

17 Innovation for the Environment

CASE STUDY 6: PLASWOOD BY DUMFRIES RECYCLING

Plastics recycling and recycle is good for the environment and good for business. Recycled material is a largely untapped resource. It is an additional resource stream waiting to be exploited by industry and an opportunity which many businesses are currently missing out on.

Rt Hon Michael Meacher MP, Minister for the Environment during a conference on recycled plastics, London, 6 March 2000

INVEST OR SELL?

British Polythene Industries PLC, of which Dumfries Plastic Recycling (DPR) is a 100%-owned subsidiary, have always placed strong emphasis on recycling. In fact, in 1999 about 25% of the company's £452 million turnover come from recycled products, £5 m of which are contributed by the products manufactured and sold through DPR. Cameron McLatchie, Chairman and Chief Executive, declares on the company website, 'As the leading manufacturer of Polythene Film Products in the UK we accept that we have a responsibility to manufacture products which meet recognized environmental criteria, and to produce them in a way that fully meets our social commitments.' With its business being in the manufacturing and selling of polythene products – primarily thin materials such as films, plastic bags and wrapping materials – McLatchie had recognized early on the need to recycle plastic.

Approximately 60% of total plastic waste is packaging which typically has a 'life' of less than 23 months.

In the early 1990s bpi produced about 400,000 tonnes of polyethylene a year, and it was felt that it should be possible to make some use of the wastage generated in the process. In addition, there had been enquiries from their customers about recyclability of PE products, most of which have a very short lifespan. It was also anticipated that legislation would be introduced to enforce recycling on a wider scale – and being able to make use of recycled material would put bpi in a competitive position.

Over the past 5–10 years the company had invested significantly in its recycling facilities – about £15–20 million in the past five years alone – but so far returns on investment had not been quite as expected. The reasons were manifold. Government regulation had not panned out the way it had been anticipated and the government's expectations of the market regulating prices had not happened – and were not likely to either with existing legislation. Instead of encouraging recycling-related industries to be established in the UK, British interpretation of EU legislation (EU Directive on Packaging and Packaging Waste) which states that in 2001 50% of packaging waste has to be recovered, resulted in much of the 'raw material' being exported to the Far East.

From bpi's 1999 Annual Report and Accounts

Despite years of experience in the recycling of post-consumer waste films, we have yet to see an acceptable return for this activity. The current system of producer responsibility may indeed be delivering compliance with packaging regulations at the lowest cost for retailers and packer fillers, but it has done nothing to improve the infrastructure for recycling of genuine post-use waste polyethylene film in the UK. This has a direct bearing on our post-use retail waste film plant at Heanor which is currently operating at a loss. Our agricultural film recycling plant at Dumfries survives on waste film sourced from Eire, the Channel Islands and mainland Europe, all of which subsidize local collection of material for recycling. In the UK, farmers cry out for help with their waste polyethylene films, but so far all we have is some marginal help for a pilot collection scheme in Wales. There is clearly a discontinuity in the government's thinking in this area.

The idea of recycling plastic was not new, but previously manufacturing processes had been restricted to the use of reasonably clean recycled plastic. A high percentage of recycled plastic was highly contaminated, requiring extensive and costly washing procedures. Backed by strong senior management support, a team of bpi engineers, led by David Butler, Operations Director of bpi.recycled products, started to work on developing processes that would allow processing of stronger contaminated materials, and to identify new applications for such a material. The company's efforts, combining two previously separate technologies of washing dirty, low-grade plastic waste and recycling it, resulted in a material called 'Plaswood' which could be manufactured into multi-purpose plastic blocks. The material was used to develop a range of replacement products for items made previously from timber, metal or concrete such as fence posts, benches and pollards. In 1995 Dumfries Recycling Ltd was set-up to manufacture and sell Plaswood products.

Contamination refers to labels on plastic bottles, soil and other waste on agricultural films.

At present there were some conflicting indicators. On the one hand, the overall cost structure as defined by legislation and 'raw material' prices meant that parts of the recycling division operated at a loss. On the other hand, there were the company's firm commitment to recycling, consumers increasing environmental consciousness and their interest in products made from recycled materials, and requests by users of PE products for environmentally friendly solutions for the disposal of plastics.

PLASTIC RECYCLING IN THE UK

Recycling: to reclaim a product after its primary use, for the manufacture of either the same or another product.

UK's Producer Responsibility Obligations (Packaging Waste) Regulations passed by the House of Commons, March 1997

Worldwide production of plastic materials has gone up annually from about 5 million tonnes in the 1950s to about 80 million tonnes in 1997, of which 3.5 million are consumed in the UK. As most plastic products have a fairly short lifespan they contribute hugely to waste disposal problems. Out of the approximately 2.8 million tonnes of plastic waste generated in the UK in 2000, about 60% or 1.7 million tonnes are packaging waste. With landfill being the primary means of disposing of plastic waste, this is a major problem.

The legislation defines packaging as 'All products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods from raw materials to processed goods from the producer to the user or the consumer.'

In an attempt to address increasing environmental concerns and the increasing shortage of landfill sites, the European Union had introduced a directive in 1994 that requested each member to put systems in place to recover 50–60% of all packaging waste by 2001 (94/62 EC). The minimum quota for each type of packaging material was set at 15%. How countries would achieve the target was left entirely up to them.

It is important to distinguish between 'recovery' and 'recycling'. Recycling is one method of recovery, others being incineration and what is called feedstock recovery, i.e. returning packaging to its original raw material or components as long as it would involve diverting the waste from landfill. These targets were incorporated into UK legislation on packaging in 1997. With waste from plastic packaging amounting to around 1.7 million tonnes in 2000 it meant that 255,000 tonnes of the total amount to be recovered (850,000) would have to be mechanically recycled into new products. For 2001 the anticipated volume of plastic actually recycled lay between 150,000 to 180,000 tonnes, well short of the target.

Plastic Recycling and Recovery Methods

- *Mechanical recycling* by producing new finished plastic products (melting and moulding, manufacturing regranulate)
- *Feedstock recycling* by breaking polymers down into their constituent monomers which in turn can be used again in refineries or petrochemical and chemical production
- *Incineration with energy recovery*, where plastics can be burnt to release electricity or heat

The UK is concentrating on mechanical recycling.

Who recycles and how much?

Raw material manufacturer

e.g. a manufacturer of sheet steel to be made into packaging 6%

Converter

e.g. a manufacturer of steel cans for the food industry 9%

Packer/filler

e.g. a company filling cans with food 37%

Seller

e.g. a retailer selling canned goods to their customers who throw away the cans 48%

(Companies generating less than 50 tonnes of packaging waste per year are exempt.)

Products made from recycled plastic

Polyethylene bin liners and carrier bags; refuse sacks; bottles; water and sewer pipes; flooring; fibre-fill duvets; audio, video and compact disc cassette cases; fencing and garden furniture; office accessories; seed trays and building insulation board. It is possible to buy scissors and knives with handles of recycled plastic. Recycled plastics are also used in multi-layer containers for fabric softeners, engine oil and paint. Even fleece clothes, e.g. jackets, hats and gloves, are made up of recycled PET bottles.

The UK legislation introduced a system of Packaging Recovery Notes (PRNs) which shares costs of recovery between producers of the raw material, converters, users and sellers, each part of the chain has an obligation to recover. Andrew Green, MD of bpi.recycled products explains that the PRN system is, 'Based on the legislation

a compliance scheme has developed. It is like a non-profit making club, in the end it is the club's responsibility to ensure recycling. Members pay the club, thereby buying off their organization's obligation. The club outsources recycling to companies such as bpi.' This means that a company does not necessarily undertake any of the recycling itself, it just needs to show proof – by purchasing PRNs – that a certain amount of packaging waste has been recycled. PRNs are sold by companies (reprocessors) which turn recycled materials back into raw materials or new products. However, Green also points out that at present the scheme is not working very well, the main reason being that the value of PRNs is very low. This means that a company taking on other organizations' obligations to recycle by selling PRNs can only realize small incomes, while on the other hand, the process of recycling is expensive and finding markets for products made of recycled plastic is not easy. Green indicated that a company would have to charge about £150 per tonne to make recycling financially viable – the price realized per PRN per tonne of material was £45–55 and £45–60 in October and November 2001, respectively.

In establishing their recovery responsibility companies can *discount* the following:

- Packaging that is thrown away
- Packaging that is exported
- Packaging that has been used before
- Packaging a company does not legally own
- Production residues (from production process)

There are several aspects of the plastic industry that make the recycling less straightforward than one might expect:

- There are about 50 different family groups of plastics, with hundreds of different varieties; the number of different plastics makes sorting complicated and requirements for successful recycling vary
- Methods have yet to be developed to process different types of plastic together
- Most post-use plastic is contaminated, e.g. by labels, soil, etc., and cleaning can be difficult and costly
- Plastics are light in weight which means that transport costs for waste plastic to a recycling centre are relatively high
- Quality of recycled plastic is never as good as virgin material and also more variable
- Virgin material is about £400–600 per tonne for polyethylene, recycled polyethylene costs about £300–500 per tonne

UK estimates of post-use recycling plastic in 97

Polyethylene (PE) film	66,000 t
Polyethylene (PE) other	10,000 t
Polypropylene (PP)	20,000 t
Polystyrene (PS)	5000 t
Expanded polystyrene (EPS)	2500 t
Acrylonitrile butadiene styrene (ABS)	2000 t
Acrylics	1200 t
Polyvinyl chloride (PVC)	10,000 t
Polyester (PET)	3000 t
TOTAL	119,700 t

In addition, less packaging than anticipated has been used, resulting in a lower UK obligation to recycle (see Box 17.1).

BOX 17.1 UK Obligation to Recycle Plastic at 15% of Packaging Volume Predicted Versus Actual

Year	1997	1998	1999	2000	2001
Predicted	45	119	170	231	272
Actual		90	125	178	240

But there were also other factors causing problems. During a conference in London in March 2000, Keith Stenning, Group Resources Director of bpi, criticized current legislation, stating that, 'PRN funding has now reduced to a level which will only support the simplest of recycling processes. Regulations have merely sustained activity through the last plastic price cycle without significantly increasing the infrastructure of capacity in the UK.' He further referred to a study that concluded that there would be no ecological benefit in plastic packaging recycling rates above 15%, and urged greater focus on energy and feedstock recovery options, adding: 'If we are to sustain plastic recycling programmes in a free market environment we need markets and applications which can realize beneficial use at an affordable cost. If the packaging chain can not or will not support the costs of current recycling routes within the UK, and significant waste holders opt to export waste, then this not only puts the UK recycler at commercial risk but also cuts off his waste resources. Does the answer lie in low cost third world economies becoming the recycling partners of developed economies? I cannot believe that this was the intention of the global drive towards sustainability.'

While bpi has a number of competitors within the UK, the biggest threat comes from the Far East – both for the picking up of the 'raw material' (e.g. plastic waste) and supplying products which would in the UK be made out of recycled material such as plastic bags (albeit that plastic bags from China tend to be made from virgin material). Andrew explains, 'The Far East seems to have an almost unlimited demand for waste plastic which keeps the price of waste artificially high. It pays to ship plastic waste over there because of the vast number of empty containers that travel back – so transportation costs are not an issue. Once over there they have lots of cheap labour they can throw at segregating the waste.' bpi used to get plastic from Sainsbury which charged them £150/t to collect it, but now it ships all its plastic recycling to the Far East. The plastic sent to China tends to be recycled into plastic pellets that are used for rigid products such as the casing of electronic consumer goods. As a consequence of the competition from the Far East, a number of plastic washing plants all over Europe have closed down in recent years.

Today almost all carrier bags come from the Far East, and at a very good price, but most of them are made from virgin material.

Another distinction is important: scrap and post-use plastic. The former is 'process scrap' from industry, which is easy to recycle as the ingredients are known, and it is clean as it has not entered the waste stream. Many companies working with recycled plastic concentrate on this – and have done so before legislation was introduced. It is generally recycled in-house or with a local processor. Post-use plastic, on the other hand, is defined as 'plastic material arising from products which have undergone a first full service life prior to being reclaimed'. This plastic waste requires collecting, sorting and, in most cases, cleaning, which means it is more difficult and costly to recycle. In 1997 bpi recycled about 14,000 tonnes of post-use packaging and about 34,000 tonnes of process scrap.

A lot of other companies make pellets from rigid products, under the government scheme they were getting PRNs for what they had been doing all along anyway.

One of the flaws of the existing system is that it does not differentiate between different sources for recycling plastics. While processing scrap plastic is comparatively straightforward and easy, the tricky bit is working with post-use plastic. It can cost about £200 per tonne to have the recyclable material delivered to the factory alone – in comparison, the cost for other recyclable materials such as paper, glass or steel is around £20 per tonne. The problem here is that people see post-use plastic as raw material and price it accordingly. In addition, one does not get 100% return out of the material that arrives at the plant. For example, at Dumfries Plastic Recycling they get about 40% PE out of 100% delivered material. This is due partly to the fact that not all of the material delivered

A neighbouring plant was filling containers with plastic material and having to pay for its removal. bpi offered to take it off their hands and save them the container charges – but they were not interested unless bpi would pay them for it.

is usable, partly because the contamination (a) is 'dead' weight and (b) incurs costs, as the material needs to be cleaned before it can be processed.

Other companies focus more on bottles from the domestic waste stream, which are relatively easy to separate, but machinery is expensive. Bottles tend also to be contaminated by paper, and different plastics are used in the production of plastic bottles, which means that it is generally necessary to sort bottles by type of plastic. To avoid problems arising from the mixing of different types of plastic, Germany has introduced legislation that attempts to prevent mixing at the source.

One final distinction is that between rigid and flexible plastic. Rigid plastic has the advantage that it tends to be easier to segregate and clean, and many domestic or consumer rigid plastic packaging contains an identification marking. David Butler Operations Director, Refuse & Recycling, bpi Recycled Products explains, 'As long as products are rigid they can be sorted. For example, US grain sorters are good for sorting different coloured pellets. There are also machines that can identify different plastics. But at present there are no machines for sorting films, it tends to go all over the place.' Plastic film, even if it were marked, remains a problem as it tends to be mixed with other waste. At present, the only working plant in the UK for processing recycled plastic film is bpi's plant in Dumfries.

- Approximately 40% of local authorities in the UK now have plastic bottle recycling schemes
- There are more than 3757 plastic bottle collection banks on 2660 sites across Britain and plastic bottles are collected from more than 2.7m households
- In 1995 50% of plastic bottles collected came from kerbside collections compared with 40% in 1994
- About 95% of plastic bottles in household waste are made from PE, PVC, PET

BACKGROUND TO BRITISH POLYTHENE INDUSTRIES

Between 1983 and 1997 British Polythene Industries had grown significantly. As David Butler, Operations Director of bpi.recycled products recalls, 'In 1987 we consisted of five to six small companies. By the late 90s, after we had completed a number of mergers and acquisitions, we had grown to 50.' The expansion of the company had started with the acquisition of Anaplast Limited by Scott & Robertson in 1987, after which its current Chairman Cameron McLatchie joined the board, which was also when the company became its current name, bpi. This was followed by further important steps:

- Purchase of PCL Recycling in 1986
- Acquisition of Visqueen from ICI in 1988 – more than doubling group size
- Merger with Alida Holdings in 1989 – moving into the retail sector
- Acquisition of Brithene Bridgewater from Courtaulds in 1991 – expanding the stretchfilm sector
- In 1992 acquisition of Novathene Films from BP – expanding the collation shrink sector
- Acquisition of Parkside Flexible Packaging in 1995 – moving into the high-quality flexible packaging sector
- Acquisition of polythene film business of Wavin and Low and Bonar – establishing significant presence on the continent and market leadership in silage stretchwrap

In 1999 bpi was the largest producer of polythene products in Europe, generating a turnover of £452m and £27.5m operating profit (before employee share scheme), with just under 4000 employees. The group is now split into seven strategic businesses:

- *Recycled Products* Manufacture and sale of recycled products including refuse sacks, construction films; recycling of post-consumer waste (~19% of group turnover)
- *Industrial Products* Manufacture and sale of heavy-duty sacks and pallet covers for the fertilizer, chemical, animal feed, construction and horticulture markets (~18% of group turnover)
- *Stretchfilms* Manufacture and sale of film on the reel products including hand and machine pallet stretchwrap, silage stretchwrap and agricultural and horticultural sheeting (~16% of group turnover)
- *Films* Manufacture and sale of collation shrinkfilm, converter, lamination and overwrap films (14% of group turnover)
- *Packaging Services* Provision of services for a range of polythene-related products through manufacturing, converting and merchandising operations; products include polythene film and bags, pallet stretchwrap, paper sacks and tape (~13% of group turnover)
- *Consumer Packaging* Manufacture and sale of polythene and paper bags for the food, petcare and consumer markets (~12% of group turnover)
- *Belgium* Manufacture and sale in Europe of printed films, industrial stretch films and silage stretchwrap and agricultural sheeting (8% of group turnover)

McLatchie, Chairman since 1987, had always felt strongly about the company's obligation to recycle. Since 1995 the company had invested £16m in state-of-the-art recycling and film extrusion technology and, as stated on the company website, 'We remain at the forefront of innovative and environmentally responsible high-performance products.' However, David points out, 'It seems that we have made a lot of long-term investments and are taking a long-term view, but of course the city does not like that and they were seen to be weak and a takeover target.' The website further contains a statement on bpi's environmental policy: 'I consider it important that we let you know in a clear and concise manner the environmental Policy of British Polythene Industries Plc.' (See also Box 17.2.)

BOX 17.2 bpi's Environmental Policy

We will ensure that:

- *all our products will be manufactured to conform in every respect to prevailing government environmental standards*
- *we will seek to minimize the use of non-renewable raw materials*
- *our products will be manufactured from materials which are capable of being recycled*
- *recycled products will be offered where they can be demonstrated to be fit for purpose*
- *we will provide, wherever practicable, the facilities for the collection and recycling of polythene film products*
- *we will be a responsible employer and a good neighbour*
- *we will manage our operations and processes in a way which respects and protects the environment*
- *our operations will conform to current legislation*
- *we will be in the forefront of developing new environmentally responsible initiatives, where it is economical and practical to do so*

In 1999 the company discharged its recovery obligations on paper through the national compliance scheme, but plastic recycling obligations were met through its own resources. Seven sites were accredited by the Environment Agency, which meant that they could sell PRNs to generate additional income. However, while the legislation on packaging waste recovery had originally been thought to give this aspect of the business a significant boost, the company had to learn to the contrary at its cost.

Deteriorating prices of PRNs and cheaper processing in the Far East meant two things. First, volume throughput was likely to go down, and secondly, access to suitable waste would become increasingly difficult.

While the Annual Report 1999 still mentioned seven sites dedicated to the recycling business, 2001 saw the closure of two, partly due to difficult circumstances in the recycling industry – competition from the Far East – and partly to consolidate bpi's recycling efforts. In addition, one of the five sites has been reassigned to the production of high-quality refuse sacks made from virgin material (see Appendix II for the use of the remaining four sites).

The competition from the Far East is particularly felt in the market for carrier bags – and this is true for the retail as well as the recycling side. Whereas bpi used to have a business recycling bags from stores, that part of the company was closed down in June 2000 as supermarkets preferred to ship their waste plastic east; Sainsbury, formerly a customer of bpi, being one of them. As David explains, 'To ship a 24-tonne container from the UK to Hong Kong costs about \$500; to ship 1 tonne back costs \$150. Once the container gets to China the contents get dumped into the streets of small villages where the villagers sort the plastic by hand. Polyethylene goes to one village, polypropylene to another. The people sort it by colour and degrees of contamination (paper, etc.). Labels and other paper-based contaminations are then cut out by hand and used as fuel. The plastic is then hand-stuffed into the extruders – something that would be forbidden for safety reasons here. The pellets resulting from this process can then be blown into good film.' He continued, 'Our Chairman Cameron McLatchie has tried to explain it to the government and other interest parties how short-sighted it all is – but no one wants to listen. So the UK allows massive exports of recyclable plastic. Ireland, on the other hand, is much stricter. Its exports to Dumfries are the exception and allowed only because Ireland does not have its own film recycling plant.'

To be allowed to issue PRNs bpi had to be accredited, by the Environment Agency for England and the Scottish Environmental Protection Agency in Scotland. Through accrediting companies the government maintains a certain degree of control and can collect the data necessary to prove to the EU that they are fulfilling the UK's post-use packaging recycling commitment.

bpi Product Range from Recycled Plastic

Rigid products

- Geoblock ('porous' pavement system)
- Plaswood (fencing, street furniture, signposts, garden furniture, marine use, playground furniture)
- Reblocks (traffic bollards)
- Pallets
- Cable ducting

Flexible products

- Envirollope (genuinely recycled envelopes)
- Carrier bags
- Waste sacks
- Collation and transit packaging (shrinkfilm and pallet stretchfilm)
- Tissue overwrap (for toilet paper)
- Mailing film
- Multibags (crisps and snack food)
- Refuse sacks and bin liners
- Kerbside collection sacks
- Polly Teen (educational scheme for primary school children developed by bpi)

DUMFRIES PLASTIC RECYCLING

The Dumfries plant is now solely dependent on imported agricultural plastic waste from subsidized collection schemes in Southern Ireland and Continental Europe. As yet there is no sign of any Government support for a Farm Plastic Recycling Programme in the UK.

bpi Annual Report 1999

In 1995 bpi spent £5 million to set-up Dumfries Plastic Recycling as a subsidiary to manufacture and sell rigid products made of Plaswood. Between 1992 and 1995 bpi had produced Plaswood on the company's site in Stroud, Gloucestershire. Dumfries had been chosen for its closeness to Ireland, a major source of its 'raw material', post-use agricultural film. But there were other favourable conditions: the process of recycling plastic needs an abundance of water – and the site was right next to the River Nith; the previous owner of the plant had been trying to sell it off for quite some time and was therefore willing to negotiate the price; and finally, some grants were available.

Plaswood, a substitute for wood, concrete and metal, is made from 100% recycled polyethylene. It is produced in a wide variety of shapes, lengths and colours, and can be customized to match clients' requirements. It is extremely durable, rot proof, maintenance and splinter free. Applications include children's play areas, harbour decking, park fencing and floating pontoons.

When bpi first entertained the idea of producing rigid products from post-use plastic waste, they had hoped to be able to sink large amounts of recycled material in the process. However, they soon enough found out that it would not work like that. To arrive at a 'raw material' that is suitable for the production of rigid products, the recyclate going into the process had to be homogenous with its characteristics known, otherwise the outcome would be too variable both in terms of quality and performance. They found that only certain plastics were suitable – and segregation is a costly and labour-intensive process.

A competitor of DPR had recently gone bankrupt mainly because they did not understand the importance of segregation and that one could only achieve good results from recycling if materials are separated; otherwise the resulting material is too inconsistent and not suitable for producing film.

Interest in the new material was extremely slow to pick up. When they re-assessed the market after about one year, they decided that they would need something that people could see which would help them to understand the benefits of the material – and they needed something that would bring in money quickly. In 1993/94 they decided to build a set of street furniture: a park bench, a picnic table (adult and junior) and a backless bench. These were some very basic products, but people reacted positively saying, 'Now I see what you were talking about.' Kim also remembers, 'The street nameplates introduced in 1995 were our first big hit, not least because people did not need much imagination to see how that would work.'

While bpi have invested a lot in recycling technology, they tend not to spend on R&D. Andrew explains, 'We are doing very little R&D in this area. Some of the machinery manufacturers and raw material suppliers are doing a lot but this will not continue if the commercial viability of recycling continues to be very poor.' However, DPR have developed processes that allow for the recycling of lower grade plastic waste than other companies are using. When asked whether they did some research before going into the production of rigid products Andrew answers, 'Very little research was done before developing the process. We embarked on it primarily because we were looking for a product that would accommodate lower grade waste than was necessary for making film. The technical and market strategy was developed in conjunction with a Dutch manufacturer of similar products with whom we began a licensing agreement some 10 years ago. The agreement ended about five years ago although we continue to work

together and continue to buy product from them. The Dutch effectively sold us their process technology in return for a royalty on the products we make and sell.'

The end of the collaboration agreement with the Dutch company and the decision to specialize in the recycling of agricultural film were the trigger for setting up DPR. After

In agricultural stretchfilm about 58–60% of the 'ingredients' are sand, soil and water.

David, who had been charged with preparing the plant for the production, had remodelled the plant it was capable of producing 5000 tonnes per year of pellets from post-use agricultural stretchfilm. However, as bpi.recycled products Managing Director Andrew Green remembers, while they had been part of the plant in Stroud, 'There was no real allocation of costs.' Once they had moved production to Dumfries this became all too obvious, the washing plant lost money from day one. Only recently had it started to make a small contribution. In fact, DPR came under serious review about four years ago, and the question was asked, do we really need to be in Plaswood? Strongly influenced by the company's commitment to the environment it was decided to continue production – but that product prices would have to start reflecting true production costs. Kim remembers, 'When Andrew took over and realized how much money they were losing, one of the first things he did was to put up the price for our products by 30%. It was quite remarkable, we explained to our customers that the reason for the price increase was the need to cover cost – rather than to increase our profits – and we lost hardly any of them.' Another reason customers stayed with them was that their products were of a quality superior to competitors' products.

Coming to talk about competition, there was agreement that there was in fact quite little – at least in terms of similar products made from recycled plastic. David comments, 'There is not much competition, certainly not for street furniture. One company is making flat panels for pigsties but that's a niche market. There are a few companies on the continent, one in the Netherlands and two in Italy, the latter also making furniture from recycled plastic but only on a small scale. As transport costs are quite high, there is not much cross-border trade. On the other hand, for flexible recycled plastic products, such as refuse sacks, there is horrendous competition.'

With 45 employees DPR processes about 60,000 tonnes of polythene a year, about half of which is post-use plastic. After the recyclate has been washed it is 'reduced in size' – which means it is shredded – and then melted in an extruder. In the extrusion process the liquid plastic is pressurized into moulds. Once the material has cooled down in water, it is pushed out by compressed air. David points out, 'Make sure that you don't stand in the way when it is pushed out, it is like a torpedo!' It is important to give sufficient time to the cooling process. Again David explains, 'The outer skin has to be "frozen" before the product can be taken out of its form; it must be kept in its mould until the outside is sufficiently hard, otherwise the product will disintegrate.'

Over the years the Plaswood product range had expanded continuously. Asked about where product ideas come from David comments, 'They come from within the organization as well as from our customers. We also scan the market for existing products and ask whether making them from Plaswood would bring any advantages to the consumer.' Kim Williamson, Sales Manager, adds, 'We are working very closely with our customers, for example Safeway and Waitrose. We supply Waitrose with all their car park requirements and also take their old plastic bags back – it is a win-win situation.' Kim continues, 'It is important to be reactive to customer needs – and listen. It is also important to keep the sales team informed and provide them with the latest insights, knowledge and developments. We at Dumfries aim to give very good service and delivery. My philosophy is, get in front of customers as much as you can. Honesty is very important too. Say if you believe something does or does not work.

Waitrose is a very enlightened company, they have 'bags for life' which customers buy, use until they are worn out and can then exchange for a new 'bag for life'; the worn out bags get collected and come back to Dumfries who then produce Plaswood products with them which in turn go back to Waitrose which use them either for their shops or donate them.

You have to know the product inside out so you don't make promises that cannot be delivered. For example, if the customer requires something for which Plaswood is not the ideal solution, we do not hesitate to recommend a combination with other materials.' About 75% of products sold are off-the-shelf solutions, 25% are bespoke to customer requirements.

bpi's products from recycled materials are sold predominantly into the following markets: the building industry, local authority and private waste contractors, as well as catering and janitorial. However, most of these markets are interested in flexible rather than rigid products. DPR's main customers tend to be local authorities. In fact, the four top accounts are with local authorities, and about 40% of DPR's business is conducted with its four major customers. 'Keeping in constant contact with the local authorities is very important,' says Kim. 'Our sales staff contact all local authorities with the latest product info, etc. about twice a year. In fact we conduct much of our sales activity over the phone. Persistency, and the fact that our organization has been around for some time, delivering high-quality products and good service, had led several local authorities to start specifying products made from recycled materials in their tender documents. Of course they cannot request our products but it is a step in the right direction.'

The material characteristics – maintenance free, non-rotting, resisting vandalism, immune to infestation by insects and salt water resistance – make it ideal for the outdoor/marine environment. Hence the product focus is on outdoor furniture – benches, bollards, street signs – and other outdoor products such as children's play environments, fencing and decking products for wet environments (band revetments, floating pontoons, fendering, etc.). DPR also supply people/companies with 'raw material' for them to do their own furniture.

The team at Dumfries are keen to identify new applications and product ideas for Plaswood material. One recent move was to add different colours. Kim comments, 'Originally all of our products were black. Since we have developed brown Plaswood in addition to the black, the market for fencing has taken off.' They have just started the production of some Plaswood products in brighter colours such as yellow, green, red and blue, which gives the customer more choice and makes them particularly attractive for playgrounds and nurseries. Early in 2001 DPR introduced a new product called Post Saver. Post Saver is a boot of recycled plastic lined with bitumen which can be heat-shrunk onto a wooden post which means that the part of the post that is underground is protected and hence less likely to rot. Environmental concerns had motivated the product, as previously posts had to be treated with a highly toxic wood preservative containing copper chrome and arsenic.

Fancy a Sturdy Kung Fu Partner?

Dummies, traditionally made from wood, are an important part in Kung Fu training. When Simon Brooker, dedicated Kung Fu disciple, wanted to acquire his own he ran into unexpected difficulties: price, quality and size were not encouraging. Having heard about Plaswood he approached DPR who were, while initially sceptical, happy to help. Assuming that more people were struggling with traditional wooden training dummies, he set-up his own company, Immortal Creations, now selling four variations.

While this was all very exciting, and DPR had just finished a record quarter, there were some concerns. Plaswood was not a cheap material, neither was production, so consequently nor were any products made of it. In fact, while they were much easier to maintain and of longer durability (expected lifetime is a minimum of 50 years), they would sell at about the same retail price as hardwood. In addition, despite the advantages, many customers would still prefer wood to plastic, and Kim points out, 'One of our biggest challenges is how to change the consumer's perception of our product.' Andrew points out that 'Manufacturing cost for the products would have to come down by 50–70% to make them commercially viable. To achieve that we would need to increase throughput considerably.' DPR had plans to recycle 10,000 tonnes of plastic by 2006. 'But,' Andrew asks, 'would there be sufficient customers for our products?' On top of that recent checks had revealed that the washing plant in Dumfries had lost between £500k and £1 million between 1994 and 2000.

QUESTIONS

1. Putting yourself in Andrew's shoes, what decisions would you take regarding Dumfries Plastic Recycling?
2. What are factors underpinning success for 'green' products?
3. Discuss the difference between 'green' and 'sustainable'?

APPENDIX I: ALTERNATIVES TO RECYCLING

(Source: bpi website)

1. BIODEGRADABLE PLASTIC

Biodegradability is an exciting and potentially very useful technology used in the correct applications. However, until EC standards are set any manufacturer of biodegradable products can make untrue and misleading claims about their products. This means that some degradable products may be marketed for use in inappropriate applications. Currently, biodegradability is suitable for products which will be composted, not for products going to landfill or being recycled where the effects of biodegradability on the recycle are unknown. Biodegradability is expensive. Environmentally it is acceptable in some specific applications but at present it is generally undesirable.

2. CALL FOR INCINERATION

Incineration might be an alternative to landfill, but there is some public resistance against it; it is a question of education. Arguments for and aspects of incineration include:

- Is safe and clean; modern plants control emissions by the installation of devices such as acid gas scrubbers, bag filters and electrostatic precipitators
- A minimum temperature of 850°C is needed
- Incineration converts nearly all carbon to CO₂, while in landfill under normal conditions methane is predominantly formed; methane gas contributes to the greenhouse effect 30 times more than CO₂
- Incineration of municipal solid waste (MSW), i.e. domestic refuse, drastically reduces the volume of waste by up to 90%
- Plastics have a calorific value greater than coal, make up 7% by weight of MSW, and produce 50% of all energy produced during incineration, making plastic a vital component of MSW (Switzerland, Denmark and Sweden rely heavily on energy recovery from waste)
- Plastic waste can also be used to manufacture high calorific fuel pellets, termed Refuse-Derived Fuel; RDF can be transported and stored and are used to generate heat for industrial processes

APPENDIX II: RECYCLING AT bpi

The six recycling related sites and their activities are:

<i>Dumfries</i>	Washing plant; production of rigid products from recycled plastic. 100% is post-use
<i>Stockton</i>	Refuse sack plant; processing about 12,000 t/year of refuse sacks; selling mainly to the NHS; the plant process bpi scrap; bpi own the site

<i>Heanor</i>	Used to be part of bpi retail; recycling has taken over half of the site since January 2001; this plant too is scrap based, scrap here comes from inside bpi as well as outside; the washing plant at Heanor has been mothballed
<i>Stroud</i>	Production of flat sacks for local authorities; part of company since 1987; also scrap based, some stems from Dumfries and more is bought from other companies within the UK
<i>Rhymney</i>	Production of building films from 100% recycled plastic about 60% of which is post-use
<i>Witney</i>	Production of building dampproof course from 100% recycled plastic about 80% of which is post-use

