only about 1.5 million tons of textiles are reused in some way or another while the remaining 3 million tons are landfilled or incinerated.

Textile recycling on an industrial scale has existed for more than 130 years and high recycling rates were realised until the late 1960s early 70s. In Germany in 1970, 90% of textiles were reused but by 1991 this percentage had dropped to 18%. In 1970 the main applications for recycled textiles and clothing were for second hand use, wiping rags and fibre production. Textile waste was also used in the paper industry which utilised 60% in 1970, a figure which by 1991 had plummeted to 14%.

The recycling of textiles and clothing is now merely an overseas trade to less affluent countries in which the intrinsic value of the product is not used and the merchandise goes to the highest entrepreneurial bidder. At present the recycling of textiles means that the products are very rapidly downgraded.

Currently, there is no good alternative for lower grade textile waste just incineration (with or astonishingly without energy recovery) and landfill. For instance, only the best quality cloth is gathered other textiles such as curtains and non-wearable, worn, damaged clothes are not gathered at all in most countries of the EU.

The energy consumption in the production of fabrics with a high content of recycled fibres are often much lower compared to the energy use in the production of virgin materials. Savings of 50% and

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more are reported in literature\textsuperscript{15} but more sophisticated textile recycling according to the principle of cascading can have even greater environmental benefits such as

- less use of raw materials, fertilisers, pesticides and energy for the production of textile fibres
- less area needed for growing/production of virgin fibre
- less waste production

Textile recycling must use sophisticated technologies available elsewhere to begin to be keenly competitive with virgin products, also there must be an integrated approach to all links of the chain in order to regain fibres of a higher quality and greater intrinsic value. The main causes for concern and the areas urgently in need of research support are\textsuperscript{16}

- low gathering rate: the traditional waste streams are drying up and recyclers are relying more and more on charitable donations
- unsorted gathering: obvious qualities are collected and the rest discarded for incineration
- fibre damage in opening the fabrics
- impurities in the gathered material
- manual handling: leading to high labour costs
- low end markets: where post consumer textiles are viewed as rags for export to third world sold and by weight

The low gathering rate is a problem because for a given end product a continuous stream of waste material of a certain quality is needed. Only then can a feasible market for the end product be developed. In the past, many recycling projects ended due to lack of discarded material. A high quality end product can only be produced if the gathered materials can be sorted in an efficient way, which is at the moment by hand. A more sophisticated and automated sorting system will improve the quality of the obtained fabrics. In opening fabrics (a process of tearing cloth apart numerous times to return to its constituent fibres) with current technology, the fibres are often damaged severely. The average length of the fibres can be decreased enormously, leading to fibres which have a lower value. The general quality of recycled fibres means that often only the low-end markets can be served with 100\% qualities, resulting in a lower margin of business profits.

\textbf{GATHERING}

There are different sources of textile wastes. The highest quality is production waste originating from the textile and clothing industry. This waste stream is relatively clean and well-defined i.e. the chemical composition is known, although the volumes are restricted. A second important waste stream originates from commercial or institutional organisations like professional clothing and textile

\textsuperscript{15} \textit{ETBPP GG79} - Reducing costs through waste management: the woolen sector
\textsuperscript{16} op cit p.5.
rental companies and from industrial laundries. The composition of this (post consumer) textile waste stream is often less complex compared to textile waste from households gathered by charities. This last stream constitutes by far the largest but also the most complex and most contaminated part of the total textile waste streams. The gathering and sorting of this waste, with its complex content is very difficult, especially with respect to logistics and economy. The gathering of production waste as well as institutional waste is only covered to a certain extent. The gathering of the post-consumer waste from households can be largely improved by new gathering concepts. (These are in fact old systems like deposits on goods retrievable upon return to point of sale such as glass and plastic bottles, and ‘return’ shops as seen in the Netherlands). A higher density of containers for textile waste would discourage disposal via the domestic refuse system as would organised kerb-side collections on a more regular basis. Only in this way with a maximisation of the collection quantities, combined with advanced recycling technologies resulting in high-end applications, can the economically feasible processing of post consumer textile waste be realised.

IDENTIFICATION
In order to implement textile recycling on an industrial scale, the waste should be sorted according to demands put forward by the specific end-markets or end-users (e.g. colour and chemical composition). Automation of this process is also desirable, in order to reduce the sorting costs and to enhance the quality of the resulting fabrics. Conceivable research concepts for automatic colour sorting include, for example, the use of image-processing systems, which already represent established facilities for similar identification tasks in other areas, but identifying the fibrous materials and chemical composition of textiles involves considerably more complex tasks. In other areas such as the sorting of plastics, near–infra-red spectroscopy (NIR) is employed to identify material composition, but due to the complex composition of textiles, this technology is presently not yet able to provide satisfactory results. Other fast identification technologies include laser induced breakdown spectroscopy (LIBS) and thermal impulse response (TIR). LIBS is based on plasma locally induced by a short laser pulse at the surface. The analysis of the plasma spectrum yields information about the composition of the fibrous material. This technology possibly also enables the identification of dyes and finishes. TIR uses the temperature and cooling measurements of materials, upon heating by laser. The software used to process the analytical data is a key element for identification technologies. Further improvement will make this tool even more powerful. Looking toward the future, neural network technologies and artificial intelligence will be leading the identification process. Further improvement in "remote sensing" from greater distances, increased analysis and

17 Liuken, H. TNO Institute of Industrial Technology. Interview Enschede the Netherlands October 1998.
identification speed, automatic focussing on parts, and the combination of various methods will enable the industry to advance identification capabilities immensely. Currently available identification techniques are often developed for the identification of specific materials or products like plastic bottles and metals. These techniques have to be adapted for the recognition of the chemical composition of textile wastes. Many of the devices in use today are based on research instruments. In the future they have to be tailored to industrial applications, making them simpler, smaller and lighter, more robust in rough conditions, easier to handle and less expensive.

"The identification has to be carried out on single pieces of textiles. Due to the complex structure of textile products, including the use of different materials, some degree of pre-shredding may be required as well. The technology of this pre-treatment has to be further developed, as the results are crude. Upon identification a separation step is necessary. This physical separation has to be carried out by mechanical or pneumatically devices or by air-jets. The interface between identification and separation equipment has to be developed".18

As a result, the textile waste is sorted in a limited number of categories in order to make textile waste recycling economically feasible. The most important categories of textile wastes are 100% cotton, 100% wool, 100% polyester and blends of cotton and wool with polyester. Furthermore there will be a large residual category of less common fibres and fibre mixtures. This category can be mechanically recycled as well, but generally to low value end-uses. These complex mixtures can also be incinerated but this must be in combination with energy recovery which is often completely inadequate.

CLEANING

For certain reprocessed products, textile waste needs to be cleaned of impurities and/or disinfected. This is carried out by means of washing or chemical cleaning processes before or after sorting. At present the washing and cleaning processes for textile waste are adequate.

In order to obtain the more valuable uncoloured materials a decolouration step could in some cases enhance the economics of textile recycling. Decolouration can be combined with the disaffection of the textile waste and a removal of a number of finishes. Only a number of dye classes, like azo-dyes can be fully decolourised. However, it has to be realised that decolouration can have a negative effect on the mechanical properties of the fibres. As an alternative, separation based on colour is heavily used.

UNRAVELLING

The unravelling of textile materials into fibres can be performed on an industrial scale. Specialised machinery is available to open the textile materials to their full extent. Total opening is very
UNRAVELLING
The unravelling of textile materials into fibres can be performed on an industrial scale. Specialised machinery is available to open the textile materials to their full extent. Total opening is very important for the subsequent processing of the fibres on the textile machinery normally in use in the textile industry. The quality of the regained fibres can vary greatly; depending on the origin of the textile waste, the chemical nature of the fibres and the way the unravelling is performed. The length and the mechanical properties of the regained fibres are important and determine the possible application of the regained fibres. Also, the colour and purity of the fibres are important: white or uncoloured materials and mono-materials and mixtures of materials with a known composition can be used in high quality end products. Only then can textile waste recycling on an industrial scale be economically favourable.

NON WOVENS & FELTS
In terms of quantity, the use of reprocessed fibres in the production of bonded fabrics is the most important area at present. Familiar products here include mattress fillings and insulating mats for cars. Deficiencies still exist in this area with regard to the processing of only coarsely opened reprocessed material and special bonding processes. Existing fabric-forming systems require adaptation to enable processing of the particle range which results from the highly productive tearing of textile waste (short fibres, yarn pieces, flat pieces). Opening of the reprocessed material up to the individual fibre is unnecessary for many applications involving bonded fabrics, such as insulating fabrics for thermal and sound insulation. At present, existing web-forming machines, which function according to the aerodynamic principle, are not ideally adapted to the processing of only partially opened waste textiles.

Further research within the field of non-woven-fabric manufacturing is also required on the subject of the strengthening of bonded fabrics. It should be possible to expand product diversity with regard to appearance and or functions by means of a supplementary thermal treatment process to the reprocessed fibre-bonded fabrics containing bonding agents.

YARN AND FABRIC PRODUCTION.
The area of yarn and fabric production covers the spinning of reprocessed fibres into yarns and the further processing of these yarns into textile fabrics, such as woven fabrics, knit fabrics and other structures. These fabrics are used in household and home textiles for blankets, upholstery fabrics and carpets; in the clothing sector pullovers, jackets, and suits; and in technical textiles for filters etc. In the area of spinning preparation various machine constellations are available for opening, cleaning and blending the most diverse fibre materials, and these configurations are able to fulfil the processing requirements for secondary raw materials. Development work is required in the area of the
mechanisms to remove remaining non-textile components such as buttons and zips which can cause damage to machine elements and lead to problems in the subsequent processes, one of which is flammability. The various reprocessed fibre yams are subsequently processed into textile fabrics and other structures by means of a variety of fabrics forming and finishing processes. For this purpose, the fabric-forming and finishing processes require to be adapted to the yarn properties, which result from reprocessing, so as to enable the most diverse possible range of products.

**PRODUCT DEVELOPMENT**

Virgin fibre producers understandably argue, that recycled fibres are inherently of a lower quality than virgin fibres and that the only way to add value to products made from recycled fibres and raise their image is to improve the performance qualities and the design of end-products. Involving designers throughout the whole recycling and product development process is crucial. Working concurrently with all parties involved in the recycling process will create links with technology, science, manufacturing, business and marketing. This is where ideas for new applications and designs will grow. Focusing on research and design maximises the potential to create innovative new products for both textile and non-textile applications. Good design will create new markets with products that close the loop of the recycling supply chain, inevitably creating demand for recycled fibre products.

**Conclusion**

Textile recycling can be moved to a higher level when recurring problems can be solved. These are:

- the collection of large quantities of textile waste in order to guarantee a continuous stream of end products
- the development of a fast, non-labour intensive, reliable identification and sorting system
- minimisation of fibre damage in the 'pulling' process

However product development plays an important role in specifying the specifications of commercial attractive new products from recycled fibres.¹⁹

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¹⁹ Much of this chapter is adapted from personal notes, interviews and supporting literature from _Ecotextile 98 Textile Environmental Conference Bolton, UK, 7/8 April 1998_
CASE STUDY 1: INSTITUTE OF INDUSTRIAL TECHNOLOGY (TNO) THE NETHERLANDS.

The TNO is a multi-disciplinary organisation for applied scientific research with over 4000 employees based in the Netherlands, which is spearheading the development of recycling technology (fig71). Research is carried out in 12 institutes, covering a broad range of expertise in the fields of industry nutrition, health, environment and defence. Its aim is to collaborate with businesses to strengthen their competitiveness and profitability through the application of innovative technology.

"A distinctive feature of TNO is a combination of expertise and the capacity to integrate and apply breadth of knowledge and a variety of facilities. With the demand for flexible and innovative technology businesses can benefit from the practical expertise the Institute can offer. This ranges from short term, low volume orders to projects requiring a broad and integrated approach. Whether the project involves creating a product concept or manufacturing and producing a product, either as a one off or in mass production, for consumers or for professional applications, the Institute of Industrial Technology can put together a team of specialists that has the specialised knowledge to answer the brief. The TNO Institute of Industrial Technology has numerous divisions covering Product Development - Production Technology - Product Manufacturing including Rapid Prototyping - Materials Technology and Product Testing."  

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20 TNO Institute of Industrial Technology the Netherlands, promotional literature. 1998.
The activities of the "Product Development" and "Product Testing" divisions are carried out under ISO 9001 certification. Moreover, many of the activities are accredited on the basis of EN 45001\textsuperscript{21}. Unusually, research on recovery, recycling and reintegration of a number of materials and waste streams, which include textiles, is carried out mainly in the division "Product Development", where expertise is available on collection technology, identification techniques, sorting techniques and reprocessing technology in order to reuse waste. In the case of textile materials the combination of advanced product development tools, new product concepts and products out of waste materials are under development for a large number of industrial companies. The TNO is involved in many recycling projects and in a large number of Life Cycle Analysis (LCA) studies. The Institute participated in the organisation of international environmental congresses like R'97 and R'99 in Geneva.

Textile Research & Testing Research on textile processes and textile applications is carried out by the 20 employees of the TNO Centre for Textile Research, part of TNO Institute of Industrial Technology. The main clients of the Centre for Textile Research are the textile industry, textile and clothing importers, consumer organisations and the floor covering industry.

In production technology, energy conservation in textile processing is one of the main items. Also much attention is paid to the reduction of the environmental impact of textile processing by 'process integrated measures' to reduce the use of water and chemicals through techniques for control and measurement. Textile waste recycling, wastewater treatment, water recycling and the development and implementation of new environmental friendly processes are key items as well. In product testing all international standards on textile and floor covering testing can be carried out from simple fastness tests to testing clothing on skin models and flammability tests. In product development new textile products are developed. The Centre offers all kinds of product development, from product upgrading to totally new products containing textiles. In product development there is often a close cooperation with other specialists in TNO Industry on coating technology, materials science and industrial design.

\textsuperscript{21} ibid.
each specialising in simple processes, for instance, spinning, dying, yarn twisting, beaming, weaving and finishing. The various activities are coordinated by the mills, which constantly collaborate with one another in setting up a huge variety of networks and a multitude of end products. The integrity of the manufacturing system and the legacy of the accumulated technical know-how have facilitated the continuous adaptation of offerings to satisfy world demands from dynamic markets. (Prato exports over half of its production and does business with more than one hundred foreign countries). The many independent companies which form the Prato community, of which Nanni Filati Srl. is one, has a common objective consisting of high quality and standards, rapid delivery, small lots and competitive pricing. Prato's industry is distinguished by its capacity to design, develop, and market a wide assortment of original products, growing out of the combined efforts and research of several companies working together. The annual production of over four thousand yarns and one hundred and twenty thousand new fabric designs is not unusual. It is estimated that research and development of these new products represent 5% of the total textile turnover. By retaining their original organisation, Prato's industries effectively combine the typical advantages of industrial scale production, (like efficiency and reliability) with the advantages of the craftsman's small scale of trade and customer care. They are flexible enough to deal with rapid product change, custom lots and prompt response to market demands and is an outstanding exception on the First World textile scene. Nanni Filati is a family-run woolen spinner, with the Woolmark licence and produces virgin and reprocessed quality yarns in tandem (fig 73).
The factory has state of the art, with spinning and research and development facilities (fig74).

The business creates for top end clients such as Vivian Westwood and Paul Smith, but the bulk of its products are used in mass-market knitwear for ladies and men's jumpers guaranteeing a recycled blend of a minimum 70% wool 30% mixed fibres. Out of a turnover of about 2,000,000 kilos of yarn a year, more than ¼ is reprocessed. The company has a network of agents and exhibits at Pitti Filati, Filatia in Hong Kong and Transform in Mauritius.

Mr. Galli is certain that if you produce reprocessed wool using the same scientific approach, as when using virgin fibres there is no real difference to performance. However he acknowledges that there is one problem with reprocessed fibre which is that 100% wool qualities can not be achieved because the hand sorting of garments can not effectively divide pure new wool items from blended items.

Nanni Filati carry in their collection completely reprocessed blends from a 90-shade colour palette.

Fig75
They buy reprocessed wool fibres in garment form, which they sort for colour, card, and process the fibre. Mr. Galli is concerned that it is getting more and more difficult to get post consumer waste, because more and more is going to the Third World via the charities from where it has to be reimported. (Appendix interview Galli)


LONDON BOROUGH OF ENFIELD

There are 111,760 households in the London Borough of Enfield, producing 118,496 tons of domestic waste, which is over one ton of waste per household a year. 83,000 tones of that waste goes to the incinerator at Edmonton, which is owned in by the London Waste Company. Some of the material collected from dustbins via the dust cart goes directly to unload at the incinerator. The remaining 36,000 tons go to Civic Amenity sites or rubbish 'tips' and taken for landfill, carried by road in 'bulkers' which are very, very large vehicles which no single Council would have as part of their fleet and are operated by London Waste. London Waste Ltd., which operate the Edmonton incinerator try to minimise the cost to itself of disposing of such large tonnages, which cannot be burned as there is so much. Enfield's waste travels by road as far as Lincolnshire and Bedfordshire to be land filled, essentially buried wherever it is the cheapest.

The additional cost of landfill over incineration is met by London Waste Ltd, which balances its costs by dealing with commercial customers. London Waste Ltd. is a very profitable company in which 7 constituent Boroughs in north London have a share: Barnet, Camden, Haringey, Hackney, Islington, Waltham and Enfield. By the middle of 2000 all these Boroughs will be incinerating the majority of their collected waste. On the one hand Councils are trying to reduce domestic waste yet on the other hand they part run the incinerators from which they profit, through disposing of their commercial customers' waste. More commercial waste means more revenue for the Councils.

Little or no pre-sifting goes on at the incinerator but steel and iron are removed after combustion. The ash remaining is about one third by weight of the original material. It is a concentrated residue from which those metals are extracted by magnets. The London Borough of Enfield get a proportionate reduction to the recycling costs for this metal which was about 2,000 tons from Enfield in 1997. Enfield Council will not support any recycling which is not self-sustaining and self-financing which is one way of ensuring that the recycling does not stop and start and the people lose interest.

Currently no kerb side collections exist as at £30 to £80 per household, it is a considerable cost for the taxpayer to pay out on something which is not proven to be the best option. However, for aluminum
cans, paper, metals, and textiles there is a very clear case for recycling because of energy and the environmental benefits from recycling must outweigh the cost of landfill and burning. But because the groundwork and the lifecycle of those processes have not been done it is subjective. The Council has estimated that the 5% increase in domestic waste will cost Enfield, an additional £/million annually on a tonnage basis and with landfill taxes and the cost of transportation increasing it has to be more and more economical to recycle. The benefit to the Council is finance and agencies offering the best financial return for the Council in relation to recycling win the contracts, zero cost to the Council means it is sustainable.

LONDON RECYCLING OFFICERS GROUP

The meeting of the London Recycling Officer's group or LROG was held in Westminster. Approximately 20 recycling officers attended the presentation from a variety of the 32 London boroughs. The presentation took the form of a selection of slides, which broadly and simply highlighted the research to date at the Royal College of Art on the project Wool: From Straw To Gold.

I explained the life cycle of wool from the farm to the manufacturer and post consumer, focusing on the environmental and social costs of that production chain. The recycling officers at the meeting were fascinated and at the same time shocked by the complexity and controversy of the story of wool and its implications. The group saw themselves for the first time as part of the textile lifecycle and they saw their industry in relation to the numerous links of the chain.

Will Gardiner, who is the Waste Reduction Officer from the London Borough of Enfield, made it possible for me to make this presentation to LROG. He took great pains to point out to those assembled that Local Authorities throughout Britain were unknowingly contributing to the trade in the exportation of textile wastes to the Third World. He was concerned about the reaction if such information was leaked into the public domain and that he or rather they should be looking for an alternative use for collected textile wastes which could be sustainable.

After the presentation, there was a question and answer session in which I was careful to point out that my research was about asking 'the question' in order to challenge the status quo and not to provide the answer. I also was at pains to explain that the primary reason for giving such a presentation to the borough officers was to engage their support, as part of the links in the chain, in executing an experimental design project.

The question and answer session was very lively with a genuine concern shown by those present about the way in which councils dispose of textile waste, primarily through agents which was to those present shockingly inadequate.
It would seem that the main frustration is that currently there are just three solutions to the increasing problem of textile waste

- the first is to recycle through agents such as L M Barry (which creates revenue for the council)
- the second to incinerate giving the council energy credits and revenue but also some costs
- thirdly to landfill, an increasingly expensive exercise for the ratepayer

The chair of the meeting, who represented the Borough of Lewisham, said that it was textile waste which earned the most revenue for the council, this in turn enabled the council to develop other recycling activities as the market had disappeared in relation to recycled paper and glass.

Another delegate from the borough of Merton said that they had numerous kerbside collections in their borough, which cost the council nothing, as the collectors were independent charities. The benefit to the Council of allowing kerb side collections by others was that there were zero disposal costs for the council. Where the council did tender for merchants to collect textiles from textile banks etc, an average annual fee was round about £7,500 for literally tons of textiles. One delegate was concerned that the Councillors he answered to would not understand the point of the research project because, in general, Councillors were part-time and not experts in the field. They would find it hard to agree to stop the contracts with textile merchants such as L M Barry, which they would see as purely, lost revenue.

They felt, as did Will Gardiner (who has advised me periodically on my research) that the way forward would be to get the problem into the public domain i.e. make a documentary which highlighted the situation, forcing Councillors nationally to confront the growing problem. Another delegate wanted to know what would happen if such large streams to the Third World were stopped. In other words if these countries relied on garment wastes from the Developed World, how much suffering would be cause if that were to cease.

The outcome of the debate was that there is a sincere wish to contribute to the project in any way possible (except financial) to establish a model that proves that recycling textiles can work. There were offers of tonnes of textile waste to use in the future.

Perhaps the most interesting offer was a carefully targeted kerb side collection, which would be the start of the documentation to record the design project, post consumer.
WOOL: FROM STRAW TO GOLD

DESIGN PRACTICE

CHAPTER 6
WOOL: FROM STRAW TO GOLD
DESIGN PRACTICE
CHAPTER 6

6.0 Introduction
The life cycle of a wool fibre has been described from 'cradle to grave' and 'beyond' in preceding chapters, where the environmental and social cost of producing one wool sweater has been discussed, at the farm, in the factory, via the UK retailers and finally as post consumer waste.

It is a long and complex journey of thousands of miles between continents, where wool fibres are subjected to chemical and genetic manipulation, are instrumental in environmental degradation, human exploitation and greed, and are finally worthless after a short life span as a fashion item. This is a story of extortionate profit, dubious charity and government inertia contributing to dumping waste on the Third World.

There are many links in the wool knitwear production chain and each been separately assessed with the assistance of authoritative literature such as at the 'start of pipe' (or beginning of the production), John Hearle 'genetic engineering of wool'; at the manufacturing stage in Annie Phizacklea's 'Unpacking the fashion industry'; in design such as Nicholas Coleridge's 'Fashion conspiracy' and finally disposal in Murray's 'Creating wealth from waste' to name but a few. However no single work makes a total ecological assessment of the lifecycle of wool, which assesses each stage from 'birth to death' and beyond.

This research has flagged up that industrial specialists are well informed about the work of their immediate neighbours i.e. the knitwear manufacturer knows about 'black lung' and carcinogens in the spinning and dyeing process and about profit margins and quality at retail. The knitwear manufacturer would, however, normally be unaware of scientific practices on the farm or the looming crisis of landfill. Similarly disposal agencies are unaware of the exploitative conditions in factory

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2 Annie Phizacklea's 'Unpacking the fashion industry' Routledge 1990
3 Coleridge, N. The fashion conspiracy: a remarkable journey through the empires of fashion 1957 London Heinman 1988
4 Murray, R. Creating wealth from waste Demos 1999.
camps in wool manufacturing countries, or that they are instrumental in the growing lucrative trade of exporting textile waste to the Third World.

6.1 THE PROJECT

At present, wool production, consumption and disposal is a 'one way street'. Wool leaves the farm, goes to the processor, the dyer, the spinner the garment manufacturer, the retailer, and the consumer where it has 'a brief moment in the sun', then to incineration, land fill or to the third world as waste. (Diagram A Appendix 7)

The waste disposal situation is at crisis point in the UK and the exportation of textile waste under the guise of charity is culpable. Therefore it is apparent that methodologies for reducing and transforming textile waste should be revisited as a matter of urgency to alleviate the problem, aiming to close the loop and achieve sustainability. (Diagram B Appendix 7)

The business partners in the wool apparel chain are international, however for practical purposes my partners in the 'regeneration' project are British. My previous research and professional practice unearthed some of these blue chip industrial experts, who are already involved in various wool knitwear processes. These hand picked companies agreed to be part of the experimental development of a small range of yarns and garments, composed of post consumer fibres made from 100% waste. The project partners 'closing the loop' were:

- The Boys Brigade 16th Enfield Company and the London Borough of Enfield for door to door textile collection.
- Oxfam Wastesaver for transporting the collection and textile sorting.
- JP Textiles (Evergreen) and Lightowlers Yarns for shoddy and yarn production.
- Charnos PLC for knitwear manufacture.
- The British Standards Institute for theoretical accreditation.

Before beginning the project, having won the BSI award for environmental design I travelled to Europe to meet with companies at the cutting edge of textile reprocessing. Mentioned in chapter 5, Enchede in Holland is where the TNO Institute is spearheading mechanical rag sorting technology. The TNO have funding from the EU to develop a project based on the development of new machinery which will increase the recycling of textiles (currently at 2% of total textile waste) by 10% resulting in an increase of 500,000 tonnes per annum. (Appendix 8)

I also travelled to Prato in Italy to see the factory and ranges of reprocessing experts Nanni Filati also mentioned in chapter 5, who continue to use post consumer wool fibres in their ranges, either as 100% recycled wool qualities or in blends with virgin fibres.

I did not have time to develop many blends of post consumer wool and other fibres, both natural and man made, virgin and post consumer, nor did I have time to explore a variety of products, using
regenerated fibres, for fashion and non-fashion. However these are potential projects for development in the future.

THE DEVELOPMENT OF YARNS AND GARMENTS

The following pages document the production of a small collection of yarns and garments composed of 100% post consumer waste and the innovative collaboration of partners to 'close the loop'.

- The first stage was to establish a direct house to house textile collection, which results in the best quality post consumer textiles because they are clean and uncontaminated.

Fig 76

In conjunction with the Waste Reduction unit at the London Borough of Enfield (fig 76) and the Boys Brigade 16th Enfield Company, a target ward for the pilot textile collection was identified. Flyers (Appendix 7) advertising the date of the textile collection and the type of textiles needed were delivered in the target area a few days before the collection date.

Fig 77

On the day, a team of boys from the Boys Brigade co-ordinated by their captain Mr Brasher (fig77) gathered the sacks of textiles, which were left on the pavement (fig78) and collected into the brigade transit (fig79).
Enfield Council paid the Boys Brigade £222 for the collection, replacing the newspapers they previously gathered every two months and which are now virtually worthless.

The benefit to the Council in the long term will be waste reduction, minimising disposal costs and Possibly becoming sustainable in the area of textiles.
• The second stage, saw the first collection of the unsorted textiles from Enfield Boy's Brigade headquarters, by Oxfam which was transported via their Welwyn Garden City depot to Oxfam Wastesaver HQ in Huddersfield (fig 80).

Fig 80

It is here that the textiles are hand sorted into generic qualities of wool and cotton etc. (fig 81). The benefit to Oxfam is the establishment of a direct textile collection of good quality material, generating more textiles than do textile banks or Oxfam shops in a similar area.
In the third stage, the processed sorted wool rags (fig 82) with zips and buttons removed became shoddy (fig 83),
John Parkinson's company 'Evergreen' is cited constantly as the perfect example of a successful, environmentally sensitive textile producer. He and his work is quoted in Eco literature, referred to at conferences throughout Europe, and his company was even a case study on successful environmental textiles via the DTI. Ironically, Parkinson was not taken seriously by the textile industry and Evergreen went into liquidation in 1998 despite his company's fame and success. However he continues a personal crusade and believes that waste of such magnitude for landfill and exportation is immoral.)
The wool shoddy was combined before spinning with post consumer polyester from plastic bottles and cotton fibre from old denim jeans (fig 85) at Lightowers Yarns Ltd. Huddersfield.2

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2 Mark Lightowler, Managing Director has worked with Parkinson for years and was instrumental in the development of yarns made from 100% and blended post consumer fiber on the woolen spun principle. His Father owned the Victorian mill which is equipped with spinning mules, used to make woolen yarns from regenerated rags 200 years ago. Lightowler believes that in 5 to 10 years time the textile industry in the UK will have disappeared, as week by week the small and large industries in manufacturing, such as spinners, dyers and knitters are closing their doors. This tragedy, he believes, has been caused solely by the power of the big five retailers and their tireless quest for the lowest price.
Then the fibre mixture was carded (figs 86, 87).

Fig 86 mixture goes into the hopper

Fig 87 the fibre is carded in fine toothed rollers
Fig 88 Blended web of fibre mixture

Fig 89 wool cotton polyester sliver
Fig 90 Victorian machinery spins the fibre

Fig 91 single and double knitwear yarns
Finally the yarn was delivered to Charnos PLC in Derby where it was industrially knitted as trial samples into school uniform pieces of knitwear.³ (fig 92)

Charnos PLC are major knitwear suppliers to Marks and Spencer and are one of the lucky few to have avoided the contractual withdrawal of M&S from its UK supply base. The company has close links to senior technologist Mervyn Davies at M&S, who has advised me periodically on the project and the uniform pieces have kindly been knitted commercially by them).

³ In 1998 this research won the BSL/RCA award for Environmental design (fig 99). The SSW were keen to support a product which could carry an accreditation which was a partly recycled manufactured product.
The yarn and resulting knitwear could be given a BSI accredited label, which flags up the fact that the yarn contains a proportion of post consumer fibre. This would form the basis for a future development project.

Samples of the yarn and swatches along with a small collection of post consumer fibres and textiles are to be found in Appendix 10.

Conclusion

The sample yarn collection and supporting text is simply a tool to enable the status quo to be challenged, to enable the right questions to be asked and to confront entrenched attitudes and moral inconsistencies within the textile and clothing industry. The yarn, it could be argued is not new, nor

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4 In 1998 this research won the BSI/RCA award for European Environmental design (fig 93). The BSI were keen to support a product which could carry an accreditation which was a part-recycled/regenerated product. To establish testing procedures would be complex and expensive though not impossible, i.e. one test could be microscopic visual recognition of reprocessed fibres. However it would be simpler to give the accreditation to a yarn or garment through the involvement of accredited suppliers in the manufacture.
is the concept of textile recycling. But what is new is the overview of the whole story of wool, enlightening various industries to the problems of their physical and environmental partners, and pointing up the idea of producer responsibility within one production chain.

This collection shows that design in the 21st Century can focus on post consumer issues and the manufacture of aesthetic, commercially viable products created from waste materials.

RECOMMENDATIONS FOR FURTHER RESEARCH

- to collaborate with sorting technology researchers to produce design solutions for recovered fibres from domestic waste streams
- to create experimental design solutions both on craft and industrial levels with textile waste from kerb side collections
- to collaborate with retail on special projects to transform textile waste such as RTM (return to manufacturer) into alternative products
- to collaborate with Local Authorities such through LROG and/or charities to develop alternative strategies to incineration, landfill and Third world dumping of thousands of tones of textile waste

of the product using post consumer components. Such an accreditation could be a model, which could be applied to various substrates and products, not just in the field of textiles.
APPENDICIES
APPENDICIES

Appendix 1

Interviews

1. Liuken, A. TNO Institute of Industrial Technology. Interview Enschede the Netherlands October 14 1998.
5. Galli, R. Chairman and Owner of Nanni Filati Srl. Interview Prato Italy October 28 1998.

Appendix 2

The Burton Group Factory Evaluation Report

Appendix 3

Multi Fibre Arrangement Details

Appendix 4

Burton Group Sourcing Policy

Appendix 5

Incinnerator Emission Details

Appendix 6

Earth Summit Details
Appendix 7
Diagrams A and B

Appendix 8
TNO Project Proposal

Appendix 9
Kerb Side Textile Collection Flyer

Appendix 10
Fibre Yarn Fabric
APPENDIX

TNO INSTITUTE OF INDUSTRIAL TECHNOLOGY

Interview with Anton LUIKEN
Centre for Textile Research
October 14th 1998, Enschede, Holland

J. Please explain a little about the textile sorting equipment you are trying to develop.

L. We are looking at the chemical and composition of a material. There are scientific differences between polyester, cotton and wool. You can also make the distinction between several mixtures such as cotton/polyester, in 50/50 blends or 65/35 polycotton. The most frequently used blends are wool, wool and polyester blends, which you can separate by manmade recognition.

The laser system evaporates a small piece of material and the fumes are analysed which is all old technology.

J. What feedback have you had from the Industry about such a machine?

L. They are sceptical, but that is typical of the textile industry in general. When you talk to the rag merchants involved in exporting garments out of the EU they are involved in a lucrative trade at present and their answer is “Why bother?” But we would like to make the textile chain more sustained by adding such a product.

J. In my research I have met with negativity at every stage of the wool process from farming to the point of sale the production chain has no responsibility after the point of sale.

L. Yes! The producers generate the volumes and that is why we at TNO which is a large organisation in focusing its efforts on this work. We can’t change the amount people buy. We don’t intend to influence that but we want to make more use of the intrinsic value of the fibres, and materials, which are produced in one way or another irrespective of the types of fibre. In natural fibres in fact all fibres have a certain impact on our way of living, on the ecology of an area. Polyester manufacturers have developed some recycling procedures like ECOLOR and QUORN but it is a small part and relatively easy part to process. But you have to go further.

Wool processing has been in approbation for centuries; cotton processing has been done for centuries because when you went to East Germany 10 years ago you had the ZERO system where it was an offence to throw away any textile which could and was re-used. It was a great system, which can be applied now. But we can replace part of this system of separating fibres by the use of technology. We now have the technology to separate neatly undamaged fibres because even when you have trousers for instance only parts of the trousers will be worn at the lines for example, but parts of the trousers will contain fibres of the highest quality.

J. There is also a question about producing garments with a tremendous longevity even though they may be unfashionable in 12 months, worn 2 or 3 times in a season and discarded. Surely there is a question about the sub-strate durability of a fashion item. If you look at the paper industry then a percentage of the product must contain a re-cycled/re-used element, in certain lines.

L. I think that ultimately it is the quality of the material that counts, not whether it has 80% or 50% virgin fibres. That is why the success of the 100% virgin qualities i.e. 100 pure new wool has been sustained. Some textiles which have a part recycled content do not have the intrinsic quality you like. In my opinion when you talk about textile recycling you must make it as good as new. In fact there is no difference between the two.
There can be a difference in paper products, for example printing on recycled paper can be less efficient than on a virgin product.

Yes, that is true but 10/15 years ago all those recycled papers were grey and brown. Now after sustained R+D those products visually are indistinguishable. They have all the characteristics of virgin paper; i.e. they are white, etc.

Here at TNO we are working on such problems. For instance we have a large de-inking facility, how can we remove inks from such paper. Now there a number of Dutch paper mills working solely on recycled paper products, no virgin fibres whatsoever.

In textiles we are lagging behind 15-20 years in our thinking. It is so important now that the whole chain is working together so that there is good end product including design. I don’t have the view that it is possible to use recycled fibres everywhere or to make sure that all fabrics are made out of recycled material.

Why should we, in a way, because a shirt is washed once or twice a week at the end of its 5-year life it has served its purpose - as had the upholstery in car estimated to have an average lifespan of 15 years, earning itself the right to go to the incinerator or to landfill - but a sweater you wear a few times and throw away should have other things made out of it?

Yes, it is important to look for the right applications, which have good design, and be attractive. The governing of the whole textile chain is determined by the last step, the life of the fibre survives but the articles may not. You have to make the same profits as you would with virgin material. In my view you could make higher profits probably.

Who are the players helping to develop such products?

On the Dutch side we are concentrating on the fireside but will incorporate spinning and wearing and finishing. Also the clothing industry will be involved. Partly because they would like to get rid of their industrial waste at this moment but also here industry is interested, always looking for new opportunities. The don’t see what the opportunities are at the moment but they don’t want to miss them either. That is why we are able to make very large projects including technological projects at this moment. We would like to make a range of end products in this Dutch National Project ranging from non wovens, wovens, yarns and knitwear and now that we are attached to a “school” we can constantly make products to show what can be done. We have gathered many samples from Evergreen and the end products were quite good although they were not that technologically sound. But it shows you that the yarn consumer doesn’t know what the possibilities are. We even don’t know ourselves.

Part of the problem with Evergreen was products were developed without an end consumer in mind. Items were made with the promise that someone would buy it.

Here the consumers will be the school. They will often test or design the product made from recycled fibres and will get instant feedback. But were the chain usually falls down is with the retailer.

Yes, that is why I think it is important to focus on one product or one small area and try to develop the perfect product, rather that product a wide range of items.

First you should look at what can be managed, to join all those separate steps? What type of yarns can we make? What kind of numbers is achievable? Look for a line of products, which
can be made out of such yarns, i.e. jackets? They must not look like second hand or recycled. They have to be as good as new.

J. One of the drawbacks in the quality of recycled yarn is knitwear because it breaks. But if you look at the technology of integral knitting from the hosiery area, there is no stress and strain on the yarn in knitting. So the correct machine must be also in the equation.

L. In our project we have spinner who’s using drew technology, which is very suitable for recycling short fibres. They are a small firm, Atofil, with 2 or 4 spinning techniques operating to make specialty yarns. We also have material, machine cut but when you have cutting you damage the longer fibres. You have to go to tearing and shredding because the weakest points break first retaining the longer fibres.

J. But in the tearing there is lots of damage too?

L. Yes, but I'm looking at ways to limit this damage and re-make the yarn into fibres on a good scale. There are number of studies by Italian machine builders which show that if you control the tearing you can minimise the damage. In Germany, in Aachen they are working with tearing, taking out the yarns first then reducing the yarns to fibres, then by wind-shifting you can sort out the fibre lengths.

J. Parkinson wants to work on the project somehow.

Do you know the Prato organisation and the collection system?

L. A colleague of mine, Mr. De Hoot Delft, has been in Prato recently and has visited various people. Phone him for details.

J. I need to go there finally for the BSI project. The BSI are willing to test a product which is part recycled and accredit it. At the moment there are so many confusing cables but they recognise the BSI logo - which could be accredited to a product and be recycled inspite of itself. The product would be an opening price piece of knitwear for example which would carry the mark. This would be subliminal labelling rather than a major selling point. In the UK people can be alienated by the idea of a product being second-hand.

L. Here in Holland and Germany also there is a re-cycling culture. People hate to throw away things, but they want to buy new items so we have a problem. To solve this there is likely trade in second-hand clothes especially children’s clothes, which have never worn out.

J. In the UK clothing is given to the charity shops or thrown away.

L. Having said that though there is still a lot of material thrown away. The average fibre consumption in Western Europe is between 15 to 20 kilos per year. I have heard even higher numbers in Germany - but an average per person on a Global is 7 kilos. We are talking about huge amounts of potential material - even if you could make one product like String out of gems you would instantly reduce the mountain.

But we need to see the whole picture and possible products for recycled material. Here in Holland people are prepared to sort their refuse into green brown and grey bins. They are conscious of the consumer problem.

J. how have the population become conscious of a need to recycle? Do you have information packages?

L. Yes, sometimes the Government have advertising campaigns. There are programmes in schools and local authorities are active in giving information. Also it is made easy for people
to sort their rubbish to recycle; there is no trouble.

J. In the UK it has been mentioned that there may be a levy introduced to households per sack of rubbish taken away. Do you have such a system here?

L. This is being introduced in Holland also, but what will happen is that people will drive to the next town and dump their sacks there or on the highway. This won’t help us - everyone is paying the same amount to get rid of the waste no matter how much they have.

J. Do you have any system to pay people for the materials they had in to be recycled?

L. We do have that system on returned plastic bottles. There is a levy on each bottle: when it is returned you get reimbursed - 1 guilder. The fillers are all part of the loop. They collect, clean, refill and deliver to the shops. In Holland the bottle recycling system is very good indeed. The bottles go round and round again. Beer bottles have a levy of 50 cents. Cans are free and are thrown away but always removed for recycling along with other metals at the depots. We don’t have a levy on clothing but there should be something per item and some discussion.

J. How do you thing that would work though?

L. The main problem is gathering. Were to you bring it back, in what kind of form? Should you bring it back to the retailer? Should you bring it back to the producer? There are problems because goods are coming from all over the world - but back to the point of sale would be ideal. Otherwise it is separate collecting bins from each household like paper and glass, etc.

J. Earlier this year there was chaos in Europe amongst textile merchants because the EU were considering labelling textile exports (used goods) as waste and what then would happen to their businesses and to the mountain of waste? But that decision was reversed.

L. Yes but in my opinion that legislation will come and it will come soon - especially if the technology exists to make good recycling products out of it is available. At this moment there is not the facility to use the amount of textile waste available. That is why it is more interesting to try to find ways of using this textile waste and re-used fibres. The technology is coming available as it is for carpet materials. You probably heard of the project DSM in the Southern part of Holland. They are recycling carpet materials in order to recover the ‘nylon 6’. It is de-polymerised and recovered. The project is looking good and they are building such a factory in the USA in partnership with ‘Alan Signal’ and DSM to recover carpet waste in the US.

J. How do they gather the material?

L. They are working together with the main waste transporters to recover the material. At the moment they are just using office and industrial carpet waste with massive volume. It is proven to be commercially attractive to recover the material. The residue is incinerated to produce ‘charr’ which is added to the cement process to improve the colour of the cement. It is a very reasonable use.

With all materials we should be looking at using the fibres once or twice before burning. The Government here is also intervening insisting that the way carpets are manufactured should change, for example introducing a strippable carpet method which will enable the fibres and backing to be separated with a dissolvable adhesive or ‘hotmelt’ which may be the future.

J. Would you see recycled products/yarns used in floor coverings, carpets and such like?

L. Well, carpet yarns are very thick and it may be that recycled fibres are not good enough for
the purpose. I would look at bedding materials for instance, trousers, shirts and non-wovens. For short fibres maybe the paper industry such as banquets which need quality fibres to make the paper. Maybe all synthetics should be re-processed as in the case with polyesters and such as are plastics and rubbers are recycled.

You don’t have to always look to see if it can be re-used in a textile case, but perhaps in a non-textile way also. Of course there will be a large part of the textile material recovered which you can do nothing with and that will be used for incineration.

This is why separation is so important. We don’t like to separate on colour but we can separate in colours mechanically but it is more difficult. We need to make the separation on chemical composition (dyes). We are also looking at de-coloration when some type of dyes can be de-coloured quite easily to leave white materials, which are more useful. But colours can be changed for instance if you have greys and browns you can make them black - but part, not all, of the recovered materials we would like to de-colour. Probably you can de-colours and disinfect at the same time (de-coloration is in all the textile handbooks but the problem is producing it on a large scale).

When you produce your yarns keep it in place in the steamer for a period of time to disinfect. Or keep them in carbon dioxide then your microfills will dye if they are present. You could have the process at the autoclave stage if not earlier.

J. At the moment the merchants have a good living disposing of waste as they are. What do you think would make them re-think their methods?

L. Probably only legislation.

J. Do you have links with your Government to give them information?

L. Yes, we do. We have official lines of communications to take with the Ministry of the Environment, which is very important for us. The Government also contributes or sponsors part of our research on each project, which is separate from any EU funding. The National Dutch Project is funded by the Ministry of Economical Affairs combined with the Ministry of the Environment. I inform the Government of what is taking place in the textile industry in this country.

There is no doubt that when there is a good recycling method the exportation of clothing will be over in a matter of short years. Then I can see that the post-consumer textiles will come through the charities only and the other sorting/merchant areas will die out.
BURTON MENSWEAR.

Interview with Cathey MILLER
Senior Technologist
June 20th, 1996

Q. What is your job title and role?
A. I am a Technical Services Manager. I am responsible for the quality of merchandise and sourcing base from initial design/concept into work, through to quality of deliveries into the warehouse and distribution centre and any feedback from stores on quality of merchandise issues. My responsibility is for overall quality, rather than just quality of manufacture which was the historical role.

Q. Responsibility for overall quality, that's all issues surrounding the manufacture of the garment?
A. Yes.

Q. Including social issues?
A. Yes. The Burton Group has a sourcing policy laying out guidelines, i.e. no child labour, etc. It is my responsibility as part of the factory evaluation procedure to make sure that our suppliers adhere to the guideline conditions. The guidelines feature in our suppliers’ handbook. I make a photographic record of the factories I visit to remind me just what they looked like, as I have been to so many.

Q. How did you come to be in this job?
A. I've always been interested in clothing. At school, my O+A levels were clothing/textile related. I did a diploma course at Hollins (part of Manchester Polytechnic) in clothing and footwear. It was a very broad technical/industrial course including marketing, business studies, statistics, garment cutting, running a factory. In my year out I worked for William Baird who manufactured for Burberry and Pringle and Sussmans shirts in Essex. It was a deliberate choice, which made me realise that I loved factories especially well run, organised ones. However (ambitiously perhaps) I realised that there was only so far I could go being predominantly male dominated and that in retailing I had a better chance. I decided against Buying and took a position as an allocator with Burton to decide what I wanted to do - that was in 1989. Although the job was awfully boring it gave me insight into how merchandising worked and buying. Buying at that time was very creative and without the support of design I felt I wouldn't be happy and possibly couldn't do it. Quality control was just starting to gain in importance then and I decided that would be a good compromise combining office and factory garments. I became the first quality/garment technologist at Topman and helped to set up the apportion there. After 2 years I became Senior Technologist and ran a team across Topman and Top Shops until March 1995 when I joined Burton Menswear.

Q. When you joined this division you took on existing suppliers. How did you decide if you should continue with them or that you should look for others to build new relationships?
A. Yes, we already had relationships with suppliers. I reassessed the quality of garments, which the manufacturer delivered to us monitoring what was going on hold. I worked with the buyers looking at on-time deliveries, correct sizing, had the manufacturer followed the specification on quality. On top of that I visited the factories. That analysis showed which supplier was worth continuing with and which was not. For example, if you take deliveries which were constantly a problem, poor quality, mismasured differences, etc., and you visit the factories invariably, I
found they were chaotic, the didn't know what they were doing. There was no control and they were inefficient. That means their mistakes were costing us money and that their cost prices for successful garments were costing us money - otherwise they wouldn't make any profit.

Also the Group's decision to reduce the supplier base made it easier to focus on the suppliers who were using the best factories for best product. For instance, Floreal's business would come from our buyer; Floreal would then decide which factory to make the garments. It would be their responsibility to get the product right.

Q. What prompted the Group to reduce the supplier base?
A. Economy of scale.
Q. Meaning what?
A. Meaning that if you place a lot of business with one supplier, you are important to them. Their factory is full of your product and they in theory tune in to your way of thinking. Things become streamlined and more efficient and then the cost prices should be driven down.

Q. Would you say this was more than just an economic relationship?
A. Yes, it is much more than economic. If you are managing five suppliers rather than twenty-five, you can give those five suppliers more time and effort to building the working relationship. Communication is much better. Quality of information is much better because it is concentrated on certain people and your relationship and trust grows with them. I would think that the key suppliers we have now are the best of the original bunch.

Q. Do you travel the world searching for supplies and vetting them?
A. Yes, from the North of England to Bangladesh.
Q. What do you find when visiting a place like Bangladesh?
A. Bangladesh is quite a lot like India and I find it fascinating, purely because Bangladesh and India are so different. The people's concepts of right and wrong are so different that from a personal point of view it is a learning curve, culturally. I'm not keen on the open sewers. I don't like walking into buildings which have no light and you can't see where you are walking and the smell takes a while to get used to. I never feel unsafe or threatened because you are chaperoned wherever you are. The fantastic poverty doesn't disturb me, because it is a poor country and I expect there to be poverty there.

Q. What do you know about the production of fibres, for instance wool? Do you make sure that you know how it is grown, produced, dyed? Are you aware of the environmental issues relating to production?
A. Less so than I should be is the answer to that. As a business, we are looking to have product manufactured and put together correctly with colours, which won't run, and fabrics that don't shrink. This is the second stage of the "Grand Plan" if you like that is to get control further back up the chain of production. The aim is to get in contact with the mills, dyers and spinners. The mills that I have been to have been largely formalwear mainly in Portugal for weaving and spinning. In terms of wool I don't know anything about production for instance effluent output. I did however, when I went to Madagascar, I looked at how they were getting rid of waste, particularly in such a poor country. I was quite interested in where it goes and how it is treated. In Madagascar they were cleaning the effluent first before disposal. Now, since then, I have tried to get more into, trying to check out the chain but it is difficult because at present it is not part of my job description.
Q. So, it is not in your present job description?

A. No, my job description is largely what I make it at present. It should be but I didn't have enough time at Fernley Spinning in Mauritius for instance because it was quick. In fact we have only just started checking out factories properly now. Since April last year (93) we have come up with a factory evaluation across the group with a system of grading. That has been the first phase. The second phase in getting to the dyehouses and making sure that they know what they are doing and are ecologically sound. The third stage is the mill, but it is a long programme of development. You come across quite a lot of resistance from suppliers and factories that have their friends and historical links to other suppliers involving yarn or fabric. It is a sort of Mafia, which is difficult to crack. I approach it along the lines that we are trying to help them get it better and we will come with them to their friends and suppliers to talk about these issues directly.

Q. Further back in that supply chain is the hidden end of the fashion business where the public are perhaps less clear about how the chain of supply works. Why do you think that it has been less important to know about start of pipe issues as a business?

A. I think it is a historical and parochial business where traditionally buyers are courted by suppliers with "here is the garment, this is what I can do for you". The buyer would change the colour and lay down the order. They have never asked who's dyeing it, which's knitting it. It has always been the supplier saying, "I can give you this". The chain has always been long with the buyer at one end and the supplier who is also an agent working through another agent through 2 or 3 factories. The factories may have 2 spinning mills and other dyehouses that they will use: it has all been quite convoluted and it is only now that we are clamping down on the number of suppliers that we can 'weed out' further up the chain. Now there are less agents around, less middlemen and retailers can go directly to key suppliers and factories. Now we can have those conversations with factories about environmental and social issues, which were impossible before because of the complexity and parochial nature of the system, which had an attitude of "I don't really want to know...".

Q. As far as dyehouses and finishing go, what are the best and worst you have seen?

A. The best one of the limited few I have seen was Brownside Dyers and Finishers in Hitchcliffe. Worst in India with someone with a big old drum and the dyes and chemicals in plastic buckets and a big scoop to ladle out the dyes into old-fashioned scales.

Q. Is that recently?

A. Yes, about 1½ - 2 years ago.

Q. It doesn't surprise me, because in India there are record of knitwear production for example in volume. But there is no record of where it is made or by whom on what machinery. French Connection, Next and now Benetton are all manufacturing out of India despite the problem.

A. Yes, India as a country has cut of potential but you have to guide them. You have to understand their culture to enable you to get what you want.

Q. It is a massive home market also.

A. My knowledge and experience of technology has always been factory and manufacturing based rather than chemical dye based. I have help from experts in that area like Gay (now technologist at Next) for that information.

Q. Have you ever seen children working in factories?
A. Yes, in India, they always say "Oh, the children are too young to go to school; they are just sitting with their mothers - they are not working".

Q. What is the minimum age the Burton Group require of factory workers?

A. The minimum age we require is the minimum age in that country. China has very stringent laws about children and how many years they are expected to attend school. I have never seen children in any factory in China at all. Places like India and Bangladesh, it is much harder to control because they don't have birth certificates and you don't really know how old these people are and as a culture they look quite young anyway. I went into a factory in Bangladesh. I asked for her personnel reports to check her age. And that factory tries its hardest to meet age requirements by using birth certificates, etc. This girl who I suspected of being under age was in fact approximately 30 years old. You never really know. Some of the countries we are dealing with have a school leaving age of less than fifteen.

Q. In Mauritius for example they have a labour problem and have to bring workers in from China. Do you know how that works?

A. Yes, they come in on a two-year contract and they are generally single women from the North of China. Because of poverty the Northern Chinese region is much poorer than the South so workers either migrate south or abroad to earn money to send home are. They come over and are provided with accommodation with two or three meals a day by the company that is employing them. So, for instance, a company like South Ocean Novel in Mauritius, they have accommodation blocks on the factory site. Floreal also have Chinese workers also. They are strict with the workers and if they want to many a local their contract is terminated. If they fall pregnant they are sent home.

Q. Are they allowed to go home?

A. In terms of Mauritius they are allowed one trip home within the 2-year period.

Q. Are they your or old workers?

A. Because single people are preferred they tend to be young - 25-30 mark - some of the men are older and send money home. They earn quite a lot relatively.

Q. I think it is less than the Mauritius workers.

A. Yes, I am sure it is, because the Mauritian salaries are quite high.

Q. If you think about Floreal in particular and the fact that they have had to look offshore for manufacturing even venturing into the East coast of Africa and India to get cheaper product because they are constantly squeezed by retailers, how do you think your relationship will develop in the future.

A. What do you mean?

Q. Well, if they can't maintain the prices to you, what would you do? Would you drop them and find another supplier or support them? Because in a way, the Burton Group is pushing the situation and it could be argued to an inevitable scenario.

A. The prices are governed by what people will pay in the High Street. Yes, eventually if Floreal become not cost effective as part of the strategy they would be given a fairly long period of time to get their costs down because we are not the partnership ethic. We do want to work with people for a long period of time rather than just switching and we would give them about a year
to become cost effective and we would give them same production to help set up new units. But ultimately we have to make a profit to keep operating and the prices are driven by what the High Street consumer will pay in the UK. Where if you look at places like France and other European countries the cost of living is much higher and people are prepared to spend much more money on their clothes. Even some American retailers can pay their manufacturers more than we can for us to maintain a profit margin.

Q. The profit margin is quite high in this business. Is it not relatively?

A. Yes, the intake margins are around 60ish percent and are much lower than some High Street retailers.

Q. I just wonder whether you feel there is a moral question here, if you are constantly driving down costs for a company like Floreal.

A. Well, it may be that eventually Floreal may keep spinning on but will become an office that will control satellite factories within the Pacific Rim which, if you think about it, that is exactly how UK manufacturing has gone.

Q. I suppose that makes sense. If they started factories in Africa you would get those too?

A. Well, if you take the Floreal Group in Madagascar, I have been working with them on leisurewear helping them to get the factory set up properly so that we can give them work.

Q. Do you stipulate conditions, for instance length of working day? Would that be in your supplier's handbook?

A. No, it is not. If a country had a horrendous working day expecting the workers to work a 14 or 15 hour day, then I would go to management to suggest that we talked to them about re-structuring their working day. In terms of operating 24 hours, I don't have a problem with that, provided the shift length is reasonable. Floreal knitting in Mauritius on the stall machines operate all hours of the day. I generally ask how long the working days are, how long for breaks, how many days a week they work and how many holidays. If they seem really excessive in relation to what the rest of the country is offering, I would raise and discuss the subject. But you have to relate to the country because in China they have just 3 days off a month, they don't have weekends - that is how the whole country operate. So it becomes a moral question really: are we within our rights imposing our Western values and working practices on them? I have a conflict in doing that.

Q. In your role too, you have to ensure that you don't become desensitised as you have to qualify and prove that what you do is correct. Do you think that retailers should take more responsibility for their manufacturers? For instance, historically the business was vertical with retailers owing the chain. Now the risk has been removed from the retailers with a gentleman's agreement with suppliers. On the face of it 12 months trading to put things right at the factory sounds long time but it isn't. Do you think there will be a return to more of a vertical structure eventually, for instance the way Gap appears giving back and owning the spinner?

A. I see the development as being vertical but it is a vertical partnership rather than a vertical ownership - so we would be driving it right the way back to wanting to know where the fibre is from and who is spinning to ensure that people are taking responsibility right back through the chain. I don't see us being a manufacturing company but I definitely see it being vertical in the partnership sense. I think it is a long way off for us as a group but it is the way we are going.

Q. At the moment you have a risk-free operation?

A. Yes, the supplier is responsible. We do as much as we can do at this end but it is up to the
supplier to alter their ways of working. It is the mentality trying to be far sited enough to see what will be needed in the next five years and getting over the fear of the unknown.

Q. Thank you.
L.M.BARRY TEXTILES

Interview with Mr. Lawrence Barry
Docklands, London.
June 1996

J. How long has the business been going and how did it start?

L. It started with my father who came out of the forces in '47, had several jobs selling lorries to various companies and sold lorries to Tom More. Realising this man was buying a dozen at a time made my father think that More's business was a very lucrative one.

More offered my father a job. He started on the bailing press, which is really hard work. He started at the bottom and worked his way up at the end of the day he bought Tom More out in 1975. I started working for my father in 1976. I thought this looks good just as he did, no more dinner suits (I worked in casinos), wonderful and fabulous life. My father thought 'you must be mad to join me'. I said 'no, this was much better' and he put me on the bailing press (laughs).

What a hard graft. Now then our business was a lot harder then than it is now. We didn't do second-hand clothing to the African markets as we do now. The business was build supplying secondary fibres. You had to learn about all the grades of fibres, wool, cashmere, cotton, polly-cotton we sorted for secondary fibres and industrial wipes.

Then we had 15-16 drivers and 5 others, and we used to do about 15-16 tons every week, all for recycling.

J. So, when you say secondary fibres what do you mean?

L. Going round a second time! Primary fibres are raw wool. Secondary fibres are reclaimed from garments.

J. What happened to these fibres in '75?

L. It was pulled, carded, garneted and re-made into wool again.

The death knell for the secondary fibre industry was the Wool Mark. Until then companies like Burtons, their industry was made on the overcoat in the '50s and '60s. The anorak did not exist. Everyone went to work for a few years to buy themselves a lovely raglan or crombie and it was an expensive thing. He would have his blue-dye suit, which he probably got for his 21st and would get married in it. Go to a christening in it and get buried in it (laughs).

That Industry was made from these garments and most of the wool used in those garments came from this industry. That's also how they could produce such volumes of material so competitively to sell in the high street. You couldn't afford in those days to have a tailor make a suit from pure, new wool - it had to be from recycled fibres.

Now you buy a suit from Burton and it is made from a variety of mixed fibres making it even cheaper than in those days using recycled wool.

J. What happened to cotton?

L. Cotton went for a predominantly industrial wipes. Kimberly Clarks and other supplying packages wipes for the Industry went in such force then. In the '60s we supplied all of those fabrics. Industrial cotton wipes were far superior than paper which is mostly used today. If
there was an oil spill then it was cheaper to mop it up than repair the machine.

Many years ago we used to make a grade called 'fines' made from white cotton which was used to make a grade of top quality cotton. We still do a job similar to your old fines. Ever looked through a pair of industrial gloves? The white cotton fibre inside is attached to the rubber. We still send a lot of white cotton to a mill in the North who makes these gloves. Or they can grind it, use it with a plastic filler like: 2 of sand, 1 of cement, and they use that for the cotton as a cheapener.

J. What happened to your synthetics?

L. They would have turned out as a plastic bowl! It is petrochemical base, which can be reused. Nowadays we sort the multicolour from the self shades. If something is 2 or 3 colours it doesn't matter. What you do with it; it always turns out a grey colour. When they tease it and pull it, it always end up an underfelt colour. Now, that would be pulled and sold to companies making car insulation panels. If you sort the self shades we sell them to a company who if it is blue they are sorting will make several shades of blue, such as turquoise, pastel, blue navy. It's like a paint chart. The girls will make several shades of blue or several shades of red. Then that goes to a mill that pulls it, cards it and spins it right back up and it ends up as a blanket. The Spanish and Moroccans have the big mills over there that use a lot of recycled synthetics. They buy it rather than buy new. Now, a few years ago Courtaulds were producing the fibre so cheaply. It really did look as though it would rock that business. We have to cheaper than the raw material. Luckily chemical prices have gone up, their prices have gone up and our industry, because of that, is reasonably sound.

I don't think that we could hold onto a business like my father's now without the second-hand clothing. You couldn't live on recycling today. You really couldn't.

J. Have you found that the Industry has peaked and troughed?

L. Oh yes, 7 years full and 7 years lean. We have been on a really good run in recent years but now we are on a downward trend. The trade has changes completely. Now the emphasis is on reclaiming. It was all recycling in my father's time. Now my father is still involved in the company although now retired. He advises us on policy and is very much abreast of the situation. This business has been very much a family business. The big companies, for example ICI and others, don't want to come into this: they just don't want to know. It is hands on knowledge, small markets. We are dealing with an unquantifiable product. We depend on what people throw away and what they donate to the charity shops. We don't make raw materials.

Now, in dad's time it was the totter who cleared the streets. He was the most effective way of recycling. He went round in his horse and cart (now it's a transit van) and he would take anything that would return him the effort to pick it up. If it was rags and it would return to him £50 a ton he would pick it up. He'd do it. So he would take anything that was recyclable.

When it came about that he couldn't afford to make a living anymore as a totter they would go into a factory or sign on the social.

We had the last working totter with his horse and cart coming to us as last as the mid '70s (laughs). This guy trained his horse to shit after it had been weighed on the weighbridge (laughs) to make up the weight. Imagine the weight of 2 buckets of what's its especially if he was doing wools! It was a lot! (laughs).

Do you remember Rober of Cambridge? Pockets full of wet sand. He also had a water tank on his lorry so that when took the lorry off and it was unloaded he would turn on the tap over a drain and let the water run away to lighten the vehicle (laughs).
The couldn’t make a living in that era and they dyed out.

J. Was your business on a different site then?

L. Oh, yes, Crickey. We had very humble premises until recently. Father’s yard was a unique piece of architecture. Huge metal and corrugated structure freezing in the winter and boiling in the summer. That was in Barking, 33 thousand square feet.

J. When your father started was it a respectable business to be in?

L. No. You see people confuse the rag-trade with the scrap-metal trade where there are unscrupulous people in business. In the rag-trade we are very hardworking honest people. The scrap-metal business deals in stolen metals, etc. This is an honest trade where your word is your bond. Even if is 20-30 thousand-pound sale. I agree it, send it anywhere in the world, and I’ll be paid for it. It doesn’t matter what anyone else offers me for those goods. I wouldn’t sell it twice.

J. Do you call yourself a recycler?

L. No, a ragman.

J. Are you touch with the other recycles in the UK?

L. Yes, I was the founder member of “Recyclatex”. We looked at our industry and realised that the public perceive us as a Swift and Son, not that we employed 125 people and 20 lorries going all over the country.

People donate to the charity shops; they don’t know what happens to it then. Only 10-15% of those goods are sold over the counter. So we put together Recyclatex which would work with the local authorities and set up recycling banks. We did that first with Richmond council. That worked very well. I said to a couple of other merchants if we were to go forward and we went to the local authority to, say, clear asbestos, then they’d want to see accounts, property they’d want to make sure you are working as a fair employer, etc., etc.

My father in the old days was a voluntary ember of a group who dealt in waste textiles and we put together a package including 15 of the most respected rag merchants in the country who had decent premises who would employ people sensibly with a sensible wage structure and were running a business as a firm should be run.

We get very small-minded people who are running a business in a very antiquated way, no health and safety, a couple of sons employed. They are not very professional.

So we tried to change the image but we were too successful! We all put in to the group a bond, which guarantees fidelity so that if any member de-faulted on a deal there would be a guarantee payment to the wronged party. So far we have never had a claim on it in 5 years. Their word is their bond.

J. There are all British companies?

L. Yes.

J. Do you network with anyone abroad?

L. Yes, we have contacts all over the world. If we relied on British trade we would be bankrupt. Most of our business is for export. We do 5 or 6 packed containers a week. 60% of our
products is exported directly and another 10-15% indirectly through bedding manufacturers, etc. This is predominantly clothing. As I said before we supply self shades to a company in Yorkshire, which then produces coloured fibre, which is then sold to a Moroccan company.

J. Where do you export? You mentioned Africa.

L. We have our own place in Africa. We export to Togo. We export to Hungary, Eastern Europe, Poland, and East Africa, Central Africa.

J. How do you break into these export markets? Do you have an agent?

L. No, they come to England and ask for our reclamation journal and they contact us. Also, word gets around. The Chamber of Commerce is also useful for new enquiries. Also, because our product is good, people find out through the shipping offices worldwide that sent the goods and contacts spring from that route. For instance, there is a guy in Uganda who we do business with who put a lot of effort into marketing our product. He’s loyal and reliable. We could probably get slightly higher prices if we sold to others but he made the market for us so we stayed faithful to him. We know the market price for our product and if we get a fair return for our product, that’s fine.

J. What happens when the product reaches Uganda?

L. I've spent a lot of time over there and it works exactly the same way as it does here. Same as if in the East End stuff is imported from Greece. It is stored in the warehouse and they sell it onto individual shops who market it out. We sell it to our man over there. He's got 3 big warehouses who'll take our contingents and store them there. Then the local market boys will come. There'll be one who deals in shirts. One in shorts, etc.

J. Are the garments clean when they get there?

L. When you throw stuff away, where do you put it? In a textile bank, charity shops or dustbin?

J. Charity shops.

L. Have you ever been guilty of taking your clothes off and giving them to a charity shop dirty?

J. No.

L. That’s right. They are washed, often ironed when we get them.

When you have put a few pounds on or taken them off, when the clothes are out of fashion or you are tired of them after a holiday and they are a bit faded, you fold them up, bag them and take them to a charity shop. The women sort through them and they decide what they can sell. The rest they put into a rag-bag and they sell to us. We get that and it comes back here.

What we get from textile banks isn’t necessary so clean - but for us to wash that would put expense on and kill the market at the other end. Also, they can wash dirty stuff for peanuts at the other end.

J. So, they would launder it and prepare it for sale.

L. I’ll show you and African laundry (gets out photographs and albums).

J. I didn’t realise just how much knowledge was needed about all aspects of fibre and clothing to run a business like this.
L. Well, don’t forget that before the second-hand clothing pure fibres was our business. It was everything for us. The sorters are skilled. With their eyes shut they can tell you what a garment is made of, whether the garment is a mixture or it is solid.

(I begin to look through the photographs. Brilliant shots of African Villages, chiefs, water and laundry markets).

J. These are wonderful pictures. Did you take them yourself?

L. Yes, I have been to Africa many times although not so often this year. This is a hot of the laundry and back in Alai. My wife and I were honoured as village chiefs in a Nigerian village. It is really outback and primitive. Here we are in traditional Ibo hats. The Ibo tribes consider themselves as Jewish Africans. The hats look like sailors’ hats, don’t they? Apparently the costume is derived from the Dutch navy.

J. From these photographs you look like you are treated like a VIP in Africa.

L. Yes, although it is all very friendly, a partnership. Chief Oji (in the photograph) and I do a lot of business together and also in the past. And yes, if I go to Nigeria there is tremendous hospitality. I would never go to Africa without calling in to see him. It would be too disrespectful. The Chief lives in Togo but his actual village is in the outback in Alai, a sort of Richard Attenborough place. Since the business came he’s put in generators so there’s lighting in certain parts of the village. Water has come too which is amazing because you are mud-hut land!

J. Has that happened on the back of your business relationship?

L. Yes. Although it has happened on the back of him being a good business man too. He wasn’t born with money. But, oh yes, the development of the village is due to our development.

Actually there should be more photographs but M+S have some. Channel 4 took some and BBC2 recently were here about some program they are making. We are very popular!

J. Do you have a company philosophy or Mission Statement? There’s a lot of interest and kudos attached to this industry, for example recycling and regenerating - because of environmental issues.

L. We think it is quite comical. When father had a disastrous fire we nearly had to call it a day and I almost worked for someone else. Then at the last minute we found premises. We had spent nearly a year finding somewhere to open up a rag dump. There were little areas here and there but in general local authorities didn’t want to know us. You’d see out in Rainham, scrap metal yards and breakers yards rubbish dumps. Father’s place in Barking was brilliant site but then no local council wanted us and our business. We were perceived as being unprofessional and not serious about what we do.

But you’ve seen this factory and the way it is run? It changed (council policy) so much so that Docklands (LDDC) pushed really hard for us to be here on this site. Yes, they pushed very, very hard indeed, because we wouldn’t be categorised to come onto a site like this. Everyone bent over backwards, Recycles yes, they said. The whole image of our business has changed completely. It is all hip and trendy now. It has been going on from time immemorial (laughs in disbelief). For instance, we’ve always recycled cars! It is all crap this hype.

If we are not careful we’ll go down the same route as Germany where I’ve spent some time. You are going to pay fortunes to recycle stuff with no market. You can recycle anything. For instance, the drinks carton with plastic on the outside and paper on the inner is called Tetra Pack. Squeezed and crushed you can make palettes with it. They make all these waste products
with no real end use. Paying for and using masses of energy to produce unwanted products. No end market.

We were doing it because there was an end market that made it pay. It costs the average German housewife £25 per week in recycling costs. And there are some lovely companies making big money out of recycling. We could have done the same. Because the .... that be will ray it is in vogue and we must be seen to be involved. They are wrecking the whole recycling trade in Europe. There is so much recycled paper in Europe. They are dumping it on the other countries, which is insane, isn't it?

It should (recycling) be hand in hand with market forces. Let me show you an African rubbish dump here. Now there is recycling where it works. Look anything with any value has gone. They take everything out of it that they can possibly have.

J. Where do you think the future lies?

L. Our biggest problem at the moment is that we can move foreward, new ventures like the one in Africa - but the problem is that the charities have to develop a social conscience. They hold us to ransom! We put a professional image together to show them what we can do and how we can do it properly employing people at the right rates, etc.

A few years ago the ethnic minorities that were supplying us who didn’t know about fibres or self colours just about shipping to Africa though 'hey, we can do this ourselves'. They go round to the local charity shops and say we'll give you ‘X’ for a bag of rags and we were giving them ‘Y’ and if ‘X’ is more the charities don’t look to see how those people run their businesses. It could be child labour. Now that has put our prices up.

It thinks I’m a fair employer, paying about £4 per hour. We start them on £3. They stay on that for about 4 weeks. Then build up to over £4 per hour. Compared to the ethnic minorities who are paying £1.80 an hour. Recently someone got ‘done’ employing school kids. The factory was closed all day and only opened when the kids came home. The charities were supplying him! This was in Birmingham. The major charities have no values. If the guy raid will give them 20p more they will sell to him. I would say to them 'look at his business in comparison'.

J. I'm surprised that in Charity policy the public I'm sure isn't aware of that.

L. Salvation Army, South Kettering textiles limited. People think they are donating clothing for the homeless. There is a countrywide trawl on a the moment - not for the down and outs but it's not. It’s going to a private company and someone is getting very rich out of that.

J. That is fantastic, isn’t it?

L. it is really stinking up the name Sally army!

J. Who do you think this doesn’t get into the news?

L. It does from time to time but are people really interested? The charity shops can sell their name under license and collectors can go door to door collecting old clothes but not on behalf of the charity.

(COFFEE)

J. Do you have people coming here who try to buy rare items or valuable?

L. We ain't in a business of trying to make the last dollar. They come down here; they are a
cottage industry as it were if they came down and sort through our stuff, take what they want. We are quite happy for them to do it and there’s some profit in it for us. What they earn out there at the end of the day at Camden market, etc., etc. is down to them.

J. How much to pay the charity shops?

L. We pay them by the bag. The average price at the moment is £1.60 a bag.

J. And that is for a mixed bag.

L. Yes, however it comes. Shoes too. There’s photographs of markets in Africa there where all the shoes have been completely rebuilt. Handbags too. The look brand new, completely refurbished.

This is what I say to the charities. I haven’t put my prices up for clothing for 3 or 4 years; my end market is the guy who buys a shirt in Ghana. A shirt for a man in England is £30. That’s OK out of an average salary. When we send a shirt to Africa it is washed and starched locally. Gone into the market stall, everyone has had their cut out of it. The guy who is buying it is costing him a day’s wages. He is my ultimate customer. I never forget that. I spend a lot of time there. I eat in the markets. I never get a bad stomach. When I start selling to a country I go out there, spend time there trying to understand the place and customer. What people wear in Nigeria is totally different from what they were in Togo. What they were in Togo is different from what they wear in Ghana. For instance what they wear in Uganda is anything from the 1950s. The want blue and white striped shirts, won’t wear jeans. Yet I can sell that to Nigeria and they would love it. So you have to spend a lot of time sitting and observing, taking photographs and understanding what they want.

J. Would you ever consider advertising because at the moment you are relying on your relationship with the Charity shops.

L. We work closely with the charities but unless they realise that they are being a bit greedy, well - for instance Great Ormand Street have just sold their name. People now can go calling on doors collecting using their name.

If that situation gets worse we will do a recycling programme with the local authorities and completely expose and cut out the charity shops - because they are just greedy.

At the moment you donate to the charity shops who sells it to raise money for its good works. If they had to pay competitive rates and wages to its shop people they would get slaughtered. They are so particular. I’ve offered for them to buy me out for them to become rag-merchants and do it properly. Have the ups and the downs of the market forces but you have to do the job right. Other than that, they sell it to us. I will employ people and everything will be put in line, not employing volunteer workers, etc. and they should say we deal with you because we know you do it right and we are not prepared to work with people who take short cuts.

J. Do you deal with key-players in the charities or do you deal with them locally?

L. Bernados are very good. We have dealt with them for years and they are very interested. I know we run our business. We do a lot with dear old Cancer Research. I’ll give you a print out of the charities we deal with. We have a good relationship with all the charities. The people we deal with are good people.

It is when you get these University people in whose business morals belong in the gutter! They don’t care how they get money as long as they get it. I’m afraid they forget what they are there for.
J. Do you have connections with retailers disposing of new clothing?

L. (things needed signed missed .....)

J. Your drivers go out with an itinerary and call on the charity shops?

L. The drivers clear every one of those shops on the list once a week, the whole lot, about 4000 collections a week. Someday it's market day, someday it's early closing. You have to take all that into consideration.

The thing I though of a few years ago was that if you look a Barclays employee, etc. what happens to all their old uniforms? If they release it to landfill, they are not seen to be green. If they give it to a charity, it becomes a high security risk. So we got involved with the big companies and said we had a service and we could dispose of these uniforms, i.e. British Telecom, building societies, etc.

Halifax was the latest one to have a change of clothing. We were given something like 27 tons of uniforms. So we went through it and said that the trousers were like any high street trouser. Therefore we would dispose of them outside of the EEC. Some of it would be cut for wipers, some we have to shred. We maximise the most to both parties benefit.

British shoes corporation have a fabulous distribution centre over tens of acres. They supply all shoe shops in the country. Now it is all fully automated. Now, if shoes fall off the belt there is no one to pair them back again.

They make about 7 tonnes of shoes a week which are shoes which have lost their destiny, either being seconds, mismatched in the box, etc.

The Mirror or the Sun got hold of it, found out that they were shredding them and why were they giving them to charities or selling them to charities? Sally Army had 26 million in their bank account at the last check, without their other investments. They don’t buy anything. If you were to fall over outside one of their buildings they wouldn’t let you in unless you had a DHS certificate so that they could claim £750 for putting you up for the night. Sally Army is the biggest hotel chain in the world. No one goes in there free.

We got in touch with British Shoe. We went to see them first. They went keen. In the past their stuff had ended up with market traders in the UK undercutting shops. We offered to put up a bond as a sign of trust. We'd collect the shoes and pair up about 50-60% of them backs here. We sent out the rubbish and ship them straight to Africa. There's about a dozen guys pairing them up. The benefit goes to Africa and it doesn't affect the UK market. It has been going on for a couple of years now.

We are counting M+S at the moment. For instance, the recent Manchester bombs rived clothing in the store. If the stuff went to landfill it would be as rape as the driver at the dump. If we get the contract to remove it we can guarantee it won’t end up on UK market stalls. It will be shredded, colour-coded, used as wipes, etc. They can be certain it is safe. We see that as growing business in the future. At the moment we are contracting major retailers.

And for Royal Mail to say to the press that they have recycled 2,700 garments it is brownie points for them. Also they can be seen to be helping people in foreign countries with no security or otherwise risks to them. If it is shredded it ends up on secondary fibres.

J. I was reading recently that from Europe has come a directive to reduce by the year 2000 landfill by 60%. Do you have links with landfill owners?
L. Yes, I work closely with two of them and with local authorities. I'm a member of the recycling forum. We meet and discuss how to reduce the landfill burden. If you could at the moment take out all glass, paper, tin, textiles, timber, all those bulk things you get in rubbish bins, what would be left with? You are left with all the toxins. It would make a very toxic waste tip disposing of just that. If you look at Essex alone, we do enough gravel and ballast extraction we need landfill to compensate. When the GLC was around it couldn't fill the pits as fast as they were dug! We need landfill and the technology is there to make those sites safe. With landfill we are only taking one thing out and putting another thing back.

In my view the best solution for the future is not just reducing landfill by recycling components of it necessarily. It is to reduce the packaging of goods in the first place. If you go to B+Q for the screws the packaging weighs more than the screws. If like the old days you bought nails in a brown paper bag you can compost that bag yourself at home if you wanted to. Stop the rubbish at the start of the chain. They have attached a problem at the wrong end. We should reduce the packaging by 50% at its source. At the beginning of the chain.

Yes, I think that view could be taking looking at a lot of products. Less is more, etc.

Interview ends.
INTERVIEW WITH MRS CLELI

Mother of a Floreal Knitwear worker
Who spoke through an interpreter in Creole
Mauritius May 20th 1996

Q: What is your name?
A: My name is Marie Yvette Cleli.

Q: How old are you?
A: I am 65 years old.

Q: Where is your family from originally?
A: My grandfather came from India to Mauritius. I don't know when that was.

Q: Where were you born?
A: Mauritius.

Q: How big is your family?
A: I have 4 brothers and 4 sisters.

Q: What did your father do for employment?
A: He used to be a supervisor in the fields, then a contractor in the sugar cane industry. When he was younger he used to fish for a living.

Q: When you were young did you have a formal education?
A: Yes, I went to school until the third year, but I was the oldest next to my elder brother and I had to leave school to look after the other children. I never learned to read or write.

Q: How old were you when you got married?
A: 23.

Q: How many children do you have?
A: Six children but one died. Two girls and three boys.

Q: Where did your husband work?
A: He was a carpenter when he was younger then he was a Mason working in the building industry.

Q: Where did your family live, in a village, small town or countryside?
A: In a small village.

Q: Before you were married, do you remember what life was like in Mauritius?
People were poor - a lot poorer than now. People now live quite comfortably.

Did you have electricity?

No, it was all petrol lamps.

Did you have running water?

No, we got water from the public tap in the square.

When do you remember the changes coming, electricity, cars, etc.?

I remember when we got electricity in our village in the 1960s.

Where was your village?

About 3 miles from the airport Plain Bois.

When Mauritius became independent from the British in 1968 did you notice changes then?

After independence the changes were for the benefit of the people. There was a state pension for the children (child allowance) and old people.

Is there social security for people who don't work?

No, there is no social security. The people who have no employment must work for 4 days a week in the community digging the road etc. for the government, then they are paid something. If you don’t work as a domestic, cleaner, etc. you get nothing.

Is there unemployment?

Yes, much unemployment. Usually your family supports you, and you can get a little amount for the work you do for the government but it is not enough to live on. If you are handicapped you can get a pension. Very old people get a pension. If you are sick you get nothing.

Do people work into their old age?

No, they stop when they are 60-65. If you have worked as a labourer etc. you have paid some money into a fund and you get an old age pension because of their contributions. I get an old people's pension even though I was a housewife.

What is an average working wage in Mauritius for a plantation worker or textile worker?

A labourer working 5-6 days a week would earn 40 rupees a day that's between harvest. During harvest he would get a bit more especially if he’s big and strong; it depends on their strength how much they get. If you go to work in the sugar factory you get about 1500 rupees. It is better than the labourers but not as good as working the sugar factories.

In the hotels?

It is the same as in the knitwear factories but they get bonuses with food, or maybe they get some luxuries. Domestic, cook, porter, it is not as hard as the knitwear workers or labourers.

Is it true that most of the employees in knitwear are women?
A: Yes, many women work to support their men.

Q: Why do you think most employees are women?

A: Some men do work in knitwear. They will do it because there is no other job, if they have no qualifications from school. They would rather work in the factory. For instance, the Indian origin peoples would traditionally have a small holding, have cows, etc. Now they don't want to do that. Their women don't want to bring food for the cows. If the men can't get jobs, they stay at home whilst their wives go to the factories, and they look after the children. The conditions could be improved.

Q: Are 40-50 rupees a day enough to live on?
A: No, the labourers are still really poor.

Q: Do you have a television?
A: Yes, everyone has a television.

Q: Do you have European and American programs too?
A: Yes, American, English and French.

Q: Do you have soaps?
A: Yes, yes. Dallas, very good!

Q: What do people think about the outside world in Europe and America?
A: They would like to live like that but what can they do about it? It is just like a dream. I think this is why Mauritians want to come to America and England where they think they can be rich.

Q: Is that why old traditional employment like keeping animals is less important?
A: Yes, now we have a big view of the world. We don't want to work like that, very hard.

Q: I notice lots of women in the factories wear European dresses.
A: Yes, it is a much freer way to dress, even if they are Hindu, although they will be traditional when they are with their parents and when they get married. They want to have all the comfortable European things. They will get loans to get washing machines and microwaves, etc.

Q: Do you always remember a textile industry in Mauritius?
A: No, textiles came in the early 70s. Before that girls learned sewing and embroidery.

Q: Was that to earn money?
A: No, you learned to sew so that you would be a good wife. There was little else.

Q: Now Mauritius is known as a honeymoon and holiday destination, isn't it? Tourism is an important employer?
A: Yes.
Q: And I know knitwear factories in Mauritius are looking elsewhere to manufacture more cheaply, i.e. Madagascar and Africa. What do you make of that?

A: My daughter says that the biggest profits and pay are for the bosses not for the workers so they look to another country to get more profit. Now they can take the profits out of the country (since 1992).

Q: Would you agree Mauritius has changed rapidly in the last 20 years?

A: Yes, the young girls are beginning to complain about the conditions, standing all day, the 'fly' in the air, etc. It is very busy in June in the factories. They work long days and are asked to work on Saturdays longer than 7:30 - 5:15.

Q: Have you heard that Mauritius has become a tax haven for European companies?

A: No.

Q: This should make Mauritius visible to the International Community and the government etc. should become more accountable to its people. This will have benefits for all the people.

A: Oh, that is very good news. Thank you.

Q: Thank you.

Interview ends.
Interview with Rolando Galli, Chairman and owner of Nanni Filati Srl
October 28 1998 Prato Italy.

J In the UK amongst the retailers there is an underlying notion that reprocessed/reycled fibres is inferior. Yet at the UK 97 conference in Bolton, Mr. Luigi Gestri of Prato presented a paper which supported the use of recycled fibres insisting that they were equal to but different from virgin fibres and pure wool qualities. Could you comment on that statement?

G We are Woolmark licensed so we produce pure new wool items but we also produce reprocessed items so I have a completely balanced position. I have no 'push' one way or another because I happily produce both.

J but what would the benefits to you be to use recycled products: is it a price issue?

G Actually at the wool price currently that we see today, prices are almost comparable. But this is a very particular moment in the wool industry history for sure. Wool prices have never, never been so low since the IWS began. This really is the bottom of the wool price.

Anyway, I completely agree with Mr. Gestri because reprocessed doesn’t mean inferior. Reprocessed means different; it is true. Pure new wool is a brand which gives you a particular point of sale but looking at two items - one produced with Pure New Wool, the other produced with reprocessed - you would compare them and realise that the difference is very, very minimal.

J What about performance?

G Well, performance, if you produced reprocessed wool which is certificated and you do not include any kind of waste when you produce yarns. If you do it with the same scientific approach when you use reprocessed as when you use virgin fibres there is no real difference to performance.

Sure, you can’t make 100% wool from reprocessed because the picking of the garments couldn’t be so effective as to divide pure new wool items from blended items. So it is difficult to produce 100% wool item from reprocessed wool.

J Do you blend with other virgin fibres then?

G We have items which are completely reprocessed. We have items which are blends of reprocessed and virgin. We have 100% virgin products also.

J When you market your reprocessed ranges do you use that as a marketing tool or do you ignore that element?

G No, we don’t use it as a marketing tool, but we may in the future. For instance, I am amazed at the successful marketing of PET by the Americans especially Malden Mills with their polyester fabrics reprocessed pile. So we are thinking about a way to use the reprocessing of wool as a marketing aid.

J Do you find manufactures in Italy ready to accept a textile product with a reprocessed content?

Manufacturers all over the world would accept reprocessed fibres but the point which encourages them is price, because for sure you have an advantage with price except for the unusual situation we are experiencing as I said before with wool. But this is not usually the case.
The thing that I'd like to point out is that throughout the world there is a tremendous amount of waste. For instance, your pullover: the neck becomes broken, you throw it away. Your pullover becomes feted and you throw it away, because you have not maintained the fabric and so on. The garments get used - if you have to waste this item you have to burn it, bury it that in turn makes smoke and poisons for the environment. You consume energy. So, it is a completely wrong point of view to destroy textile waste!

J Do you believe this from a professional or personal viewpoint?

G From both! It is completely wrong to destroy the textile waste. It should be collected then reused in the textile process.

J I have recently returned from the TNO in Holland where there is a project to develop a mechanical sorting system. I don't know if you know about their work?

G No.

J So, when that happens the machine will run night and day cutting the sorting costs to a minimum, making the raw material even cheaper. I am in part working with them to see the textile waste development in the future.

G To choose the different fibres... Mmm... Very interesting!

J I find it interesting that you have an idealistic viewpoint in relation to recycling.

G Yes, I certainly do. One more thing, one of the most polluting sequences in textile production is the dyeing. Using reprocessed wool you save a large part of the dyeing process, i.e. using black for black, red for red, etc. and saves a tremendous amount of pollution and cost.

J Yes, but if you have continuous order can you guarantee colour continuity?

G Yes, I can offer 90 colours per card on a stock basis system.

J On what sort of product?

G For pullovers Men's and Women's in our cheapest range. Actually it is one of the company's best-sellers because of the quality, handle and performance.

J What sort of blend is it?

G 70% wool and 30% other fibres: we can't guarantee what percentage content are the other fibres but we can guarantee the wool.

J What are your personal views on the textile waste situation whereby countries like the UK are exporting textile garment waste to Third World countries? At present export accounts for 65% of garments.

G You know, it is a very difficult situation. Now we see massive amounts of waste when 30 years ago there was one box of waste. Now you have 4 as a minimum such as one for aluminium, one for glass, one for plastic, one for organic. So I think that we should enforce a consciousness on the consumer insulation to waste. For instance, to isolate textile waste into cotton, wool and blends at the household by label, i.e. 3 bags, if we were each to do that it would be a 'peach' to reprocess all the textile waste.

J Are you a vertical operation here?

G Yes, we are but we do buy reprocessed wool fibres for the most part. But we do some ourselves. We receive it, sort the garment for colour then we card the garment to be processed. But it is
getting more and more difficult to collect the waste, because more and more is going to the Third World.

We feel two things: firstly it is difficult to find the waste which is sent to the Third World and then comes back here.

J  It comes back here?

G  Sure, otherwise where do we find the things to make reprocessed?

J  Do you collect in the Third World?

G  Oh yes, not us, but our suppliers go to India, Tunisia, Eastern Europe. So we have difficulty collecting the product. The Third World is buying the goods and making the commerce of their own. On the other hand, we have another problem which is cost of picking, for instance if you have a bale of textile waste you choose to divide the bale into acrylic, cotton and wool, then you have to cut away the labels, the nylon tapes zips, etc. Then you have to card the things in order for them to be worked. This costs an incredible amount of money in Italy because our labour costs are very, very high.

There are two chances to overcome this. First is to increase the consciousness of people, letting them divide the waste in-house. Or on the other hand to teach them Third World company to make the reprocessed fibres correctly and to save the money reprocessing in the developed countries.

You know, people like Marks and Spencers who produce huge amounts of pure new wool and high level wool products and blends, for us it would be a very interesting relationship to acquire their textile waste, i.e. ‘return to manufacturers’. It would be a good chance for instance if the Government forced Marks and Spencers to take back their used garments. It would be a good chance for us to use their product.

J  We have talked briefly about just that point. Because at present RTM goes for burning, they are reluctant to let the RTM products go to merchants because of security, in that merchants have re-sold these garments to market-stall holders, etc. for little prices.

G  You know, if Marks and Spencers would consider such a relationship we would be happy to discuss a relationship such as this, e.g. prices of wool waste at £1.00 per kilo. They send out for example they send out 20 tonnes, we pay them with insurance that they will not re-sell as they are in garments. They will be reprocessed and put into the reprocessed pool. On the other hand they could buy from us 20, 40 or 100 tonnes of yarn with their product or force their supplies to buy in the composition they like.

J  I guess the ideal scenario would be for Marks and Spencers to send you the CMT and RTM waste which could be put into a special line of yarns to be used again by the manufacturers. Partly their waste could be used in a reprocessed line at an entry price point thus closing the loop. Marks and Spencers buys the fibre, produces the garments, the faulty garments are reprocessed into quality yarns for a Marks and Spencers line.

G  Should they want to experiment on 5/10 tonnes of garments and see what we can produce I would be more than interested to meet with a representative for discussions.

Marks an Spencers deal with serious producers like ourselves and not merchants or middle men.

J  What volumes in general does your company deal in?

G  We have a turnover of about 2,000,000 kilos a year. We make about 5-600 tonnes or reprocessed so ¼ of total production. We exhibit at Pitti Filatia, Filatia in Hong Kong and
Transform in Mauritius.

J  Do you have any Government pressure or support for your industry?

G  You know, Government support now in Italy is completely absent taking money from Fashion and Textiles but don't return any. Fashion and Textiles are 2 of the top money producing businesses in Italy.

J  Do they encourage the people to have a recycling mentality?

G  No, not at all. The Italians have little consciousness of the environment and pollution as in Northern Europe such as Germany, Holland, Austria, etc. France is a little like Italy; we are behind.

J  Do you have a system where by the householder could be paid for giving you their items?

G  No, here it is collected by charities or the Church and sold to merchants as it is in the UK.

Interview draws to an end and a tour takes place at the plant.
LONDON BOROUGH OF ENFIELD.

Interview with William GARDINER
Waste Reduction Officer
December 5 1998

J Do you know what tonnage of refuse is collected from the London Borough of Enfield (LBE)?

G Yes, it is 118,496 tonnes of household waste p.a.

J From how many households?

G 111,760 households. It is over one tonne of waste per household a year.

J Where does the waste go?

G 83,000 tonnes of that goes to the incinerator at Edmonton which is the London Waste ......
That's all the material collected from dustbins via the dustcarts which go directly to the
incinerator. The remaining 36,000 tonnes to our Civic Amenity sites or 'tips' and taken for
landfill just because of the way London Waste operates the system.

J Is it landfillcd in your Borough?

G No, it goes o a variety of places. London Waste Ltd., who operates the incinerator, will try to
minimise the costs to themselves and so the waste may travel as far as Lincolnshire; the waste
currently goes to Bedfordshire. It is very much wherever is the cheapest.

J How is it transported to landfill?

G It is carried by road in 'bulkers' which are very, very large vehicles, which no single Council
would have as part of their fleet.

J Do you (LBE) pay for that service?

G The additional cost of landfill over incineration is met by London Waste Ltd. who balance their
costs by dealing with commercial customers. London Waste Ltd. is a very profitable company
in which 7 Councils have shares - so it is a bit of a contradiction because Councils are trying to
reduce waste on the one hand but they part run the incinerators by which they profit because of
the diversification of commercial customers.

J Are these 7 Councils in London?

G Yes, there are 7 constituent Boroughs in North London who have a share in the incinerator.
They are: Barnet, Camden, Harringay, Hackney, Islington, Waltham and ourselves Enfield. By
the middle of next year all these Boroughs will be incinerating the majority of their collected
waste, but at the moment Barnet and Harringay send their waste by rail for landfill to Hendon,
but this is closing.

J There is another big incinerator in South London, Lewisham?

G Yes, South East London, combined heat and power. That is a more modern version than the
Edmonton version, which is less advance technologically. I have been to Sclchip, which is very
impressive and compact. Both incinerators had to meet the new EC emission standards of
1996. The directive forced the incinerators to meet these new standards and that is why most
incinerators in the country have closed because if you didn't meet these standards you closed.
Any additional resources which London Waste had last year were used to meet these new emission controls which they have achieved, otherwise we (LDE) would be in a total landfilled situation.

J Why can London Waste not incinerate everything and a large proportion still go to landfill?

G Because there is just too much of it! We are looking at a 5% increase of waste in the next year from the 7 London Boroughs which is very, very worrying as a waste reduction officer.

J At the incinerator site is there any sifting or sorting of the waste pre-incineration?

G Yes, there is called an F.P.P. or Fuel Preparation Plant material which is bulked up from the Civic Amenity site, is sorted and some is destined for incineration. A variety of wood waste, etc. are suitable for burning. There is a large cylinder with large holes - waste in one end and different waste falls out. However it sits there unused - because resources have been used on emission improvement. They haven't seen sorting waste as a priority however it is up to the constituent Boroughs to press London Waste Ltd. to a policy of waste reduction. This sorter would be ideal as the first part of call in a materials' recycling programme.

J Presumably they do remove metals?

G No, that is done after the burning process. Steel and iron are removed after combustion. The ash remaining is about 1/3 by weight of the original material for burning. It is obviously a concentrated residue from which those metals are extracted by magnets. We (LDE) get a proportionate reduction to our recycling rate for this metal, which is about 2000 tonnes from Enfield last year.

J The burning process contributes to energy?

G Yes, there is energy recovery at Edmonton from burning the rubbish and the energy is fed back into the national grid at a subsidised rate because of the current policy of the use of non-fossil fuel.

J It looks like it is up to the Council to inform the residents about the rubbish they are throwing away, to divide it and recycle.

G Yes, we do encourage people to recycle but there is a loophole in the law which means that at the moment Councils cannot encourage waste reduction because of legislation.

J Why is that then?

G There was a mistake in the original legislation and there is actually a waste prevention bill going through now which should close that loophole this month and readdress that. Recycling is very much down the waste pipeline and you have to deal with waste reduction first.

J As far as kerbside collections go, do you think they are achieving anything?

G They are definitely achieving something. It is whether that is the best practical environmental option for those waste streams. We have issues in Enfield that we won't support any recycling which isn't self-sustaining. That is one way of ensuring that the recycling doesn't stop and start and the people lose interest. We make sure that it is self-financing. Currently we couldn't do a kerbside collection because of cost. Even very simple collections cost £30 and more combined material collections £60-80, so it is a considerable cost for the tax payer to pay out on something which is not proven to be the best option. But for aluminium cans, paper, metals, paper textiles there is a very clear case for recycling because of energy and the environmental benefits of those things by recycling must outweigh the cost of landfill and burning, we would
argue. But really the groundwork and the lifecycle of those processes hasn't been done and therefore is subjective.

J I was reading in Germany each bag of rubbish left for waste disposal has an extra fee (over and above taxes) levied on it. What are your views on this system?

G We are hampered again by legislation in this country whereby we cannot charge a fee for collection of household waste. What we can do is require people to put out waste in a certain way but we can't charge.

J So, 20 bags costs the same per household as one bag?

G Yes, in other countries they can charge by weighting waste and anything over and above a certain weight has a charge. But in this country we don't have that technology. It is Germany and Holland. We have talked about rebating people on their Council Tax for recycling more and that is a route the Council will look at.

J Industrially, recycling has to be beneficial financially. There is no philanthropy involved it seems; the bottom line is cash.

G That is how households view it also. The Council has to look at the 5% waste increase will likely cost Enfield on a tonnage basis about £4 million additionally and that is when it starts to bite. And if you look at landfill taxes increasing the cost of transportation will increase and so it has to be more and more economical to recycle.

J Does the lack of availability of landfill concern you?

G Well, predictions are that UK landfill will run out in 2010.

J As far as terminology goes, what is red and green waste?

G That is an European classification which is related to waste which is transported from one country to another and in particular to countries outside the European Community. Effectively Green waste can be transferred without obligations to countries outside the EC. Red waste can't be; it is effectively precluded from exportation. There are certain exceptions to that rule. We in Enfield export waste; our paper for instance goes to Sweden because of the current state of the recycled paper market in the UK, which is determined as Green waste.

J Is that cost effective? Do you get a payback on that?

G We do, yes, it is a small financial benefit for the Council of about £2-3 per tonne but environmentally we have to look at this carefully for the best environmental option. We currently justify it because the ships which take virgin pulp to this country from Sweden return to Sweden with waste paper. But to be honest it would be better to import less virgin pulp and use more recycled paper, perhaps in newspaper for example.

J Yes, interestingly that was the argument the Victorians had when they brought wool from Australia. The ships returned there with convicts.

G Yes, nothing has changed in the last few hundred years (laughs). The Council has a policy that the only way we can currently collect waste paper at all for recycling would be through that route.

J You don't then clarify your own waste within the Council in those terms?

G No, in Great Britain there are other categories of waste, i.e. household waste, municipal waste
(household waste is a proportion of that) and that is trade and commercial waste. Then you move onto special or hazardous waste including medical waste, oil, batteries, asbestos, etc. We collect those at our recycling centres and are treated in a different way. Clinical waste, needles, swabs also.

J I'm surprised that you don't categorise the waste yourselves looking at the components of it.

G There is a descriptive element there because household waste can contain batteries and clinical waste, etc. Those things form a large component of household waste. But because we have at the moment legislation, which means we can't charge for collection, all of that waste is effectively treated as a single category. Obviously within that some waste should have special treatment, particularly if its destination is landfill. It is really only when you are transporting waste between countries that the other terms apply.

J It would help if waste was categorised, particularly with regard to recycling and sustainability.

G Yes, the European Community is looking at introducing a new directive in relation to landfill, including hazardous waste. This waste will be defined.

J Looking at the area of textile waste and textile merchants and the Council's relationship with them via textile banks, what is the benefit of the Council?

G The benefit to us? Well, we have contacts with a variety of people including the textile sector for textile banks and collection. The benefit to the Council in that of finance: the current standing order I work to is that I must look for the best financial arrangement available unless there is a good reason not to, e.g. if the contractors are questionable, otherwise I have to check it and I choose the one with the best financial return for the Council in relation to recycling.

J And you get rid of your waste?

G Yes, and we make a saving in terms of disposal costs so there is a value for the waste itself and a saving in the disposal cost.

J Is a contract with the Council substantial?

G Yes, but it depends. All recyclable commodities move and it is one of the few situations, which Councils enter into whereby contracts are negotiated which change to those levels. For instance, our paper contract 2 years ago expected to raise over £120,000 in income alone then savings on top. That was an annual income of £120/125 during 96/97 but it was din that period that the paper price crashed. We would look for a return of that sort of figure across materials. In terms of textiles alone we are looking at the value of about £80 a tonne for textiles. So last year we collected about 100 tonnes so that made us £8000. If it goes about £10,000 we have to go through a formal tendering process which is to choose the best quote out of three.

J Yes, the Charities also sell to the highest bidder and as long as they get the best price for the bags of textiles they are happy.

G That is some thing I'm concerned about because if you take those decisions purely on financial grounds there are only a certain number of checks you can do on companies. There is room for misuse of the system and certainly there is evidence that Councils and Charities have been involved in contracts which have resulted in questionable practices.

J Yes, I have come across anomalies with regard to recycling textiles. That is why it is hardening that companies like Marks and Spencers take months and years to make certain decisions with regard to suppliers: their decisions have to be water tight.
G Councils do try to be as fair as possible and that is why we have a policy of no net cost which is sustainable if you like. But that doesn't mean that our current arrangements are the most environmentally beneficial. Really if we are looking to supporting recycling it shouldn't be on financial grounds alone.

J Is there an Inter Council Forum where you meet and discuss problems?

G Yes, there are a variety of different forum. There is a local one which is for the 7 recycling offices of the North London Waste Authority and then there is a London-wide forum. There is also a London-wide forum concerned with a London-wide challenge, which is a £12 1/2 thousand bid, and we (LBE) are part of that forum too. There's the Thames Regional Forum run by the Environmental Agency, so there are plenty of ways to raise issues.

J Do you attend?

G I go to the local and regional one but don't attend the national one but get feedback. Information travels fairly fast. For instance, if someone dies in a textile bank we will know about it instantly and action taken very soon after.

J Do you have access to political decision-making through that forum?

G Yes, Government legislation is passed down and discussed at Council level.

J Does the Government take advice on recycling from you?

G No, usually from the National Forum on Recycling. There is a Local Authority Advisory Committee who advise the national body. We are asked to comment on a particular legislation and how that may affect us detrimentally or otherwise. It is a pretty good system, but the decisions made don't always reflect the Local Authority point of view.

J As far as the Local Authority goes, how close are you to the decision makers?

G I write the reports, which go to Committee for Council member's approval. That is a 2-way process and the Council relies on me to advise them on waste reduction, and full decision is made on that.

J Are they specialists?

G Particular members may take an interest in environmental issues so there is an environmental committee, which deals with that problem. Then there's Community Services which looks at recycling issues in particular so members on those committees have a level of power and expertise and represent the Council of the North London Waste authority who advise. It is a shared responsibility.

Interview comes to a close.
APPENDIX 2

SWEATER FACTORY EVALUATION REPORT

DIVISION: ........................................ DATE: ........................................ 95

GENERAL VENDOR INFORMATION

COMPANY: ........................................................ CONTACT: ........................................................

TEL. NO.: ........................................................ FAX NO.: ........................................................

FACTORY DETAILS

ESTABLISHED: 1971

FACTORY NAME: Floreal Knitwear Ltd.

CONTACT: ........................................................ ADDRESS: P.O. Box 45, Core End

TITLE: ...........................................................................................................................

TEL. NO.: ........................................................ FAX NO.: ........................................................

PRINCIPAL PRODUCT

YARN TYPES: Shetland, Lambswool, Angora, Wool Blends, Cotton and Cotton Blends with Silk

SWEATER TYPES: Mens and Ladies Sweaters

PRODUCTION CAPACITY: 350,000 Pieces PER MONTH

COMMENTS: Knitting Æ Linking Æ Washing Æ Pressing Æ Packing

MIN QTY PER ORDER: 1,000 Pieces

PRODUCTION LEAD TIME: 2 MONTHS AFTER DESIGNATION OF COLOURS & SIZE BREAKDOWN

CURRENTLY USED BY: Burton Retail, Designers and PR, Principle,

..................................................................................................................
COUNTRIES SUPPLIED

MAIN MKT & PRINCIPAL CUSTOMER:

( 25 )% UK ........... CUSTOMER: BOSTON, N.E.X.T., BHS

( 45 )% FRANCE ........ CUSTOMER: .................................................................

(15 )% GERMANY ........ CUSTOMER: .................................................................

OTHERS: (5 )% ITALY

(10%) USA - GAP, EDIE BAUER, J. CREW

PREMISES

ARE PREMISES?: OWNED: Partly OR LEASED: Partly

DO THEY CONTAIN:

a. RAW MATERIAL STORAGE YES / NO........ 150,000 sq ft

b. KNITTING DEPARTMENT YES / NO........ 50,000 sq ft

c. LINKING DEPARTMENT YES / NO........ 300,000 sq ft

d. FINISHED GOOD STORAGE YES / NO........ 300,000 sq ft

APPROXIMATE TOTAL OPERATING SPACE: 550,000 sq ft

COMMENTS: THEIR PRODUCTION BASE CONSISTS OF 4 UNITS FOR KNITTING.
14 UNITS FOR KNITTING/LINKING, 1 UNIT FOR LINKING, 1 UNIT FOR FINISHING
AND 1 SPINNING MILL.

SYSTEMS UNDER AUDITING. HOPE TO BE ACCREDITED BY 1996.

ACCREDITATION: I.S.O. 9000 ........... B.S. 5750 ...........

WORK STUDY UNIT: YES / NO ........... 

Q.C. INSPECTION SYSTEM: ON LINE / RANDOM / FINAL . . . . . . 2.5%

SPECIFY SYSTEMS USED: COMPUTER; LIGHT BOX/ LIGHT TUBES ETC....

YARN/ACCESSORIES INSPECTION: THE YARN/ACCESSORIES ARE TESTED BY THEIR
OWN LABORATORY FOR BULK PRODUCTION. - LAB IS ALSO UNDER RENOVATION.

IN LINE INSPECTION: PRIMARY & SECONDARY LIGHT INSPECTION

MENDING (FOLLOW AQL STANDARD)

FINAL INSPECTION: FINAL LIGHT INSPECTION / MENDING (FOLLOW AQL
STANDARD)
## EQUIPMENT

### NUMBER OF KNITTING/LINKING MACHINES BY TYPE:

#### 1. HAND FLAT KNITTING 'V' BED MACHINES

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<td>2.5G</td>
<td>'Three Stars' &amp; 'Flying Tiger'</td>
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<td>765</td>
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<td></td>
</tr>
<tr>
<td>425</td>
<td>7G</td>
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<td>10G</td>
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#### 2. AUTOMATIC 'V' BEDS MACHINES

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<td>5G</td>
<td>'Stoll Cms 238', 'Stoll Cms 402', 'Stoll Cms 422'</td>
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#### 3. AUTOMATIC COLLAR/STOLLING MACHINES

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#### 5. DIAL LINKING MACHINES

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<td>------------------------------------------</td>
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<tr>
<td>1. SINGLE NEEDLE LOCKSTITCH</td>
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<td>2. 3RD, 4TH, OR 5TH THREAD OVERLOCK</td>
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<td>3. COVER STITCH</td>
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<td>4. BLIND HEM</td>
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<td>5. BUTTONHOLE</td>
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<td>6. BUTTONSEW</td>
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<tr>
<td>1. WASHING MACHINES</td>
<td>7 DRYTEX SPENCER</td>
</tr>
<tr>
<td>2. HYDRO EXTRACTORS</td>
<td>7</td>
</tr>
<tr>
<td>3. TUMBLE DRIERS</td>
<td>7 PASSATS</td>
</tr>
<tr>
<td>OTHERS</td>
<td>8 SIDE PADDLE MACHINES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF PRESSING MACHINES BY TYPE:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. STEAM IRONS</td>
<td>60 HAND STEAM IRONS</td>
</tr>
<tr>
<td>2. VACUUM TABLES</td>
<td>40</td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
</tr>
</tbody>
</table>
SPECIALIST MACHINERY/CAPABILITIES:

CONDITION OF EQUIPMENT: E = EXCELLENT G = GOOD S = SATISFACTORY F = FAIR P = POOR

SAMPLE ROOM:
1. NUMBER OF KNITTING/LINKING MACHINES
   BY TYPES:
   30 ALL GAUGES KNITTING MACHINES

   10 LINKING MACHINES

2. NUMBER OF WORKERS FOR HANDKNIT, HAND CROCHET, HAND EMBROIDERY AND BEADINGS:
   SUB-CONTRACTED

3. NUMBER OF WORKERS FOR SEWING EMBROIDERY AND APPLIQUE WORK:
   30 WORKERS + SUB-CONTRACTOR

4. NUMBER OF KNITTING TECHNICIANS AND INTARSIA PATTERN MAKERS:
   50 WORKERS

OTHERS:
PERSONNEL

b. NUMBER OF LINE SUPERVISORS .......................... 255 (INCLUDING FEMALE/MALE)

c. NUMBER OF PRODUCTION PERSONNEL ............... 300

d. NUMBER OF TECHNOLOGISTS .............................. 10

e. NUMBER OF QUALITY INSPECTORS...................... 50

TOTAL ..........................................................................

FACTORY WORKING DAYS PER WEEK .................. 5 DAYS

WORKING HOURS PER DAY ..................................... 9 HOURS

HOLIDAY PERIODS .................................................. (> WEEKS) END DEC - BEGINNING OF JAN

COMMENTS:
DURING THIS VISIT THE FACTORY AND THE PRODUCTION MACHINES WERE FOUND VERY CLEAN. THEIR HOUSE KEEPING AND MANAGEMENT SYSTEMS WERE WELL DEVELOPED. IT WAS CONSIDERED SUITABLE FOR THE BURTON GROUP

ORDERS ........................................................................

GENERAL CONCLUSION/RECOMMENDATION:

THEIR Q.A. SYSTEMS ARE GOOD AND THEY MAINTAIN DAILY PRODUCTION STATUS REPORTS AND INSPECTION REPORTS ON EVERY ORDER. AQI STANDARD IS APPLIED TO IN-LINE AND FINAL INSPECTIONS. FLOREAL IS CONSIDERED TO BE A WELL MANAGED FACTORY WITH THE ABILITY TO PRODUCE A CONSISTENT QUALITY OF PRODUCTION.

OVERALL GRADE: E = EXCELLENT G = GOOD S = SATISFACTORY F = FAIR P = POOR
(FOR INFORMATION ONLY - NO EVALUATION WAS MADE)

THE BURTON GROUP PLC
SWEATER FACTORY EVALUATION REPORT

DIVISION: BURTON RETAIL
EVALUATOR: .................................... DATE: 14/12/95

GENERAL VENDOR INFORMATION

COMPANY: ........................................................ CONTACT: ........................................................

TEL. NO.: ........................................................ FAX NO.: ........................................................

FACTORY DETAILS

ESTABLISHED: 1987

FACTORY NAME: FAREAL (MADAGASCAR)

CONTACT: ........................................................ ADDRESS: ZONE 2, ZIAL INDUSTRIELLE,
TITILE: ............................................................ ANKORAREANO ANTANARIVO,

TEL. NO.: ........................................................ FAX NO.: ........................................................

PRINCIPAL PRODUCT

YARN TYPES: SHETLAND, LAMBSWOOL, ANgorA, WOOL BLENDS, COTTON AND COTTON BLENDS WITH SILK

SWEATER TYPES: MEN'S AND LADIES SWEATERS

PRODUCTION CAPACITY: 150,000 PIECES PER MONTH

COMMENTS: KNITTING → LINKING → WASHING → PRESSING → PACKING

MIN QTY PER ORDER: 1,000 PIECES

PRODUCTION LEAD TIME: 3 MONTHS AFTER DESIGNATION OF COLOURS & SIZE BREAKDOWN

CURRENTLY USED BY THE BURTON GROUP? YES □ NO □

IF YES BY WHICH DIVISION: BURTON RETAIL, DEBENHAMS AND PRINCIPLES

.............................................................................................................................................
COUNTRIES SUPPLIED

MAIN MKT & PRINCIPAL CUSTOMER:
(25)% UK ........ CUSTOMER: Burton, Next, BHS
(45)% FRANCE ........ CUSTOMER:
(15)% GERMANY ........ CUSTOMER:

OTHERS: (5)% ITALY
(10)% USA - GAP, Eddie Bauer, J. Crew

PREMISES

ARE PREMISES?: OWNED ☑️ OR LEASED: ..........................................................

DO THEY CONTAIN:

a. RAW MATERIAL STORAGE YES ☑️ NO ................................................ sq ft
b. KNITTING DEPARTMENT YES ☑️ NO ................................................ sq ft
c. LINKING DEPARTMENT YES ☑️ NO ................................................ sq ft
d. FINISHED GOOD STORAGE YES ☑️ NO ................................................ sq ft

APPROXIMATE TOTAL OPERATING SPACE: ...................................... sq ft

COMMENTS: Floreal have 2 Sweater factories in Madagascar
Which are located in Antananarivo.

SYSTEMS

ACCREDITATION: I.S.O. 9000 .............. B.S. 5750 ...................

WORK STUDY UNIT: YES .............. NO .............. FINAL 2.5 ..............

Q.C. INSPECTION SYSTEM: ON LINE ☑️ RANDOM ☑️ FINAL 2.5 ..............

SPECIFY SYSTEMS USED: COMPUTER/ LIGHT BOX/ LIGHT TUBES ETC....

YARN/ACCESSORIES INSPECTION: ..........................................................

IN LINE INSPECTION: SAME AS MAURITIUS

FINAL INSPECTION: ..........................................................
### EQUIPMENT

**NUMBER OF KNITTING/LINKING MACHINES BY TYPE:**

1. **HAND FLAT KNITTING 'V' BED MACHINES**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>GAUGE</th>
<th>BRAND NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200</td>
<td>2.5, 5, 7 &amp; 1066 'SILVERED' &amp; 'THREE STARS', Flying</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>5.5</td>
<td>INTERA</td>
</tr>
<tr>
<td>160</td>
<td>2.5/2</td>
<td></td>
</tr>
<tr>
<td>530-1120</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>380</td>
<td>1066</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>700</td>
<td></td>
</tr>
</tbody>
</table>

2. **AUTOMATIC 'V' BEDS MACHINES**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>GAUGE</th>
<th>BRAND NAME</th>
</tr>
</thead>
</table>

3. **AUTOMATIC COLLAR/STOLLING MACHINES**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>GAUGE</th>
<th>BRAND NAME</th>
</tr>
</thead>
</table>

4. **IACQUARD/INTARSIA MACHINES**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>GAUGE</th>
<th>BRAND NAME</th>
</tr>
</thead>
</table>

5. **DIAL LINKING MACHINES**

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<thead>
<tr>
<th>UNIT</th>
<th>GAUGE</th>
<th>BRAND NAME</th>
</tr>
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<tbody>
<tr>
<td>200</td>
<td>7, 8 &amp; 1066</td>
<td>'Kaifung'</td>
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### NUMBER OF SEWING MACHINES BY TYPE:

<table>
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<tr>
<th>Type</th>
<th>Number</th>
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<tbody>
<tr>
<td>Single Needle Lockstitch</td>
<td>45</td>
</tr>
<tr>
<td>3rd, 4th, or 5th Thread Overlock</td>
<td>20</td>
</tr>
<tr>
<td>Cover Stitch</td>
<td>16</td>
</tr>
<tr>
<td>Blind Hem</td>
<td>1</td>
</tr>
<tr>
<td>Buttonhole</td>
<td>10</td>
</tr>
<tr>
<td>Buttonsew</td>
<td>10</td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

### NUMBER OF WASHING MACHINES BY TYPE:

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washing Machines</td>
<td>4 Side Paddle + 8 Rotary</td>
</tr>
<tr>
<td>Hydro Extractors</td>
<td>4</td>
</tr>
<tr>
<td>Tumble Driers</td>
<td>9</td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

### NUMBER OF PRESSING MACHINES BY TYPE:

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam Irons</td>
<td>63</td>
</tr>
<tr>
<td>Vacuum Tables</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>
SPECIALIST MACHINERY/CAPABILITIES:

CONDITION OF EQUIPMENT: E = EXCELLENT  G = GOOD  S = SATISFACTORY  F = FAIR  P = POOR

SAMPLE ROOM:
1. NUMBER OF KNITTING/LINKING MACHINES
   BY TYPES:  N/A

2. NUMBER OF WORKERS FOR HANDKNIT, HAND CROCHET, HAND EMBROIDERY AND BEADINGS: N/A

3. NUMBER OF WORKERS FOR SEWING EMBROIDERY AND APPLIQUE WORK: N/A

4. NUMBER OF KNITTING TECHNICIANS AND INTARSIA PATTERN MAKERS: N/A

OTHERS:
### PERSONNEL

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. NUMBER OF PLANT MANAGEMENT</td>
<td>7</td>
</tr>
<tr>
<td>b. NUMBER OF LINE SUPERVISORS</td>
<td>6</td>
</tr>
<tr>
<td>c. NUMBER OF PRODUCTION PERSONNEL</td>
<td>3088</td>
</tr>
<tr>
<td>d. NUMBER OF TECHNOLOGISTS</td>
<td>2</td>
</tr>
<tr>
<td>e. NUMBER OF QUALITY INSPECTORS</td>
<td>40</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3133</td>
</tr>
</tbody>
</table>

**FACTORY WORKING DAYS PER WEEK**

- 5 DAYS/WEek

**WORKING HOURS PER DAY**

- 8 HOURS/DAY

**HOLIDAY PERIODS**

- To be advise: 2 weeks (May) and NEW YEAR

### GENERAL CONCLUSION/RECOMMENDATION:

Floreal's Madagascar Factory has yet to be assessed and an evaluation is to be scheduled in the near future. Attached factory evaluation report is for information only.

**OVERALL GRADE:** E Excellent, G Good, S Satisfactory, F Fair, P Poor

**RATING:** E = Excellent, G = Good, S = Satisfactory, F = Fair, P = Poor
The Multi Fibre Arrangement

What is the MFA?

The Multi-Fibre Arrangement regulates the bulk of international trade in textiles and clothing between developed and developing countries. It restricts imports of textiles and clothing made of cotton, wool, synthetic and other fibres coming into UK and other developed countries from developing countries.

MFA Quotas

The MFA works through a series of 'quotas' for imports of each type of garment. Every year the developed importing countries and developing exporting countries in the Arrangement have to agree the quantity of specific types of garments which can be traded between them (the 'quota'). Then the exporting country allocates licenses to firms to export a specific part of each quota. No exports beyond the quota are permitted.

Operation of the MFA

It was introduced in 1974, supposedly as a short term measure to give developed countries a breathing-space to adjust to competition from low-cost imports from developing countries. It does not regulate international trade in textiles and clothing between rich countries. So while it restricts the quantities of Asian-made blouses, T-shirts, shirts etc that are available for us to buy in Britain, it does not restrict the availability of garments made in Germany, or Italy, or USA.

Textile protectionism was not new in 1974 - systematic restrictions were introduced in the 1930s as a reaction to the Depression. Then Britain imposed what it called 'imperial preferences' to keep out Japanese cotton goods, and the USA and Japan negotiated a 'gentlemen's agreement' limiting Japanese exports.

After the war, a new agreement was set up to promote freer international trade: GATT - The General Agreement on Trade and Tariffs. This outlawed discrimination against particular groups of countries. But when the newly industrialised developing countries began to compete successfully in the international market for textiles and clothing, the rules were bent to allow the MFA to discriminate against them. The MFA has been renewed at intervals in the 1970s, 80s and 90s, and although there are plans to scrap it, many of its restrictions are expected to linger on into the 21st century.
Arguments about the MFA

Governments of Third World countries are against the MFA, claiming that it unfairly restricts their exports to the developed countries, exports that are vital for development. Consumer groups, such as the International Organisation of Consumer Unions, are against it, arguing that it restricts choice and puts up costs and hits poorer consumers most. Businessmen and trade unions in developed countries tend to be for the MFA, arguing that it protects profits and jobs. In practice, it has not prevented job loss, since many companies have "gone global" - shifting their production or sourcing their products from low cost countries.

Free Trade vs Protection?

So, do we have to choose between the protectionism of the MFA and the 'free-for-all' of free trade? In the view of Women Working Worldwide, neither of these options is adequate to meet the needs of women, as producers and consumers, in both developed and developing countries. Both options fail to challenge the regulation of international trade by the drive to make money. Making more profit is all too frequently at the expense of peoples' rights, and of the need to sustain resources, both human and environmental.

An alternative

There is another alternative:

social regulation of trade in textiles and garments. This would require products to meet certain social criteria before being allowed to be put on sale. Textiles and clothing would only be allowed to be sold in the UK market if they were produced in ways which respected the rights of workers producing them to healthy and safe working conditions and autonomous organisation for better pay and conditions; and in ways that respected the rights of consumers using them to safe products which do not destroy the environment and to a range of products to meet the needs and pockets of different groups.

This kind of social regulation would not discriminate against developing countries - it would apply equally to goods made in developed countries. It would not need a huge bureaucracy - the onus in ensuring the regulations were met could be put upon retailers and wholesalers. Groups campaigning for workers rights and for ethical consumption could be funded to monitor and publicise compliance or lack of compliance with the regulations. Breaches of the regulations "could be penalised using the machinery of organisations like Health and Safety Inspectorates and Industrial Tribunals.

Neither free trade nor the MFA really meets the needs of women - social regulation of trade in textiles and garments would be better than both.
Overview

This section of the Supplier handbook is for suppliers to the trading companies of the Burton Group plc. It covers each of the Multiples Divisions (that is, Burton Menswear, Dorothy Perkins, Evans, Top Shop and Top Man, and Principles and Principles Menswear).

It is important that you read, understand and consistently apply the quality assurance procedures laid out in this Supplier handbook. You should issue this section to the appropriate managers within your company.

If you need any further advice on specific issues relating to quality assurance, please contact the relevant Technical Services Department. A contact list is included in the Reference section of the Supplier handbook.

Objective

The objective of this section is to explain the quality assurance procedures which are needed to achieve a quick and effective flow of quality-assured goods into our Distribution Centres (DCs) and on to our stores.

It is important that you follow all the relevant procedures when completing orders. This will allow the stock specified in our order to be delivered to the correct specification and at the right time. Accuracy is vital at all stages in the supply chain.

Quality performance standards

You must follow our quality assurance procedures. We will provide help wherever possible, including pre-delivery quality reviews.

Our DCs monitor whether these quality assurance procedures are being followed. If you do not follow these procedures you may have to pay charges to cover the cost of the disruption to our planned work. Please see the main Reference section in this Supplier handbook for details of the charges.
2: THE BURTON GROUP SOURCING POLICY

We will only work with reputable suppliers and manufacturers who have acceptable working conditions and practices.

We will not buy goods from any supplier or manufacturer who has unethical working practices or conditions.

We will regularly review our sourcing policy to make sure that it remains relevant.

You must meet the conditions of our sourcing policy, as set out in this document. If you do not make the goods you must make sure the manufacturer also keeps to these conditions. (In this policy 'you' means the supplier, the manufacturer or any other person involved in supplying goods to the Burton Group.)

a) **Wages, hours of work and entitlements**
   You must keep to local laws on conditions such as minimum wages, overtime, hours of work and sick pay. If no laws apply, the conditions you impose upon your workers must not be less favourable than the normal terms in your area for workers doing the same type of work.

b) **Child labour**
   You must not employ children in manufacturing goods. (For this purpose a child is any person who is younger than the normal local school-leaving age.) Legitimate apprenticeships or education-related work are acceptable as long as the children are not being exploited and there is no risk to the children's health or safety.

c) **Health and safety**
   You must provide a safe place of work and keep to all local laws relating to health and safety in the workplace. This condition also applies to any homes you provide for the workforce.

d) **Forced labour**
   You must not use forced labour in your workplace.

e) **Discipline**
   You and your representatives must not use, or threaten your workers with, any physical punishment, or dominate or restrain workers by force, authority or threats.

f) **Discrimination**
   You must treat everyone fairly when choosing and dealing with your workers. You must not treat any person less favourably because of their race, religion or sex.
APPENDIX 5

Pollution release summary for
NORTH LONDON WASTE AUTHORITY

These figures are based on the best available data. For necessary background information, read FAQ1. For information about the health hazards and their definitions, read FAQ2.

Find out how you can Take Action!

<table>
<thead>
<tr>
<th>Substance</th>
<th>Kilograms Released To...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>All emissions for 1996:</td>
<td></td>
</tr>
<tr>
<td>Substance</td>
<td>Air</td>
</tr>
<tr>
<td>ATRAZINE</td>
<td>0.03590</td>
</tr>
<tr>
<td>CADMIUM</td>
<td>0.01380</td>
</tr>
<tr>
<td>CARBON MONOXIDE</td>
<td>276000</td>
</tr>
<tr>
<td>DICHLOORVOS</td>
<td>0.03110</td>
</tr>
<tr>
<td>DIELDRIN</td>
<td>0.03320</td>
</tr>
<tr>
<td>FENITROTHION</td>
<td>0.00814</td>
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<tr>
<td>HEXACHLOROBENZENE</td>
<td>0.00814</td>
</tr>
<tr>
<td>HEXACHLOROBUTA-1,3-DIENE (HEXACHLOROBUTADIENE)</td>
<td>2070000</td>
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<tr>
<td>HEXACHLOROCYCLOHEXANE (LINDANE)</td>
<td>0.00877</td>
</tr>
<tr>
<td>HYDROGEN CHLORIDE</td>
<td>1487</td>
</tr>
<tr>
<td>HYDROGEN FLUORIDE</td>
<td>1487</td>
</tr>
<tr>
<td>MERCURY</td>
<td>60</td>
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<tr>
<td>METALS - GROUP 3 (AS+CR+CU+MN+NI+PB+SN)</td>
<td>57</td>
</tr>
<tr>
<td>NITROGEN OXIDES (AS NO2)</td>
<td>478000</td>
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<tr>
<td>ORGANIC TIN COMPOUNDS - TOTAL NOS</td>
<td></td>
</tr>
<tr>
<td>PARTICULATES</td>
<td>263000</td>
</tr>
<tr>
<td>PENTACHLOROPHENOL COMPOUNDS - TOTAL NOS</td>
<td></td>
</tr>
<tr>
<td>POLYCHLORINATED BIPHENYLS - TOTAL</td>
<td></td>
</tr>
<tr>
<td>SIMAZINE</td>
<td></td>
</tr>
<tr>
<td>SULPHUR DIOXIDE</td>
<td>250000</td>
</tr>
<tr>
<td>TEF (TOXIC EQUIVALENT OF PCDD + PCDF)</td>
<td>0.00550</td>
</tr>
<tr>
<td>TRICHLOROBENZENE - ALL ISOMERS</td>
<td>0.03080</td>
</tr>
<tr>
<td>TRIFLURALIN</td>
<td>0.00814</td>
</tr>
<tr>
<td>VOC - VOLATILE ORGANIC COMPOUNDS (AS C)</td>
<td>1570</td>
</tr>
</tbody>
</table>

Table of Toxic Emissions From Edmonton Incinerator 1995
Earth Summit

by Nigel Dudley

the Earth summit: progress and setbacks
In June 1992 over a hundred of the world's heads of state met in Rio de Janeiro, Brazil, to take part in the United Nations Conference on Environment and Development (UNCED). The meeting, popularly known as the Earth Summit, was unique in a number of ways. It was the largest gathering of world leaders in history. It was by far the largest conference ever to be held about the environment. And it succeeded in agreeing two globally important treaties, with countries signing up faster than ever before.

a globally significant damp squib
Yet for an event that might almost be compared with the formation of the United Nations in terms of global significance, the meeting gave the distinct impression of being something of a damp squib. Economic interests watered down many of the finer ideals on which the conference had been set up. Although there were many fine words, there is little money to back them up. The rift between North and South was, if anything, widened rather than healed by the discussions in Rio.

high ideals whittled away
The Earth Summit was a UN-sponsored meeting to discuss issues relating to environment and development, and the links between the two. It began with very high ideals, some of which had been whittled away in the two-year build-up process. This had included a number of preparatory conferences (precons) in different parts of the world. By the time the conference was actually launched, much had already been argued about, and won or lost, during the precon process.

two important treaties signed
In the event, two significant treaties were signed at Rio, although not by everybody. A treaty on climate change was agreed, calling on countries to commit themselves to stabilize emissions of greenhouse gases by the year 2000, and on signatories to act before the convention becomes effective. A second treaty, on biodiversity, was originally drafted to ensure that signatories took steps to preserve plant and animal life, but eventually also included rights to exploit life in their territories as well.

impact of treaties weakened by rich countries
Unfortunately, both of the treaties were significantly weakened by the time they reached Rio, mainly because of opposition from the rich countries and especially the USA. The greenhouse treaty was originally supposed to be binding, but was reduced through softer wording, less commitment, and a reduction in the support provided by the rich countries to help in meeting the targets. The biodiversity treaty, which the USA refused to sign owing to fears of losing rights to exploit other country's biological resources in biotechnology, has some high-sounding ideals but little money. Again, the rich nations opposed moves to include provision for much financial support for the poorer countries in conservation of biodiversity.

environmentalists score with Agenda 21
A gain for the environmental lobby was the agreement reached on Agenda 21, an ambitious 500-page plan to protect the environment, with 115 specific clean-up programmes. This caused a furore in discussion because of the enormous costs it was calculated as requiring, some $825 billion a year, most of which was to have come from the South. In practice, and in line with much of the rest of UNCED, far less money was available and the Agenda, although agreed, is nonbinding.

failure on forests
The largest single failure of the conference was the failure to agree any binding treaty on forests. Instead, a nonbinding statement of principles to conserve forests was agreed, which few
people expect to make much difference to practical forest-management policies. Here, the main opposition came from the South, and was spearheaded by Malaysia which already has a massive logging programme and plans to continue the exploitation. Malaysia's threat to pull out of UNCED unless the treaty was dropped had a large influence over its abandonment. Here, ironically, the USA was a prime supporter, but there was failure even to agree the need for a convention in the future.

so, was the Earth Summit a success or failure?
It was a failure in that it did not produce the major shift towards greater protection for the environment that was originally hoped. Yet it did result in an unprecedented statement of concern by most of the world's leaders, and it did result in two major treaties being signed. As one environmental lobbyist said, if you read the small print on what was agreed there are a lot of hooks to hang countries on if they don't meet up to the requirements. The UNCED meeting was not the solution to the world's problems that some people were looking for, but it was a step in the right direction.
APPENDIX 7

DIAGRAM A

WOOL

\downarrow

ONE WAY STREET

\downarrow

PROCESSOR

\downarrow

DYER

\downarrow

SPINNER

\downarrow

GARMENT MANUFACTURER

\downarrow

RETAILER

\downarrow

CONSUMER

\downarrow

LANDFILL

\downarrow

INCINERATION

\downarrow

THIRD WORLD WASTE
DIAGRAM B

WOOL

CLOSING THE LOOP

FARM

PROCESSOR

DYER

SPINNER

GARMENT MANUFACTURER

POST CONSUMER TEXTILE SORTING

RETAILER

DISPOSAL

CONSUMER
Summary

In the European Union, consumers discard every year 5.8 million tons of textiles. At the moment only about 1.5 million tons (25%) of these post-consumer textiles are recycled by charity and industrial enterprises. About 1 million tons are exported directly to Third-World countries; about 0.5 million tons are converted to various products and sold inside the European Union. The remaining 4.3 million tons (75%) of these post-consumer textiles are landfilled or burnt in municipal waste incinerators, representing an enormous unused source of raw materials. Of the 500,000 tons that is recycled, the main applications are wiping rags, fibre production and application in the paper industry.

The aim of this project is to increase the amount of post consumer textile that is being recycled by 10%. In other words the recycling percentage aggrandises from 25% to 35%, i.e. 500,000 tons yearly extra. Three technologies will be used for the identification of fibrous raw material and dye/finish:
1. Near Infra Red (NIR);
2. Thermal Impulse Response (TIR);
3. Laser Induced Breakdown Spectroscopy (LIBS).

Combined these three techniques should be able to identify the raw material of the textile with a 90% accuracy.

For the identification of textile raw material two parallel developments will take place. The first will be the development of the LIBS/TIR technology. A combination of these technologies will enable the proper identification of the raw material and the hazardous components in either the dye or the textile. Next to this the NIR technology will be further developed and adapted for identification of textiles and textile finishes. Since NIR is a technique that has been successful applied in many areas it is held that it can also be applied in the textile industry.

The concept of identifying fibrous raw material of textiles and sorting it into different fractions is new. However this concept can be applied in other areas as well. Not only post consumer textiles can be recycled, but other textile waste as well. Next to this, the specific identified streams of textile can be used for the development of new end-products in other industries. However the developed identification methods can be used as quality control as well. Verifying the nature of the blends that are imported from other countries. Thereby reducing the probability of expensive lawsuits afterwards, where mutual recriminations are settled by an arbiter.
TNO Institute of Industrial Technology

Division Production Technology

- Textile Technology and Development
- Welded Constructions
- Manufacturing Technology
- Paper and Board
- Consultancy
- Centre Lightweight Constructions
TNO Textile

Apparel and confection industry

Suppliers:
Machines
Chemicals
Water purification

Carpet industry

Textile industry

TNO Textile

TNO Institute of Industrial Technology

Centre for Textile Research

TNO Textile

Apparel & confection industry

Carpet industry

Suppliers

Textile industry

TNO Institute of Industrial Technology

Centre for Textile Research
**Items in carpet and textile industry**

- Cost reduction
- Process optimisation and innovation
- Product innovation
- Reduction environmental load

**Items suppliers**

- General knowledge of textile
- Products
- Processes
- Reduction environmental load
Items in Apparel/Confection industry

- Cost reduction
- Logistics (EDI, JIT)
- Product innovation (Product performance)

Expertise TNO Textile

- Adaptation of end user demands into technical specifications
- Processes
- Products
- Environment
- Testing and Certification
Processes 1

'Taking new and technological high-grade processes available to the textile industry.'

Examples:
- Reactive cotton
- Plasma technology
- UV/EB polymerisation
- Enzyme technology

Processes 2

- Collective research 'de Voorzorg, aimed at the reduction of energy, water and chemicals usage.

Examples:
* Development of sensors for finishing (optimising chemicals usage)
* Application vacuum technology
* Minimal application techniques
Processes 3

- Collective research for NOVEM and 'de Voorzorg'
- User-groups NOVEM/KRL:
  - Drying
  - Wide washing
  - Discontinuous processes
  - Climate control
  - Waste reduction

Products

TNO Textile:
- Bilateral research
- Production technology
  (Made to measure)
- Creation of new niche markets
- Trends with respect to professional clothing
  * Ease of maintenance
  * Safety
  * Comfort
Environment

Expertise TNO Textile:
- Energy (MJA, Saving)
- Water (Re-use, effluent purification)
- Air (Emission reduction)
- Chemicals (Reduction usage, dosing of and use of alternatives)
- Re-use of textile

Consultancy

Examples:
- Monitoring global technological developments
- Quality control and standardisation (ISO, CE certification)
- Troubleshooting
- Logistics
- Subsidy
Product judgement

- Expertise:
  - *Judging*
  - *Advising*
  - *Arbitration*

Testing

Over 250 standard tests

- Certification
  - TNO Product label
  - CE label
  - ISO

Testing

- Raw material composition
- Comfort
  - *Skin model*
  - *Water vapour transmission resistance*
  - *Heat transfer*
  - *Suppleness/grip*
- User properties
Testing user properties

- Shrinkage during cleaning
- Tensile strength
- Tear and shear resistance
- Pilling
- Seam strength
- Water permeability resistance
- Colour fastness to crocking, washing and light
Textile chain

Fibre production → Cloth production → Confection → Application

Expertises TNO Textile:
- Fibre materials
- Application areas Fibres
- Process optimisation
- Determination properties

Centre for Textile Research
TNO Institute of Industrial Technology
Textile chain

Cloth production consist of:
- Spinning, weaving, knitting, non woven
- Pre-treatment: desizing, souring, bleaching
- Dyeing/printing
- Finishing

Spinning and weaving

Expertise TNO Textile:
- Sizing process
- Hairiness van de fibres
- Determination of yarn and cloth properties
- Development spinning-machines and looms
Pre-treatment 1

Fibreproduction | Clothproduction | Confection | Application

Expertise TNO Textile:
- Process optimisation
  - water
  - energy
- Process renewal
- Regulating chemical doses

Pre-treatment 2

Fibreproduction | Clothproduction | Confection | Application

Expertise TNO Textile:
- Cloth control
- Specification and control properties:
  - Desizing degree
  - Hydrofililty
  - Whiteness
**Dyeing / printing**

- Fibreproduction
- Clothproduction
- Confection
- Application

Expertise TNO Textile:
- Dyes
- New fixation processes
- Purification effluent
- Judgement end result

**Finishing**

- Fibreproduction
- Clothproduction
- Confection
- Application

Expertise TNO Textile:
- Degree of fixation
- Emissions
- New finish-chemicals
- Testing and judging end result
Textile chain

- Fibreproduction
- Clothproduction
- Confection
- Application

Expertise TNO Textile:
- Functionality Confection
- Made to measure
- Expertise problems
- Control and testing of confection

Member Branch Centre Apparel Technology

Centre for Textile Research
TNO Institute of Industrial Technology

Textile chain

- Fibreproduction
- Clothproduction
- Confection
- Application

Expertise TNO Textile:
- Determination of comfort
- Durability Textile
- Advising applications
- Testing and inspecting of textile

Centre for Textile Research
TNO Institute of Industrial Technology
THE BOYS' BRIGADE
16TH ENFIELD COMPANY

Textile Recycling Scheme.

Thank you for your support.

Please continue to save old clothes, curtains, towels and bed linen.

Our next collection will be on Saturday 13th May.
KEY COMPONENTS USED TO MAKE YARNS FROM 100% POST CONSUMER WASTE

1. an example of virgin sheep fleece
2. post consumer wool
3. wool shoddy
4. wool shoddy well blended
5. cotton denim
6. P.E.T.
7. cotton and polyester fibres
8. cotton and polyester well blended
9. wool/cotton/polyester sliver
10. wool/cotton/polyester yarn 2/12's
FABRICS MADE FROM YARNS COMPOSED OF 100% POST CONSUMER WASTE

34% Wool
33% Cotton
33% Polyester
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LIST OF ACRONIMS

1. BMB Biotechnology Means Business
2. BSI British Standards Institute
3. DC Developing Country
4. DTI Department of Trade and Industry
5. EDA Ecological Design Association
<table>
<thead>
<tr>
<th></th>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>6.</td>
<td>EMAS</td>
<td>Eco management and Audit Scheme</td>
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<td>7.</td>
<td>END</td>
<td>Environmental Data Services</td>
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<td>8.</td>
<td>ETBPP</td>
<td>Environmental Technology Best Practice Programme</td>
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<td>9.</td>
<td>ETBPP</td>
<td>Environmental Textile Best Practice Programme</td>
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<tr>
<td>10.</td>
<td>FTZ</td>
<td>Free Trade Zone</td>
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<td>11.</td>
<td>GATT</td>
<td>General Agreement on Tariffs and Trade</td>
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<td>12.</td>
<td>HMSO</td>
<td>Her Majesties Stationery Office</td>
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<td>13.</td>
<td>ILO</td>
<td>International Labour Organisation</td>
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<tr>
<td>14.</td>
<td>IRM</td>
<td>Integrated Resource Management</td>
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<td>15.</td>
<td>IWS</td>
<td>International Wool Secretariat (The Woolmark Company)</td>
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<td>16.</td>
<td>JSDC</td>
<td>Journal of the Society of Dyers and Colourists</td>
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<td>17.</td>
<td>LCA</td>
<td>Life cycle analysis</td>
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<td>18.</td>
<td>LROG</td>
<td>The London Recycling Officers Group</td>
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<td>19.</td>
<td>MAFF</td>
<td>Ministry of Agriculture Fisheries and Food</td>
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<td>20.</td>
<td>MEP</td>
<td>Member of the European Parliament</td>
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<td>21.</td>
<td>MFA</td>
<td>Multi Fibre Agreement</td>
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<td>22.</td>
<td>NCBE</td>
<td>The National Centre for Business and Ecology</td>
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<td>23.</td>
<td>NDC</td>
<td>Newly Developing Country</td>
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<td>24.</td>
<td>NIC</td>
<td>Newly Industrialised Country</td>
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<td>25.</td>
<td>TEN</td>
<td>Textiles Environmental Network</td>
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<td>26.</td>
<td>TNO</td>
<td>Institute of Industrial Technology, Netherlands</td>
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<td>27.</td>
<td>WEN</td>
<td>Women's Environmental Network</td>
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<td>28.</td>
<td>WTO</td>
<td>World Trade Organisation</td>
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