



Creating markets for recycled resources

Optimising the Value of Recovered Fibre

Project code: PAP0020

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1 Executive summary

The overall objective of this study was to assess whether there was value in further sorting recovered fibre. Value would be realised if the costs of collection and sorting of paper justified the revenue received from the sale of the recovered paper. This assessment has been undertaken for household and office paper.

1.1 Background Data

Data illustrates that the UK collection rate has increased from 41% to 51% of paper consumed between 2000 and 2003. The majority of this was utilised by UK paper mills, with the surplus paper exported to mainland Europe and the Far East. Figure 18 shows the recovered fibre flows for 2003, estimating the type and quantity of different recovered paper grades that are used in the manufacture of newsprint, printings & writings, packaging and tissue.

1.2 Collection from households

The collection of recyclable material from households is increasing, a trend strongly led by Local Authorities as they aim to meet their statutory recycling targets. The fastest growth is seen in the kerbside collection of recyclables, with at least a quarter of authorities providing a co-mingled collection where paper is collected mixed with recyclable packaging. The sorting of co-mingled recyclables at a Materials Recovery Facility (MRF) adds between £12 and 27/tonne to overall collection costs. More detailed work needs to be done to refine these figures however useful data is provided in the report which can be used when comparing individual systems.

An increased quantity of paper is generally collected through a co-mingled scheme compared with a source separated scheme. As the quantity of paper collected increases in the UK, a wider range of paper types is collected. A consequence of this is a need for sorting. A detailed discussion is provided in the report on the range of collection and sorting schemes provided in mainland Europe for comparison purposes. Based on practice and experience in these countries, the UK should see:

- An increased requirement to sort out the white paper and paper packaging component (possibly up to 20-30% of the total paper stream) to ensure a clean news and PAMs stream
- Introduction of mechanical old corrugated carton (OCC) screening plus complimentary manual sorting to increase handling capacity and reduce the need for fully manual sorting at a MRF

The UK's current capacity for recovered fibre is full and therefore additional collected paper will be exported in the shorter term. The demand for recovered paper from the Far East is currently high, allowing this surplus to be accommodated.

1.3 Collection from offices

There is a large amount of office paper that is not currently collected which has potential to be a high value recovered fibre stream. As there are no statutory recycling targets for office waste, the difference in the cost of recycling compared with the cost of disposal is a key driver.

There are a wide range of costs for collecting office paper. In the UK, woodfree fibre, such as copier paper, is most commonly collected from offices. Low-tech sorting of mixed papers can be achieved at an estimated £16/tonne, implying that this is worth undertaking if collection costs can be kept low. This will usually require collecting either a large amount of paper or collecting from a high density area of offices. The cost of collecting and sorting a limited, clean source of office paper compared with a mixed stream still needs to be assessed.

In several European countries, increased waste disposal costs have enabled companies to charge for paper collections. If the types and volumes of office paper collected increases, the likelihood of more contamination would increase and sorting may increasingly be necessary.

There are two current approaches to the collection of office paper:

- Limiting collection to woodfree paper (i.e. copier paper). No sorting is carried out and classification of the grade of recovered paper takes place at a paper merchant/baling centre
- A broader collection from offices of woodfree and mechanical papers, including envelopes, binders, brown paper etc which would normally be sorted

Where sorting is conducted it is almost always undertaken manually but optical sorting technology has been tested in several countries and may become a complementary stage to manual sorting in the UK.

1.4 Conclusions

This report provides indicative sorting costs for mixed household papers, however more detailed work will need to be done to refine these figures and to ensure local circumstances can be incorporated. For office paper, basic manual sorting is likely to cost effective. As there is strong demand for all these papers on the export market as well as continued UK demand, currently there is value in further sorting mixed paper.

2 Introduction, background and aims of the study

The main objectives for the study are to assess:

- the potential for recyclers to improve sorting and/or collection to optimise the value of recovered fibre
- the potential for paper mills to use the higher value fibre

The focus of the study is on the two main opportunities for optimising the value of recovered fibres, which are to:

- improve the sorting of recovered fibre from the household stream
- to increase and improve collection/sorting from offices.

The study objectives are linked as the mills provide the main customer base for the recovered fibre. It should be noted that the UK is already a net exporter of recovered fibre and additional tonnes collected, in the near future, are thus likely to increase the quantity exported.

As part of this investigation a number of interviews have been conducted with a range of companies and interested parties from collection through to the end users (paper mills). Available data both published and from a previous WRAP survey have been analysed and has been used to form, and substantiate, the conclusions drawn in this document.

The work has been led by Mr Nippe Hylander from the ÅF group. Mr. Philip Hartwell, PRH Ltd has been responsible for and conducted the UK visits and interviews. Mr Nippe Hylander, assisted by Mr Peter Gitzen, ÅF Celpap GmbH, Germany, and Mr Jean Francois Ramusat, ÅF Chleq Froté, France, conducted interviews in other European countries. Mr Richard Harris, NLK Associates has covered issues relating to recycled fibre availability and price.

3 Recovered fibre utilisation – export, import and historical trends from a UK perspective

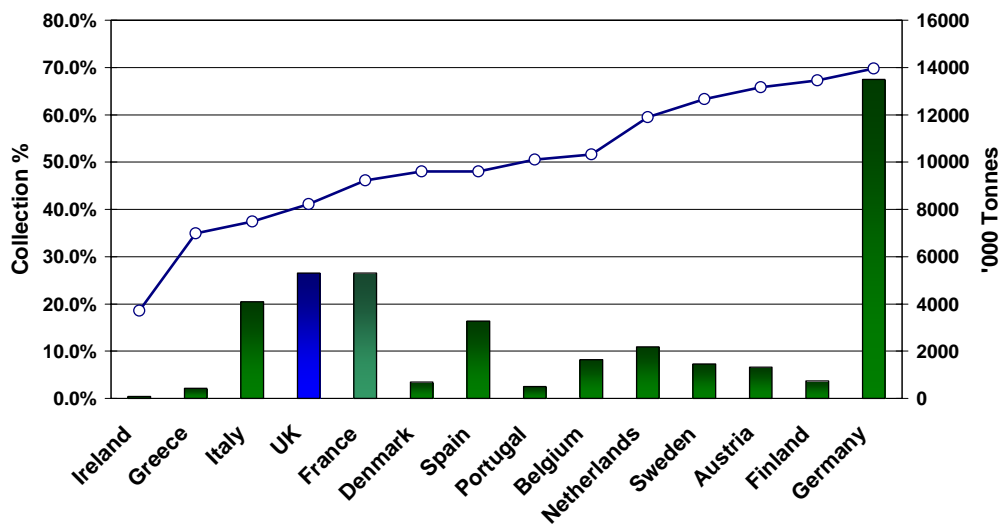
3.1 Trends in collection and utilisation of recovered fibre

In this section background information is presented to show how recycling within the UK fits within the broader context of Europe and commentary is provided on the situation over the last couple of years.

Our research illustrates how collection has grown, while utilisation in the UK has shrunk leading to a surplus of recovered fibre and a consequent growth in the export market. This study investigates the potential to increase the value of UK recovered fibre as a raw material through improvements in sorting, and investigates the opportunity to increase the quantity of paper collected from offices.

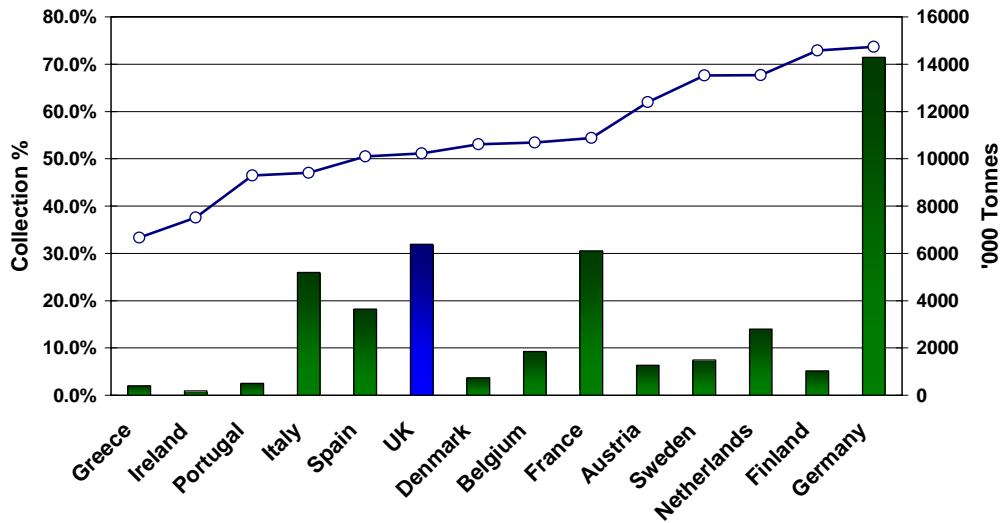
Figure 1 illustrates how much recovered fibre was collected in Europe three years ago (2000 statistics). In the following chart, Figure 2, we show how the picture has changed today (2003 statistics).

Figure 1: Collection of Recovered Fibre in Europe, 2000



Source: Cefi Statistics

Figure 2: Collection of Recovered Fibre in Europe, 2003



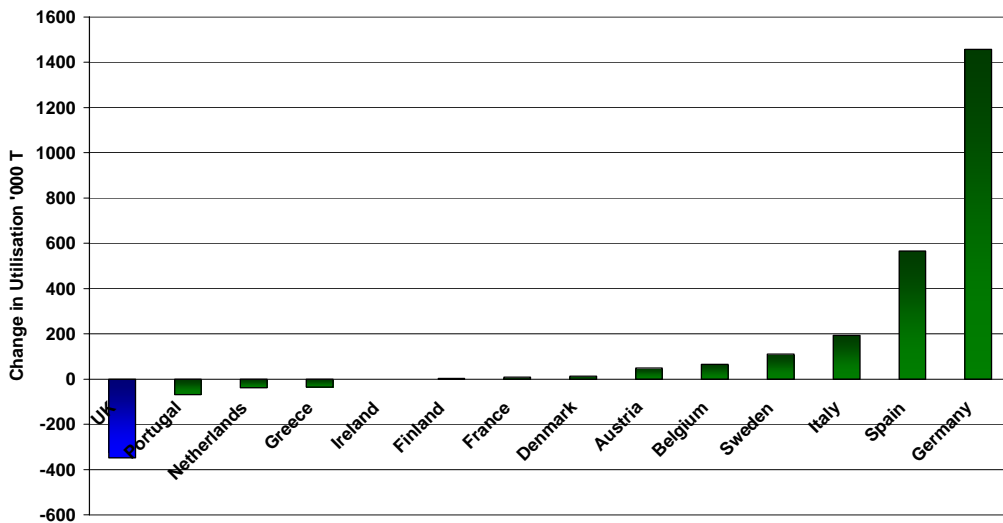
Source: Capi Statistics

This pair of graphs clearly shows how collection rates have increased across all of Europe with slightly shrinking differences between countries. The UK shows one of the largest increases in collection rate and some improvement of its ranking relative to other countries.

The total collection rate for all grades of recovered fibre in the UK in 2000 was 41%; by 2003 this had risen to 51% and is still continuing to rise. This represents an increase in the quantity of recovered fibre collected of over one million tonnes.

However, the same progress has not been achieved for utilisation, which is shown in the following chart, Figure 3. Here it can be seen that, in terms of improving utilisation of recovered fibre between 2000 and 2003, the United Kingdom has been the worst performer in Europe, with a net decrease of 349,000 tonnes. This decrease is as a result of the closure of a number of packaging mills and no investment in new mill capacity.

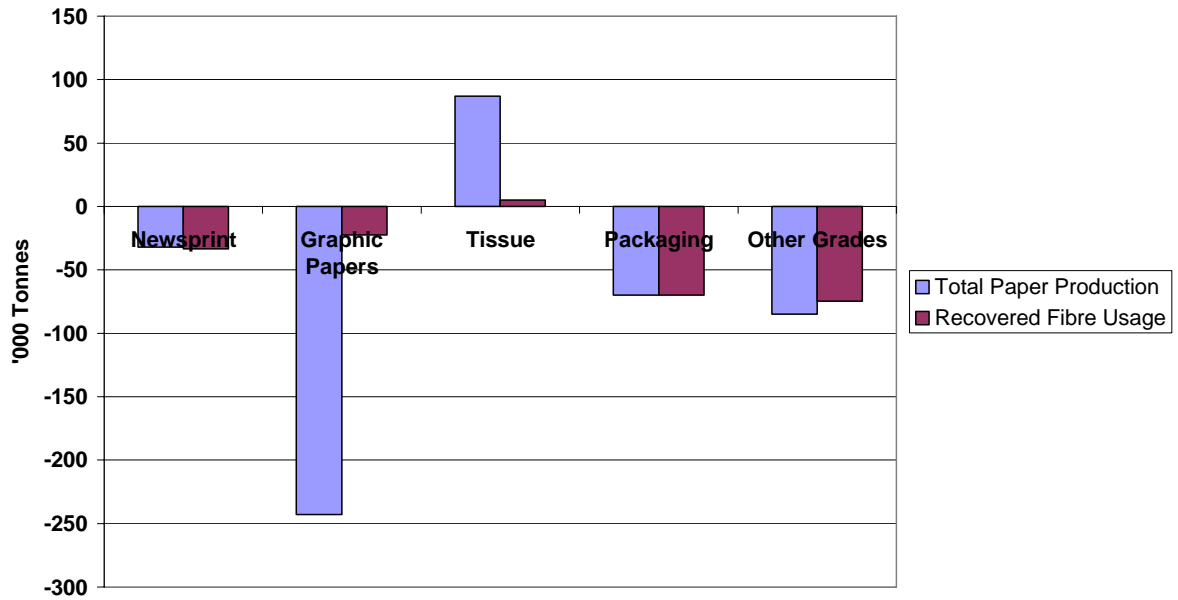
Figure 3: Change in Utilisation of Recovered Fibre in Europe 2000 - 2003



Source: Capi Statistics

The change in production and use of recovered fibre by grade between 1999 and 2003 is shown in Figure 4.

Figure 4: Changes in Utilisation & Production in UK 1999 - 2003



Source: Cefi Statistics

It can be seen from this graph that all sectors of the UK production except tissue have decreased since 1999. These decreases have caused a corresponding drop in the quantity of recovered fibre used.

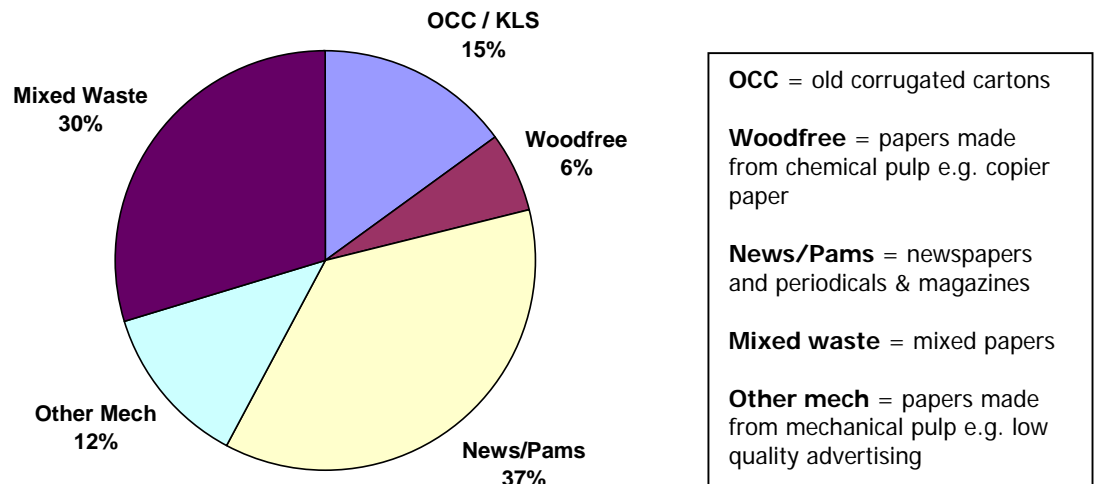
Tissue is the only exception where there has been some growth in production. However, this growth predominately uses virgin fibre, so the utilisation rate of recovered fibre has fallen from 69% to 63% over this period.

The increase in collection rates combined with the decrease in utilisation as has led to large surplus of recovered fibre in the United Kingdom and consequently a growth in the export of recovered fibre.

3.2 Trends in the export of recovered fibre

The total amount of recovered fibre exported in 2003 is estimated to be 1.86 million tonnes. The total collected was 6.613 million tonnes of which 4.753 million tonnes was utilised by the UK paper industry and the surplus was exported. The export is split by recovered grade in the pie chart shown in Figure 5.

Figure 5: Export Market by Grade, 2003 (total amount exported = 1.86 million tonnes)

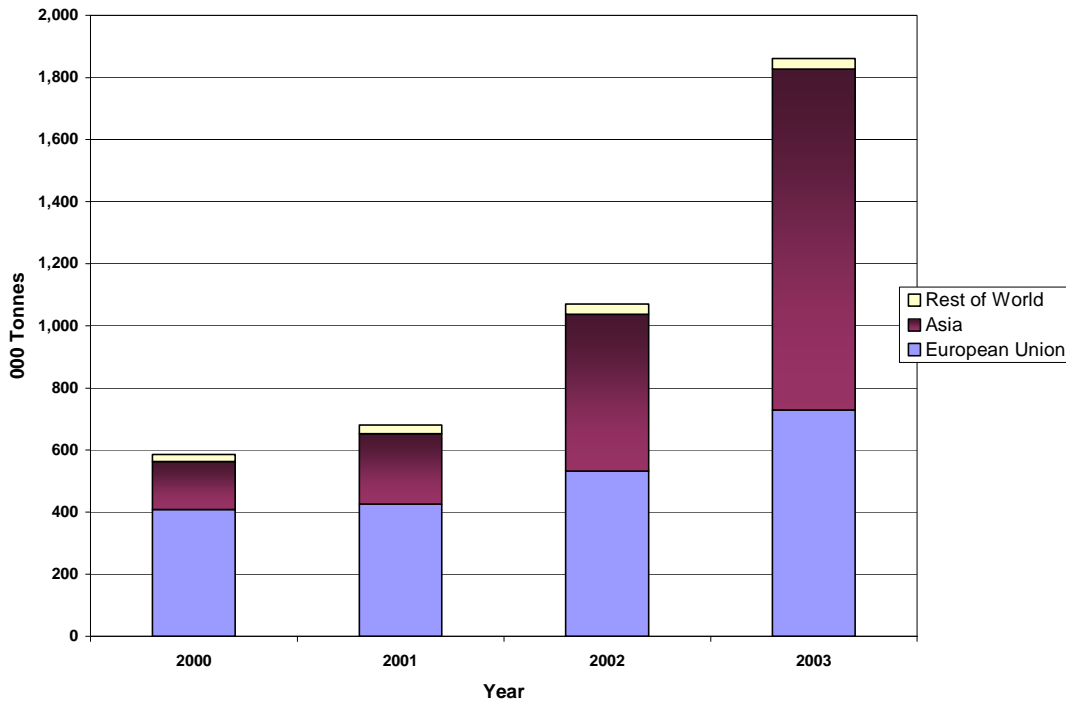


Source: Customs & Excise & Cepi Industry Estimates

Figure 5 shows that Mixed Waste and News and PAMs account for the largest volume of exports. The volumes of Woodfree and Other Mechanical Papers that are exported have dropped significantly since 2002. The shares should be taken as indicative, although based on official export figures, since the Customs and Excise definitions do not fully correspond with the definitions of Groups G 1 - 4 (mainly Woodfree but some Wood containing in G 3). The 'Group' categories were those used by the UK recovered paper industry up until 2003, before EN643 classifications were introduced. Statistics relating to rcf in the UK are still only available using the Group definitions. A table cross referenced to the new European grading system (EN643) is provided in Appendix 1.

The distribution of exports by geographical region is shown in the following chart, Figure 6 that clearly shows the importance of the European Union and Asia as export markets for UK recovered fibre. It also shows that the main growth has been in the export to Asia.

Figure 6: Export Market Trend by Geographical Area, 2003



Source: Cepi, Customs & Excise

Of the recovered paper the UK exports to the European Union, the greatest quantities are exported to France (219 thousand tonnes), followed by the Netherlands (134 thousand tonnes) and Sweden (133 thousand tonnes). Between them these three countries account for two thirds of the UK's European export. News & Pams are predominantly exported to Europe and the mixed paper is predominately exported to Asia. The growth in export to Asia coincided with the growth in exported mixed paper, which has increased by 76% between 2002 and 2003. The unsorted mixed paper is either sorted on arrival or used directly as mixed paper.

3.3 Conclusions for historical analysis

From this analysis it can be seen that there has been a trend for collection rates to increase, mainly due to the recycling targets imposed on local authorities in recent years. It is anticipated that this trend will continue and that the quantity of recovered fibre collected will continue to rise.

During this period, utilisation of recovered fibre by the UK paper industry has fallen due mainly to decreases in overall production. This has led to a situation where the current utilisation of recovered paper in the UK, is significantly less than the total amount recovered.

The UK already has one of the best utilisation rates for recovered fibre in Europe and it is unrealistic to expect dramatic increases in utilisation rate from the current position in the near future. To increase the actual tonnes utilised substantially additional production capacity is required. This will take both large capital investment and time to implement.

In the near future, as collection rates continue to increase, the principle recycling route will be the export market.

4 Potential for mills to increase their use of recovered fibre

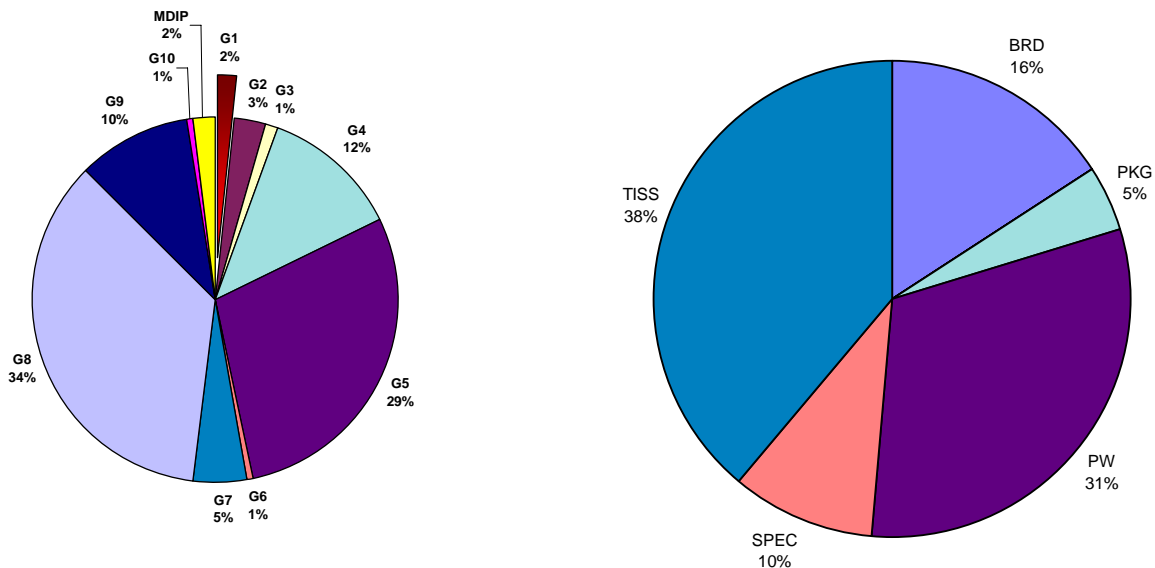
4.1 Types of paper collected and where it is used in UK paper manufacturing

As discussed in the introduction, usage of recovered fibre in the United Kingdom has been decreasing in the past few years. This is partly due to a decrease in paper production in the UK of 529,000 tonnes between 2000 and 2003 and partly due to reduced utilisation by the mills, in particular in the tissue sector.

The following set of charts show which sectors of the industry are using the various grades of recovered fibre. The data is presented using the old United Kingdom grading system for recovered fibre groups. A table cross-referenced to the new European grading system (EN643) is given in Appendix 1. For each recovered fibre group, a common chart is given on the left, highlighting the percentage this group comprises for all paper grades. The chart on the right illustrates where this fibre is used in the manufacture of new projects. These products are as follows:

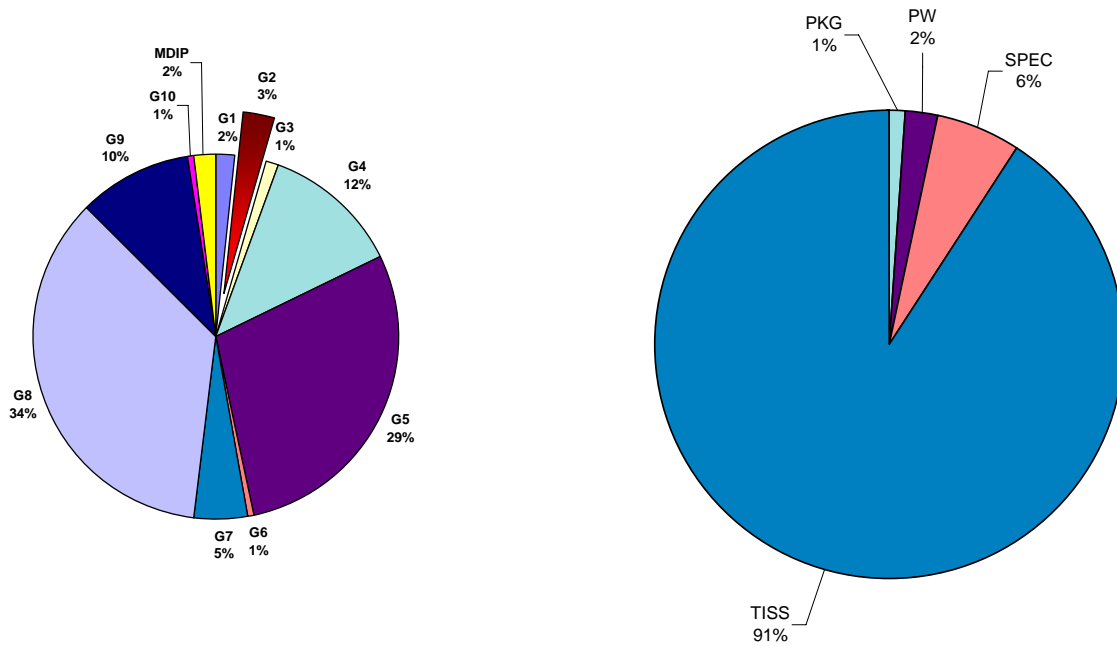
- BRD – board
- PKG – corrugated packaging
- PW – printings and writings
- SPEC – speciality papers
- TISS – tissue

Figure 7: Group 1 (white woodfree unprinted, printers off cuts, etc.)



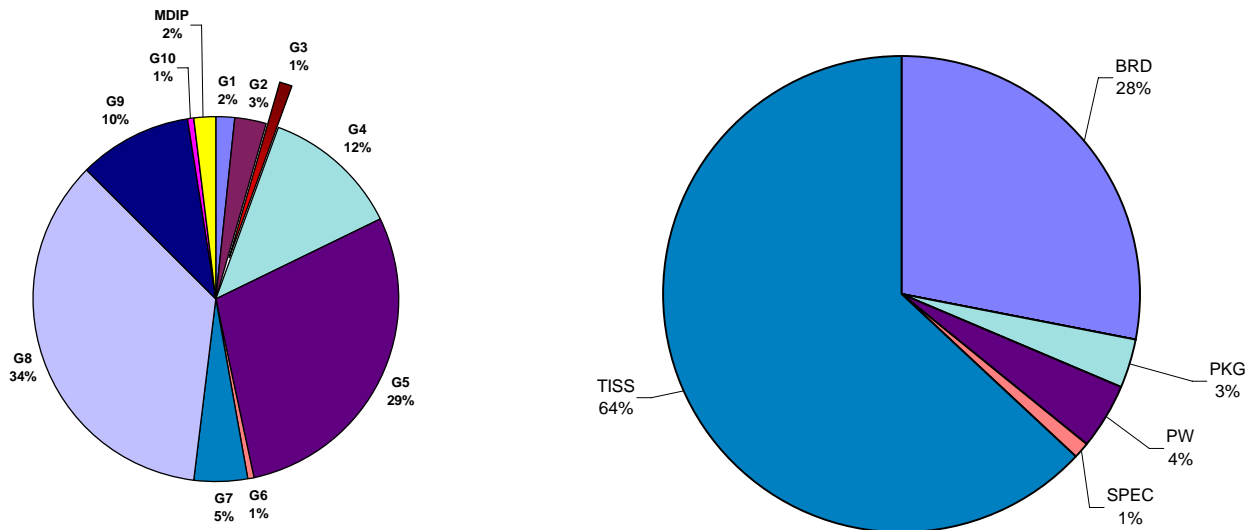
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 8: Group 2 (white wood free printed stock, B&W pams, white heavy letter, etc.)



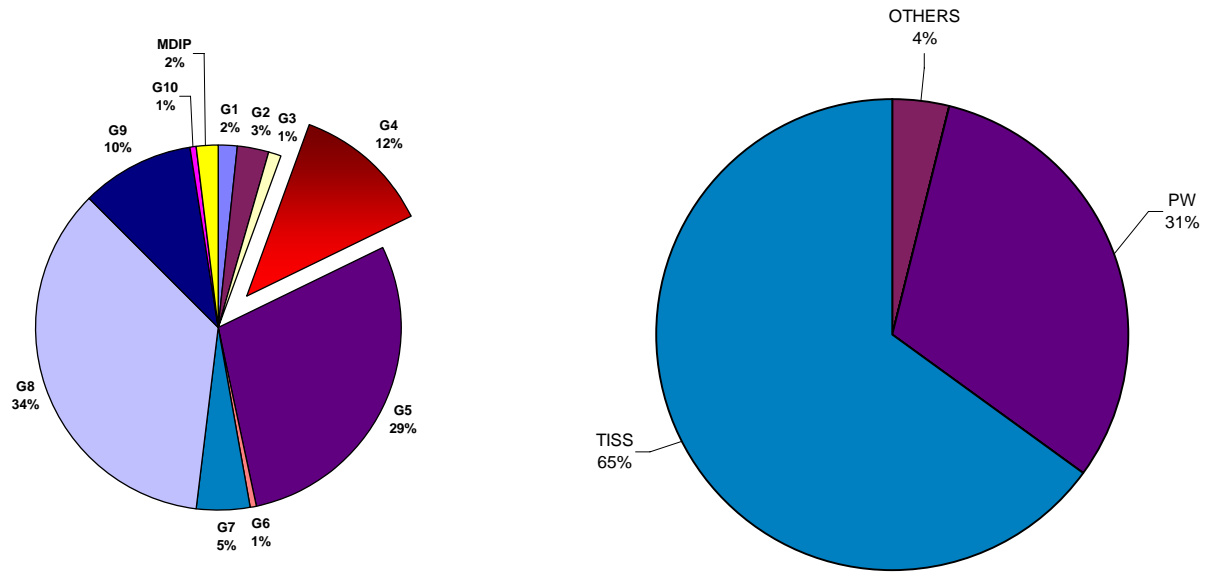
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 9: Group 3 (white and lightly printed wastepaper, mainly wood containing, unprinted newspaper, etc.)



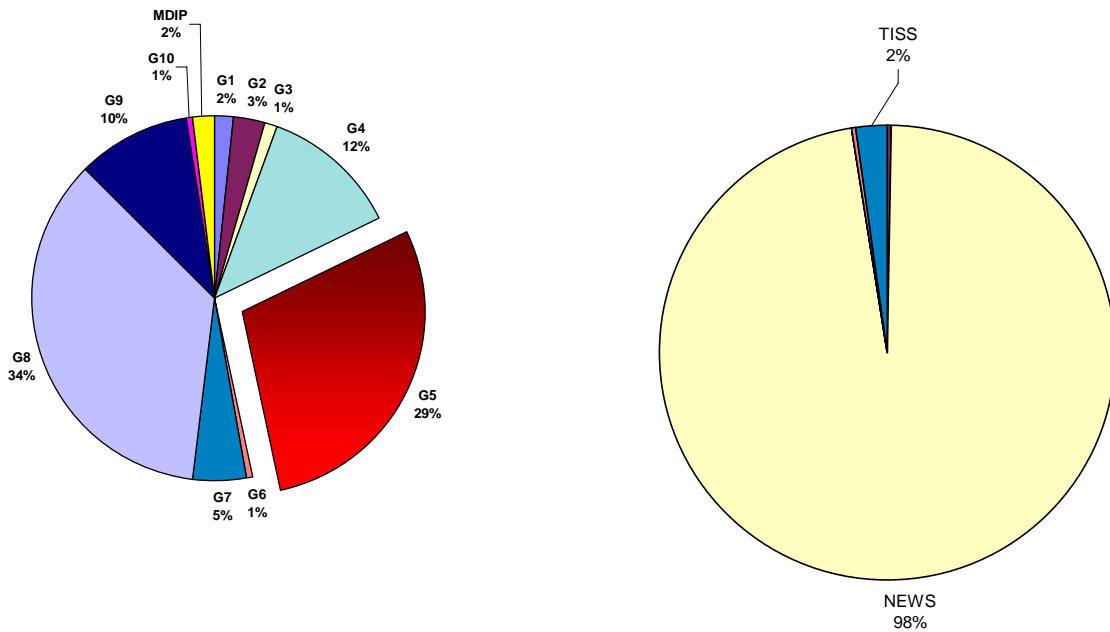
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 10: Group 4 (coloured woodfree stock, coloured pams, coloured heavy letter, etc.)



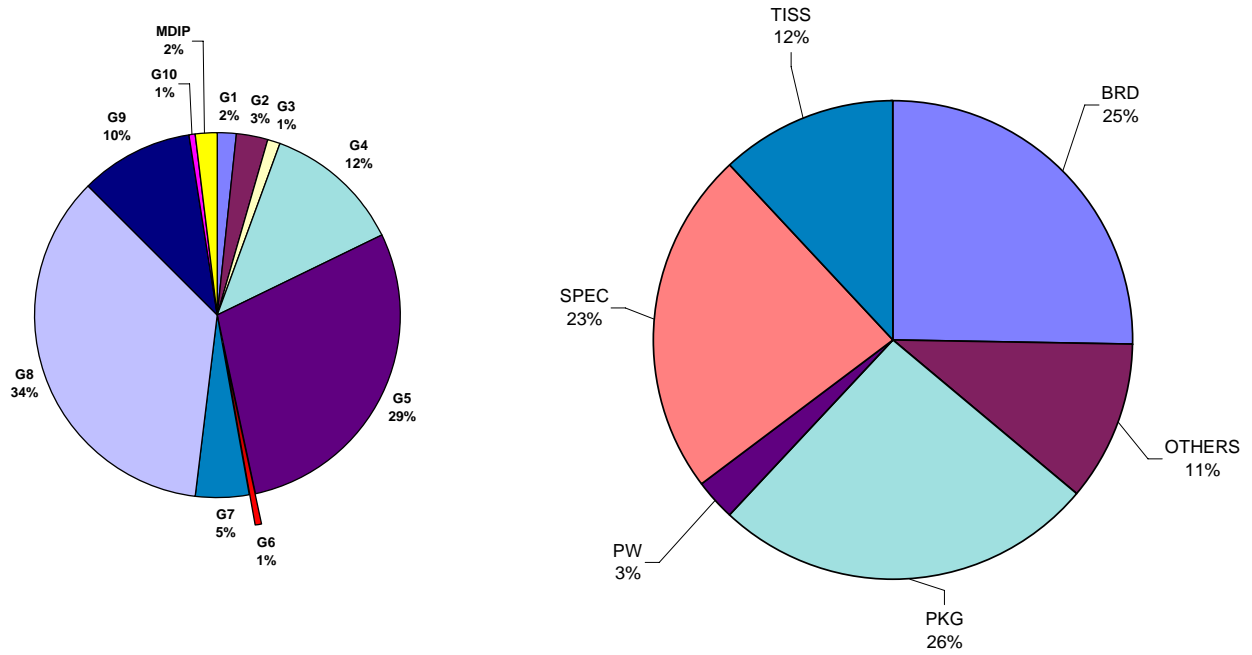
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 11: Group 5 (heavily printed mechanical paper, old newspaper, over issue news, etc.)



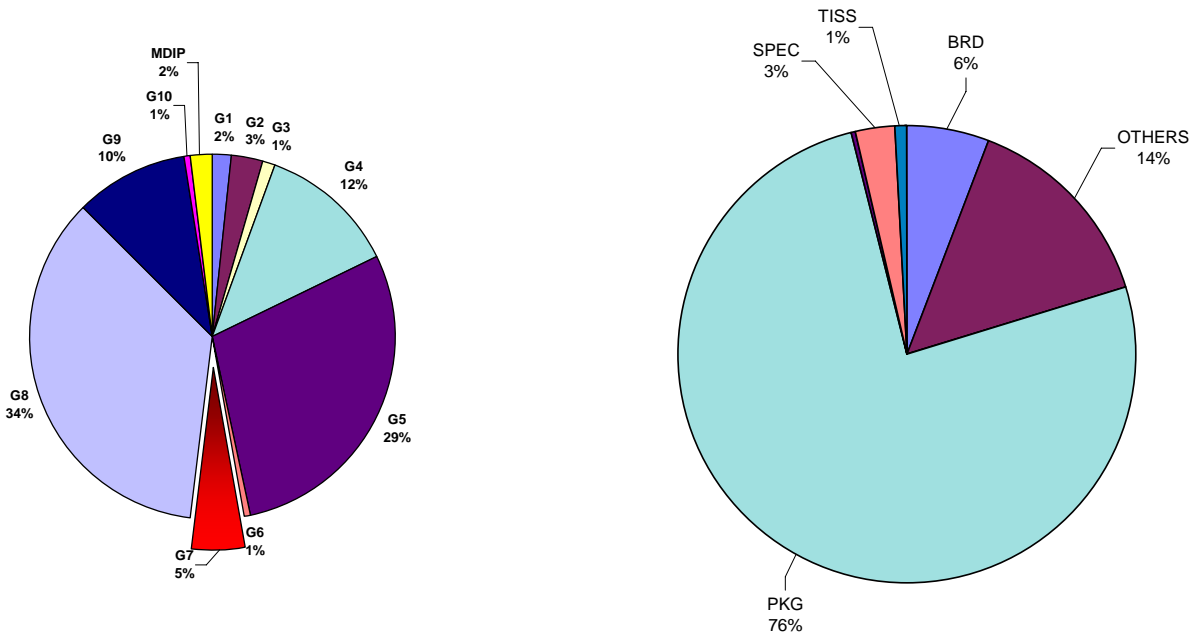
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 12: Group 6 (coloured kraft and manilla, envelope cuttings, kraft sacs, etc.)



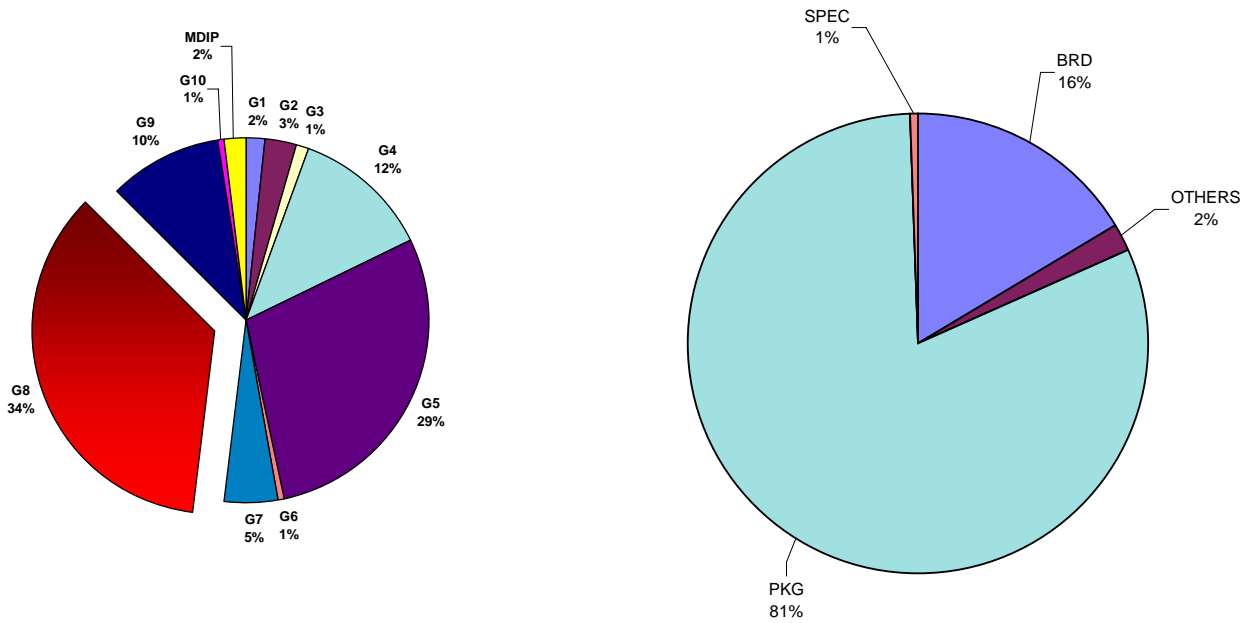
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 13: Group 7 (new kraft liner cuttings, converting off cuts, etc.)



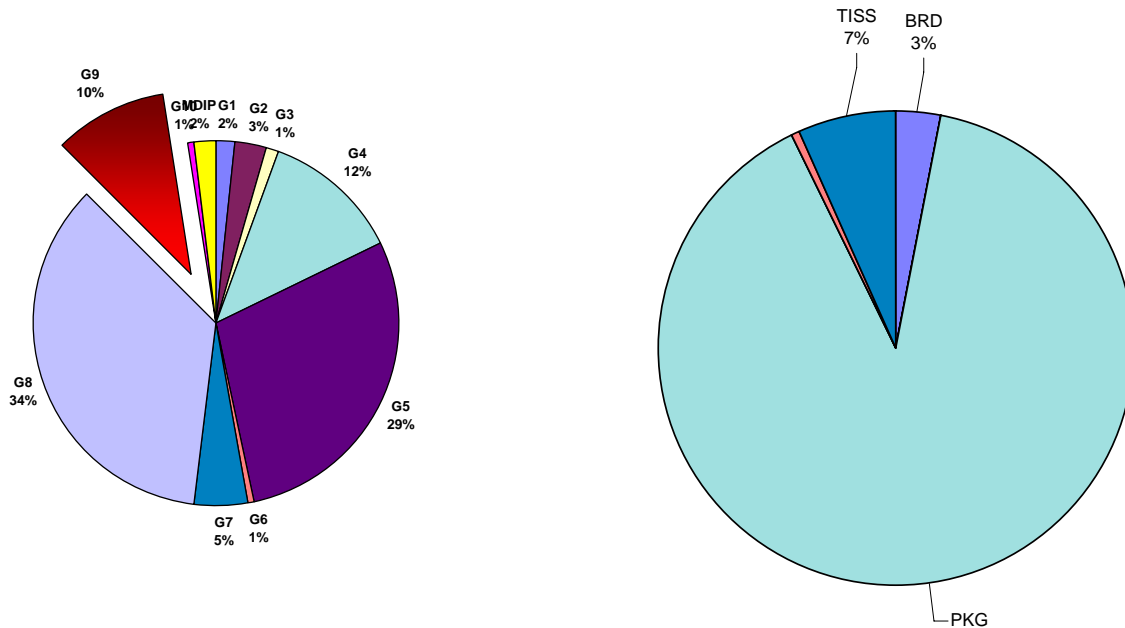
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 14: Group 8 (container waste stock, cardboard boxes and solid fibreboard)



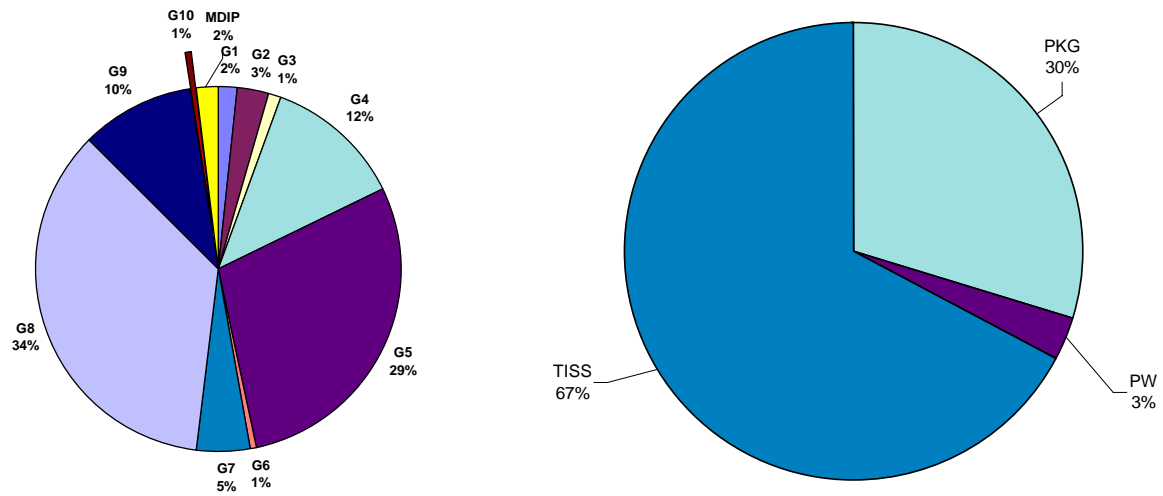
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 15: Group 9 (mixed waste paper)



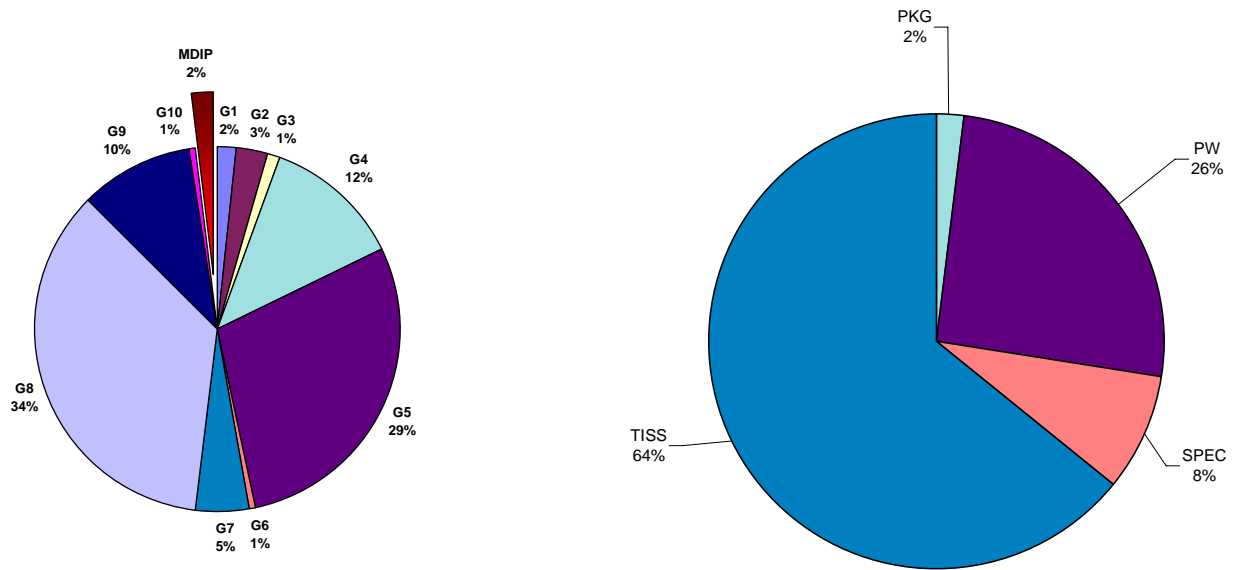
Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 16: Group 10 (coloured card stock, unprinted card, white lined boxboard)



Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

Figure 17: Recovered Fibre Usage: MDIP (Both from the UK and imported)



Source: UK Paper Mills: Review of current recycled paper usage Secondary Fibre Study (WRAP report 2002)

From these charts it can be seen that the largest volumes of rcf are in group 5 (old newspapers) and group 8 (old cardboard boxes); these represent nearly two thirds of the total fibre collected. These two groups are relatively simple in terms of recycling structure. Taking group five first: the newsprint mills use 98% of the old newspapers that are recycled in the UK. This demonstrates a virtually closed loop system with recovered newspapers being used to make new newsprint. The remaining 2% of newspapers recycled in the UK are estimated to be collected as mixed paper and used in packaging manufacture. In addition, a significant proportion of old newspapers are also exported for recycling.

Group 8 is another example of this type of closed system with old corrugated boxes being predominately used by the packaging and board industries to make new boxes or solid board. In this case 81% is used to make corrugated boxes and 16% in the board industry, giving a total of 97%. Old corrugated boxes are also exported for recycling.

Groups 1 – 4 (which contain the woodfree papers and office waste) can be looked at together because they contain fibre of a similar nature. They are used predominately by the tissue and printing and writing sectors. Taking the total utilised fibre from groups 1 to 4 together, 66% is used by the tissue industry and 26% is used by the P&W sector.

The next biggest group is mixed waste paper, 90% of which is used by the packaging industry.

The remaining groups are much more diverse in their use but when all seven of them are added together they only account for 15% of the fibre utilised.

4.2 Analysis of fibre flows in the UK

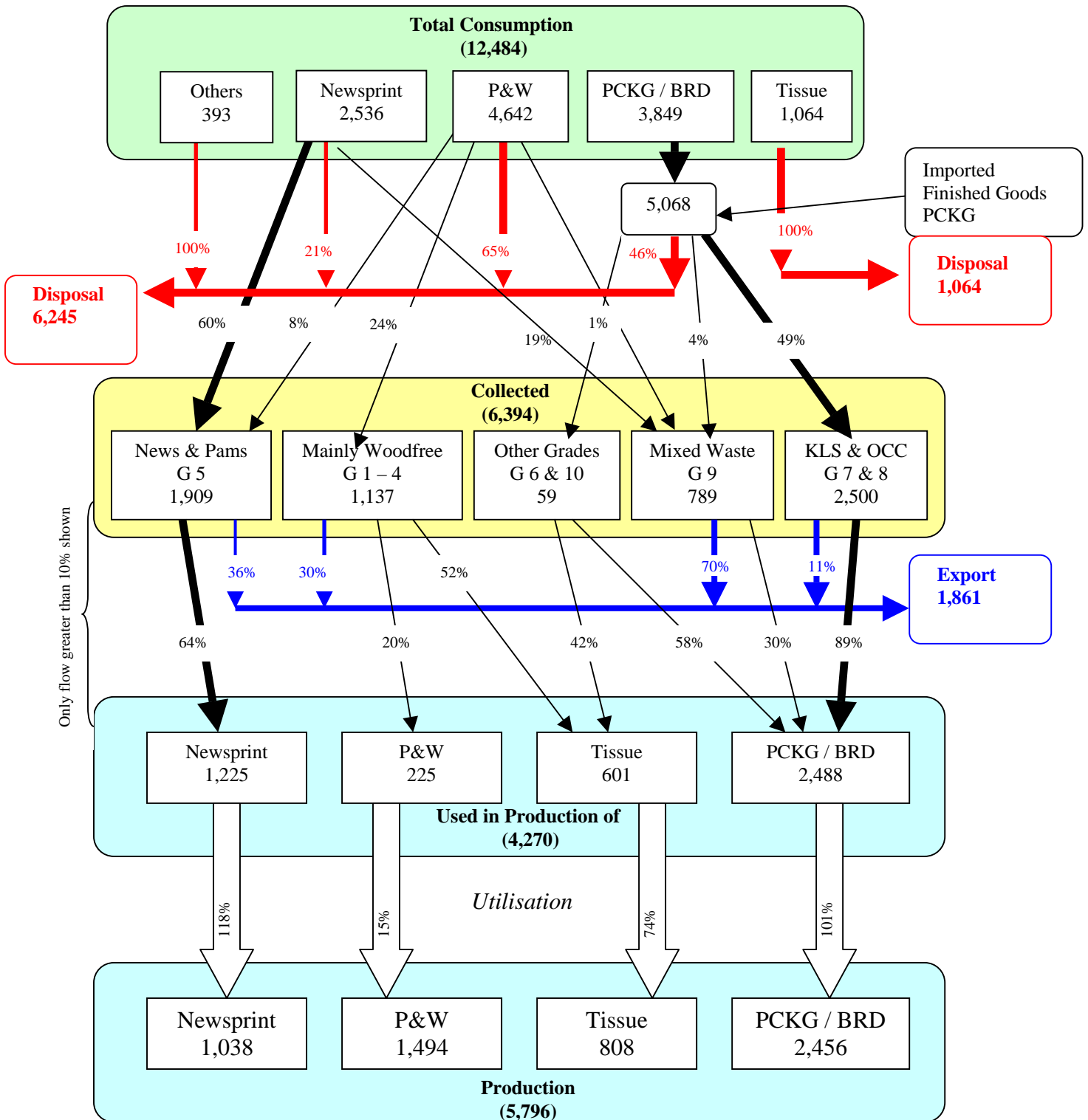
To add a further perspective to the patterns of use of recovered fibre, the following diagram (Figure 18) shows an analysis of the main fibre flows in the United Kingdom. It is based on Paper Federation and Cepi statistics for 2003, backed up by data from a survey undertaken for WRAP in 2002 and analysis of the composition of the household waste stream supplied by Project Integra. This is a mature partnership of 14 Councils in Hampshire plus Hampshire Waste Services (now Onyx Hampshire), aimed at delivering an integrated household waste strategy. Project Integra has been in operation for 10 years and has undertaken comprehensive waste compositional studies to inform the development of recycling schemes.

The following assumptions have been used for the production of this chart:

- The relative proportions of the various grades of recovered fibre being used by the Paper Industry sectors today are still in the same ratio as they were in 2000 i.e. the relationships shown in the charts Figure 7 to Figure 17 are still valid
- The mixed waste grade comes predominantly out of the household waste stream
- The composition of the household waste stream, averaged for the whole of Hampshire, is for the purposes of this exercise, considered as representative of household waste for the UK as a whole. This survey is a substantial piece of work and appears reasonably representative of the UK, containing a mixture of urban and rural environments

The chart illustrates the quantity of paper consumed in the UK, what proportion of this is collected and how it is utilised in the manufacture of new paper and board.

Figure 18: Recovered Fibre Flows, 2003 ('000 Tonnes)



Archive papers are excluded (both input and output, which should eventually be equal)
 Speciality virgin fibre only grades are excluded (not included in the 'other grades' collected)
 Source: Cepi Statistics, Federation Statistics, Mill Survey 2000, Integra, VALPAK, PRH Ltd

4.3 Current patterns of usage of recovered paper

As part of this study a number of mills were interviewed to establish current patterns of use of recovered fibre and also to see whether the views they expressed in the survey carried out for the previous WRAP study have changed in any way. As part of this study, twelve recycling companies, eleven paper mills and six organisations/local authorities were interviewed.

The general impression from the interviews with paper mills is that the last two years have been a difficult period for the paper industry in general, and for recyclers in particular.

The comments made are summarised by industry sector below:

Packaging

The packaging mills surveyed did not have any major concerns with quality of recovered fibre; price and availability were the main issues that they mentioned. One expressed that the future availability of good quality recovered fibre is a main concern.

Newsprint

The third deinking plant at Shotton has enabled the newsprint sector and local authorities to develop collection infrastructure with more confidence in order to supply the increased fibre demand. This increase is being supplied largely from the household stream, with a number of new kerbside collection schemes being instigated.

One current issue for the newsprint industry is the growth of co-mingled collection in addition to segregated collection systems. Evidence from work previously conducted by WRAP indicates that a well managed co-mingled stream can produce fibre that is as clean as fibre that has been segregated at source. However, the more contaminated the source material the more scope there is for contraries to pass through the sorting process and contaminate the newsprint. Views were expressed that the UK newsprint industry would struggle to exist if the collection was 100% commingled and comments were made on the possibility of a two tier pricing structure in the future.

Tissue

Almost all the tissue mills had slightly reduced the quantity of recovered fibre since last surveyed in 2000. Furthermore, none of the tissue mills surveyed were using or planning to use recovered fibre from the household stream.

A repeated message from all mills was that legislation such as climate levy, energy costs, landfill costs and rising transport costs are all reducing the incentive to recycle. From the perspective of many single mills, recycling already means increased use of energy and more waste generation compared with using virgin pulp so any increased costs resulting from the items mentioned above did not encourage greater levels of recycling.

4.4 Conclusions on potential to use more recovered fibre

Recycling activity and utilisation of recovered fibre in the UK paper industry differs by sector:

Packaging

This part of the industry is already a very big user of recovered fibre, with most mills already producing 100% recycled product. Where this is not the case, the use of virgin fibre is a result of specific product and strategic policies. The potential to substantially increase utilisation in this sector can only come from increases in capacity. Long term there could be room for a big new test liner/medium mill, in line with the present development of industry structure in continental Europe, where new machines with 300 – 600 000 tpa capacity are built, partly at the expense of closing smaller machines.

Newsprint – The newsprint sector is already 100% recycled and increased utilisation can only come through increased capacity. Theoretically there could be room for a new paper machine since the import share of newsprint is more than 50% (higher than several other comparable EU countries) but this is clearly a strategic decision from the big dominating multinational newsprint producers. This will be strongly influenced by the fact that several new rcf newsprint mills have or are coming on stream in other European countries and the fact that growth in demand for standard newsprint has levelled off.

Tissue

The current economic climate, environmental costs such as climate levy, energy costs, landfill tax and fuel taxes together with a low pulp price all seem to have discouraged further development of recycling in the tissue sector. In addition to this the current market trend is for the high end, soft products that are predominately made from virgin fibre. The possible willingness to expand existing DIP-plants or to buy market DIP pulps will be strongly pulp price dependent.

In March 2004 SCA announced that it is planning to invest 33 MEuro in its tissue mill Prudhoe, Northumberland to rebuild one of the three existing PM's (today total 86 000 tpa) in order to upgrade quality. It also involves a rebuild of the recycling plant to guarantee sufficient DIP (de-inked) pulp quality from mixed office waste and a capacity increase from 52,000 to 60,000 tpa. Long term there is a plan for the UK operations to increase the utilisation of recovered fibre by 100,000 tpa, provided that mixed office waste with >70% woodfree can be sourced in the UK (personal communication with an SCA official in Sweden).

Printing & Writing

Recycling activities in this sector are currently dominated by the New Thames Mill, operated by M-Real. The remainder of the sector has shown a willingness to use more deinked pulp if a competitively priced, high quality market deinked pulp could be made. However, most of these mills cannot justify installation of their own DIP plants due to the small tonnage required individually. In addition the current tough climate has led to a period of very low investment in this sector in the last few years and plans for any large scale developments seem unlikely in the short term.

When all sectors of the UK paper industry are considered, it is really only the Tissue and P&W sectors that have the capacity to increase utilisation of recovered fibre without increasing overall manufacturing capacity.

None of the woodfree mills surveyed expressed a desire to pay more for a better sorted fibre and the general trend is for mills to accept a lower quality recovered fibre in order to reduce the cost of their raw material. In general this sector is not interested in obtaining fibre from the domestic stream for hygiene and cleanliness reasons.

The possibility of a two-tier price structure for recovered newsprint fibre has been raised and could merit further discussion. This would enable the mills to exercise more choice over their raw material and purchase an appropriate blend of quality. It would also provide incentive for the Materials Recovery Facilities (MRF's) and recycling facilities to produce a cleaner product.

5 Potential to add value to RCF – household stream

5.1 Summary of current collection systems in England

In 2002/2003, 3.7 million tonnes of household waste was collected for recycling or composting in England. This was collected using the following routes:

- At civic amenity sites ^(a) and bring banks - banks and recycling centres where householders deposit their recyclables
- Separate collections - kerbside collections of recyclables which are collected separately from the residual waste (including separate co-mingled collections)
- Integrated collections – kerbside collections of mixed recyclables that are collected together with residual waste in the same vehicle
- Voluntary/private collections – material can either be deposited at banks or collected at the kerbside

The following Table 1 gives a breakdown of the different volumes of waste collected for recycling by each of these methods. The majority of recycling is achieved through civic amenity sites and bring banks.

Table 1: Household Waste Recycling in England 2002/2003 - All recyclables

Collection System	'000 tonnes collected	% of all household waste
CA ^(a) & Bring Sites	2,460	9.5
Separate Collection	1,154	4.5
Integrated Collection	91	0.4
Voluntary / Private Collections	37	0.1
Total Household Recycling	3,742	14.5

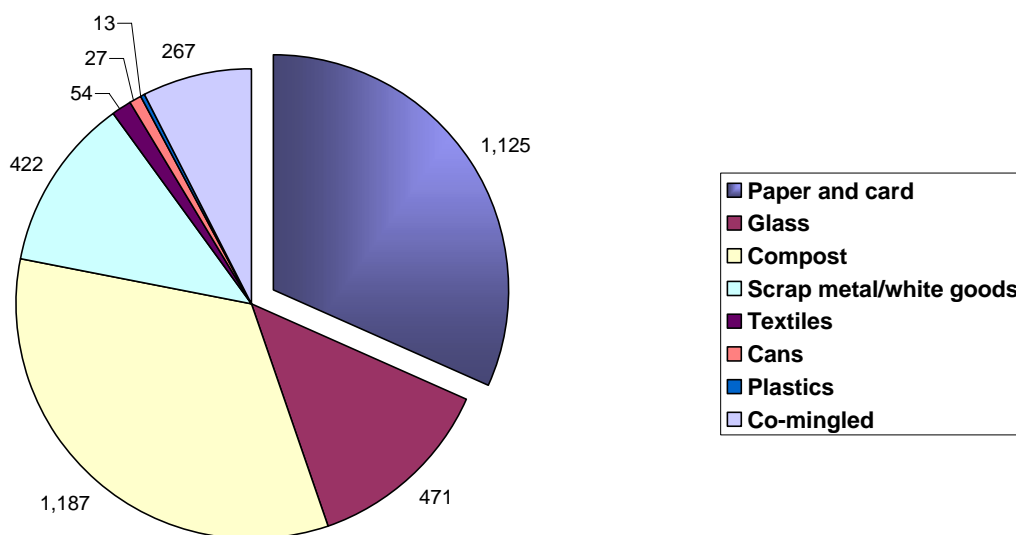
Source: Defra Municipal Waste Management Survey 2002/03

(a) – data refers to civic amenity sites which are also commonly referred to as Household Recycling Centres (HRC) or Household Waste Recycling Centres (HWRC) which are facilities provided by waste disposal authorities (WDAs) for householders to deposit recyclables and waste.

However, it should be noted that of the 37,000 tonnes of waste collected by voluntary organisations in 2002/2003 almost all of it is thought to be paper.

Of the various constituent recyclables collected for recycling, paper and card have traditionally been the biggest component. However, for the first time in 2003, materials for composting have overtaken paper and card. Paper and card now make up 30% of the total collected in England while compostable waste makes up 32% as Figure 19 shows. The co-mingled collections are those that cannot be sub-divided into various material fractions as a result of how the original waste data was collected.

Figure 19: Amounts of Materials Recovered from households for recycling or composting in England, 2002/3 ('000 tonnes)



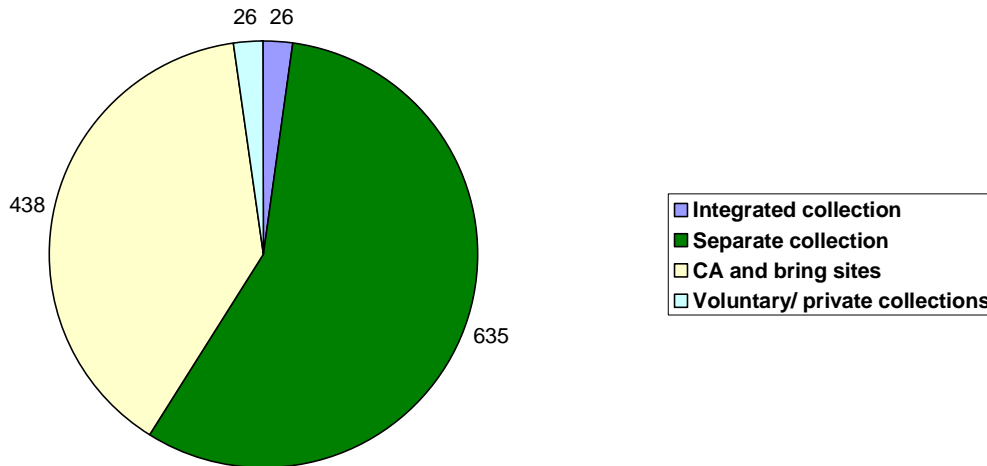
Source: Defra Municipal Waste Management Survey 2002/03

The degree to which paper is collected co-mingled with other dry recyclables cannot be determined from the DEFRA statistics because the separate collections referred to in Table 1 include collections of paper mixed with other recyclables as well as source separated schemes. The Aylesford Newsprint Recycling Atlas indicates that in 2003, 104 out of 376 local authorities collected paper combined with other recyclables. This represents 28% of the total.

The amounts of paper and card collected by collection system are shown in Figure 20. Although civic amenity and bring sites represent 66% total waste collected for recycling, only 18% of the material collected from these sites is paper (based on the DEFRA figures for 2002 /2003), with 40% of waste collected at CA sites being green garden waste which is then composted.

By contrast, kerbside collections account for only 34% of recyclables collected but these systems actually provide 60% of the total paper and card collected for recycling. Many kerbside collection systems are either exclusively for paper, or dominated by it, with the result that 54% of all the recyclable material collected at the kerbside is paper or card. This demonstrates that, proportionally, kerbside collection schemes yield greater quantities of paper and card than bring bank/civic amenity collection systems.

Figure 20: Amounts of Paper & Card Collected for Recycling by System in England in 2002/3 ('000 tonnes)



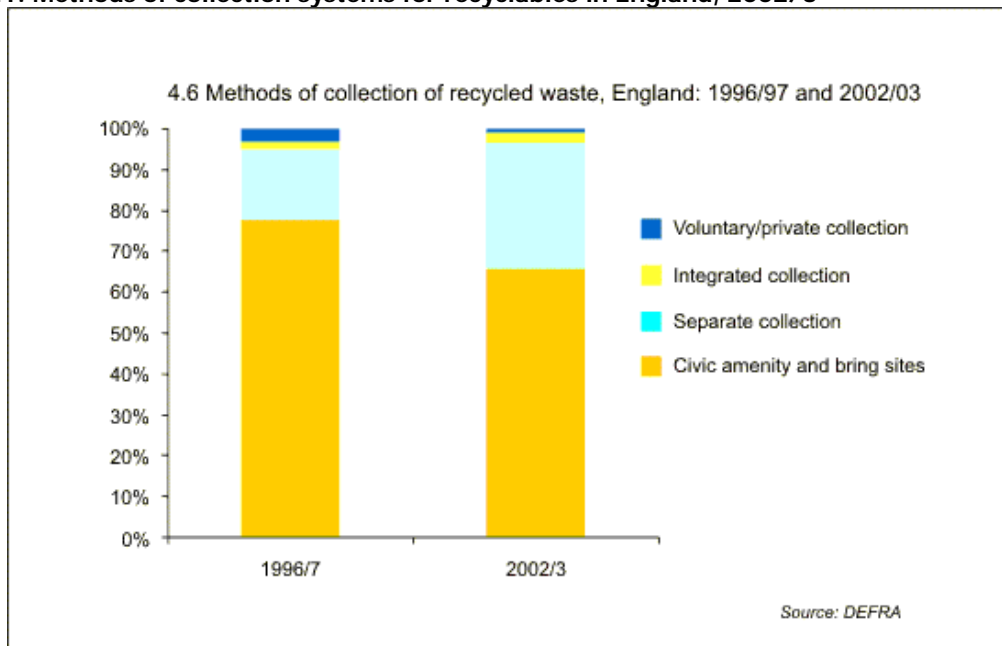
Source: Defra Municipal Waste Management Survey 2002/03

5.2 Trends in collection systems in England

The growth in household collections of recyclables has shown wide regional variation and these are documented extensively in the Aylesford Newsprint Recycling Atlas. The highest growth in household recycling is in the North East and North West of England, which has averaged growth rates of 3.5% per annum over the last six years. The lowest is London, which has only managed an average growth rate of 1.1%.

In 1996/7 kerbside schemes accounted for only 19% for the total quantity recycled from households, by 2002/3 this figure had increased to 34%, indicating a clear growth in this method of collection. During this period, the amount of recyclables collected at the kerbside increased by 25% per year, whereas recyclables collected by civic amenity and bring sites only increased by an average of 11% per year. This trend is shown in Figure 21.

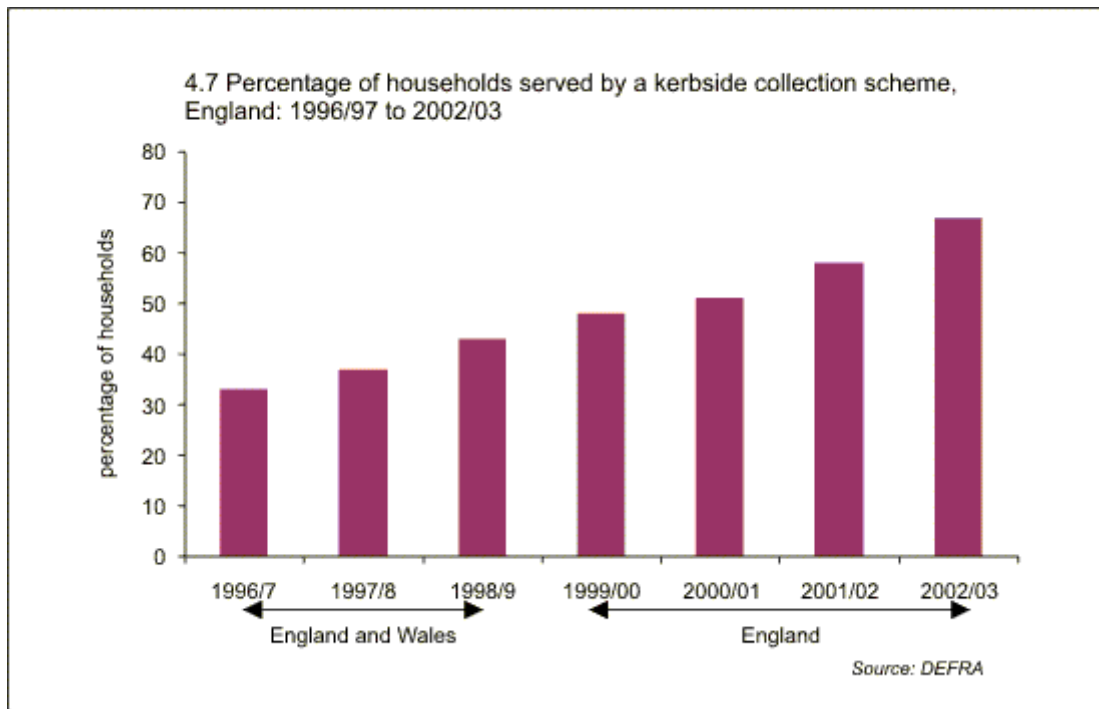
Figure 21: Methods of collection systems for recyclables in England, 2002/3



Source: Defra Municipal Waste Management Survey 2002/03

The following graph shows the percentage of households served by kerbside collection and the trend for growth in this method of collection can be clearly seen.

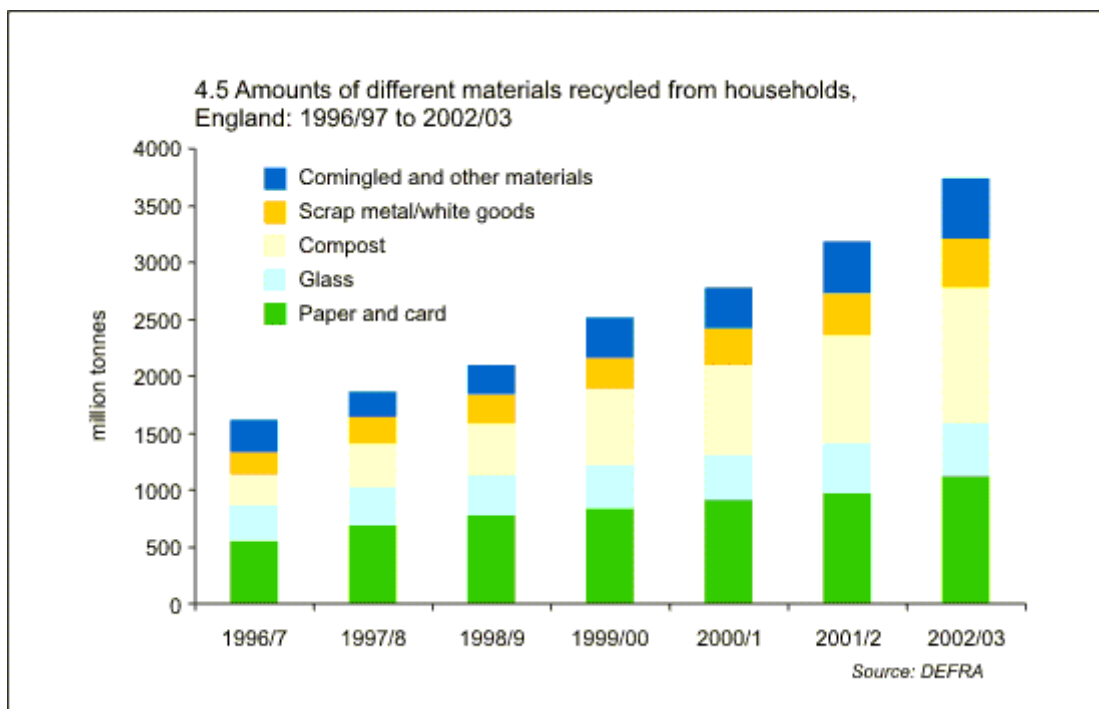
Figure 22: Growth in Kerbside Collection of recyclables in England, 2002/3



Source: Defra Municipal Waste Management Survey 2002/03

Although some growth has been present in all areas of recyclable collected, including paper, the major area of growth has been in material for composting. This is clearly shown in Figure 23.

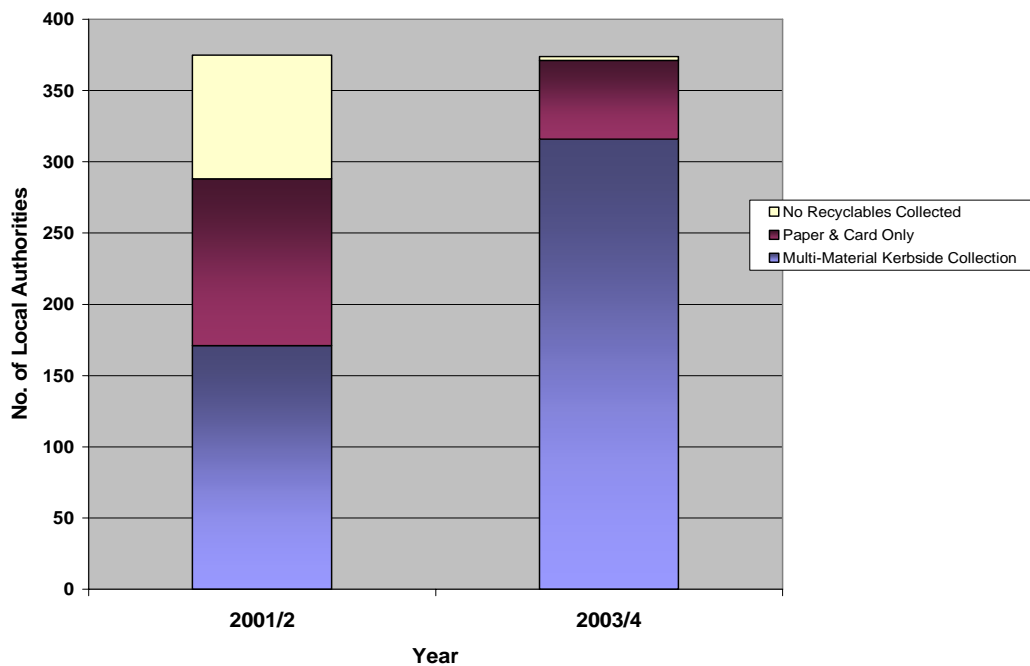
Figure 23: Trends in collection of types of recyclables collected from households in England, 2002/3



Source: Defra Municipal Waste Management Survey 2002/03

There has been recent and rapid growth in the collection of more than one stream of recyclables from the kerbside. This can be seen in the following graph (Figure 24) that shows the changes that have happened in the last couple of years. Today 84% of local authorities offer a multi-material collection, although only 31% offer this service to at least 95% of households. In total 79% of all households now have a kerbside collection of dry recyclables with 49% having multi-material collection systems.

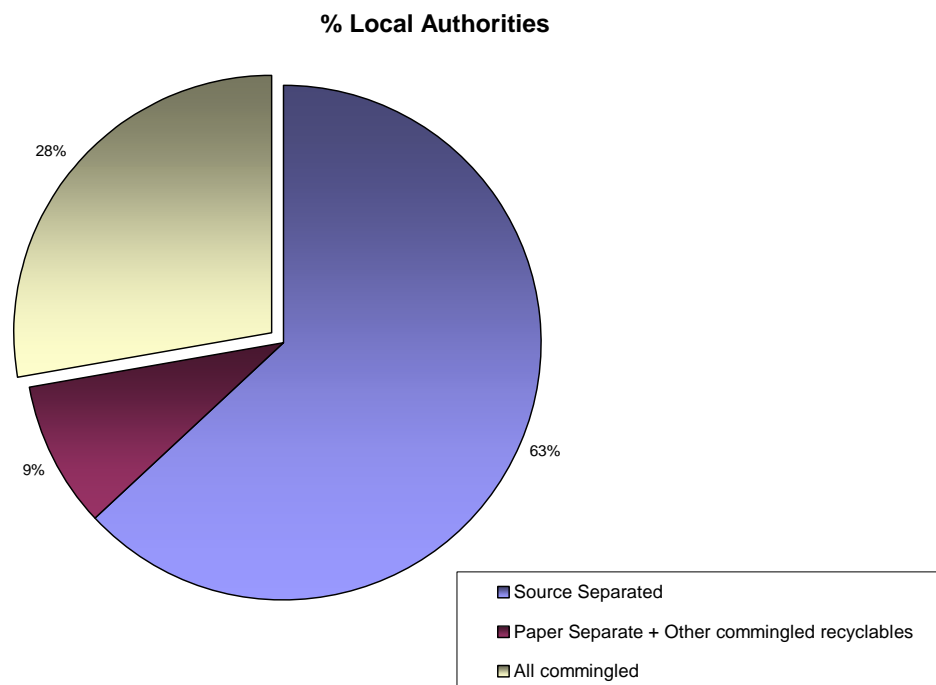
Figure 24: Change in the types of kerbside collection systems for recyclables in England & Wales between 2001/2 and 2003/4



Source: Aylesford Newsprint Recycling Atlas

At present the majority of paper collected from the kerbside is segregated by the householder (63%). This can be seen in Figure 25.

Figure 25: Types of kerbside collection systems for dry recyclables in England & Wales, 2003/4



Source: Aylesford Newsprint Recycling Atlas

However, there has been a growth in the proportion of paper that is collected co-mingled with other recyclables. Within the paper industry there is a view that the increase in collection of co-mingled recyclables has led to a fall in quality, particularly of news and PAMs. It seems likely that commingled collection will continue to grow for economic reasons.

This is an area where technology for sorting is still improving. A combination of technology improvements, improved output quality control from MRFs and more purchasing choice for the paper mills as the surplus of recovered fibre grows should help to stabilise any slide in the quality of the feedstock for mills.

5.3 Household collection of recyclables in other European countries

In the UK the responsibility for achieving recycling targets is with Local Authorities and only applies to household waste. In other countries different systems apply, according to how EU legislation/policies have been interpreted by individual member states and the presence of local recycling mechanisms and policies. The collection method used and the degree of source segregation that takes place has a major influence on the degree of sorting that is required.

5.3.1 Collection systems in Sweden

Sweden has a collection rate of 68%, one of the highest in Europe. The responsibility for achieving recycling targets, excluding for office waste, rests with the producers. The collection from households is driven by producer responsibilities. It is dominated by bring systems where there are normally separate containers for:

- News & PAMs (joint responsibility of the newspaper producers)
- household packaging paper (shared responsibility of packaging producers and packers, SKÅ, see below)

- glass, metal, plastics and wood.

At a small number of bring sites (<10%) the news & pams and the household packaging paper are combined into “Allpaper” containers in an attempt to simplify collection and cut costs (see further discussion below).

For News & PAMs (but not other recyclables) kerbside collection is practised in many areas or cities (approximately 40% by volume of the News and PAMs is collected from kerbside collection systems). No paper or board is collected mixed together with other recyclables in Sweden.

Most corrugated card is collected at commercial sites (industry, trade and small offices) and there is also a producer responsibility shared between the paper & board manufacturers, the corrugated converters and the packers. There is a mandatory level of 65% but the actual level achieved is 85%. Out of this, 90% is collected at commercial sites and only 10% from households as part of the “household packaging paper collection”. The latter is the only non self financing part of the corrugated collection system and is paid for by a small fee (20 EUR/t on all corrugated, 45% of which is paid by converters and 55% by the importers or packers). The converter or the importer normally pays the fee but the packing company has to pay if they can't prove that it has already been paid.

Collection of News & PAMs

The collection of News & PAMs was originally made a mandatory Local Authority responsibility in 1972. The high level of recycling (80–85%) has been driven by Swedish newsprint industry's need for a cheap source of fibre. Initially it was often run by voluntary non-profit organisations (football clubs etc). Rural areas with low population density can be exempt from the responsibility.

Today, the system has changed with the responsibility being with the newsprint producers. This has led to a structure in which recycling is basically run by three competing recycling companies, one of which, IL Recycling, is owned collectively by the paper companies. The mandatory level is 70% with 80% recovery actually being achieved.

The system is profitable so no financing from Local Authorities or the newsprint producers is needed. Bring systems are dominant and the trend is for these to increase. Where kerbside collection is practiced it is usually restricted to News & PAMs. However, sometimes corrugated and other packaging papers are also co-collected. Households are, however, asked to avoid envelopes and plastics.

Therefore in general the stream of news & pams is reasonably clean with a contamination level of “brown” fibres normally <5% and sometimes down to 2-3%, most of that being corrugated and shopping bags of brown paper. These are relatively easy to separate by hand or in OCC-screens at the sorting centres.

Almost all of the collected News & PAMs go to three newsprint mills in Sweden, which also import several hundred thousand tonnes of News & PAMs. Less than 10% is used in tissue manufacture.

Collection of household packaging paper

The collection of household packaging paper is organised by SKÅ (Swedish Carton Recycling), one of six materials companies jointly bearing the packaging producer responsibility. The legislation goal for such paper is 40% materials recycling and 44% was achieved in 2003.

The costs and fees for this collection of household packaging paper have varied as the system has been built up but today financing is achieved through a fee of 50 EUR/tonne on all household packaging paper and 20 EURO/tonne on all corrugated.

The material collected consists of approx 1/3 corrugated, 1/3 other packaging (of which ~30% is liquid packaging board and other paper/plastic laminates) and 1/3 news and other papers thrown into the containers designated for packaging. This mixed composition has made the material suitable for only a few mills (gypsum board and white lined chipboard) due to fibre composition and need for special equipment in mills to recycle paper/plastic laminates so price is as low as around 20 EUR/tonne i.e. 1/3 of the OCC-price level in Sweden.

Due to the low sales price of this recycled material and the high collection costs of the comparatively small stream of mostly low density packaging paper and board, there has been a strong interest in methods to lower the total costs and thus the fee. One possibility could be to further develop the “Allpaper” system where all papers from households are collected together in one bring bank container, a system which today is practiced in only a few cities (<10% of the volume).

“Allpaper” – a co-collection alternative?

The pros and cons of co-collection of all grades of paper mixed together (“Allpaper”) versus segregated collection has been the subject of a recent study by SKÅ.

The main advantages are cheaper collection, estimated to be in the range 5-10 EUR/tonne, and higher recovery volumes due to the simplicity of the system, for consumers.

The main disadvantage is the cost for extra sorting, to clean the dominating stream of News & PAMs, which is 4-5 times greater by weight than the packaging stream. There is also an increased risk for higher proportions of brown fibres in the deliveries to paper mills, which costs extra at the mill (higher rejects, extra chemicals etc).

A positive effect of the extra sorting is that the output is less of a mixed OCC, packaging and news grade (today’s “household packaging grade” which is not sorted and thus has a low value ~20 EUR/ton) and more of higher value OCC (value ~70 EUR/t) and of News & PAMs (value ~70 EUR/t) which would otherwise be “lost” into the mixed grade.

There is currently a lot of debate in Sweden between different stakeholders as to whether the “Allpaper” system is better than segregated collection. It tends to vary depending on logistics, recovery targets, sorting technology, cleanliness etc.

- Newsprint mills tend to prefer their present system (separate and profitable) and fear the negative effect of less clean News & PAMs fraction
- Packaging producers tend to like the possibility of cost sharing of the expensive collection of the “household packaging papers”
- Authorities and municipalities would tend to like the systems if it leads to greater total paper recycling and less municipal waste for landfill or incineration.

An “Allpaper” system would in fact be quite similar to the collection system in The Netherlands, but based on voluntary agreements and not producer responsibilities.

5.3.2 The Netherlands

The Netherlands has a long tradition of paper recovery – industrially as well as from households – and is among the highest in Europe with a collection rate of 68%. Paper producers have a strong presence in paper collection and sorting. Examples are SCA and Kappa Packaging (making waste based liner, fluting and solid board production) and, Parenco and Norske Skog (making newspaper from ~90% recycled News & PAMs).

Approximately 50% of the total 2.45 million tonnes of recovered paper and board are collected from households. There is currently no producer responsibility legislation but a similar voluntary agreement between the parties in the “paper chain”, involving a goal to recover 85% of all recyclable paper, including “take-back” guarantees and a fund to handle possible “negative prices”. Normally there is no fee for collection in the system, but in some cases local governments may pay the voluntary sector a fee of some 10 EUR per tonne if they have undertaken the collection.

For household collections, bring systems are dominant in the cities while kerbside collections dominate in rural areas. The typical content of the recovered fibre from city collections is 85% News & PAMs and 15% packaging and other papers and in rural areas 60% and 40% respectively.

Of the 2.45 million tonnes collected about 1.2 million tonnes are exported, half of which to the Far East. At the same time, 1.3 million tonnes are imported primarily from Germany.

5.3.3 Germany

Germany has the highest collection rate in Europe of 74% where the collection is mainly separated into collection from “households or close to households” and from “commercial places” (supermarkets, shopping centres, etc.). Almost equal quantities are collected from both systems (6.26 million tonnes and 6.25 million tonnes respectively). Most of the “commercial collection” is corrugated waste and originates from industry or retail stores (directly or from consumers who have the right to dispose of “secondary packaging” at the stores). This total of 12.5 million does not contain any packaging converting off cuts (approximately 1 million tonnes in 2001) or unsold news and magazines (approximately 0.3 million tonnes in 2001).

The different household collection methods that operate in Germany can be summarized as follows:

- 2.52 million tonnes comes from recycling centers or bring sites, where paper is either collected segregated by paper grade or combined into a single paper and board stream.
- 3.05 million tonnes comes from mono containers and bins (“green bins” or “blue bins”), for mixed fractions of types of paper and board. These are either provided for each household or a container is provided for a certain area.
- 0.25 million tonnes is kerbside collection segregated by grade. Traditionally this is sorted collection of News & PAMs or board, usually conducted by charity organisations.
- 0.45 million tonnes are collected by other means.

The composition of the collected paper is strongly dictated by the structure of the collection systems.

Packaging

Households, or groups of households, normally have a green glass bin, a blue paper bin (for most packaging papers but also graphic papers) and a yellow bin for collection of all other lightweight recyclable packaging (plastic, metal and also some paper based packaging like liquid packaging board and other laminated cartonboard). This packaging collection arrangement was started twenty years ago, driven by the desire to make the system as simple as possible for the consumer and thus achieve high volume collection, since the German law “Verpackungsverordnung” – a forerunner of the EU Packaging Directive - says that the packaging material of all goods should be returned.

The DSD¹ is a non-profit organization that contracts collectors to collect and sort material in order to meet the targets in the “Verpackungsverordnung” under the “Grüner Punkt” system. They have collection systems with yellow bins, yellow bags or yellow containers. About 25-30 % of the collected material is paper & board, an estimated 1,411 million tonnes in 2003. The paper fraction has a large percentage of board and other foil or plastic laminated paper which is difficult or expensive to remove. The rcf is deemed unsuitable for making new graphics papers. The quantity of collected paper has increased since the introduction of the DSD but the quality has deteriorated (according to INGEDE, the International Association of the deinking industry) due to contamination with non-paper products and unwanted papers.

This has led to quality issues for the paper industry and the trend has been to move away from co-mingled collection and to aim for more segregation at source. Today 89% of the paper collected in Germany comes from paper only streams.

However, the DSD system has led to very high recycling rates of difficult materials such as liquid packaging board with 65% of all liquid packaging consumed in Germany being recycled.

Non-packaging paper

For most households there is another “green (or blue) bin” for all other paper (mostly news, magazines but also some corrugated and other packaging papers). Mostly these bins are close to households (240 litres) but sometimes they are located at bring sites. In some areas there are no “green (or blue) bins” so in these situations most paper ends up into the “yellow bins”.

This “paper only” collection systems, where a mix of almost all available paper and board types are contained, needs a high degree of sorting, which is mainly done by collectors in automated systems. A few mills buy mixed waste and do the sorting themselves (mainly manually e.g. Leipa, Schwedt and Perlen, Switzerland). The sorting at the Leipa mill yields different waste paper qualities going to the different paper machines making linerboard, folding boxboard and improved newsprint. In Perlen the amount sorted out is returned to the market.

For **all** graphic papers (no distinction between newsprint, office papers etc) the industry associations have set up a voluntary target of 80 +/- 3% as recycling rate. It is a joint responsibility of all involved parties (paper producers, printers and publishers) through AGRAPA (Alliance for Graphic Papers).

As waste collection in general is the responsibility of the municipal communities, systems for collection vary according to local waste management strategies. Specific targets for recycling are set by the respective city, county or “bundesland” parliaments.

¹ Duales System Deutschland, which carries the responsibility for achieving the packaging recovery targets and administering the (high) fees for the different materials.

The consumers pay the cost for collection to the communities. They are charged on an annual basis for the cost of collection (bins, pick up, transportation, landfill, partly for sorting). The fees relate to the total cost to the community for the collection and disposal of all waste from the previous year, and is charged to the households (either by headcount in the household, by number of pick ups or by weight). The collectors are subsidised (from community taxes) to the extent that they are guaranteed a fixed price independent on how much they achieve from selling the waste paper to dealers or the paper industry.

The paper industry contributes by both take off guarantees for waste paper and recycling content guarantees. They also advise the public sector and help in marketing efforts to promote recycling and methods of collection.

The incentives for the communities to recycle are the escalating cost for disposing to landfill, which in a highly populated country like Germany are getting increasingly scarce. On top of that there is the political pressure and legislation from the federal government level.

Pattern of utilisation

In Germany the high collection rate (>70% of consumption) has stimulated utilisation. Total paper production in Germany in 2001 was 17.88 million tonnes, and 11.53 million tonnes of the raw material was recovered paper. As shown earlier in Figure 3, utilisation of recovered paper increased by ~1M tonnes between 2000 and 2002, i.e. from ~60 to 65 %. The increase, in terms of tonnage, was mainly in the packaging grades due to increased total production. There was also an increase in recovered paper utilisation for the P&W papers (both woodfree and wood containing, i.e. with mechanical fibre content) from 37 % in 2000 up to 44% in 2001 and 2002.

Out of the 11.53 million tonnes of recovered paper utilised in Germany:

- 8.88 million t were “Ordinary grades”, i.e. group 1 of the CEPI list (mostly post consumer mixed packaging and mixed news & pams)
- 0.86 million t were medium grades covering group 2 (cleaner white grades, some preconsumer shavings, some unsold news etc)
- 0.79 million t were upper grades covering group 3 (white, clean, mostly woodfree preconsumer shavings etc)
- 0.99 million t were group 4 Kraft grades, (mostly unbleached packaging grades with high content of unbleached kraft pulp).

There was a strong reluctance to talk about which grades were utilized where during the German interviews. However, it was clear that high quality grades were in short supply. To quote one comment: “As soon as some high grades of waste paper turn up on the German market it will be snapped up immediately.”

Some tissue producers in Germany take mixed wood containing and woodfree grades (primarily for towels and cheaper brands) but over the past years there has been a clear trend towards increased use of woodfree grades or virgin fibers (which mirrors the trend in the UK).

However unlike the UK mixed wood containing and woodfree grades are also used for lightweight coated (LWC) (Leipa, Schwedt) and supercalendared (SC-paper) (StoraEnso, Maxau and SCA Laakirchen) in up to 40% of the furnish).

Trend away from co-mingled collection

As a result of deteriorating quality of the recovered paper collected via co-mingled schemes, there has been an increasing request to change the collection methods and promote separate collection of board and graphical papers, as an alternative to extensive sorting which is practised widely today. Industry associations are trying to convince communities by showing that there are better economics if the paper is collected via a separate collection. Sorting is considered to add too much cost to the raw material but trials are ongoing which aim to demonstrate that increased recovered paper quality is achieved through source separated schemes.

5.3.4 France

France has an overall collection rate of 54%, which is about the average rate for Europe. The structure of collection and use, however, differs from many other continental countries. France has little collection directly

from households (except for News & PAMs), since approx 50% of household waste is incinerated. With the exception of News & PAMs only about 10% of all recovered paper and board is collected from households.

Tables 2 and 3 compare UK and French paper statistics for consumption, recovery and utilisation.

Table 2: Comparison of consumption rates

Activity	France	UK
Paper & board consumption	11.2 Mt	12.4 Mt
- Collection rate	50%	48%
- Paper & board production	9.8 Mt	6.2 Mt
- Utilization rate	58%	74%

Source CEPI (for year 2002)

Table 3: Comparison of collection and utilisation rates

Grade	France	UK
Share of collection:		
-Corrugated & kraft grades	50%	42%
-“Graphic”(news, magazines +high grades)	37%	50%
-Mixed grades	13%	13%
Export (+) or Import (-)	-0.3 Mt	+1.3Mt
Share of own utilization into:		
-packaging paper & board	68%	55%
-newsprint	17%	27%
-other graphic papers	7%	5%
-tissue	5%	13%

Source: CEPI, Copacel, PRH Ltd

Some tentative conclusions can be drawn from these comparisons:

1. The high French collection of packaging grades is explained by both the high production of liner and fluting (more export than import) and by the producer responsibility on packaging recyclables (Ecoemballages), encouraging collection through “credits”.
2. Except for the EU Packaging Directive target (minimum 60% recycling for packaging paper and board) there are no other legislative targets for paper recovery.
3. Newsprint is reasonably well collected (60%), due to a voluntary agreement, but for other graphic papers there is no agreement, leading to a low total figure for all “graphic papers” (37%).

5.4 Sorting methods

The degree of sophistication of a sorting line depends to a large extent on the collection method. The main fibres recovered from the household stream are newsprint and a small quantity of old corrugated cardboard (OCC). These need to be separated since the newsprint mills cannot tolerate more than a few percent of brown fibres.

If the paper is being collected as a separate newsprint stream, then very little sorting is required. If it is collected as a mixed paper stream, the removal of the brown fibre is necessary, and if the paper is collected commingled with other dry recyclables more sophisticated sorting is necessary to remove the other recyclables, as well as the brown fibres.

The following section gives a brief description of some of the main sorting methods available, and describes their typical use. Some examples in which the sorting techniques are used are then briefly described.

Screens

There are a number of different types of screen all of which work primarily by separating by size. One of the most common designs of screen has a number of disks either oval or triangular in shape, which are positioned at angles to each other on a shaft. This is commonly known as a disk screen. The screen is comprised of a number of these shafts positioned parallel to each other. The large material passes over the top riding on the disks (also being shaken from side to side due to the offset angle of the disks) while the smaller material drops between the shafts. This type of screen is often used to separate OCC from other paper, but can also be used to separate contaminants from newspaper.

Another type is the trommel screen which comprises a rotating inclined drum with holes in. The rotation of the drum separates the smaller fractions (such as glass, plastics, tins and paper scraps), which then drop through the holes in the drum while the larger material is conveyed along inside the drum by shaped baffles until it is discharged from the open end of drum. These screens are often used early in the sorting process to remove glass, cans, etc from the paper stream.

A new development of the disk screen is the "V Screen". This screen consists of two inclined tables, the angle of which can be altered. A UK installation has taken place recently for Norfolk Environmental Waste Services and appears to be performing well. The screen is designed to separate rigid containers from the paper stream with the minimum breakage of glass thus making the paper stream easier to clean in subsequent stages. Currently, glass is not being collected co-mingled in Norfolk.

Magnetic Separation

There are three main types of magnetic separation. Suspended magnets can be positioned over the stream or conveyor head pulley. Ferrous material is then lifted out of the main stream by the magnets, where large volumes are anticipated the magnets are cleaned automatically by rubber belts.

A second type of magnetic separation is to have a magnet built into the conveyor head pulley. Ferrous material then sticks to the belt and is collected underneath when the belt separates from the magnetic pulley.

The last type of magnetic separation use eddy currents, these can be used to separate aluminium and other nonferrous material from plastic and glass. They are usually positioned after magnetic separation of the ferrous material.

Vibratory Fingers

These are used to help even out the flow of material. They work best when large quantities of paper are not present and are often used later in the process on the non-paper stream.

Optical Sorting

These devices use cameras and image analysis to analyse the paper stream, which has already been separated to individual sheets by a fast moving conveyor. The identified sheets of paper are then lifted off the head of the conveyor by air jets and blown across a gap to a separate conveyor, while the rest of the paper drops down a chute at the head of the conveyor. These machines are relatively new and are not 100% efficient. They are normally used to remove contaminants such as coloured paper from the main stream and are often followed by a reduced manual sort.

Vacuum Screens

These are used to suck lighter material out of a mixed waste stream. They can be used to remove plastic and there are examples of them being used to separate office waste and junk mail from a newsprint stream.

Manual Sorting

Here the material is passed along a conveyor and contraries are removed by hand, usually into chutes, which drop away below the conveyor. Manual sorting is labour intensive but is very flexible and can produce a very clean accept stream. For these reasons a degree of manual sorting is included in almost all plants.

Sorting Systems

Some typical configurations for sorting of paper from kerbside collections are given below in order of increasing complexity.

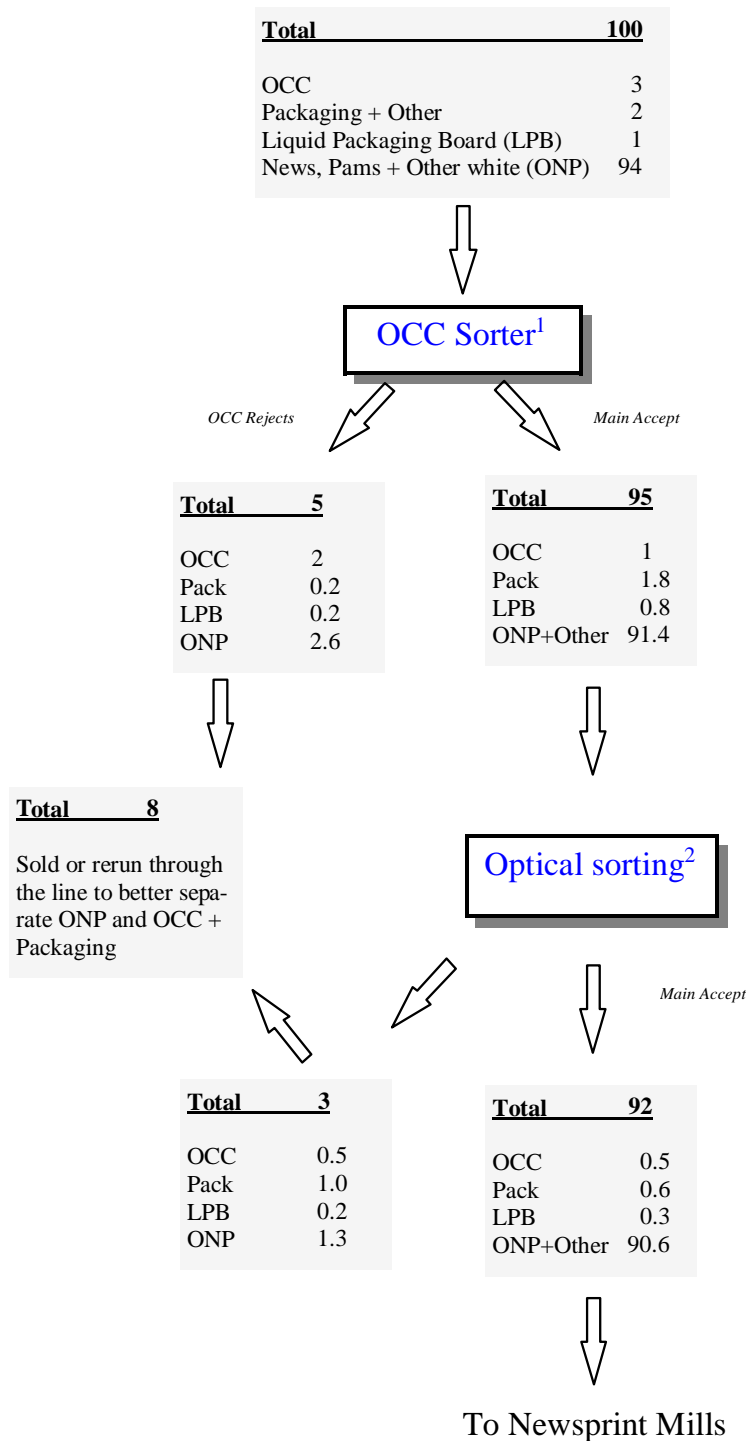
- totally manual sorting (This is still normal for newspaper only collections where the contaminants are less than 10% of the stream.)
- one-step OCC-screen (removes 80% of OCC) + complementary hand sorting to attain newsprint mill requirements for de-inking.(normally < 3% "brown" fibres)
- two-step OCC-screen + fine disk screen (to additionally remove smaller cartonboard/folding boxboard + complementary manual sorting (as above)
- three-step OCC-screen + fine screen + vacuum screen
- three-step OCC-screen + fine screen + optical sorter (to remove remaining "brown packaging", coloured card or liquid packaging board).

In some cases the rejected stream from an optical sorting station is given a secondary sorting in order to recover more of the valuable News & PAMs fraction as this can be up to 50% of the extracted proportion.

Where a commingled stream of dry recyclables is being processed additional equipment is required to remove cans, plastic and glass from the paper stream. In these cases the plants are usually larger facilities, where increased use of non-manual sorting techniques can be justified. The first stage of the plant usually consists of coarse screening to remove the OCC, followed by the glass, plastic and cans. The paper stream then goes for further sorting as discussed above, whilst the other recyclable material is separated into its constituent components using a combination of screens, magnetic separation and air classification.

In one Swedish large sorting plant (~90 000 tpa) an optical sorter has been installed. The following flow diagram shows the sorting efficiency that can be achieved in the different steps of sorting of a reasonably clean News & PAMs collection. Figure 28 illustrates how the incoming paper stream (100%) is sorted into different fractions. All the values in the figure are percentages.

Figure 28: Plant Configuration for a facility incorporating an optical sorter to sort mixed papers (percentages)



1. OCC-sorter effectively takes out OCC but has poor selectivity for LPB and small cartons and also much of news & pams.
2. Optical sorting of brown + coloured (removes 50 – 60 % of remaining OCC, other packaging and LPB)

Reparco, the Dutch recycling company of Norske Skog, has 4 sorting plants in the Netherlands and one in Germany with capacities between 50,000 and 150,000 tpa (with a total output of ~340,000 tpa pulp for deinking and ~200 000 tpa of OCC, packaging and mixed grades).

An example of the typical flow through such a sorting plant handling mixed paper is reported to be:

- 75% News & PAMs + other graphic
- 15% OCC + other packaging
- 10% packaging + other papers

The sorting sequence is as follows:

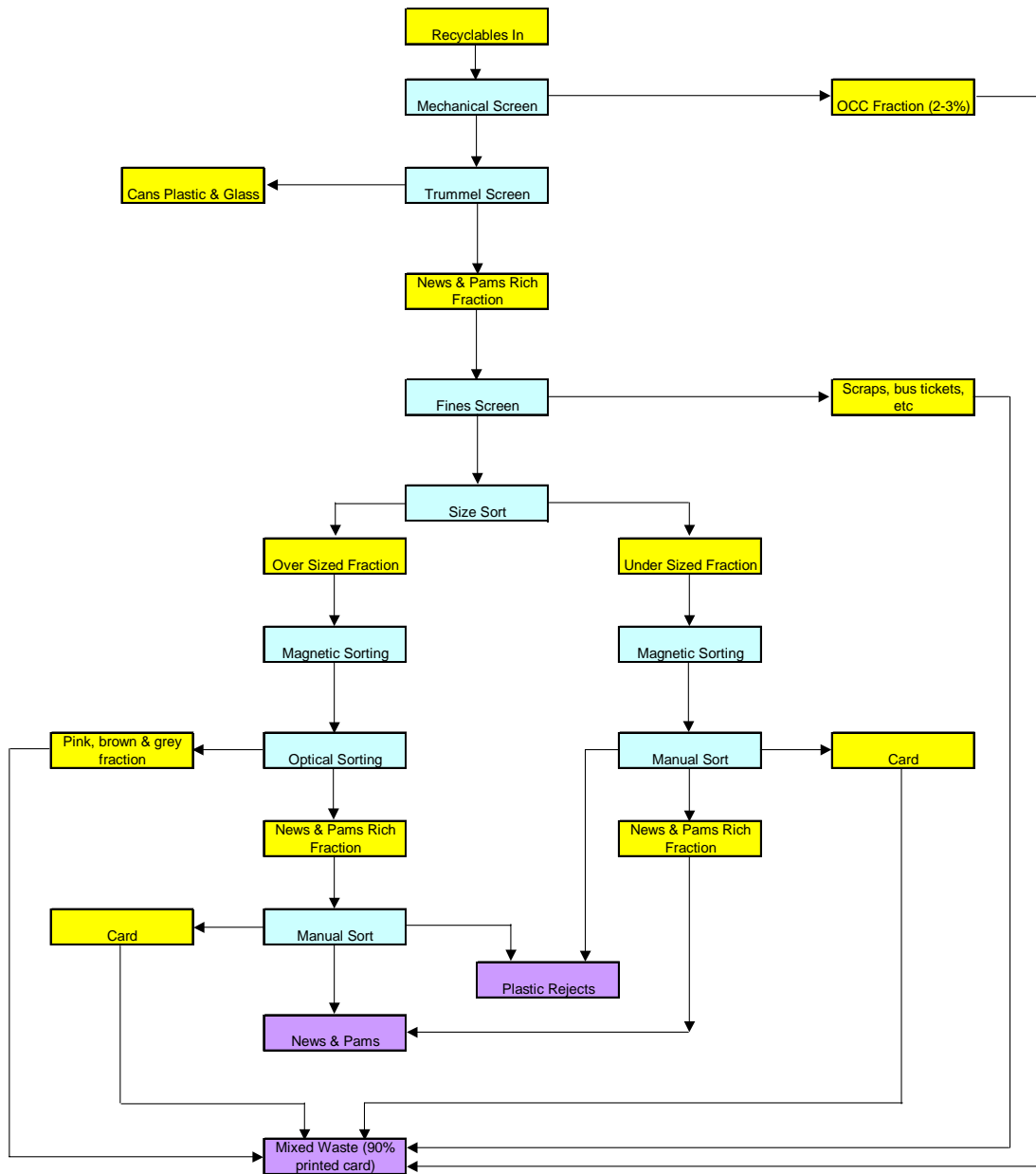
1. OCC screen – this removes approximately 20 % of the total material (15% OCC and 5% other)
2. Fine screen for beverage carton removal – 5-10% removed (>50% of which is news & pams)
- 3 Final hand sorting with typically 10 people in a 20 tonne/hour sorting line

In some lines there is a third step with a “vacuum screen” which can reduce the manual sorting to less than half. The reject from the fine screen can also be given a secondary sort to recover a high proportion (50 up to 80%) of the valuable News & PAMs fraction.

Reparco has tested much new equipment, including optical sorters, which they found less appropriate for their lines, being too expensive and having too low capacity. However, they were regarded as more suitable for sorting office waste.

The following diagram Figure 26 shows a typical configuration for a MRF designed to process co-mingled dry recyclables.

Figure 26: Typical MRF Configuration

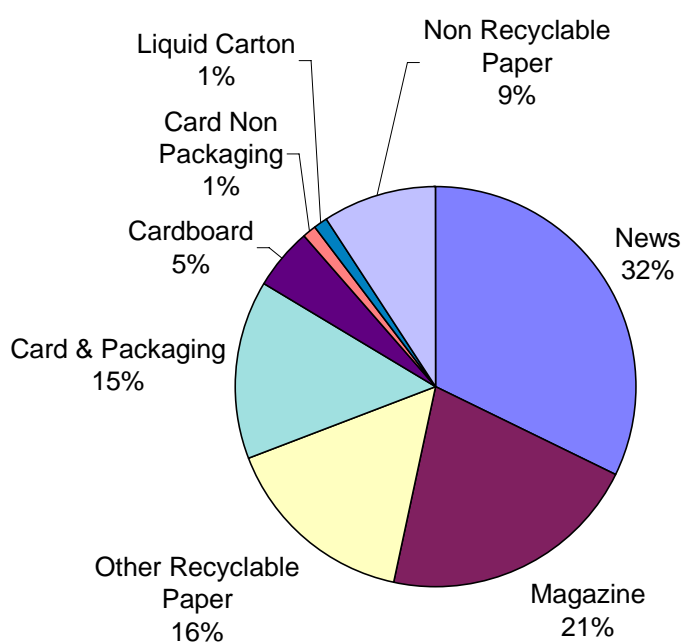


5.5 Cost benefit analysis of sorting household paper

5.5.1 The paper fraction within household waste

The following Figure 28, shows the composition of paper in the household waste stream in Hampshire. This survey for the whole of Hampshire found the percentage of News, Magazine and other recyclable paper to be 69% of the paper in the waste stream. Other interviews with companies in the recycling and collection business, however, suggested the percentage to be significantly higher at 86%. In either case, it is clear that the main stream of value, from a paper perspective, in the household stream are newspapers and magazines. This being the case, the key question is whether or not there is any added value to be obtained by collecting a wider range of recyclable paper and more rigorous sorting of the household waste stream.

Figure 28: Estimated composition of paper in the household waste stream



Source: Project Integra

We have seen earlier in Section 3 that there is very little potential for existing newsprint or packaging mills to increase their use of recovered fibre since all UK newsprint mills use recovered paper and they are at full production capacity. The only major opportunity to increase domestic consumption of recovered fibre would come if a new newsprint or packaging machine were installed in the UK.

It is important for the mills producing white papers (newsprint, p&w, tissue) not to have too much brown fibre, with 3% being a typical maximum today and probably higher demands in the future (a CEPI goal is <1.5% BS EN 643). Good source separation, where newspapers and magazines are collected only, usually requires at least some primarily manual sorting to achieve less than 3% brown fibre.

There are three principle techniques used for sorting paper:

- Manual Sorting
- Low-tech mechanical sorting
- High-tech mechanical sorting

A model to illustrate the cost/tonne of these techniques was constructed for this study. Table 4 summarises the performance characteristics of these methods.

Table 4: Summary of typical performance of paper sorting methods

Technique	Typical Size and Materials handled	Typical Capital Cost	Estimated sorting cost	Advantages/Disadvantages
Manual	Paper Only up to 40,000 tpa; generally used for office papers only	£300,000	£16/tonne	Flexible, low capital cost efficient for office waste. But has high labour cost.
Low Tech Mechanical	Household paper collections up to 100,000 tpa	£1,500,000	£12/tonne	Mainly used to sort News and PAMs from a paper only collection. Relatively low capital cost.
High Tech Mechanical	Commingled dry recyclables up to 100,000 tpa	£6,000,000	£27/tonne	Mainly used to process co-mingled recyclables; needs high throughput to support capital investment

5.5.2 Added Value Potential through sorting – model calculations

To assess the possibility of improving the value of recovered paper, a model was constructed utilising typical data in order to estimate the cost benefit that can be achieved from sorting of recovered fibre from the household stream.

The model allows for capital cost of a plant to be entered along with throughput, manning levels and other operating costs. A cost of sorting is then calculated on a per tonne basis.

Tables are provided showing how the costs per tonne were calculated is presenting - one iteration of the model for each of three examples. In each case capital costs and manning levels are typical examples for this size of plant taken from information collected during the interviews.

At the end of this section some economic comparisons are drawn with unsorted mixed recovered paper to illustrate the potential benefits from sorting.

It should be noted that purely manual sorting is more widely applicable for the sorting of office waste, and the manual cost model is included in Section 6.

Table 5 presents the assumptions used for a full high tech Materials Recovery Facility (MRF) treating co-mingled dry recyclables being run on a multi-shift basis to obtain high productivity from the plant. The plant is capable of treating 80,000 tonnes per annum and has been constructed with a high degree of sophistication aimed at minimising manning levels.

Table 5: Model Assumptions - High Tech Commingled MRF, processing capacity 80,000 tpa

Capital Cost		£6,000,000		
Manning Cost				
	<i>Description</i>	<i>No.</i>	<i>Item Cost p.a. £</i>	<i>Total Cost p.a. £</i>
	Sorters	14	15,000	210,000
	Drivers	6	15,000	90,000
	Maintenance	2	15,000	30,000
	Admin Staff	2	15,000	30,000
	Management	3	35,000	105,000
Overheads				
	Fuel	40,000	£/year	
	Heat & Light	10,000	£/year	
	Other	30,000	£/year	
Depreciation				
		5	years	
Other				
	Maintenance	2	%	
	Financing	5	%	

The results of the model are illustrated in Table 6.

Table 6: Model Results - High Tech Commingled MRF, processing capacity 80,000 tpa

Cost Component		Cost (£)
Direct Expenditure	Salaries	465,000
Indirect Expenditure	Overheads	80,000
	Maintenance	120,000
<i>Total Expenditure before Financial Costs</i>		665,000
Financial Costs	Depreciation	1,200,000
	Financing	300,000
<i>Total Expenditure</i>		2,165,000
<i>Cost of Sorting £/tonne</i>		27

The following iteration is for a high volume low tech plant designed to sort a mixed paper stream from a household source. The plant is again designed to process 80,000 tonnes per annum but in this case consists only of some simple screening followed by manual sorting.

Table 7: Model Assumptions – Low tech sorting of mixed household paper, processing capacity 80,000 tpa

Capital Cost		1,500,000		
Manning Cost				
	<i>Description</i>	<i>No.</i>	<i>Item Cost p.a. £</i>	<i>Total Cost p.a. £</i>
	Sorters	18	15,000	270,000
	Drivers	5	15,000	75,000
	Maintenance	1	15,000	15,000
	Admin Staff	2	15,000	30,000
	Management	3	35,000	105,000
Overheads				
	Fuel	40,000	£/year	
	Heat & Light	10,000	£/year	
	Other	30,000	£/year	
Depreciation				
	5	years		
Other				
	Maintenance	2	%	
	Financing	5	%	

The results of the model are illustrated in Table 8.

Table 8: Model Results – Low Techsorting of mixed papers, processing capacity 80,000 tpa

Cost Component		Cost (£)
Direct Expenditure	Salaries	495,000
Indirect Expenditure	Overheads	80,000
	Maintenance	30,000
<i>Total Expenditure before Financial Costs</i>		605,000
Financial Costs	Depreciation	300,000
	Financing	75,000
<i>Total Expenditure</i>		980,000
<i>Cost of Sorting £/tonne</i>		12

From this analysis, a number of conclusions have been drawn. The first major one is that the sophisticated expensive plants have to be run on a multi-shift basis to minimise sorting costs. For instance running the first

worked example as single shift operation would increase the sorting costs from £27/tonne to £50/tonne (excluding any income from the sale of recyclables).

Secondly it can be seen that mixing paper with other recyclables substantially increases the sorting cost, and this has to be weighed up against any benefits a co-mingled collection scheme may bring e.g. transport savings, increased recycling rates.

It is also interesting to compare the benefit that sorting gives with a baling only operation. The cost of baling only has been estimated as £6/tonne. The current UK market value for News and PAMs is around £50/tonne. If a paper stream is collected segregated from other recyclables at the household then a relatively clean newsprint stream can be achieved without sorting. This type of paper can have a value between £15 - £20/tonne because it is unsorted but predominately newsprint. These numbers indicate that if a newsprint rich stream (more than 80%) can be sorted for less than £25 - £30/tonne then there is a financial advantage in sorting it.

In other European countries, newspapers & magazines are often but not always collected separately from other papers and board. For more "difficult-to-recycle" liquid packaging board and other composite materials there is a conflict of interest between stakeholders so sometimes it is being included in other paper collection (Sweden), sometimes handled separately as in Germany, or not collected at all. It is likely that in an increasingly competitive European market, as collection rates increase, that quality of recovered paper will become even more of an issue. The quality of recovered paper required in the rest of Europe is likely to be similar to that required by UK mills. However, Asia is a big growth market and how this will affect the supply and demand balance for recovered fibre in Europe is a complicated issue and outside the scope of this report.

As discussed earlier in this report the main market for any additional collection will be export, with Asia being the growth market. There is a balance to be considered in a potential new sorting plant. On the one hand Asia can, undoubtedly, sort paper more cost effectively than the UK, as it is a labour intensive process. This may drive the market towards more export of mixed paper streams that are then sorted on arrival.

One final observation on this data is that, since recovered fibre prices can be very variable, one advantage of a simple system is the relatively low capital cost thus making it much easier to switch on and off depending on market conditions. Interviews in other European countries indicate that extreme cases – no sorting or high tech sorting – are usually less cost efficient than less sophisticated and cheaper mechanical sorting complemented by some manual sorting.

Reparco in the Netherlands estimates that it should be possible to get an efficient sorting line for 35 tonnes/hour of their type of material (80% News & PAMs, 20% packaging & others) for 1.2 – 1.4 million EUR, i.e. 60% of the assumed investment in the model assumptions above, this makes the low tech solution look even more favourable in the cost comparison.

Swedish experiences appear to be roughly in line with the Dutch. The total sorting cost in similar lines are by collection companies estimated to be on the average around 20 – 25 EUR/tonne, which pays off for the difference in price between unsorted mixed waste paper and the price for the two fractions sorted News & PAMs and mixed packaging waste paper respectively.

Any further sorting of the mixed packaging waste paper to extract a higher value "OCC-fraction" is not considered profitable.

5.6 Export Market Potential

The sorting of News and PAMs is likely to be primarily for the domestic market and for export to other European markets, while more mixed grades would go to the Asian market which can sort recovered fibre more cost effectively than the UK (and are thus are less interested in paying a premium for sorted grades).

Our research suggests that there is potential for increasing exports to Europe. The total consumption of newsprint in Capi countries is 10,082 million tonnes, while the total utilisation of recovered papers into newsprint in Capi countries is 7,380 million tonnes. Most probably there is room for more. Although standard newsprint consumption is not growing anymore in Europe "all" new capacity is recycled based while "virgin" mills convert to other grades. Furthermore there could be room for more recovered News & PAMs utilised in super calendared-papers and lightweight coated-paper manufacturing, which both show positive growth.

The only other grade of paper that can be economically extracted from the household stream is OCC but only in relatively small volumes. Currently there is a small net export of this grade of around 80,000 tpa.

Export to Asia:

Several Asian countries import recovered fibres – Japan, S Korea, India with China being the most dominant and with fast increasing import demand. China is presently importing some 8 million tonnes of recovered fibre with

the major part from the US (6-7 million tonnes) and approximately 1 million tonnes from Europe. However the very strong planned growth of the Chinese paper production (almost 40 million tonnes today and with a projected growth of 7-8% per annum) means a strong need for further import of recovered fibres (on top of domestic recycling within China) estimated to another around 10 million tonnes in about 10 years.

Germany is an interesting example of how production increases can help with this balance. For many years there has been a surplus of mixed recovered paper in Germany. The total amount of exported waste paper from Germany in 2002 was 3.5 million tonnes, while import was 1.8 million tonnes. However, during the last couple of years import of waste paper to Germany has increased and export has decreased as increased production capacity has come on line. Thus traditionally large recovered paper importers like China have received less from Germany.

5.7 Summary of interview comments

The following are quotations from interviews from a cross section of the recycling industry including local authorities, waste management companies, recycling companies and paper mills.

They have been selected to give a representative flavour of the attitudes and ideas presented during the interviews.

Interviews with paper mills

"There may eventually be a two-tier price structure for Newsprint to reflect the cleanliness of different collection methods."

"Increasing collection would help to stabilize the market."

"The Newsprint industry would not be able to run on fibre from 100% co-mingled sources."

"We don't buy from dirty MRFs"

"There may eventually be a two tier price structure for newsprint with fibre collected from co-mingled streams being worth less."

"Collecting paper as a segregated material gives the most consistent quality"

"Glass is a problem material and has issues for health and safety as well as contamination."

Interviews with recycling companies

"Ten years ago the large recycling companies, who are owned by the paper companies, dominated the market. This has gradually changed as waste companies are becoming more and more involved."

"EN643 is not well adhered to and most paper mills used their own standards."

"Under the terms of a thirty year contract we have a responsibility to meet certain recycling targets."

"There are not the same targets on the commercial waste stream and consequently this does not have the same focus of attention."

"The recycling scheme has had a good up take with only 200 out of 190,000 households refusing to participate."

"A twenty-year contract from the completion of the infrastructure and facilities has enabled us to set up the recycling facilities."

"Merchants are losing business to waste management companies"

"The public know not to include glass with the paper for recycling and we have only seen three bottles in during the life of the plant."

"Separating woodfree grades from the domestic stream is a complete non-starter because there is not enough of it."

"Co-mingled collection has a contamination level of around 10%"

"Optical sorting is too expensive and the real capacity is too low"

Other interviews

"There has been a large growth in co-mingled collection, most of which is exported to China."

"For volume, a co-mingled collection is the only solution."

"Better education of the public is key to increasing collection rates."

5.8 Conclusions – potential to add value to the household stream

There is a balance to be struck between what the industry would like i.e. News and PAMs segregated at source, and what is commercially practical. The general feeling in the Newsprint industry is that collecting all dry paper together in a single recycling stream would be the best achievable compromise.

It seems sensible that wherever possible the recovered fibre should be kept separate from other recyclables, since sorting is never perfect. However, there are examples of well run MRFs which prove that it is possible to sort a co-mingled collection (including glass) to a standard which is acceptable to the UK Newsprint industry.

This conclusion is given some support in a study by the American Forest & Paper Association, which shows that the overall system costs rises by \$3/ton when paper and other recyclables are collected in a joint collection and then processed and separated at a MRF. Kerbside collection is cheaper (-\$15/t), sorting at MRF more expensive (+\$10/t) and paper mills operating and maintenance costs due to less clean material higher (+\$8/t) (Tappi Magazine, March 31, 2004).

The estimates made in this study indicate a typical increased sorting cost of at least £10/tonne when recyclables are collected as dry commingled. This increased cost has to be evaluated against collection costs on a local basis to evaluate the best solution on a local level. It should also be considered that there could ultimately be a price differential depending on cleanliness of the recovered fibre and that the cleaner the starting point the easier it is to guarantee a clean product.

Given that most of the fibre currently recovered has been collected from a largely segregated stream with only some or minimal sorting needed to fulfil requirements of UK producers the need for further or more sophisticated sorting will depend on the kind and quality of the increasing household collection. For example if kerbside collection of paper only grows there may be increased need for traditional and not too expensive two stage OCC-screens + fine screens (similar waste paper composition and thus similar sorting lines to those described for Netherlands and Sweden). Any further sorting can only add marginal value over baling and exporting as news & PAMs and as sorted mixed waste or even unsorted mixed waste paper. However, since co-mingled collection of all recyclable materials is growing there are strategic reasons for building up the sorting infrastructure as there are some issues over the long-term permissibility of exporting mixed recyclable materials. For the long-term sustainable future it will be much easier to export a sorted News & PAMs grade than to export mixed waste, even if it is just a paper mixed waste.

In some areas a segregated collection of paper will be too expensive for reasons of infrastructure. This is most likely to occur in areas of low population density, where there is insufficient volume of waste to justify a large MRF. In these cases an emphasis on manual sorting may be the best long-term.

6 Potential to add value to RCF – office waste

6.1 Overview

Recovered office paper constitutes only a small proportion of the total paper recycled in the UK. However, since it largely consists of high grades of white and woodfree papers there has, in many countries, been a strong interest in trying to collect it cost effectively. There is also the possibility to sort out a high grade woodfree quality for deinking that can serve as a pulp substitute. A more detailed description of the present volumes and uses on the European level is given in the CEPI Special Recycling 2002 Statistics.

Total “Other Graphic Papers” (excluding newsprint) produced in Europe is 34.2 Mt. This production is where most of the “High grades”(EN643) collected (5.4 Mt) comes from. This represents a recovery rate of around 16% most of which is pre-consumer shavings, trims and printed business forms. There is only a small amount which comes from post consumer sources mainly sorted white woodfree letters, primarily collected from offices (or sorted out from mixed office waste).

Due to different definitions these figures do not quite correspond to the calculated UK figures (**Figure 18**), which are 4.5 Mt of Printing & Writing of which 1.4 Mt is collected as G1-4 grades, i.e. 31%. The main difference is in group 3, which contains some mechanical fibre that is not included in the EN643 classification of these grades. However group 3, as a total is only 10% of the volume represented by groups 1-4 so the difference is minor. The UK’s relatively high collection rate for these grades is largely driven by the high utilisation of woodfree fibre in the UK.

The main point from the CEPI figures is that the collected volumes of primarily woodfree paper from offices are quite small.

6.2 Summary of current collection systems in the UK for office paper

In contrast to the situation that exists for household collection of recovered fibre, which is largely the province of local authorities, it is private companies, either recycling companies or waste management companies, which dominate collection from the office stream. Local authorities have very little to do with the collection of office paper, with perhaps the exception of paper generated from their own offices.

Collection is usually done through some sort of bag scheme, with the bags often placed in special cardboard ‘recycling’ bins that act as office wastepaper bins. These individual collections are then normally collected together by the office cleaners and placed in some form of large collection bin. The large bins are then emptied periodically.

One of the main problems encountered with collections from offices is that the volumes are small, typically between 0.5 and 1.5 kg/person/per week. This means that the cost of collection can be greater than the value of the fibre collected (typically between £60/t and £70/t).

To make collection economic, a relatively large volume needs to be collected, a typical commercial quantity being 200 kg per premises. For many offices, however, storing this quantity of office waste paper is an issue, either due to space requirements or fire risk.

This problem can be overcome in areas where there are a reasonable number of offices, for example located in out of town business parks. Such office concentrations can provide a framework for commercially successful office collection systems with a typical radius of collection of between 50 and 60 miles.

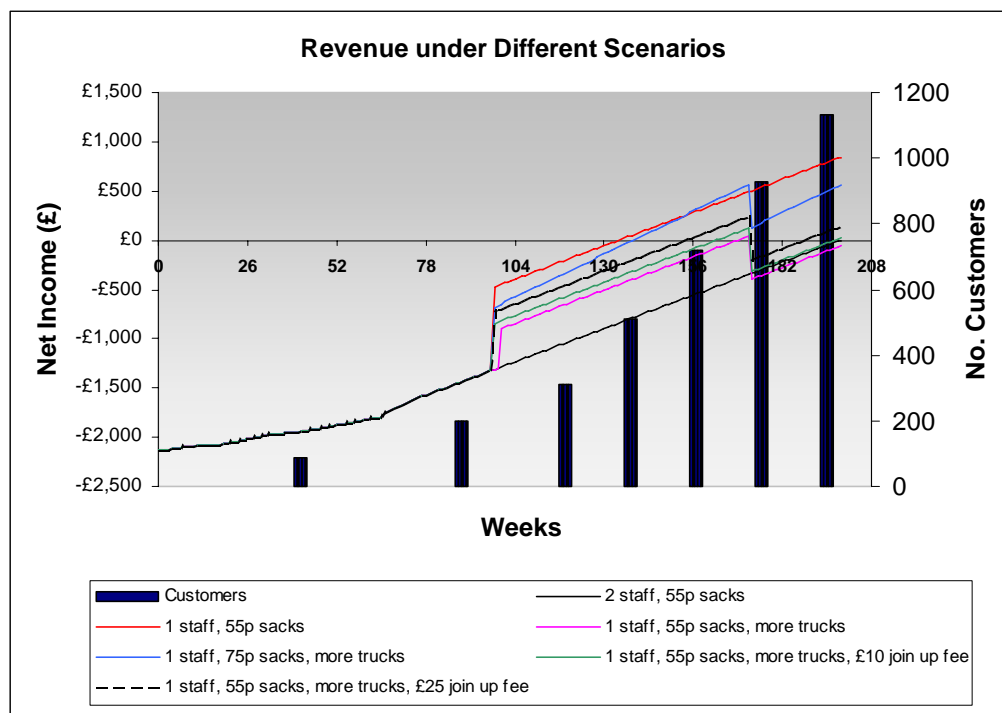
Commercially successful office collections generally follow one of two models. One approach is that the easy to collect office paper is “cherry picked” and a strong emphasis is put on the office workers to be diligent in sorting the fibre for the recycling companies. In an area where office complexes and business parks are plentiful this can be very cost effective as no further sorting is required.

An alternative is to be less selective on what is collected and to sort it afterwards. This is effective for increasing the volume collected from a given area and thus transport cost can be reduced at the expense of increased processing cost for sorting.

Collecting from big cities in general and London in particular, creates its own challenge, as transport is difficult and storing of any quantity of recovered fibre usually impossible in small offices paying high rents.

BioRegional have set up a pilot scheme called The Laundry in partnership with waste paper collector London Recycling, which collects mixed paper and cardboard via a weekly kerbside collection from small businesses in central London. This scheme has been in operation for a year. It charges 55p for each bag (10kg) and is expected to start covering costs after two and a half years of operation. The figures are based on typical collection costs plus the salary of a full-time member of staff to recruit new customers and provide a level of service for existing customers and a price increase to 75p as trade waste prices are rising.

Figure 29: The Laundry Scheme



Source: www.bioregional.com

The major reason given by the two thirds of offices that refused to join the scheme was that they are not interested for various reasons including:

- Can't be bothered to separate out paper from other waste,
- Think recycling bins look too unsightly for the office
- Claiming to be totally paperless office

It should be noted that the start up costs for BioRegional's implementation and management of this pilot scheme were covered by a landfill tax credit grant from the waste company Shanks. The cost of this has been included in the analysis. Although costs will be lower for a second collection following the Laundry model they will still be significant and will represent losses for the collector in the first year unless they form part of the round of an existing waste collection so BioRegional are now exploring this option. This scheme shows an innovative approach but also indicates the problems with collecting any quantity from cities on a fully commercial basis.

6.3 Trends in collection systems

The trend in recent years has been for recycling companies to reduce or remove altogether the sorting of office waste. At one time the sorted woodfree office paper had a value of around £200/t and the recycling companies could make money by sorting the office waste to maximise its value.

With the price today being relatively low, the value that can be gained from sorting is more marginal than it used to be.

Two comments from the interviews may be taken as examples:

- One company set up an office collection program some years ago when prices were high but has since then, cut collection to half as prices have dropped.
- Another company abandoned sorting altogether and now only classify the collected volumes at baling.

Recycling companies find that offices are reluctant to pay for the waste paper to be removed and because it is a expensive to collect small volumes from large numbers of source there are not economic drivers for collection of office waste. This is in contrast to the domestic stream where the local authorities will pay waste management companies to collect from the household.

The other main trend, in the last two years, has been the increase in the proportion of office waste that is shredded for security reasons. This is being offered as a service by many recycling companies and is seen as a way in which they can add value. Generally speaking the paper mills do not like shredded waste, although the majority of the woodfree waste users are taking some shredded waste and learning to process it satisfactorily. (The main issues are ones of handling.) However, it should be noted that waste paper that has been cross shredded in both direction is of little use to paper industry.

Experience from **Germany** also indicates that for safety and data protection reasons increasing amounts of the office waste is being shredded. This leads to handling and dust problems in the mills. An additional problem is that some of it originates from archives with old and difficult to de-ink material.

Shredding of office waste has also increased rapidly in **The Netherlands** where it is sometimes carried out by the collecting lorries.

In **Sweden** there is no legislation for the collection of office waste but the paper recycling companies have entered into a voluntary agreement (to avoid legislation). The collection is organised by the paper recycling companies who do this as a service extension to the corrugated packaging collection within offices and industry.

The voluntary agreement has a similar construction to the producer responsibility laws. Since 1966 the recycling companies have jointly and voluntarily committed themselves to reach 50% collection of office waste paper. Collection has continually increased from 32% in 1996 to 57%(=206,000 t) in 2003. The goal has been increased to 75% from 2007. Due to the success of this scheme the Swedish authorities have recently decided continue to accept the voluntary agreement and refrain from producer responsibility legislation.

Tissue mills now use most of the office waste paper that is collected in Sweden. Until recently some 50,000 t were exported but this is reducing as two tissue mills have recently decided to increase DIP-capacity for office waste (a combined increase of 40 000 tpa) partly at the expense of lower grades (news & pams).

Most of the office waste paper is collected as mixed office waste and then mainly hand sorted at sorting centres. A few years ago a fairly large sorting centre in Gothenburg (processing a total 80-90 000 tpa of household news (mostly) and mixed office waste on a one shift basis utilising, in total, 14 people) installed an optical sorting line. It is being used as a second or third step both for mixed office waste paper and for news & pams (see flow chart of the line in Section 4, showing a typical performance for removal of liquid packaging board and folding boxboard). Detailed costs/benefit analysis is not available but the greatest economical value is said to be for sorting mixed office waste paper, since approx 75% of the input stream is upgraded into a 90% woodfree fraction at a sales value of £100 – 110/tonne compared to £50-60/tonne for news & pams.

The minimum economic size for an optical sorter is said to be in the order of 30-40,000 tpa. It can then replace 4-5 people doing manual sorting (per shift).

It is interesting to note that the trend in Sweden in recent years has been the opposite of the UK trend, i.e. away from selective, collection of clean fractions at the offices to volume oriented collection of mixed office papers, followed by sorting. One reason is the commitment to high recovery. Another reason is to avoid having to pay the offices but rather “do them a favour and minimise waste removal costs”.

In **France** there is very little collection from offices, the greater Paris region is one of the few where systematic office collection system is carried out. The limited collection is mirrored by low use of recovered fibre in tissue manufacturing and other high grades such as graphic papers.

In **Germany** the collection of office waste is traditionally done only at commercial collection points such as large office complexes and shredding companies for confidential handling of public and office documents. Collectors and traders are basically the same as for the lower grades. Shredded material coming out of archive makes up a significant proportion of this fibre collection. The cleanliness is quite good but there is a high percentage of carbonless copy paper and mechanical fibre, which discourages the tissue mills from using it.

“Better grades” and the upper grades in the “medium grades” which can be considered office waste /high grades accounted for up for approximately 1 million tonnes or 8% of the total recovered paper utilised in Germany in 2002.

To increase the amount and the quality obtained, trials have been conducted to collect office waste as a separate stream. Industry associations with subsidies from the government financed these trials.

INGEDE was responsible for one such program in a large office complex occupied by Siemens. Employees were asked to put white papers in separate boxes next to each desk and then bring to collecting bins placed close to copiers, regularly emptied by the ordinary cleaning staff.

The trial showed positive results and proved that alternative collection methods can increase the cleanliness of high grade office waste and make it useable for production of new P&W or tissue paper. However, although technically successful the program was discontinued due to insufficient profitability.

The experience from **The Netherlands** is a little different. Most offices (an informed guess is >70%) have a collection of office papers. This is dominated by the collection of mixed office papers. The collected paper is then sorted, by almost exclusively manual methods, to remove packaging and envelopes.

Sometimes in big offices the small volume but high value computer printouts are being segregated and collected separately.

6.4 Sorting of Office Waste Paper

Recovered fibre from offices is usually sorted either by manual means or by optical sorting together with a manual sort.

Sorting is normally conducted to remove contaminants from the stream and thus raise the value of the main stream. Currently the collection cost in the UK is often approaching or potentially exceeding the value of the sorted mixed office waste. This both limits collection and the degree of sorting that is conducted.

The model calculations run in section 5 for household paper are repeated here to give an example of a manual sort of office waste paper. Tables 9 and 10 describe the assumptions and results of the manual office paper sorting facility.

Table 7: Model Assumptions –Manual sort of office papers, processing capacity 40,000 tpa

Capital Cost (Manual Sort + Baling)		300,000	
Manning Cost			
	<i>Description</i>	<i>No.</i>	<i>Item Cost p.a £</i>
			<i>Total Cost p.a £</i>
	Sorters	20	15,000
	Drivers	3	15,000
	Maintenance	1	15,000
	Admin Staff	2	15,000
	Management	3	35,000
			105,000
Overheads			
	Fuel	25,000	£/year
	Heat & Light	10,000	£/year
	Other	30,000	£/year
Depreciation			
	5	years	
Other			
	Maintenance	2	%
	Financing	5	%

The results of the model are illustrated in Table 8.

Table 8: Model Results – Low Techsorting of mixed papers, processing capacity 40,000 tpa

Cost Component		Cost (£)
Direct Expenditure	Salaries	495,000
Indirect Expenditure	Overheads	65,000
	Maintenance	6,000
<i>Total Expenditure before Financial Costs</i>		566,000
Financial Costs	Depreciation	60,000
	Financing	15,000
<i>Total Expenditure</i>		641,000
Cost of Sorting £/tonne		16

Collection costs vary enormously depending on size of office and location but numbers between 60 and 70 £/tonne have been indicated during interviews. Values of the sorted office fibre between £65 and £80/tonne have been given. These numbers indicate why there has been a decreasing trend in sorting of office waste in the UK.

6.5 Analysis of threat to UK industry

A survey of the paper mills that use woodfree recovered fibre did not find any mills that wanted to pay more for a better sorted fibre. The focus was very much in the other direction with mills needing to pay less for the recovered fibre and downgrading the requirements as a result. Due to historical variations in fibre quality most of the big users have, over the years, developed their deinking plants to cope with unsorted mixed office waste.

Additional sorting of this grade could increase the price of the base grade for the export market and create a shortage of the base grade in the UK. However, providing growth in sorting is accompanied by a growth in collection this should not be a major problem.

6.6 Summary – results of interviews

The following are quotations from interviews from cross section of the recycling industry including, recycling companies and paper mills.

They have been selected to give a representative flavour of the attitudes and ideas presented during the interviews.

Interview with paper mills

"Today, availability of mixed office waste is not a problem."

"If the government purchase only recycled paper then the UK industry will need cash to invest and take advantage of this opportunity, otherwise these measures will only increase the imported volumes."

"The single biggest thing, which could be done to help paper recycling in the UK would be to reduce the cost of recovered fibre."

"Taxes, such as levies on fuel, are all hindering recycling."

"We have downgraded the quality of waste we purchase and buy more mixed office waste to keep costs down."

"We would like a cleaner fibre but would not be able to pay more for it."

"We do not normally have problems with supply of office waste."

"We have used more recycled fibre in the past, but there is no cost incentive today."

"The trend in all tissue mills had been to make the deink plants more sophisticated and then to buy cheaper grades of waste. When waste paper prices were high it was worth waste paper merchants while to sort the office waste, but now that the price is relatively low it isn't so they all stopped sorting."

"We are not interested in paying extra for the sorted grades."

"We do take some shredded waste, main problems are it is more difficult to assess the quality visually and the plastic can be cut into long strips, which are difficult to remove."

"All the new taxes and legislation, such as climate levy, landfill tax, food contact legislation and transport costs all effect recycling more than virgin products. This is swinging the balance towards the point where it will be more economic to use virgin fibre than to recycle."

"We would not buy recovered fibre from the domestic stream for hygiene reasons."

"The major change over the last two years was the increase in shredding of office waste, otherwise both price and quality had been very stable."

"Shredded office waste - but it wasn't worth bothering with because the yield is too low."

"We prefer not to take shredded waste when we can avoid it due to handling and dust problems."

"We only purchase printer trimming at all because we can't get enough mixed office waste (MOW)."

Interviews with recycling companies

"We have found sorting of office waste not to be economic and have removed the sorting line."

"There is plenty of fibre available for collection in the office."

"When we introduced a charge for collection only half the business were prepared to pay."

"We have found the spending time educating the users who supply the waste paper is the most important factor to maintaining quality."

"We now export 50% of our sales."

"We supply the complete system including cardboard collection boxes, but only collect from single source of wheelie bins in each office."

"1.25 kg per employee per week is a typical collection rate."

"600 kg/week is a typical collection rate"

"It would be possible to double the collection volume for office waste but it would take some time to set up the infrastructure."

"Environmental accreditation and the data protection act are helping to promote recycling."

"Recycling companies want to collect the office waste clean and sorted from an external bin."

"We have reduced our office collection because the costs are too high"

"We found that size of the office was not always a good guide either to the quantity of paper or to care with which it was sorted."

"If wheelie bins are outside then they tend to fill with other rubbish, this is particularly a problem in London, where space is at a premium."

"The income from office waste would need to be over £100 / tonne to be financially viable to collect."

"When we introduce a small charge for collection of office waste only 50% of the customers were prepared to pay. However, they were generally the companies that did a better job at segregating the waste."

"From an image point of view it is easier for waste management companies to charge for collection than for recycling companies."

Comments from Germany, Netherlands, France and Sweden:

"Much of the interest in new sorting technologies is not because it "pays off" in better prices for higher or cleaner qualities but as a means to increase volume through- put"(Sweden)

"Automated sorting is a long term "must" – for health and sanitary reasons."(Sweden)

"We have screened several different automated systems - an interesting one was based on tearing paper & board into pieces followed by air stream sorting – but it didn't work well enough" (Sweden)

"Optical sorters are highly effective – but are maximized to take out some 5% of the stream" (Netherlands)

"Suppliers of optical sorters have claimed much higher capacities than has been realized in practical trials – less than half when tested in reality" (Netherlands)

"Optical sorters should be best used for sorting high quality office waste – and possibly on News & PAMs to further reduce cartons" (Sweden)

"Disposal of waste from offices is still too cheap, which makes the recovered fibre hard to collect cost effectively."

Other interviews

"Office schemes need a 'local hero' to promote and police them."

"Education, particularly from primary school level is very important"

"If we could collect more high quality office waste with >80% woodfree content, then tissue mills would like more of it" (Sweden)

6.7 Conclusions – potential to add value to Office waste

There is a large amount of office waste that is not currently collected and it is a virtually untapped source of high value recovered fibre.

The main issues are to find cost effective ways to collect the fibres from the large number of sources and keep it clean enough, or to sort it cheaply enough, so that it can be cost effectively used by the paper industry or exported.

There are basically two approaches currently for the collection of office waste:

- One is to educate the office workers and heavily police collection to separate primarily woodfree paper at source. Those who don't comply will be dropped. No sorting but only classification is then needed at baling centres. Quality is high but volumes are low. This approach is practiced by Holland Recycling in Birmingham.
- Another is to collect a broader spectrum from the office including woodfree as well as wood containing papers (and also having to accept some envelopes, carton, binders etc) and to sort the grade afterwards. An example of this is IL Recycling in Gothenburg, Sweden. From the larger incoming stream of office waste (with a recovery rate of >50%) the sorting abstracts 75% as a 90% woodfree quality at a value of £100-110/tonne and most of the remaining 25% as News & PAMs at a value of £50– 60/tonne.

When sorting is conducted the main purpose is to raise the value of the main stream by removing contaminants such as brown envelopes, carton and plastic.

As the total quantity collected increases, overall quality decreases. So if collection of office waste is to grow substantially, then it seems likely that sorting will be required to maintain an acceptable quality. To set up two bins in the office would probably be too expensive in many cases.

Manual sorting is very flexible and can still be cost effective when compared with high tech solutions. For a few years optical sorting technology, from a multiple of suppliers, has been in operation in several countries and in different applications. Capital costs are high (£ 200-300 000) per unit and - depending on sorting line capacity, incoming quality and cleanliness requirements - several units may be needed. Therefore they are cost effective primarily in large sorting plants and pay off by reducing the need for manual sorting rather than totally eliminating it. Also work environment and health issues are quoted as reasons for introducing more automatic systems. It seems likely that automation will continue to grow as the technology develops.

7 Conclusions on paper collection

7.1 Collection from households

The collection of recyclables is increasing, a trend which is being driven by Local Authority recycling targets. The fastest growth is seen in kerbside collection and co-mingled collection of all recyclables. The main value of the collected paper is News and PAMS.

From a purely paper reprocessing point of view, it is doubtful whether the benefits of cheaper collection of co-mingled recyclables outweighs the extra costs of sorting and the removal of more contaminants. Co-mingled collection with other recyclables adds at least £10/Tonne to the sorting cost.

Increasing levels of collection from households has resulted in the composition of the recycled paper streams in the UK becoming more similar to those in Scandinavia, Germany and The Netherlands. Based on practice and experience in these countries, it is foreseen that the UK should be seeing:

- An increased requirement to sort or exclude the non-desirable paper packaging share (possibly increasing up to 20-30% of the total paper stream)
- Introduction of mechanical old corrugated carton (OCC) screening plus complimentary manual sorting to increase handling capacity and reduce the need for fully manual sorting.

Given the UK situation where increased collection will largely be going for export, any further sorting can only add marginal value over baling and exporting as News & PAMs and as sorted or even unsorted mixed paper, if the paper originates from a segregated collection. This is particularly true if the paper is exported to Asia see Figure 6.

More sophisticated sorting technology (such as optical sorting) is available, however, its cost-effectiveness for the household stream is still under debate.

7.2 Collection from offices

There is a large amount of office waste paper that is not currently collected which has huge potential as a high value recovered fibre stream. Woodfree fibre is best collected from the office rather than the household stream, but since the cost of collection is high and in many instances on par with the value of the fibre, there must be other financial incentives if collection is to increase. The comparative waste disposal costs is a major factor in this equation.

If big volumes were to be collected, sorting would be required to maintain cleanliness.

There are currently two approaches to the collection of office paper:

- One is a limited collection of primarily woodfree paper. No sorting is carried out, but classification depending on composition and quality is then needed at baling centres.
- Another is a broader collection from the office, i.e. to include woodfree as well as wood containing papers and also having to accept some envelopes, carton, binders, plastic etc that have to be removed afterwards.

Where sorting of office waste is conducted it is almost exclusively done manually but optical sorting technology has been tested in several countries and may become a complementary stage to manual sorting, particularly on bigger plants.

Appendix 1

Cross reference of European to UK recovered fibre grading systems

Definitions: Waste Paper Groups

The Paper Federation issued a booklet (in 1992) setting out ten waste paper groups. The ten groups are as follows:

Group 1

white woodfree unprinted stock: best white shavings, cream shavings, white and cream envelope cuttings, white coated paper, white printers' shavings and white soft tissue paper

Group 2

white wood free printed stock: best one cuts, black and white PAMS, book quire, sulphate waste, tear white shavings, white carbonless copy paper, white continuous stationery, white heavy letter paper, white listings paper

Group 3

white and lightly printed wastepaper; lightly printed mechanical paper, lightly printed scanboard, white mechanical coated paper, white mechanical listings paper, white duplex board, white unprinted newspapers and woody one cuts

Group 4

coloured woodfree stock; best coloured PAMS, coloured carbon less copy paper, coloured continuous stationery, coloured heavy letter paper, coloured mill broke, coloured shavings, coloured tissue paper, multigrade paper, sulphite bag waste, white and lightly toned shavings

Group 5

heavily printed mechanical paper; crushed newspapers, green mechanical listing paper, heavily printed scanboard, mechanical book paper, old newspapers and PAMS, over-issue newspapers, over-issue PAMS and telephone directory paper

Group 6

coloured kraft and manilla stock; buff and coloured tab cards, buff envelope cuttings, dark and lightly coloured manila papers, kraft liner, multi-ply kraft sacks, new brown krafts and old brown and coloured krafts

Group 7

new kraft liner stock; double lined kraft paper and new kraft cuttings

Group 8

container waste stock; unprinted corrugated boxes and solid fibre board boxes

Group 9

mixed waste paper; mixed and various types of re-pulpable paper, cartons and board

Group 10

coloured card stock; off-cuts, sheets and blanks of printed and unprinted card, new or used grey chipboard, white lined boxboard or waste based boards.

They also list *objectionable* and *prohibited* materials which have to be removed from all wastepaper grades before they can be used. These are:

Objectionable Materials

vegetable parchment, greaseproof paper, synthetic adhesives, pins, staples, security inks, splicing tapes, wet strength papers, synthetic inks, laser print and carbon papers.

Prohibited Materials

metals, string, glass, textiles, wood, sand and building materials, plastic laminates and other plastic material, synthetic paper, waxed paper and board, bitumenized paper and other rubbish.

CEPI Definitions

CEPI now uses **5** groups of Recovered Paper Grades; the 'components of these four categories as defined by the "European List of Standard Grades of Recovered Paper and Board", are:

Mixed Grades: 1.01, 1.02, 1.03, 5.01, 5.02, 5.03, 5.05

Corrugated and Kraft: 1.04, 1.05, 4.01, 4.02, 4.03, 4.04, 4.05, 4.06, 4.07, 4.08, 5.04

Newspapers and Magazines: 1.06, 1.07, 1.08, 1.09, 1.10, 1.11, 2.01, 2.02

High Grade: 2.03, 2.04, 2.05, 2.06, 2.07, 2.08, 2.09, 2.10, 2.11, 2.12, 3.01, 3.02, 3.03, 3.04, 3.05, 3.06, 3.07, 3.08, 3.09, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 5.06, 5.07

European List of Standard Grades of Recovered Paper and Board (EN643)

These comprise:

Group 1 - Ordinary Grades

- 1.01 - Mixed paper and board, unsorted, but unusable materials removed
A mixture of various grades of paper and board, without restriction on short fibre content.
- 1.02 - Mixed papers and board (sorted)
A mixture of various qualities of paper and board, containing a maximum of 40% of newspapers and magazines.
- 1.03 - Grey board
Printed and unprinted white lined and unlined grey board or mixed board, free from corrugated material.
- 1.04 - Supermarket corrugated paper and board.
Used paper and board packaging, containing a minimum of 70% of corrugated board, the rest being solid board and wrapping papers.
- 1.05 - Old corrugated containers
Used boxes and sheets of corrugated board of various qualities.
- 1.06 - Unsold magazines
Unsold magazines, with or without glue.
- 1.06.01 - Unsold magazines without glue
Unsold magazines without glue.
- 1.07 - Telephone Books
New and used telephone books, with unlimited content of pages coloured in the mass, with and without glue. Shavings allowed.
- 1.08 - Mixed newspapers and magazines I
A mixture of newspapers and magazines, containing a minimum of 50% of newspapers, with or without glue.
- 1.09 - Mixed newspapers and magazines II
A mixture of newspapers and magazines, containing a minimum of 60% of newspapers, with or without glue.
- 1.10 - Mixed magazines and newspapers
A mixture of newspapers and magazines, containing a minimum of 60% of magazines, with or without glue.
- 1.11 - Sorted graphic paper for deinking
Sorted graphic paper from households, newspapers and magazines, each at a minimum of 40%. The percentage of non-deinkable paper and board should be reduced over time to a maximum level of 1.5%. The actual percentage is to be negotiated between buyer and seller.

Group 2 - Medium Grades

- 2.01 - Newspapers
Newspapers, containing a maximum of 5% of newspapers or advertisements coloured in the mass.
- 2.02 - Unsold newspapers
Unsold daily newspapers, free from additional inserts or illustrated material coloured in the mass.
- 2.02.01 - Unsold newspapers, no flexographic printing allowed
Unsold daily newspapers, free from additional inserts or illustrated material coloured in the mass, strings allowed. No flexographic printed material allowed.
- 2.03 - Lightly printed white shavings
Lightly printed white shavings, mainly mechanical pulp based paper.
- 2.03.01 - Lightly printed white shavings without glue
Lightly printed white shavings, mainly mechanical pulp based paper, without glue.
- 2.04 - Heavily printed white shavings
Heavily printed white shavings, mainly mechanical pulp based paper.
- 2.04.01 - Heavily printed white shavings without glue
Heavily printed white shavings, mainly mechanical pulp based paper, without glue.
- 2.05 - Sorted office paper
Sorted office paper.
- 2.06 - Coloured letters
Correspondence, in mixed papers coloured in the mass, with or without print, of printing or writing paper. Free from carbon paper and hard covers.
- 2.07 - White woodfree books
Books, including misprints of books, without hard covers, mainly of woodfree white paper, black printed only. Containing a maximum of 10% of coated paper.

- 2.08 - Coloured woodfree magazines
Coated or uncoated magazines, white or coloured in the mass, free from non-flexible covers, bindings, non-dispersible inks and adhesives, poster papers, labels or label trim. May include heavily printed circulars and coloured in the mass shavings. Containing a maximum of 10% mechanical pulp based papers.
- 2.09 - Carbonless copy paper
Carbonless copy paper.
- 2.10 - Bleached woodfree PE-coated board
Bleached woodfree PE-coated board from board manufacturers and converters.
- 2.11 - Other PE-coated board
Other PE-coated board. May contain unbleached board and paper from board manufacturers and converters.
- 2.12 - Mechanical pulp based computer print-out
Continuous computer print-out, mechanical pulp based, sorted by colours, may include recycled fibres.

Group 3 - High Grades

- 3.01 - Mixed lightly coloured printers shavings
Mixed shavings of printing and writing papers, lightly coloured in the mass, containing a minimum of 50% of woodfree paper.
- 3.02 - Mixed lightly coloured woodfree printer shavings
Mixed shavings of printing and writing papers lightly coloured in the mass, containing a minimum of 90% of woodfree paper.
- 3.03 - Woodfree binders
White woodfree lightly printed shavings with glue, free from paper coloured in the mass. May contain a maximum of 10% of mechanical pulp based paper.
- 3.04 - Tear white shavings
White woodfree lightly printed shavings without glue, free from wet-strength paper and paper coloured in the mass.
- 3.05 - White woodfree letters
Sorted white woodfree writing papers, originating from office records, free from cash books, carbon paper and non-water soluble adhesives.
- 3.06 - White business forms
White woodfree printed business forms.
- 3.07 - White woodfree computer print-out
White woodfree computer print-out, free from carbonless paper and glue.
- 3.08 - Printed bleached sulphate board
Heavily printed sheets of bleached sulphate board, without glue, polycoated or waxed materials.
- 3.09 - Lightly printed bleached sulphate board
Lightly printed sheets of bleached sulphate board, without glue, polycoated or waxed materials.
- 3.10 - Multi printing
Woodfree, coated, lightly printed, free from wet strength paper or paper coloured in the mass.
- 3.11 - White heavily printed multiply board
New cuttings of heavily printed white multi-ply board, containing woodfree, mechanical or thermo-mechanical pulp plies, but without grey plies.
- 3.12 - White lightly printed multiply board
New cuttings of lightly printed white multi-ply board, containing woodfree, mechanical or thermo-mechanical pulp plies, but without grey plies.
- 3.13 - White unprinted multiply board
New cuttings of unprinted white multi-ply board, containing woodfree, mechanical or thermo-mechanical pulp plies, but without grey plies.
- 3.14 - White newsprint
Shavings and sheets of white unprinted newsprint, free from magazine paper.
- 3.15 - White mechanical pulp based coated and uncoated paper
Shavings and sheets of white unprinted coated and uncoated mechanical pulp based paper.
- 3.15.01 - White mechanical pulp based paper containing coated paper
Shavings and sheets of white unprinted mechanical pulp based coated paper.
- 3.16 - White woodfree coated paper, without glue
Shavings and sheets of white unprinted woodfree coated paper, without glue.
- 3.17 - White shavings
Shavings and sheets of white unprinted paper, free from newsprint and magazine paper containing a minimum of 60% of woodfree paper; may contain a maximum of 10% of coated paper. Without glue.
- 3.18 - White woodfree shavings
Shavings and sheets of white unprinted woodfree paper; may contain a maximum of 5% of coated paper. Without glue.
- 3.18.01 - White woodfree uncoated shavings
Shavings and sheets of white unprinted woodfree paper, free from coated paper. Without glue.
- 3.19 - Unprinted bleached sulphate board
Unprinted sheets of bleached sulphate board, without glue, polycoated or waxed materials.

Group 4 - Kraft Grades

- 4.01 - New shavings of corrugated board
Shavings of corrugated board, with liners of kraft or testliner
- 4.01.01- Unused corrugated kraft
Unused boxes, sheets and shavings of corrugated board, with kraft liners only, the fluting made from chemical or thermo-chemical pulp.
- 4.01.02- Unused corrugating material
Unused boxes, sheets and shavings of corrugated board, with liners of kraft or testliner.
- 4.02 - Used corrugated kraft I
Used boxes of corrugated board, with kraft liners only, the fluting made from chemical or thermo-chemical pulp.
- 4.03 - Used corrugated kraft II
Used boxes of corrugated board, with liners of kraft or testliners but having at least one liner made of kraft
- 4.04 - Used kraft sacks
Clean used kraft sacks. Wet-strength and non wet-strength.
- 4.04.01- Used kraft sacks with polycoated papers
Clean used kraft sacks. Wet-strength and non wet-strength. May include polycoated papers.
- 4.05 - Unused kraft sacks
Unused kraft sacks. Wet-strength and non wet-strength.
- 4.05.01- Unused kraft sacks with polycoated papers
Unused kraft sacks. Wet-strength and non wet-strength, may include polycoated papers.
- 4.06 - Used kraft
Used kraft paper and board of a natural or white shade.
- 4.07 - New kraft
Shavings and other new kraft paper and board of a natural shade.
- 4.08 - New carrier kraft
New carrier kraft, may include wet-strength paper.

Group 5 - Special Grades

- 5.01 - Mixed recovered paper and board
Unsorted paper and board, separated at source.
- 5.02 - Mixed packaging
A mixture of various qualities of used paper and board packaging, free from newspapers and magazines.
- 5.03 - Liquid board packaging
Used liquid packaging board including used PE-coated liquid packaging board (with or without aluminium content), containing a minimum of 50% by weight of fibres, and the balance being aluminium or coatings.
- 5.04 - Wrapper kraft
Poly-lined, sprayed, or laminated used kraft. Must not contain bitumen or wax coatings.
- 5.05 - Wet labels
Used wet labels from wet-strength papers, containing a maximum of 1% glass content, and a maximum of 50% moisture, without other unusable materials.
- 5.06 - Unprinted white wet-strength woodfree papers
Unprinted white wet-strength woodfree papers.
- 5.07 - Printed white wet-strength woodfree papers
Printed white wet-strength woodfree papers.

UK, CEPI & EN643 – Correlation of Grades/Groups

UK Group 1

White woodfree unprinted stock: best white shavings, cream shavings, white and cream envelope cuttings, white coated paper, white printers' shavings and white soft tissue paper

EN 643 Ref	Description	Pre-cons %
High Grades		
3.01	Mixed shavings of printing and writing papers, lightly coloured in the mass, containing a minimum of 50% of woodfree paper	100%
3.02	Mixed shavings of printing and writing papers lightly coloured in the mass, containing a minimum of 90% of woodfree paper	100%
3.18	Shavings and sheets of white unprinted woodfree paper; may contain a maximum of 5% of coated paper. Without glue	100%
3.16	Shavings and sheets of white unprinted woodfree coated paper, without glue	100%
3.17	Shavings and sheets of white unprinted paper, free from newsprint and magazine paper containing a minimum of 60% of woodfree paper; may contain a maximum of 10% of coated paper. Without glue	100%
3.18.01	Shavings and sheets of white unprinted woodfree paper, free from coated paper. Without glue	100%
3.19	Unprinted sheets of bleached sulphate board, without glue, polycoated or waxed materials	

Group 2

White wood free printed stock: best one cuts, black and white PAMS, book quire, sulphate waste, tear white shavings, white carbonless copy paper, white continuous stationery, white heavy letter paper, white listings paper

EN 643 Ref	Description	Pre-cons %
High Grades		
3.03	White woodfree lightly printed shavings with glue, free from paper coloured in the mass. May contain a maximum of 10% of mechanical pulp based paper	100%
3.04	White woodfree lightly printed shavings without glue, free from wet-strength paper and paper coloured in the mass	100%
3.05	Sorted white woodfree writing papers, originating from office records, free from cash books, carbon paper and non-water soluble adhesives	0%
3.06	White woodfree printed business forms	0%
3.07	White woodfree computer print-out, free from carbonless paper and glue	10%
Medium		
2.07	Books, including misprints of books, without hard covers, mainly of woodfree white paper, black printed only. Containing a maximum of 10% of coated paper	100%

Group 3

White and lightly printed wastepaper; lightly printed mechanical paper, lightly printed scanboard, white mechanical coated paper, white mechanical listings paper, white duplex board, white unprinted newspapers and woody one cuts

EN 643 Ref	Description	Pre-cons %
High Grades		
3.09	Lightly printed sheets of bleached sulphate board, without glue, polycoated or waxed materials	100%
3.14	Shavings and sheets of white unprinted newsprint, free from magazine paper	100%
3.15	Shavings and sheets of white unprinted coated and uncoated mechanical pulp based paper	100%
Medium Grades		
2.03	Lightly printed white shavings, mainly mechanical pulp based paper	100%
2.03.01	Lightly printed white shavings, mainly mechanical pulp based paper, without glue	100%
2.04	Heavily printed white shavings, mainly mechanical pulp based paper	100%
2.04.01	Heavily printed white shavings, mainly mechanical pulp based paper, without glue	100%
2.12	Continuous computer print-out, mechanical pulp based, sorted by colours, may include recycled fibres	100%

Group 4

Coloured woodfree stock; best coloured PAMS, coloured carbon less copy paper, coloured continuous stationery, coloured heavy letter paper, coloured mill broke, coloured shavings, coloured tissue paper, multigrade paper, sulphite bag waste, white and lightly toned shavings

EN 643 Ref	Description	Pre-cons %
High Grades		
3.08 ??	Heavily printed sheets of bleached sulphate board, without glue, polycoated or waxed materials.	100%
3.10	Woodfree, coated, lightly printed, free from wet strength paper or paper coloured in the mass	100%
3.11	New cuttings of heavily printed white multi-ply board, containing woodfree, mechanical or thermo-mechanical pulp plies, but without grey plies.	100%
3.12	New cuttings of lightly printed white multi-ply board, containing woodfree, mechanical or thermo-mechanical pulp plies, but without grey plies	100%
3.13	New cuttings of unprinted white multi-ply board, containing woodfree, mechanical or thermo-mechanical pulp plies, but without grey plies	100%
Medium Grades		
2.05	Sorted office paper	0%
2.06	Correspondence, in mixed papers coloured in the mass, with or without print, of printing or writing paper. Free from carbon paper and hard covers	0%
2.08	Coated or uncoated magazines, white or coloured in the mass, free from non-flexible covers, bindings, non-dispersible inks and adhesives, poster papers, labels or label trim. May include heavily printed circulars and coloured in the mass shavings. Containing a maximum of 10% mechanical pulp based papers	0%
2.09	Carbonless copy paper	0%

Group 5

Heavily printed mechanical paper; crushed newspapers, green mechanical listing paper, heavily printed scanboard, mechanical book paper, old newspapers and PAMS, over-issue newspapers, over-issue PAMS and telephone directory paper

EN 643 Ref	Description	Pre-cons %
High Grades		
1.06	Unsold magazines, with or without glue	0%
1.07	New and used telephone books, with unlimited content of pages coloured in the mass, with and without glue. Shavings allowed	0%
1.08	A mixture of newspapers and magazines, containing a minimum of 50% of newspapers, with or without glue.	0%
1.09	A mixture of newspapers and magazines, containing a minimum of 60% of newspapers, with or without glue	0%
1.10	A mixture of newspapers and magazines, containing a minimum of 60% of magazines, with or without glue	0%
1.11	Sorted graphic paper from households, newspapers and magazines, each at a minimum of 40%. The percentage of non-deinkable paper and board should be reduced over time to a maximum level of 1.5%. The actual percentage is to be negotiated between buyer and seller.	0%
Medium Grades		
2.01	Newspapers, containing a maximum of 5% of newspapers or advertisements coloured in the mass.	0%
2.02	Unsold daily newspapers, free from additional inserts or illustrated material coloured in the mass	0%