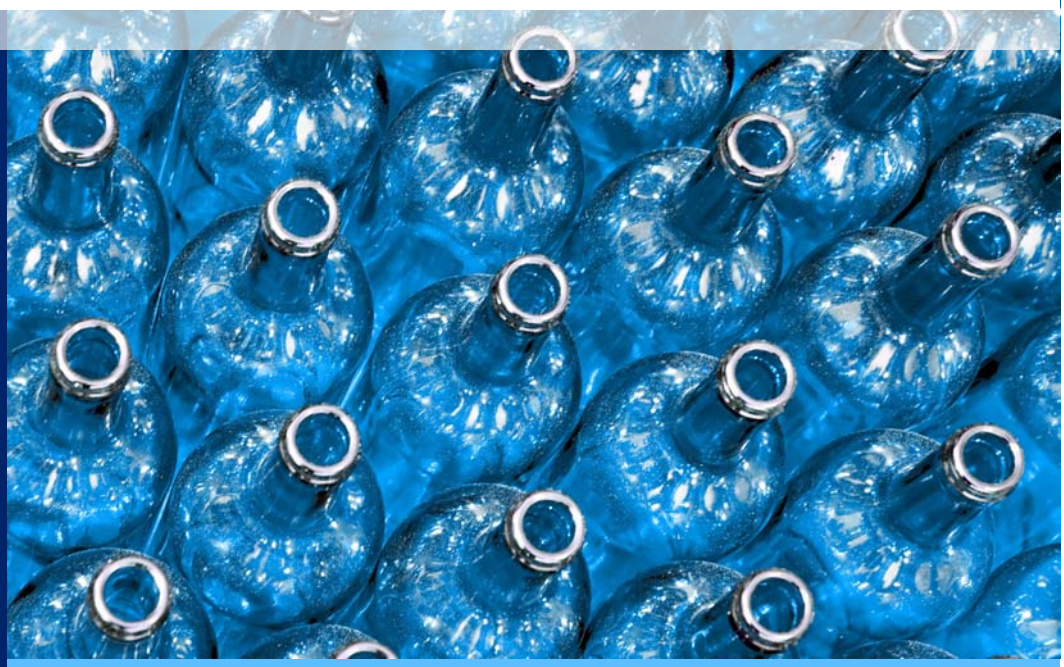
Dublin City
Baile Átha Cliath

Dún Laoghaire-Rathdown
County Council Comhairle Contae
Dhún Laoghaire-Ráth an Dúin

Comhairle Contae
Átha Cliath Theas
South Dublin County Council

Fingal County Council
Comhairle Contae Fhine Gall

Waste Management Plan
Working for the Dublin Region



Glass Collection and Recycling in Dublin

A Policy Review

October 2008

RPS

GLASS COLLECTION AND RECYCLING IN DUBLIN

A POLICY REVIEW

DOCUMENT CONTROL SHEET

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Consulting Engineers

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EXECUTIVE SUMMARY

RPS have been engaged by the Dublin Local Authorities (Dublin City Council, South Dublin County Council, Fingal County Council and Dun Laoghaire Rathdown County Council) to prepare a report on the policy for the collection of household glass in the Dublin Region. Household glass is currently collected through a network of publicly managed bring banks in Dublin. The public are required to colour separate glass at these facilities.

The objective of the report is to review the Dublin Local Authority glass collection policies and assess the effectiveness of the current arrangements in terms of capturing and increasing the collection of household glass as well as examining the quality of glass being made available for recycling.

Household Glass Collection Policy

A review of European and National policy for the collection of glass through the use of bring banks was undertaken. The following conclusions have been prepared following an analysis of the review of policy documents.

- The revisions to the EU Waste Framework Directive indicate that European policy on waste management is being strengthened and new approaches are being proposed alongside established guiding principles. To further enhance Europe as a recycling society it is proposed that Member States will provide separate collection systems for specific materials, including glass to raise the quality of recyclable materials collected and to progress the development of recycling markets.

- National waste policy since the 1990s has championed and promoted the value of separate collection of waste materials and recyclables. The value of the bring bank systems for the source-separate collection of material, specifically glass, is recognised and the government has invested significant finances in growing the number of facilities across Ireland. The continued expansion of these existing systems is an-going objective of national waste policy.

- At a regional level the policy for the collection of household glass has remained consistent in the first generation and Replacement Dublin Waste Plan. The relevant collection policies set out in the Replacement Dublin Regional Waste Plan are focused on the separate collection of recyclables. For the collection of household glass 2005 - 2010, the development of the existing bring bank system, and the continued colour separation of glass recyclables at these facilities, has been identified as the preferred approach in the region.

- From the documents and statements reviewed it is clear that the current policy for glass collection being pursued in Dublin is in line with progressive thinking at European level, which will require Member States to collect glass separately by 2015.

Household Glass Recycling

The overall total number of Bring Banks in the Dublin Region stood at 321 in 2006 and there has been steady growth since 1996 when the number of bring banks was 134. The figure below shows the total tonnes of household glass collected from bring banks in the Dublin Region from 1996 to 2006 (where data is available). Between 1996 and 2006 an increase of 392% in glass tonnage collected has been recorded.

There was consistent growth in all four areas of the Dublin Region with the largest increase of 160% recorded in South Dublin County Council for the period. Increases of 88%, 12% and 43% were recorded for Dublin City Council, Fingal County Council and Dun Laoghaire Rathdown County Council

respectively. These increases are attributed to the increase in the number of facilities and improved understanding and awareness of recycling in Dublin.

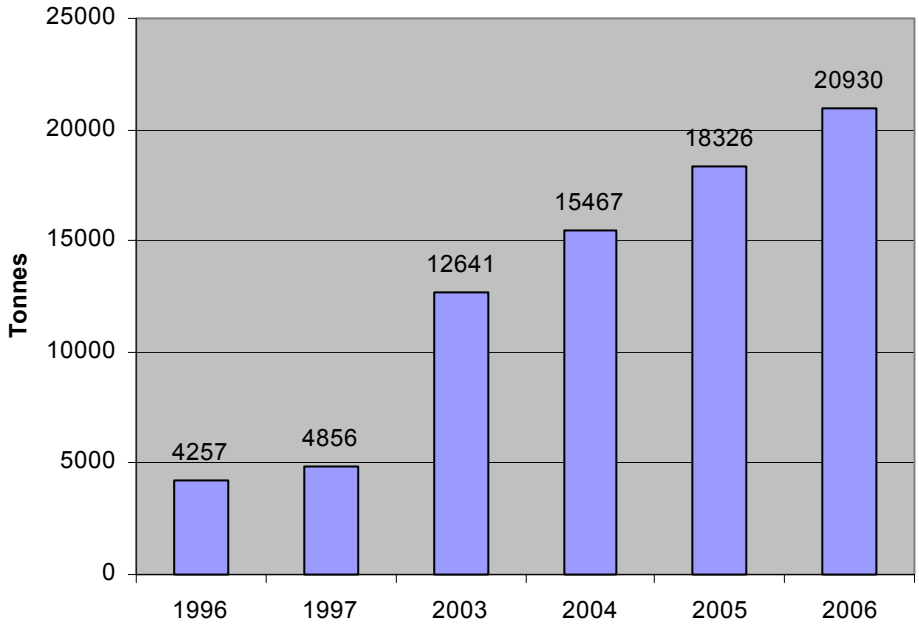


Figure: Tonnages of Household Glass Collected from Bring Banks in the Dublin Region

European Glass Collection

Details on the household glass collection systems for a number of European counties were gathered. A synopsis of the key elements of this information is presented in the table below. The green highlighting indicates the collection method of preference in that country.

	Collection Schemes In-Use		Glass Generation	Collection Rate		Treatment (%)		Year of Data
	Kerbside	Bring Bank	Tonnes	%	Kg/Capita/Year	Closed	Open	
Dublin	Y	Y	32,104	65.2	27	-	-	2006
Ireland	Y	Y	217,315	63.5	32.3	87%	13%	2006
Austria		Y	276,437	80	24.3	80%	20%	2007
Switzerland	Y	Y	322,175	95.6	41	66%	34%	2006
Netherlands		Y	515,000	80	21.1	80%	20%	2006
Denmark	Y	Y	143,385	84	22.3	62%	38%	2006
UK	Y	Y	2,650,000	50	44.2	57.4%	42.6%	2007
France	Y	Y	3,300,000	61.25	28	62%	38%	2005

Stakeholder Consultations

As part of this report RPS carried out consultations with representatives from the Glass and Paper Industry in Ireland and the UK. Detailed notes on the consultation with each party are included in Appendix A.

Some of the key points from the Stakeholder consultations are:

- Collection schemes: In the UK, WRAP has compiled a Good Practice Guide for local authorities on the collection of glass. In this document WRAP has a clear preference for collecting colour separated glass and advises local authorities to stick with existing bring bank systems rather than move to kerbside collection.

- Quality: All Stakeholders confirm that colour separated glass (at source) delivers the highest quality cullet for closed loop recycling.

- Carbon Emissions: The importance of the carbon agenda in glass recycling should be recognised. In closed loop recycling where recyclable glass is made back into glass, a saving of 314Kg CO_2 per tonne is achieved. In open loop recycling where glass cullet is sent for aggregate use, there is no saving, but rather 2Kg CO_2 per tonnes is consumed.

- Contamination: Contamination can be a real issue for cullet facility operators and manufacturers when processing mixed glass collected at kerbside, especially glass which has been collected with other non-glass materials e.g. paper, cardboard, plastics.

- Education: In Dublin over 25 years of investment has been made in educating householders to colour separate glass at bring bank facilities and a move to kerbside collections will counter the significant progress made and resources spent.

Increased dust contamination of the glass can also be a problem when the material is mixed with paper and cardboard products. Similarly paper and cardboard products can be contaminated with shards of glass when collected and compacted together. Both the glass and paper industries have a clear preference to keep glass collected separate from other materials to minimise contamination and maximise the potential to reprocesses the glass and paper collected into new glass and paper products.

Review of Glass Collection and Recycling Systems

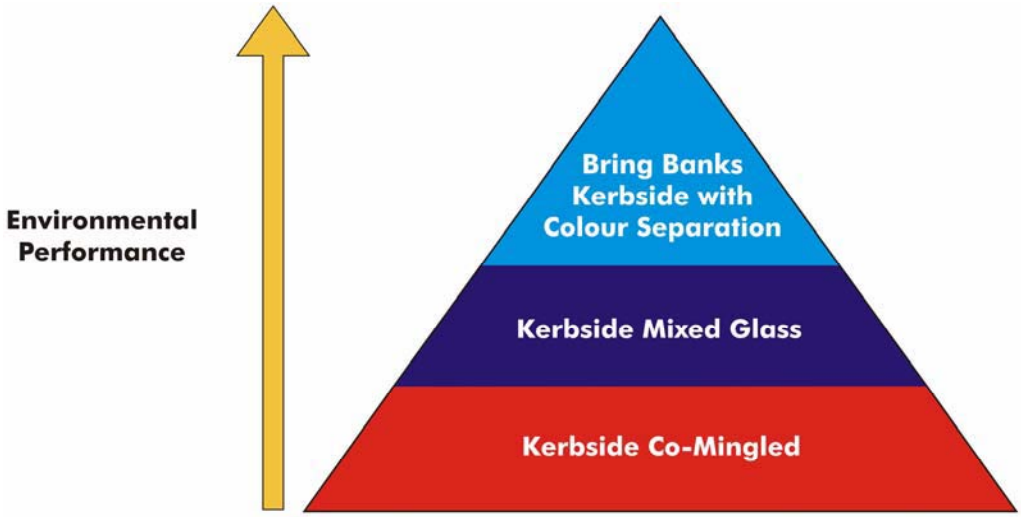
A comparative review assessing bring bank and kerbside type systems for the collection of household glass was undertaken. The findings of published reports and documents coupled with facility site visits, and consultations with stakeholders from the glass industry have helped to further inform the discussion. The following conclusions can be drawn from this review:

The existing bring bank system for the collection of household glass in Dublin is delivering high rates of collection and is meeting national targets (to increase recycling, to continue to expand the network of bring banks and a target of 111 new bring banks by 2010). Colour separation at bring banks provides a high quality and economically valuable product for the production of furnace ready cullet. The cullet material is sent to available destination markets, typically glass reprocessing facilities in Ireland and the UK as part of a closed loop recycling system.

Kerbside glass collections are in their infancy in Dublin with two different systems being offered to householders. The convenience of kerbside collection of glass is attractive to customers and the widespread use of kerbside would more than likely lead to an increase in tonnages collected in the

region. However there are contamination concerns over the kerbside collection of glass, especially systems which co-mingle glass with other recyclable materials. This type of collection system requires an additional processing step and adds further costs to the collection of glass. A specific kerbside glass collection is also on offer in Dublin at an additional charge to customers although the take up of this collection has been limited to date. The storage and use of an extra bin, in addition to the planned 3-bin system, will prevent certain householders from availing of this service.

In conclusion, the local authorities should continue to provide bring banks and encourage householders to colour separate glass at source. The following provides a priority ranking of glass collection systems for Dublin in terms of environmental performance and best practice.



Recommendations

The following recommendations for the Dublin Local Authorities are to ensure the current high collection rates for household glass are maintained:

1. It is recommended that the local authorities continue to expand the bring bank network in Dublin and aim to deliver the target of 111 additional bring banks by 2010 (on the baseline year of 2003) as set down in the Waste Plan.

Table 18.1 from the Waste Management Plan for the Dublin Region 2005 to 2010

Local Authority	DCC	DLRCC	FCC	SDCC
Existing Bring Banks	73	64	70	50
New Bring Banks target	49	13	20	29
Total target	122	77	96	79
Target Ratio (population per site)	1:3,500	1:2,500	1:2,500	1:2,500
Note: Some banks may be expanded or the range of materials accepted may be increased				

2. It is recommend that the local authorities enhance security measures at bring bank locations where fly-tipping and vandalism have occurred. A record of events of this nature should be kept and maintained.

3. It is recommended that local authorities continue to promote the use of bring banks and educate the public on the importance of colour separation at source.

4. It is recommended that the local authorities consider alternative bin collection systems for glass, such as underground or deep storage bins instead of the traditional above ground banks.

5. It is recommended that the local authorities ensure that new residential developments, including apartment complexes include for the provision of colour separated glass collection banks on-site.

6. It is recommended that Bye-Laws for Household Waste are consistent across the region and glass is prohibited from collection in the green bin.

1 TERMS OF REFERENCE

RPS have been engaged by the four Dublin Local Authorities[1] to prepare a report on the policy for the collection of household glass in the Dublin Region. Household glass is currently collected through a network of publicly managed bring banks in Dublin with the public required to colour separate glass at these facilities.

The objective of the report is to review the public authorities glass collection policy and assess the effectiveness of the current arrangements in terms of capturing and increasing the collection of household glass as well as examining the quality of glass being made available for recycling. The report includes a qualitative assessment of bring banks and alternative kerbside collection systems in terms of environmental, social and economic performance.

Collection systems from a selection of European countries are also presented along with a summary of consultations with stakeholders from the glass recycling and manufacturing industries in Ireland and the UK.

The conclusions and recommendations of this report will inform the review of waste management policy during the preparation of the third generation regional waste management plan.

[1]The Dublin Local Authorities are Dublin City Council, Dun Laogahire-Rathdown County Council, Fingal County Council, and South Dublin County Council.

2 HOUSEHOLD GLASS COLLECTION POLICY

A review of European, National and regional policy on the collection of glass has been undertaken to put in context the system currently employed in the region.

2.1 EUROPEAN POLICY

European Waste Directive

The EU Waste Framework Directive[2] (2006/12/EC) (hereafter Waste Directive) encourages Member States to adopt the guiding principles of the waste management hierarchy, to prevent, reduce, reuse and recover waste in favour of disposal to landfill. The Waste Directive encourages Member States to take appropriate measures to achieve "the recovery of waste and the use of recovered materials as raw materials" so as to "conserve natural resources".

The preparation of a revised Waste Framework Directive has been underway for some time. In June 2008 a new wording for the new Directive was adopted by the European Parliament, this has been forwarded to the European Council and Commission for approval which is expected late in 2008. One of the amendments to the Directive includes the introduction of a 50% household waste recycling target for the first time, this coupled with the separate collection objectives makes source separation for glass and other materials an imperative. Among other things the new Waste Directive is proposing to strengthen waste prevention measures, as well as introducing a policy approach that "takes into account the whole life-cycle of products and materials… and focuses on reducing the environmental impacts of waste generation and waste management, thereby strengthening the economic value of waste".

In terms of recovery and recycling the new wording of the proposed Directive provides specific policy direction for member states. The proposed Article 10(2) states to facilitate improved recovery, "waste shall be collected separately if technically, environmentally and economically practicable and shall not be mixed with other waste or other material with different properties". The proposed Article 11 goes further and states:

> "Member States shall take measures to promote high quality recycling and to this end they shall set up separate collection of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors.
>
> Subject to Article 10(2), by 2015 separate collection shall be set up for at least the following: paper, metal, plastic and glass."

The proposed revisions to the Waste Directive indicate that European waste policy is progressing and new approaches are being proposed alongside guiding principles. To further enhance Europe as a recycling society it is proposed that Member States will provide separate collection systems for specific materials, including glass, to raise the quality of recyclable materials collected and to progress the development of recycling markets. It is possible that this new Directive will be in force by the end of 2008.

[2] The EU Waste Framework Directive (2006/12/EC), (hereafter 2006 Waste Directive) was drawn up to codify the original Council Directive (75/442/EEC) on Waste and all subsequent amendments to the Directive.

Packaging Waste Directive

The targets for the recovery of packaging waste are set down in the European Parliament and Council Directive (94/62/EC) on Packaging and Packaging Waste, as amended by European Parliament and Council Directive (2004/12/EC). In the Waste Management (Packaging Waste) Regulations 2007, S.I. 798 of 2007, Ireland adopted these European targets and by the end of 2010 the following minimum recycling targets for materials contained in packaging waste will apply:

(*a*) a minimum of 60% of packaging waste by weight to be recovered; and

(*b*) a minimum of 55% of packaging waste by weight to be recycled in total, including material specific recycling targets as follows:

(i) 60% by weight for glass,
(ii) 60% by weight for paper and board,
(iii) 50% by weight for metals,
(iv) 22.5% by weight for plastics, and
(v) 15% by weight for wood.

Existing European and National legislation targets specific waste streams, including glass, and has set down specific dates for meeting recycling targets. Ireland is currently meeting its packaging waste targets for glass, and it is important that current systems are maintained and developed to ensure that future targets are met and high quality material is made available.

2.2 NATIONAL POLICY

A review of key National Waste Policy Statements has been undertaken to examine the overarching policy for the collection of household glass in Ireland.

Towards a Recycling Strategy (1994)

This National Strategy published by the Department of the Environment, Heritage and Local Government (DEHLG) provides technical, environmental and economic guidance for local authorities on the future development of recycling in Ireland. As part of the study the effectiveness of bring bank and kerbside systems was examined and recommendations prepared.

The Strategy reports that “a major advantage of bring systems is that they are relatively cheap to set up and operate” and “offer greater opportunities” for the separation of waste items. It is recognised in the report that for glass, bring banks “enable separation of materials by colour”, while this type of separation from kerbside systems is “likely to be too great”. The report also acknowledges that bring banks can be inconveniently located to householders and in some locations are noise and visual nuisances. The strategy concludes that to avoid on-going problems at bring banks “sitting is therefore an important aspect” but coupled with “education of the local population into the use of banks and their purpose”, the strategy also finds that “colour separation at source” is preferred so as to avoid contamination and processing issues post collection, findings which are all still relevant.

Changing Our Ways (1998)

The waste Policy Statement *Changing Our Ways* was published in 1998 and set out a new approach for waste management in Ireland. The waste management hierarchy was placed at the centre of this new approach and the plan was to develop integrated solutions, moving away from our over dependence on landfill.

The value of providing separate collection systems for waste materials and recyclables is recognised in *Changing Our Ways* which states the choice of system “is of paramount importance if the overall

objective of diverting significant quantities of waste away from landfill is to be successfully achieved". The Policy sets a target of 50% diversion of overall household waste away from landfill by 2013.

The use of bring banks are identified, along with other systems, as an approach "to segregate materials for recovery purposes". The Policy Statement is principally directed at local authorities who are identified as being responsible for the delivery of the preferred recycling collection systems for their waste region.

Delivering Change (2002)

A second waste Policy Statement, *Preventing and Recycling Waste: Delivering Change*, was published in 2002 and set out a range of measures and structures to further Ireland's performance in terms of waste prevention, reuse, recycling and recovery.

The Policy Statement acknowledges that by 2002 "good progress has been made in extending a network of bring centres for recyclables" across the country. The document recognises that if Ireland is to continue to improve recycling rates the provision of "separate collection systems for waste that is segregated at source by producers including householders" is necessary to provide "cleaner waste fractions and single material waste streams".

In this context section 5.5.1 of *Delivering Change* recommends that "regional waste management plans provide for the extension and upgrading of the bring bank networks" which will "assist in maximising the recovery of glass". The document recognises the value of the bring bank system and is clear in its policy direction stating that "it is important to build upon the progress achieved over the past number of years and improve the density of bring banks as soon as possible".

Furthermore the Policy Statement identifies "the degree of contamination" in recycling collection systems as a constraint against improving recycling performance. Delivering Change refers to the commencement of kerbside recycling collection systems in Ireland in 2002 which at the time focused on collecting paper and cardboard and other dry recyclable materials and states that "waste glass is not collected under these systems because of the risk of contamination of other materials by broken glass".

Waste Management – Taking Stock and Moving Forward (2004)

In 2004 the Department of the Environment, Heritage and Local Government published *Waste Management – Taking Stock and Moving Forward* and set out key points for the effective delivery of national waste management objectives.

This policy statement recognises that "good progress is being made in the roll out of bring banks" and that Government investment "is playing an important part" in improving Ireland's recycling infrastructure. The development of the bring bank system has received significant government funding with the document reporting that capital grants were put towards the development of "581 new bring sites (and upgrades of others)" and that additional funding will be made available in the future.

EPA National Waste Report (2006)

In the most recent National Waste Report 2006, the EPA highlights the importance of the bring bank system in Ireland stating that "despite the availability of separate kerbside collection services for recyclables civic amenity sites and bring banks are increasingly important for the collection of household waste". The report states that bring banks "remain essential facilities for the collection of wastes (including glass) not generally accepted in kerbside collection services". The data in the report shows that the use of bring banks increased by 14% in 2006 (from 2005) and the total quantity of waste materials accepted at these facilities was 96,727 tonnes (of which 73% was glass).

Programme for Government (2007)

The Programme for Government 2007 – 2012, agreed between the current coalition partners (Fianna Fáil, The Green Party and the Progressive Democrats), sets out overarching national policy for all sectors. In terms of waste management the Government is committed to establishing "ambitious recycling targets" and along with other waste collection objectives will "expand the network of bottle banks" to achieve this goal.

2.3 REGIONAL POLICY

Dublin Regional Waste Plan (1998)

The first Waste Management Plan for the Dublin Region was prepared and adopted in 1999. At this time a network of bring bank facilities had been established in the region providing outlets for the recycling of household glass by colour. Section 10.3.2 of the Plan sets out the policy approach for the development of the bring banks system. The proposals included extending the bring bank system to all parts of the region, complimenting planned kerbside collection of recyclables in suburban and lower density areas, while in urban areas bring banks were to be the primary outlet for the collection of recyclables from households.

Replacement Regional Waste Plan (2005)

In terms of the collection of household waste the policy for the region during the lifetime of the Plan is clear. At its core the policy states that the "Dublin Local Authorities will continue to offer an integrated and cost-effective collection service to households in the Region" with emphasis on the "separate collection of clean, high value resources". Glass is not identified as part of future kerbside collection schemes.

The model for household waste collection and recycling is illustrated in Figure 18.3 of the Waste Plan and this graphical overview is reproduced in Figure 2.1. The planned elements of the integrated household waste collection model for the region are defined in the graphical model as are the types of wastes which will be collected. Bring banks are identified (in Figure 2.1) as the preferred infrastructure for the collection of household glass with separate banks to be provided for green, clear and brown glass at each location.

The policy objectives[3] for the collection of household glass in the replacement Waste Plan aim to further increase recycling, including the number of bring banks for households.

In the Waste Plan it is stated that the "majority of bring banks (in the region) consist of receptacles for glass and cans". The continued growth of the bring bank network in the region is proposed and a specific policy objective in Section 18.4 of the Waste Plan states that the Dublin Local Authorities are "to continue to expand the network of bring banks" and a target of "111 new bring banks" by 2010 has been set.

Further objectives on the collection of glass through the bring bank system are contained in the section *Waste in Apartments – Additional Policies* of the Waste Plan. The role of bring banks is defined once again and it is stated "glass bottles will continue to be collected at bring banks". The Dublin Local Authorities are aiming to improve collection and recycling services for residents in apartments and the Plan includes an objective that "new apartments should include separate facilities for collection of glass".

[3] Section 18.4, Waste Management Plan for the Dublin Region 2005 - 2010

Figure 2.1: Overview of Household Waste Collection Policy (Source: Dublin Waste Management Plan

This objective is developed further in Appendix C, Guideline for Waste Storage Facilities, of the Waste Plan which states that "provision should also be made for the collection of glass (separated by colour) in Bottle Banks within the curtilage of the apartment block".

2.4 ANALYSIS OF POLICY

The evolution of European and National policy for the collection of glass through the use of bring banks has been reviewed to put into context the policy which is currently implemented in Dublin. The following conclusions have been prepared following an analysis of the policies reviewed:

- The revisions to the EU Waste Framework Directive indicate that European policy on waste management is being strengthened and new approaches are being proposed alongside established guiding principles. To further enhance Europe as a recycling society it is proposed that Member States will provide separate collection systems for specific materials, including glass to raise the quality of recyclable materials collected and to progress the development of recycling markets.

- National waste policy since the 1990s has championed and promoted the value of separate collection of waste materials and recyclables. The value of the bring bank systems for the source-separate collection of material, specifically glass, is recognised and the government has invested significant finances in growing the number of facilities across Ireland. The continued expansion of these existing systems is an-going objective of national waste policy.

- At a regional level the policy for the collection of household glass has remained consistent in the first generation and Replacement Dublin Waste Plan. The relevant collection policies set out in the Replacement Dublin Regional Waste Plan are focused on the separate collection of recyclables. For the collection of household glass 2005 - 2010, the development of the existing bring bank system, and the continued colour separation of glass recyclables at these facilities, has been identified as the preferred approach in the region.

- From the documents and statements reviewed it is clear that the current policy for glass collection being pursued in Dublin is in line with progressive thinking at European level, which will require Member States to collect glass separately by 2015.

3 HOUSEHOLD GLASS RECYCLING TONNAGES

3.1 BACKROUND: HOW GLASS IS COLLECTED IN DUBLIN

Bring bank facilities have been used in Dublin to collect household glass from the public since the late 1980s. The policy then was to provide banks for the separate collection of clear, green and brown glass from households at each location and this approach remains in place to present day. The Rehab Recycling Partnership (hereafter Rehab) were the first organisation to operate and service bring banks in Dublin and over the last 20 years a network of these facilities have developed steadily.

The Dublin Waste Management Strategy (1997) strategy regarded bring banks as a viable future waste management option, as an alternative to home collection and a target of one bring bank per 500 households throughout the region was set down.

Bring banks numbered 134 in 1996 across the four Dublin Local Authorities. From these 134 bring banks, 4,257 tonnes of glass was collected and recycled, and this figure increased to 4,856 tonnes in 1997. At this time Rehab were collecting the majority of the bring banks in partnership with the Local Authorities.

The number of bring banks has grown significantly in the region and in 2006 there were 321 facilities. Rehab continue to service bring banks in Dublin and today collect from over 120 locations.

Oxigen Environmental Ltd (hereafter Oxigen) began collecting from bring banks in the Fingal County Council area in 2003. In 2004 Oxigen extended their glass collection service to bring banks into the other Dublin Local Authority areas, under a publicly managed contract. The current contract remains on-going although current arrangements are due to cease at the end of 2008. The tendering process to procure the services of a new service provider for the collection of glass in Dublin is underway.

Bring bank facilities for glass provided by Oxigen and Rehab colour separate glass into Clear, Brown and Green streams. The ratio of bring banks at each location can vary depending on the type of banks provided. Green glass is the most common type of glass deposited by householders at bring banks in Dublin.

The current Waste Plan aims to continue to develop the existing bring bank network and has set a target of 111 new bring banks to be delivered by 2010. By this time it is anticipated that there will be over 370 bring banks in the region.

Figure 3.1: Bring Banks for Colour Separated Glass Collection, Dublin

3.2 BRING BANKS IN THE DUBLIN REGION (1996 – 2006)

The overall total number of Bring Banks in the Dublin Region stood at 321 in 2006 and there has been steady growth since 1996 when the number of bring banks was 134. Figure 3.2 shows the growth in the intervening years (where data is available) with an additional 187 bring banks provided during this time period. This represents an increase of 140% on 1996.

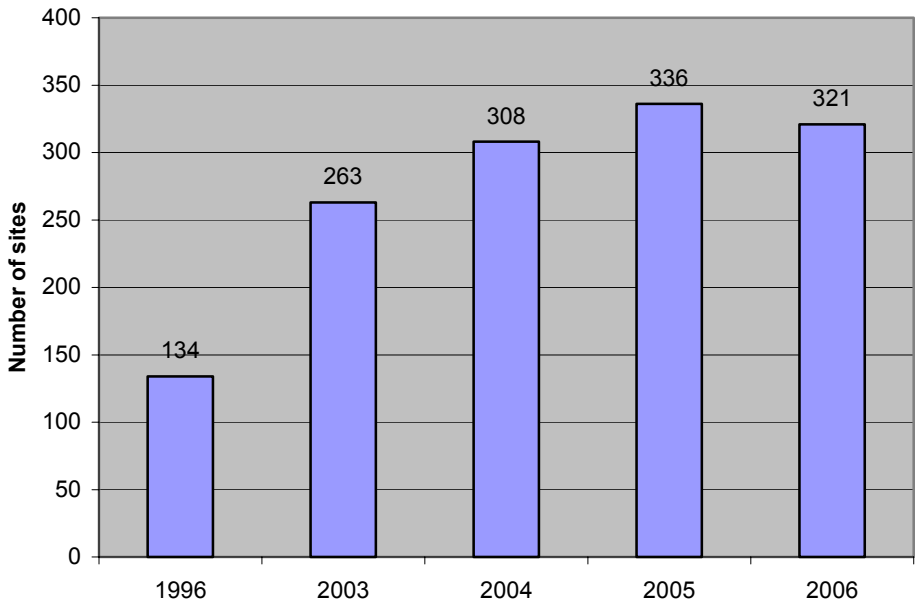


Figure 3.2: Total Number of Bring Banks in the Dublin Region (1996 – 2006)[4].

[4] Data Sources:
1996: Waste Management Plan for the Dublin Region, Adopted by DCC 1998
2003: Waste Management Plan for the Dublin Region 2005 - 2010
2004: National Waste Report, EPA 2004
2005: National Waste Report, EPA 2005
2006: Waste Management Plan for the Dublin Region 2005 – 2010 Annual Progress Report 2007

3.3 GLASS TONNAGE COLLECTED IN THE DUBLIN REGION

Figure 3.3 shows the total tonnes of household glass collected from bring banks in the Dublin Region from 1996 to 2006 (where data is available). The figure shows that between 1996 and 2006 an increase of 392% in glass tonnage collected has been recorded.

According to Rehab's figures they have increased their glass collection by 23% from 2004 to 2007, whereas Oxigen have increased their glass collection by 57% over the same period.

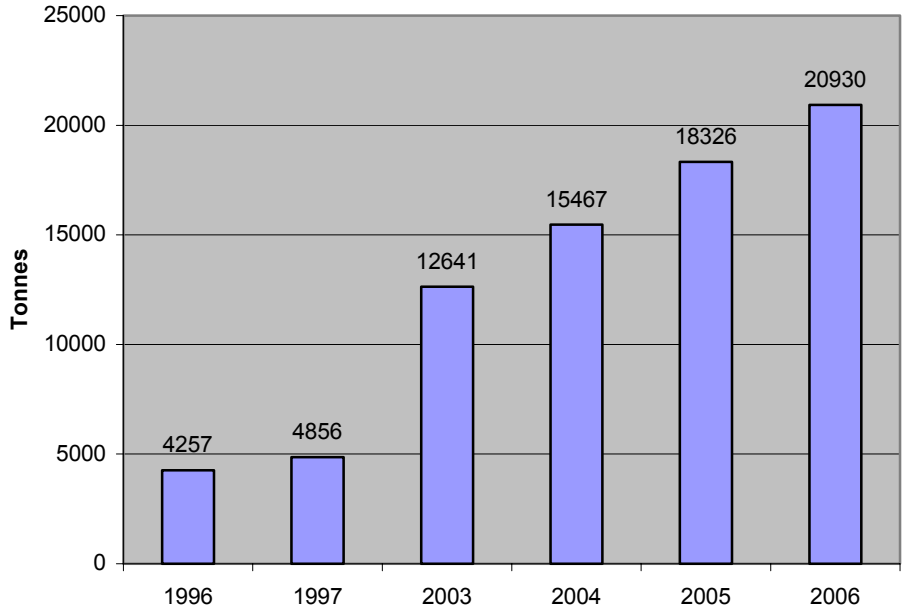


Figure 3.3: Tonnes of Glass collected in the Dublin Region (1996 - 2006)[5]

Figure 3.4 shows the glass collected in the functional area of each local authority in Dublin for the years 2003 to 2006. This shows consistent growth in all four areas with the largest increase of 160% recorded in South Dublin County Council for the period. Increases of 88%, 12% and 43% were recorded for Dublin City Council, Fingal County Council and Dun Laoghaire Rathdown County Council respectively. These increases are attributed to the increase in the number of facilities and improved understanding and awareness of recycling in Dublin.

[5] Data Sources: 1996: Waste Management Plan for the Dublin Region, Adopted by DCC 1998
1997: Waste Management Strategy Report 1997
2003: Waste Management Plan for the Dublin Region 2005 - 2010
2004: National Waste Report, EPA 2004,
2005: National Waste Report, EPA 2005
2006: Waste Management Plan for the Dublin Region 2005 – 2010 Annual Progress Report 2007

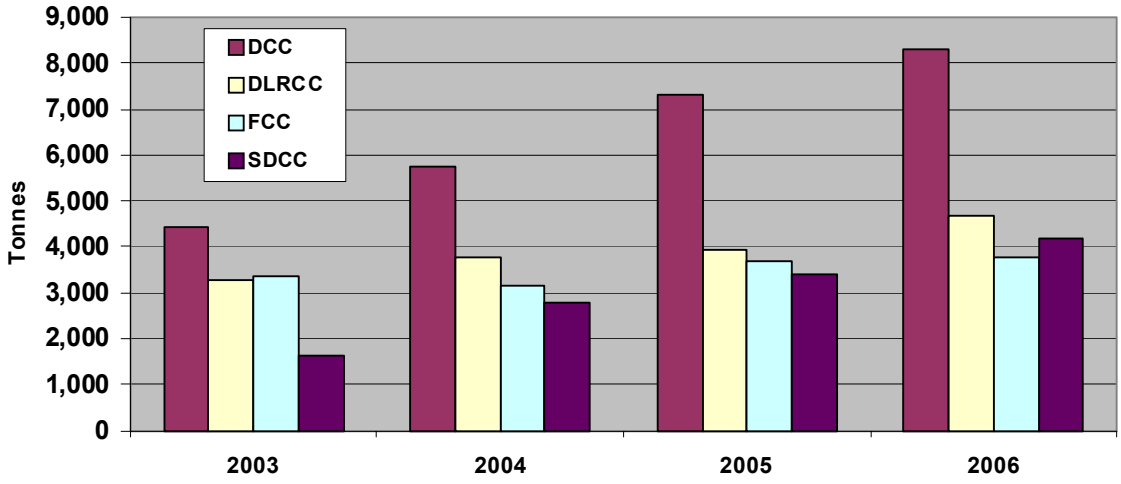


Figure 3.4: Tonnes of Glass collected per Local Authority (2003 – 2006)[6]

[6] Data Sources: 2003 - 2006: Annual Local Authority Waste Questionnaires
2006: National Waste Report, EPA 2006
2004 – 2006 Oxigen Annual Report
2004 – 2006 Rehab Annual Collection Figures

4 EUROPEAN GLASS COLLECTION SYSTEMS

A review of glass collection systems in a selection of European Member States is presented to further inform the objectives of this report.

4.1 AUSTRIA

In Austria a producer responsibility type scheme is in operation for the collection of glass. Austria Glas Recycling (AGR) organises the collecting and recycling of used glass packaging throughout Austria. AGR is part of a network consisting of municipalities, private and municipal waste-collection companies, research institutions and the glass industry. AGR is a non-profit company and is responsible for collecting glass from private households and industry all over Austria, and passing on this material to glass bottle manufacturers in Austria and neighbouring countries for recycling[7]. Household glass in Austria is collected via dedicated kerbside collection and bring banks, the latter being the collection method of preference.

In Austria glass bottles have been collected since the 1970's and the amount of glass collected for recycling has increased steadily. Since 1993 it has remained constantly around 200,000 tons, which is over 80% of the glass bottles generated in Austria. Figure 4.1 shows the quantity of glass collected in Austria from 1982 to 2007.

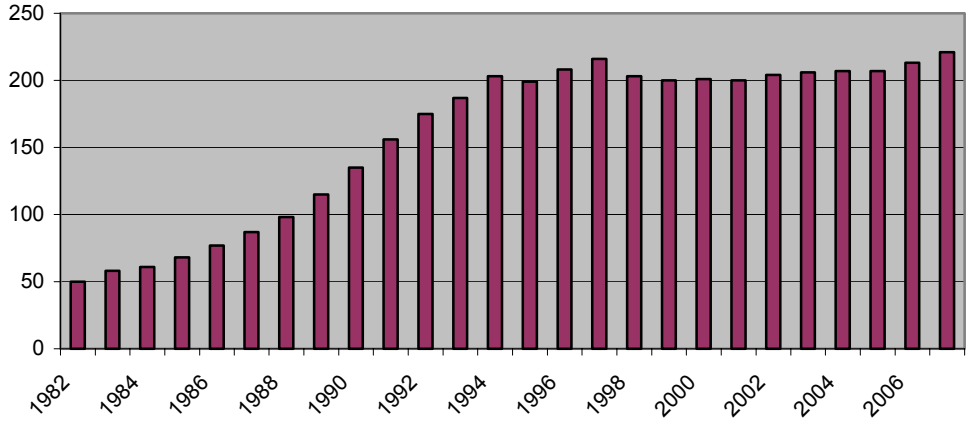


Figure 4.1: Recycling of Glass in Austria 1982 – 2007 ('000 tonnes)

In 2007 a total of 221,150 tonnes of glass was collected and recovered. Of this 195,470 tonnes were collected from households, which equates to a collection rate of 24.3kg per capita. The recycling quota in Austria for 2007 was 80%.

When sorted the separately collected glass packaging is processed in two Austrian glassworks, for the purpose of recycling and making new glass products. Quantities which cannot be accepted by the national facilities because of quality or contamination issues are exported for recovery to the neighbouring countries of Italy, German and the Czech Republic.

[7] Austria Glass Recycling http://www.agr.at/

4.2 SWITZERLAND

Switzerland has one of the highest glass recycling rates in Europe. In 2006 over 308,000 tonnes of glass was collected, representing a collection rate of 95.6% or 41.0 kg per capita.

Segregated collection of glass bottles and jars (container glass) has been taking place in Switzerland for several decades and is well accepted by the public. Container glass is mostly collected at public collection points or bring banks (in colour specific bring banks). In some communities glass is collected periodically from the kerbside with the material collected and sorted by colour (clear, brown and green) during processing. In certain regions, colour sorting is dispensed with. Less widespread is the collection of intact glass bottles for reuse (unbroken glass); with special containers and vehicles in use.

The waste glass collected is largely melted down for the production of new glass containers: about a third is processed at Switzerland's only domestic glassworks, and another third is recycled abroad. Most of the remainder is crushed and reused in the construction industry as a substitute for sand or gravel. Increasing amounts are used in the manufacture of building and insulation materials (e.g. cellular glass), or reused as bottles (unbroken glass collection). With all the various recycling options, the Federal Office for the Environment (FOEN) states that it is "important to maintain existing colour-sorted collection systems, as this makes is possible to adjust flexibility to fluctuations in demand for the various types of recycling. In addition, it will enable newly developed, more environmentally sound recycling solutions to be implemented without the need to change the collection infrastructure, which would be both time-consuming and costly".

The recycling of glass bottles, including the funding system, is regulated by the Ordinance on Beverage Containers of 5 July 2000 (VGV). The VGV sets a target rate of 75% for the recycling of glass beverage containers. Since 2002, a prepaid disposal charge has been levied on glass bottles. The charge, depends on the size of the bottle, and is included in the retail price. Revenues generated are distributed by a national organisation, VetroSwiss, to the bodies responsible for the collection of used glass collection, which enables a substantial proportion of the collection and recycling costs to be covered. Higher payments are made for colour-sorted collection in view of the greater expense involved.

4.3 NETHERLANDS

In the Netherlands the separate collection of glass packaging has been taking place since 1978. Local authorities use bottle banks to collect glass and most have a contract with a national glass recycling company. The price paid by local authorities usually covers renting the container, transport and the revenue from the sales of the collected glass. A small number of local authorities collect glass themselves. When the Glass Recycling Foundation (SPG) was set up in 1981 only 27% of glass was recycled via 6,000 bottle banks.

The EU directive on Packaging and Packaging Waste was implemented in Dutch legislation through the Packaging and Packaging Waste Regulations in mid 1997. A target of 90% for separate collection of packaging glass from households was set and also a target of at least 90% by weight of the glass packaging placed on the market in the Netherlands should be recycled.

The targets are based on the National "separate collection of household waste" programme adopted in April 1995. It was decided that glass is best collected as a separate waste fraction using bring banks. On this basis a collection rate of 90% was thought feasible, and as a guide one bring bank should be provided for every 600 inhabitants.

In 2006 the number of bring banks in the Netherlands had increased to over 25,000 with facilities located as conveniently as possible.

Municipalities decide whether glass is colour separated at the bring banks and arrangements with glass manufacturers influences this decision.

The separate collection and recycling of household glass amounted to 341,000 tonnes in 2006. This represents a collection rate of 67% or 21kg per capita.

4.4 DENMARK

In Denmark glass is collected through kerbside collection schemes, bring banks and civic amenity facilities ensuring that the targets of the EU Packaging and Packaging Waste Directive are met.

Kerbside and bring bank schemes are widespread with municipalities opting for different approaches to glass collection. The most common kerbside approach is to collect glass along with metal cans and plastic bottles although some municipalities collect glass separately from other materials. Municipalities who use bring banks typically establish one bring bank for every 200 – 300 households. Colour separation of glass is practised at some of these facilities, although it is more common for glass to be separated post-collection in Denmark.

The glass collection rate in Denmark is high and in 2006 was recorded at 84% and exceeds the European Target of 60%. The following table provides an overview of data for the generation and collection of data.

Table 4.1 Glass Packaging Collection and Recycling Data 2002 – 2006

Description	2002	2003	2004	2005	2006
Glass generation*	193,100	202,100	171,500	158,700	143,385
Glass collection*	136,500	137,500	132,000	119,500	120,915
Glass Collection Rate %*	71%	68%	77%	75%	84%
Population**	5,368,354	5,383,507	5,397,640	5,411,405	5,427,459
Collection (kg)/capita	25.4	25.6	24.4	22.1	22.3

Sources:
* Environment Project Report No. 1232, 2008, Danish Environmental Protection Agency
** Statistics Denmark (www.statbank.dk)

In Denmark glass is collected, sorted and processed into cullet for recycling but also whole glass bottles, mainly alcohol and wine bottles, are collected unbroken using specific collection techniques. Bring bank containers equipped with “glance-off” plates reduce the potential for breakage as shown in Figure 4.2.

Figure 4.2 "Glance-Off" Plates in Danish Bring Banks

In addition special waste vehicles designed to collect and protect whole glass bottles are becoming more common in kerbside collection schemes, as illustrated in Figure 4.3.

Figure 4.3 Waste Vehicles for the Collection of Whole Glass Bottles

Collected whole bottles are cleaned and sold back to producers in Denmark and in other European countries for reuse and redistribution. This approach to glass collection accounts for approximately 38% of the total glass collected.

Glass collected and processed into cullet for recycling accounts for about 62% of the total amount collected from the market and the cullet produced is sent for recycling in Denmark and abroad.

4.5 UNITED KINGDOM

Both kerbside and bottle banks are used to collect household glass for recycling in the UK. The first bottle bank was installed in 1977 and there are now roughly 50,000 banks on 20,000 sites around the country. These bottle banks are emptied by glass collection companies, or by reprocessors, with the

local authority (or other party operating the bank) receiving payment for each tonne of cullet collected[8]. In the UK the density is 1:2700 households which is about half of the European average density of 1:1500 households[9].

Kerbside collection of household glass has been increasing steadily across the UK over the last 10 years. One of the main factors contributing to the increase in this method of collection is the aim to increase the total amount of glass collected thereby reaching European recycling rate targets. Kerbside collection has been deemed more convenient for households hence the increase in this method. This is having a direct impact on the quality and hence recycling potential of the glass collected. It must be noted that the same subsidy is paid in the UK for glass whether it is processed in a closed loop (remelted into glass containers) or open loop (i.e. alternative markets such as aggregate). Figure 4.4 shows the amount of glass used for remelt (recycling into glass containers) is diverging acutely from the total amount of household glass collected. This adverse trend can be attributed to the move to mixed kerbside collection of glass and the resulting production of lower quality cullet, and the lack of an economic incentive for closed loop recycling.

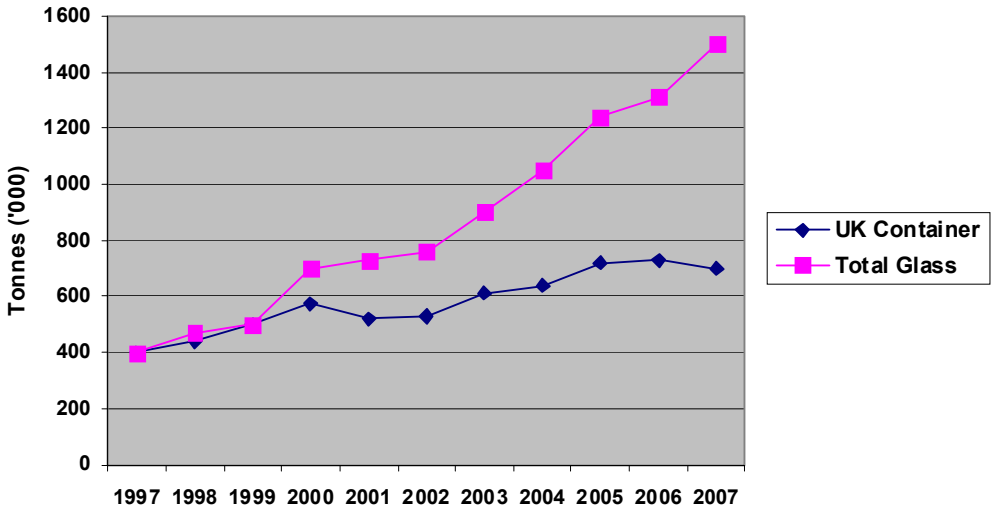


Figure 4.4: UK Glass Recycling 1997 – 2007 (Source: British Glass)

At most bring banks in the UK, glass is separated with specific banks for each colour stream; kerbside schemes typically collect co-mingled glass even though a higher price is paid for separate glass streams. The colour imbalance issue in the UK has resulted in price differentials for different coloured cullet. A recent WRAP & Rotate report (2006)[8] shows prices are around £25-30 per tonne for clear; £20-31 per tonne for amber (brown); £10-19 per tonne for green and £10-15 per tonne for mixed. Additional costs include providing separate bring banks or split vehicles and additional operating times where collection is done at kerbside. 60% of kerbside collection of glass in the UK is mixed colour and some local authorities also collect mixed colour glass via their bring sites.

One of the main barriers to increasing the glass-recycling rate is the shortage of clear cullet collected in the UK. UK glass plants predominantly produce clear and amber glass and UK exports a lot of clear glass, in the form of spirit bottles. This effect coupled with low quantities of clean cullet collected is causing supply and demand problems for the industry. The UK imports twice as much green glass as is manufactured, mainly in the form of wine bottles. In the past this has lead to a surplus of green cullet. The industry has worked hard to increase the amount of green glass recycled; currently green

[8] The costs & Operational implications of Kerbside glass collections, WRAP & Rotate Report 2006

bottles made in the UK contain over 80% recycled green glass[9]. It is also believed that there is a greater propensity for consumers to recycle colour glass. Colour separation at point of collection involves mainly glass bottles (especially green) rather than glass jars, firstly because the public perceives bring sites as "bottle" banks (not jar banks) and secondly because food jars might need washing before they are collected for recycling[9].

Mixed glass cullet collected is typically used for aggregate in the construction industry, and is processed into a material known as glasphalt. Glasphalt comprises around 30% recycled glass and can be made from mixed coloured glass, contaminated glass and maybe a good market for green glass[8]. In 2007 over 30% of collected glass went to the aggregate market, and increase of over 21% since 2004.

4.6 FRANCE

In France both kerbside and bring bank type systems are in place for the collection of household glass. In 2005 a total of 1.81 million tonnes of glass were collected for recycling – a collection rate of ~52% or 28kg per capita. The overall collection rate increased to 61.25% by 2007.

Figure 4.5 Wheelie bins in France for Household Waste Collection

The different types of collection schemes in operation in France are as follows:

- Separate collection of glass through 120,000 public containers (bring banks) at accessible locations in the community. These banks are available to 95% of the population and in 2005 over 1.35 million tonnes of glass were collected through this system.

- Separate kerbside collection of glass only in specific collection containers. Containers are provided to individual households while in other schemes a designated collection container is provided for several households. Glass is not colour separated in these schemes and in 2005 these schemes served 31% of the population and provided for the collection of 380,000 tonnes of glass.

- Kerbside collection schemes with the glass co-mingled with other materials in the collection bin. In 2005 over 50,000 tonnes of glass was collected in this manner.

[9] www.wastebook.org/glass

- Public recycling centres also provide householders with opportunity to separate and recycle glass. In 2005 these facilities provided for the collection of over 30,000 tonnes of glass.

In general household glass is not colour separated at source in France instead mixed glass is collected and processed into mixed cullet primarily to serve the indigenous wine bottle and glass manufacturing industry. The specification standards required in the manufacturing of wine bottles are lower and mixed glass cullet is generally acceptable.

In 2006 the glass reprocessing and manufacturing industry in France manufactured 3.842 million tonnes of glass packaging, using 2.174 million tonnes of cullet in the process. The amount of cullet going into the manufacture of glass depends on the colour of the end product – it can be up to 90% of cullet for the production of green glass.

4.7 SUMMARY

Table 4.2 provides a summary of the glass collection mechanisms in European Member States reviewed as part of this report. Collection rates and treatment options are included where data was available. The table shows that the colour separate collection of glass through bring banks is preferred by Member States maximising the quantity of cullet to closed loop recycling.

Table 4.2: Summary of Glass Collection and Recycling information for European Countries.

	Collection Schemes In-Use		Glass Generation	Collection Rate		Treatment (%)		Year of Data
	Kerbside	Bring Bank	Tonnes	%	Kg/Capita/Year	Closed	Open	
Dublin	Y	Y	32,104	65.2	27	-	-	2006
Ireland	Y	Y	217,315	63.5	32.3	87%	13%	2006
Austria		Y	276,437	80	24.3	80%	20%	2007
Switzerland	Y	Y	322,175	95.6	41	66%	34%	2006
Netherlands		Y	515,000	80	21.1	80%	20%	2006
Denmark	Y	Y	143,385	84	22.3	62%	38%	2006
UK	Y	Y	2,650,000	50	44.2	57.4%	42.6%	2007
France	Y	Y	3,300,000	61.25	28	62%	38%	2005

Note:
Green Highlighting denotes preferred method of glass collection

Sources:
Information obtained from those sources referenced elsewhere.

5 STAKEHOLDER CONSULTATIONS

As part of this report RPS carried out consultations with representatives from the Glass Industry in Ireland and the UK. Detailed notes on the consultation with each party are included in Appendix A.

5.1 WRAP

Currently WRAP are concentrating efforts on improving the quality of glass collected in an effort to promote the use of glass collected from households in closed loop recycling applications. A recent report published by WRAP[10] offers a good practice guide for local authorities and strongly expresses a preference for a policy of closed loop recycling.

WRAP are currently running workshops for Local Authorities to provide guidance on glass collection and more specifically to provide information and education on the issues surrounding co-mingling of glass with other materials and the issues associated with this method of collection at processing/recycling stage.

A large-scale trial undertaken by WRAP is due to commence in the next few months in order to establish whether good quality glass can be obtained from a MRF. The results of this trial will be vital in establishing the compatibility of kerbside glass collection with closed loop recycling.

5.2 BRITISH GLASS

British Glass commented that in the UK many Local Authorities are relying on co-mingled kerbside collections with processing at a MRF to assist them with meeting landfill diversion targets. This trend has resulted in the amount of material being available for remelt (use of recycled glass in the production of new glass containers) to decline. This switch to kerbside collection has led to a number of Authorities moving away from Bring banks.

British Glass favours colour separated glass at source because it can more easily be returned to remelt. Other collection methods do not allow material to be returned unless further processing takes place which obviously adds cost to the final material. The price margin between raw materials and recycled glass (cullet) is within £10. Currently cullet actually costs more than the basic raw material equivalents therefore (unlike other materials) extra processing could result in pricing cullet out of the market for glass manufacture, and losing the environmental benefit associated with it.

The UK Glass Industry is being hit in a number of ways (increases in energy prices, increases in raw material costs) when these factors are combined with working towards targets under Climate Change and EU Emissions Trading it is clear the use of more cullet could be of assistance in meeting these targets. As quality and availability of cullet decreases despite the UK increasing its overall collection rate the opportunities for enhanced closed loop recycling are being lost to a lower grade application in the form of aggregate.

[10] A good practice guide for local authorities “Choosing and improving your glass collection service” WRAP 2008.

5.3 GLASSCO

On the 26th of June 2008 a number of Local Authority Representatives along with RPS undertook a site visit to Glassco. Glassco are a glass recycling company who collect and process colour separated glass and mixed glass products. The Glassco plant is located near Naas, Co Kildare and has a capacity of 50,000 tonnes. It is operated in compliance with a Waste Facility Permit (No. 247/2006) issued by Kildare County Council.

Glassco pay premium rates for colour separated glass whilst applying a charge (gate fee) to accepted mixed glass, thereby reflecting the quality of the product. The collection of colour separated glass through the Local Authority Bring Bank system generates revenue whereas glass collected in co-mingled systems is more contaminated than source separated products, i.e. will need more processing to meet the specification of glass manufacturers and as a result incurs higher costs to process.

The glass collected and processed by Glassco is sent to glass manufacturers only and is made into new glass containers. The percentage of virgin material used with the recovered feedstock will depend on the quality of the feedstock and the end products being produced.

5.4 REHAB

Rehab collect Glass from bring bank facilities throughout Dublin and the material collected is transferred to their cullet production facility in Navan. The Rehab facility has an operational capacity of 20 tonnes per hour and was commissioned in 1999. Rehab are planning to extend their operations increasing the capacity of the facility and the timeline for completion of the new facility is late 2009 to early 2010.

Rehab confirmed that bring bank use has increased significantly in the last 10 years with corresponding increases in the quantities of glass being collected pre-sorting. Contamination levels at bring banks are dropping each year with current rates approximately: 8% for clear glass, 10 – 15% for green, and 20% for amber. To produce furnace quality colour separated streams, contamination levels need to be rigorously met. Collecting mixed glass with other materials is not a good idea as it contaminates other recyclables (paper) and generally produces a lower quality glass-recycling product suitable only for open loop recycling.

Mixed glass material can be separated into individual colour streams but this reduces the hourly throughput considerably at the cullet facility. Typically a plant which is processing at approximately 40 tonnes/hour of colour separated product reduces to a throughput of 16 tonnes/hour when trying to separate out into individual streams a mixed glass feedstock. The economics of doing this generally do not stack up. Mixed glass collections generally produce a mixed glass cullet for the manufacture of mixed (coloured) glass bottles i.e. wine bottles. There is a lower economic value to mixed glass product compared to clear, green or amber glass cullets.

Rehab remain explicit that the current system of colour separation at bring banks should be retained. Rehab note that 25 years of education and investment has been made into encouraging the public to separate their glass into specific colour streams and in their opinion would be a negative step to commence co-mingling of glass at collection points or door-to-door.

5.5 BERRYMANS

Berryman are at the forefront of glass processing in the UK and. they operate six facilities in the UK. Berryman collect and buy both container and plate glass. The cullet produced is sold to the container industry (UK and EU markets), the plate glass industry and to the aggregate market.

In the 90s Berryman charged a gate fee to take mixed glass into their facilities. At this time the aggregate market represented under 5% of the total material they handled, whereas now it represents ~70%. The subsidy paid in the UK for recycling glass is equal whether the glass is used in container or aggregate production (i.e. closed or open loop recycling). This has created an economic driver for glass use in aggregates making the aggregate market the largest destination market in the UK. The UK is the only EU country who defines the use of glass cullet in an aggregate as recycling.

Berrymans stress the importance of the carbon agenda in glass recycling. In closed loop recycling where recyclable glass is made back into glass, a saving of 314Kg CO_2 per tonne is achieved. In open loop recycling where glass cullet is sent for aggregate use, there is no saving, but rather 2Kg CO_2 per tonnes is consumed[11]. The equal subsidy (for closed and open loop glass recycling) does not recognise this environmental difference and Berrymans feel that in the long term the UK government cannot continue to ignore this imbalance.

Berrymans state that for the container manufacture industry colour separation is preferred in conjunction with the following collection methods: Bottle Banks, Colour separated kerbside and kerbside – mixed. Where mixed colours are collected together it is preferable for the glass to be left as whole as possible to allow sorting by colour.

Gate fee varies dramatically from glass colour separated at source down to glass from MBT facilities. Berryman pay up to £35/tonne for clear glass (flint) but they may charge to take glass material from MBT or MRF facilities depending on the quality.

5.6 QUINN GLASS

At the Quinn glass facility located in Derrylin, Co. Fermanagh, there are 2 furnaces with a total combined capacity for producing 1,000 tonnes of glass material per day. Quinn currently source and purchase about 500 tonnes of cullet per day locally. Suppliers include Mr. Binman and Rehab and costs paid for cullet (as at August 2008) are as follows: Flint £40 Stg, Green £30 Stg, Amber £35 Stg.

Quinn have very stringent specifications on the contamination content of cullet and have expressly stated they would take and use more Irish cullet if it were available and in line with their stipulated specifications. These specifications set the amount of pure cullet and the amount of permissible contaminants.

- Flint Permissible contaminant level (2%)
- Green Permissible contaminant level (5%)
- Amber Permissible contaminant level (5%)

A large portion of the cullet used at their Derrylin facility is now sourced and imported from the UK and Germany due to a lack of available cullet in Ireland.

5.7 ARDAGH GLASS

On the 13th August a site visit to the Ardagh Glass facility outside Leeds in the UK was undertaken. RPS and Local Authority representatives were present. Ardagh Glass (previously Irish Glass Bottle Company) an Irish owned company has 22 sites throughout Europe and employs 7,000 people. The site visited houses a glass production plant and a cullet production facility. The cullet facility produces furnace ready glass by removing impurities to <5g/tonne, producing a high end feedstock for glass manufacture. The facility only accepts colour separated cullet and its feedstock is sourced from local

[11] Independent Life Cycle Analysis for Glass Recycling, Enviros Consulting Ltd. 2006.

authorities who operate bring bank schemes. This facility has been designed to process 400,000 tonnes per year but is currently running about 37% under capacity due to lack of available suitable material.

A glass manufacturing facility is also located at the site which has three furnaces with a combined capacity of 650,000 tonnes/year. This facility produces 900 million bottles per year and is operational 365 days a year (24 hours per day). At this facility the green glass bottles produced contain 80% recycled material, with the clear glass bottles containing approximately 40% recycled flint. When cullet is used in processing the energy requirement is reduced by 25%. Ardagh glass use plate glass as much as possible, up to 50% when mixed with bottle bank glass. They also import a small amount of cullet.

Ardagh Glass have recognised that the quality of glass is getting progressively worse in the UK. There are countless types of household collection schemes in the UK and the public are very confused about glass recycling. Ardagh believe that the growth in the aggregate market for glass is providing no real incentive for glass collection/recycling companies or the council to separate material. Ardagh cannot source the required quantities of cullet for glass production. The recycled content in clear bottles and jar (~40%) is vastly different to that in green bottles (~80%) simply because there is not enough clean cullet available. The lack of cullet keeps the costs of running the plant high, as the energy required to melt sand is significantly higher.

Ardagh Glass believes the UK may have to look at producing containers using mixed glass cullet and as a result brand specifications from the food and drink companies will have to change accordingly.

5.8 UK PAPER INDUSTRY

PaperChain

PaperChain[12] launched in 1995 is a highly focused campaign sponsored by the Papermaking Sector Members of the Confederation of Paper Industries (CPI) that rely on recovered paper as their primary raw material. In 2006 PaperChain's Members used over 3 million tonnes of recovered paper in the production of new paper products covering a number of grades. Members include:

- Aylesford Newsprint Ltd
- Bridgewater Paper Company Ltd
- SCA Recycling UK Ltd
- Smurfit Kappa Group
- St Regis Paper Co Ltd
- UPM-Kymmene (UK) Ltd

PaperChain Members have serious concerns that the introduction and growth of single stream (co-mingled) collection systems by Local Authorities and the Waste Management industry is unsustainable. This development is having a negative impact on the quality of recovered paper to the detriment of the UK industry, and the long term sustainability of global recovered paper markets in

[12] http://www.paperchain-recycling.org.uk/index.html

general.

Single stream (co-mingled) collections of mixed dry recyclables carry higher risks to recovered paper quality as the paper and board are exposed to other materials. Although material recovery facilities (MRF's) are able to segregate the material streams to a reasonable quality when they are running well, it is easy to end up with recovered paper that is not up to the standards required for reprocessing without further sorting.

Paper reprocessing is a continuous, capital-intensive process and Mills cannot risk closing the machines due to raw material quality problems. Any shutdown, or reduction in process efficiency during the papermaking process, has a negative impact on the Mills carbon generation and causes increased waste levels. Recovered paper from single stream (co-mingled) collections carry higher risks than segregated material therefore UK Mills are less willing to take material from this stream.

A report published by PaperChain[13] provides a review of the British Standard BS EN 643: 2002 – "Paper and board – European list of standard grades of recovered paper and board" and a guide to the quality requirements for recovered paper.

The main implications of this British Standard for the UK paper industry will be an increasingly unwillingness to accept recovered paper from co-mingled sources. The Standard does not endorse paper coming from mixed recyclable collections, there is a clear message that it will be unsuitable for food packaging applications, and that to assist in tracking, it must be marked as such.

The paper industry suggests paper should be recovered and kept separate from all other materials. This will allow the increasingly tight quality demands to be met.

Glass residues from collections mixed with paper cause papermill system problems, and are hazardous to operators. There is pressure to keep paper separate from glass throughout the recovery process.

The industry preference is for paper separated from other recyclables at source and kept separate throughout sorting and storage until dispatched to the papermill.

[13] A guide to the quality requirements of recovered paper: A guide for those involved in paper recovery and recycling. Produced by Corrugated Packaging Association, British Recovered Paper Association, Independent Waste Paper Processors Association, PaperChain. Published by PaperChain, 1 Rivenhall Road, Westlea, Swindon, SN5 7BD

6 REVIEW OF GLASS COLLECTION AND RECYCLING SYSTEMS

In this section a comparative review of bring bank and kerbside type systems for the collection of household glass is undertaken. The findings of published reports and documents coupled with facility site visits, and consultations with stakeholders from the glass and paper industry have helped to further inform the discussion.

Glass is a unique material which can be reprocessed into new glass products over and over again while retaining all of its properties and qualities. Used or waste glass is a valuable resource and every effort should be made to collect and reuse glass continuously and deliver a "closed loop" recycling system for glass generated in Dublin. The system employed to collect glass is an important part of the glass recycling process and the type of system selected can affect the quality of the recycled glass product and the end destination market.

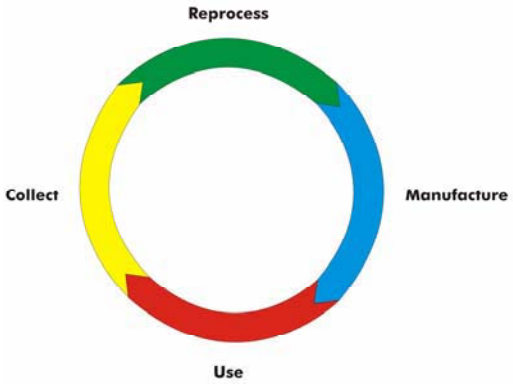


Figure 6.1 Glass Closed Loop Recycling

Collection Coverage

Glass generated by householders in Dublin is principally collected through bring banks of which there are over 320 in the region. At these locations householders source separate their glass by colour, disposing of different coloured glass (i.e. clear, amber and green) bottles and jars into specific banks. This existing collection system is delivering results, with a household glass collection rate of 65.2% for 2006 recorded, a figure which exceeds the national target of 60% due to be achieved by 2010.

There are also two kerbside collection systems being provided by private collectors in the Dublin Region, particularly to householders in the Dún Laoghaire-Rathdown County Council functional area. The design of these systems is as follows:

- Kerbside Glass Only – this system provides relevant householders with a separate bin into which household glass bottles and jars for recycling are placed. The bin is collected on a monthly basis with householders charged per collection.

- Kerbside Co-Mingled – this system allows for householders to dispose of their glass, along with other recyclable materials, into the household green bin. The household green bin was introduced in Dublin by the Local Authorities for the collection of dry recyclable materials such as paper and cardboard products, plastic bottles, aluminium cans, food tins and tetrapak. The green bin is collected fortnightly from householders and there is no specific charge for its collection.

Kerbside collection of household glass is in its infancy in Ireland with schemes operating in a few local authority areas and data on the amount of glass collected through these schemes is not yet available. In the UK the widespread collection of glass at the kerbside commenced from 2002 onwards. Until then bring banks had been the preferred collection system for collecting glass from householders. By reviewing available data the impact of this move to kerbside in terms of the tonnage of glass collected is clear. Figure 6.2 shows the quantity of glass collected in the UK from 1997 to 2007.

The main driver for kerbside glass collection in the UK was the requirement to meet packaging waste targets and to increase the tonnage of glass material being collected. The move to the kerbside has

achieved the higher capture rates of glass material but the quality of material for reprocessing, referred to as cullet by the glass industry, has suffered considerably. Glass collected at the kerbside is typically collected mixed or co-mingled with other materials. Co-mingled kerbside collections tend to produce the lowest quality glass cullet which is often unsuitable as feedstock for glass manufacturing furnaces.

In the Dublin region the quantity of glass collected through bring banks is exceeding the national target and a move to kerbside collection is not required to increase tonnages. The local authorities in Dublin, and across Ireland, have invested in providing facilities and in educating the public and promoting the recycling of glass through bring banks. Similarly the government has also provided financial support to local authorities for the rollout of bring banks to enhance recycling through these systems. Householders have responded to this investment as borne out by the tonnages of glass collected and also by the low level of glass being identified in the black residual waste bin. Waste characterisation studies of the black bin in Dublin completed in 2007 show that glass represents only 3.6% of the total residual waste. This figure indicates that glass collection at bring banks is very much a part of recycling practices for householders in Dublin.

The challenge for local authorities is to further expand the existing network and to find suitable and acceptable locations for new bring banks. Kerbside systems will always be attractive to householders for recycling materials in general, and some consumers may be content to pay for this service. The Dublin Regional Waste Plan has set targets for the Dublin Local Authorities to achieve. The use of innovative bin systems, such as underground or deep storage bins, should be examined as alternatives to the traditional above ground bring banks.

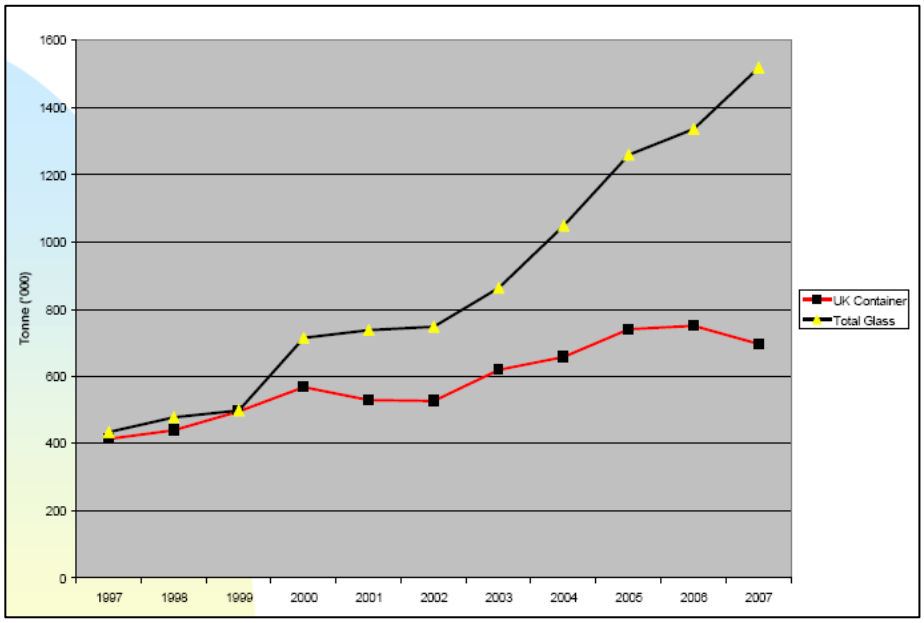


Figure 6.2 Glass Collection and Recycling Data 1997 to 2007 (Source: British Glass)

Collection Systems and Cullet Production

Glass collected through either a bring bank or kerbside system needs further processing before it can be delivered to a glass manufacturing plant. Glass collected from bring banks in Dublin is transported to facilities where the glass or cullet is processed to meet the requirements of the glass manufacturers. The colour separation carried out by householders is the initial step in sorting and preparing glass for manufacturers.

At the cullet facility the individual colour streams of glass collected from the bring banks in Dublin are processed separately. The glass material is screened and crushed and run through a series of

processing and cleaning stages to remove all contaminants including plastics, metals, lids, stones, ceramics, porcelain and labels. This ensures that the end product meets the furnace requirements. A colour separation unit is also used as part of the processing line and removes wrong colours from the coloured glass being processed. Depending on the colour of the glass being processed a limited level of contaminants is accepted in the final specification e.g. for clear glass the acceptable level of contaminants is typically <1%, for green or amber it is higher ranging from 3 to 5%.

Glass from bring banks is typically high quality feedstock and can be processed quickly at a cullet facility to the required standards. Cullet operators will typically pay a fee for colour source separated glass material, reflecting the quality and value of the resource.

Glass collected through kerbside systems requires additional processing compared to colour source separated product from bring banks. Mixed glass, collected separately or with other materials, is a lower value glass product and cullet operators typically charge collectors or industries to accept this product.

Mixed glass can either be processed into a furnace ready mixed glass product or can be colour separated into individual colour streams. The separation of mixed glass into individual colour streams is a slower process and limits the throughput at a cullet facility. Whether an operator decides to colour separate a mixed glass batch will depend on several economic factors including the current market value of glass (colour separated or mixed product), existing orders and stockpiles, and the cost-benefit of slowing the facility throughput.

Contamination can be a real issue for cullet facility operators (and manufacturers) when processing mixed glass collected at kerbside, especially glass which has been collected with other non-glass materials e.g. paper, cardboard, plastics. Prior to transport to the cullet facility materials from kerbside co-mingled collections will be sorted at a materials recovery facility and the glass separated out from the other materials. According to Industry sources it is important that the glass separated out is not reduced to a size <10 – 12 mm, as it is then unsuitable for subsequent remanufacturing. Glass collected in a co-mingled kerbside system requires an additional processing step, compared to glass collected from bring banks, which is transported directly to the cullet facility.

Increased dust contamination of the glass can also be a problem when the material is mixed with paper and cardboard products. Similarly paper and cardboard products can be contaminated with shards of glass when collected and compacted together. The glass and paper industries have a clear preference to keep glass collected separate from other materials to minimise contamination and maximise the potential to reprocesses the glass and paper collected into new glass and paper products respectively.

Finally the type of collection bin or bank used to collect glass can also impact on the level of ceramic or porcelain contamination of the glass. These contaminants are particularly damaging to the cullet recycling process. Bring banks are designed with small round apertures, which are suitable for glass bottles and jars and by their nature reduce the potential disposal of larger sized porcelain and ceramic items. Kerbside collections in Dublin are using wheelie bins with wider openings and householders can often dispose of large porcelain/ceramic items, which are mistaken as glass.

Destination Markets

Glass manufacturing plants are the typical end destinations for glass cullet generated in Ireland. The cullet accepted at these facilities is fed into the furnaces and used in the production of new glass products. The extent of cullet used in the making of a glass bottle is conditional to the colour of the end glass product and availability of cullet. The production of green bottles at manufacturing plants can typically contain between 80% and 90% recycled cullet, reflecting the abundant supply of green cullet. For the production of clear bottles, the quantity of cullet used would range between 40% to 50% reflecting the lack of availability of this cullet material. The more cullet a manufacturer can use in the glass production process, the less heat required for melting and the more economically and energy efficient a plant's operations. The reuse of glass cullet in the manufacture of new bottles and jars

represents not only environmental best practice but also provides significant savings in terms of carbon emissions[14].

Glass manufactures deal directly with the cullet production facilities setting out their specification requirements for the cullet and the levels of contamination permissible. For manufacturers it is very important that specifications are consistently met and the quantities of high risk contaminants such as porcelain and ceramics are kept in line with the required standards. Manufacturers are ultimately responsible for ensuring the glass produced meets their customers brand requirements.

Furnace ready colour separated glass is in high demand in Ireland and UK, especially clear cullet which will fetch a premium market price from glass manufactures. Amber and green cullet materials are similarly in demand with slightly lower rates per tonne paid for these products. Cullet sourced from bring banks in Ireland will invariably be processed to a high quality and fetch the highest possible market rates.

In Ireland Quinn Glass operate the only glass manufacturing plant, north or south of the border. The facility is located in Fermanagh and has two furnaces with a combined total capacity for producing 1,000 tonnes of glass material per day. This facility principally accepts colour separated cullet for the production of brand specific glass bottles, and accepts cullet sourced from bring banks in Dublin. Mixed glass cullet is not generally required.

Mixed glass cullet produced in Ireland is typically exported to mainland Europe for use in mixed glass furnaces and the production of non-brand specific glass bottles e.g. wine bottles, food jars etc. There are no mixed glass manufacturing facilities in Ireland or the UK. In the UK the construction aggregate market is a growing alternative destination for mixed glass. Figure 6.3 shows the growth of the aggregates market in the UK since 2004.

The rise of kerbside collection in the UK has lead to a significant increase in mixed glass cullet, a product which the aggregates industry will accept with high levels of contamination. This form of recycling, named open loop recycling is of lower environmental performance thereby limiting the potential continuous use of glass cullet and consuming carbon rather than saving it[15]. In the UK the subsidy paid for closed loop and open loop recycling of glass is the same, reflecting the growth in the alternative aggregates market. In Ireland there is a higher subsidy paid for closed loop recycling of glass, recognising the better environmental benefits of this system.

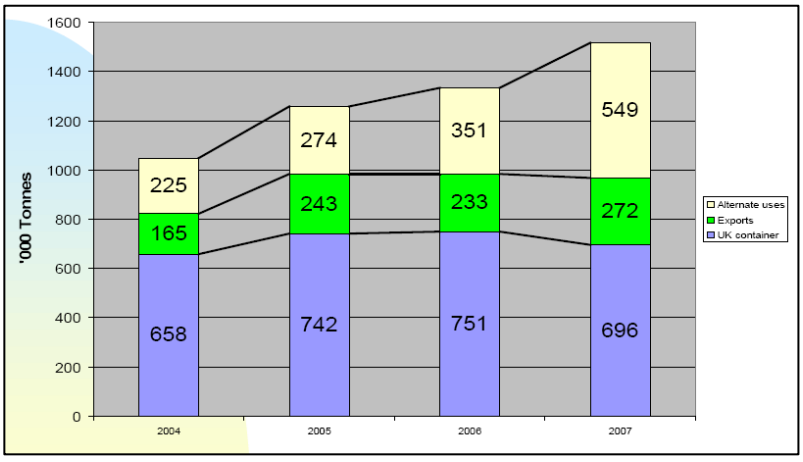


Figure 6.3: Destination Markets for Glass Cullet in the UK (Source: British Glass)

[14] In the UK it has been estimated that the melting of one tonne of recycled glass cullet provides a net saving of 314 kg of CO_2.
[15] In the UK it has been estimated that the use of glass cullet as aggregates in roadfill generaftes 2kg of carbon per tonne crushed.

Conclusions

The existing bring bank system for the collection of household glass in Dublin is delivering high rates of collection and is meeting national targets. Colour separation at bring banks provides a high quality, uncontaminated and economically valuable product for the production of furnace ready cullet. The cullet material is sent to available destination markets, typically glass reprocessing facilities in Ireland and the UK as part of a closed loop recycling system.

Kerbside glass collections are in their infancy in Dublin with two different systems being offered to householders. The convenience of kerbside collection of glass is attractive to customers and the widespread use of kerbside would more than likely lead to an increase in tonnages collected in the region. However there are contamination concerns over the kerbside collection of glass, especially systems which co-mingle glass with other recyclable materials. This type of collection system requires an additional processing step and adds further costs to the collection of glass. A specific kerbside glass collection is also on offer in Dublin at an additional charge to customers although the take up of this collection has been limited to date. The storage and use of an extra bin, in addition to the planned 3-bin system, will prevent certain householders from availing of this service.

In conclusion the local authorities should continue to provide bring banks and encourage householders to colour separate glass at source. The following provides a priority ranking of glass collection systems for Dublin in terms of environmental performance and best practice.

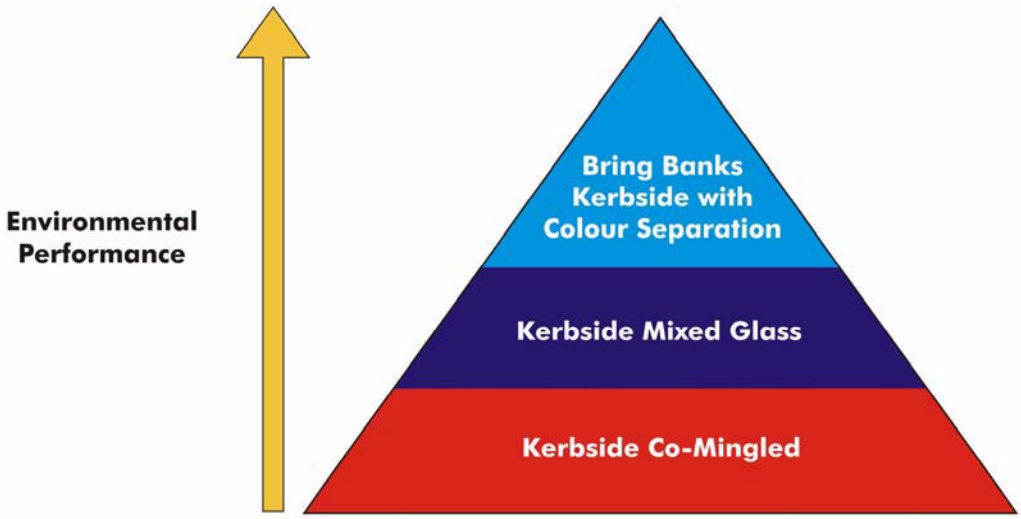


Figure 6.4 Priority Ranking of Household Glass Collection Systems

7 RECOMMENDATIONS

The following recommendations for the Dublin Local Authorities are to ensure the current high collection rates for household glass are maintained:

1. It is recommended that the local authorities continue to expand the bring bank network in Dublin and aim to deliver the target of 111 additional bring banks by 2010 (on the baseline year of 2003) as set down in the Waste Plan, see the following table for details.

Table 18.1 from the Waste Management Plan for the Dublin Region 2005 to 2010

Local Authority	DCC	DLRCC	FCC	SDCC
Existing Bring Banks	73	64	70	50
New Bring Banks target	49	13	20	29
Total target	122	77	96	79
Target Ratio (population per site)	1:3,500	1:2,500	1:2,500	1:2,500
Note: Some banks may be expanded or the range of materials accepted may be increased				

2. It is recommend that the local authorities enhance security measures at bring bank locations where fly-tipping and vandalism have occurred. A record of events of this nature should be kept and maintained.

3. It is recommended that local authorities continue to promote the use of bring banks and educate the public on the importance of colour separation at source.

4. It is recommended that the local authorities consider alternative bin collection systems for glass, such as underground or deep storage bins instead of the traditional above ground banks.

5. It is recommended that the local authorities ensure that new residential developments, including apartment complexes include for the provision of colour separated glass collection banks on-site.

6. It is recommended that Bye-Laws for Household Waste are consistent across the region and glass is prohibited from collection in the green bin in the interests of higher environmental performance.

APPENDIX A

STAKEHOLDER CONSULTATION NOTES

Telephone Conversation: Quinn Glass (Derrylin, Co. Fermanagh)

Date: 1st August 2008

Conversation between:

- Mr. Barry O'Reilly (Quinn Glass)
- Mr. Warren Phelan (RPS)

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1. Quinn glass in Derrylin, Co. Fermanagh, NI, buy glass from the south of Ireland as feedstock for their furnaces. (Mr. Binman and Rehab are suppliers).

2. Quinn glass have precise specifications which must be met for each glass colour stream. These specifications set the amount of pure cullet and the amount of permissible contaminants.
   Flint (98%) Permissible contaminant level (2%)
   Green (~95%) Permissible contaminant level (5%)
   Amber (~95%) Permissible contaminant level (5%)

3. Quinn glass have 2 furnaces with a combined total capacity for producing 1,000 tonnes of glass material per day.

4. Everyday Quinn glass purchases about 500 tonnes of cullet for use in glass processing.

5. The more cullet that can be used - the better, as it reduces the amount of sand required to be melted to make glass. The key to any glass reprocessing plant is the amount of energy being used – the more efficient a plant can be, the lower overall costs can be.

6. It is the current opinion of Quinn glass (Barry O'Reilly) that it is prohibitive to transport cullet to the UK at the moment due to the high cost of fuel.

7. Quinn glass would take and use more cullet in their processes if they could get more material from Ireland that meets their specifications. They are currently buying material from the UK and Germany, as they can't source enough in Ireland.

8. Typical costs paid for cullet (as at August 2008) are:
   Flint £40 Stg
   Green £30 Stg
   Amber £35 Stg

9. Site visit a possibility.

In summary, Quinn glass have 2 furnaces on site with a total combined capacity for producing 1,000 tonnes of glass material per day. Quinn currently source and purchase about 500 tonnes of cullet per day locally. The main suppliers include Mr. Binman and Rehab. Typical costs paid for cullet (as at August 2008) are: Flint £40 Stg, Green £30 Stg, Amber £35 Stg.

Quinn have very stringent specifications on the contamination content of cullet and have expressly stated they would take and use more Irish cullet if it were available and in line with their stipulated specifications. These specifications set the amount of pure cullet and the amount of permissible contaminants.

Flint (98%) Permissible contaminant level (2%)
Green (~95%) Permissible contaminant level (5%)
Amber (~95%) Permissible contaminant level (5%)

A large portion of the cullet used at their Derrylin facility is now sourced and imported from the UK and Germany.

Prepared by Ms. Katie O'Neill (05/08/08)

Based on notes taken by Mr. Warren Phelan (01/08/2008)

RPS

Site Visit to the Glassco Facility (Naas)

Date: 26th June 2008

Attendees:

- Mr. Hugh Coughlan (Dublin City Council)
- Ms. Margaret Coles (Dun Laoghaire-Rathdown County Council)
- Mr. John Guckian (Dun Laoghaire-Rathdown County Council)
- Mr. Alain Kerveillant (Fingal County Council)
- Mr. Warren Phelan (RPS)

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1. The Glassco plant is located near Naas, Co Kildare and can process source separated glass and mixed glass. The facility has a capacity of 50,000 tonnes and operated in compliance with a Waste Facility Permit (No. 247/2006) issued by Kildare County Council. The through put at present, whilst developing, is substantially below the capacity of the plant. The facility accepts source separated colour glass collected from local authority household bring banks and commercial customers as well as mixed glass cullet. Most commercial customers are providing colour separated glass.

2. The Glassco facility has been designed to meet the needs of the Irish market. Colour separated product is common to the Irish market and as a result Glassco have designed their sorting line accordingly. If the market changed in Ireland and mixed glass became the more commonly collected product, Glassco would re-invest in processing equipment and re-configure their operation.

3. From Glassco's perspective source separated glass feedstock is better as less cleaning and sorting of the cullet is required. Glassco can then run the sorting line at a faster rate. The facility can also process mixed glass material and uses a colour separator to isolate individual cullet pieces.

4. Mixed glass can be separated out into individual colour cullet but whether Glassco does this depends on the quantity of stock at the facility (requiring processing) and the time taken to get the mixed product to a required specification: The separation of mixed glass to single glass is a slower process.

5. The sorting line is made up of several components whose primary function is to clean the product using a combination of magnets, a crusher unit, eddy currents, a picking line, a blower and a screen. There are two other key components to the line. The CSP unit which removes ceramics, stone and porcelain. These items are particularly damaging to glass recycling and very low proportions of these materials (if any) are allowed in the final product. The final unit is the colour separation which performs different separation functions depending on the product being processed:

    - If source separated glass is being processed the colour separator removes wrong coloured glass e.g. brown, from the main glass stream being sorted e.g. clear cullet. A certain percentage of other colours are typically acceptable in the final processed product, with the exception of clear glass. Clear glass needs to < 3% other coloured glass in the final product to be useful to a glass manufacturer. For brown and green glass a higher tolerance of other colours is acceptable. The colour separation unit can be modified depending on the recovered specification required by the manufacturer.

    - If mixed glass is being processed the colour separator is used to remove too much of one particular colour and ensure a consistent mix in the end product.

6. Glassco will pay collectors/local authorities for source separated glass, while collectors are charged for mixed glass cullet i.e. a waste collector/operator or a Local Authority will have to pay Glassco to take this material.

7. Glassco receive premium rates from destination glass manufacturers for source separated product. Clear glass gets the best price followed by brown then green. Mixed glass product is paid a reduced rate compared to source separated product (of the order of twice as less). Typical market rates vary from €10 (mixed cullet) – €70 (for clear cullet) per tonne.

8. Both mixed glass and colour separated product are sold to glass manufacturers. Colour separated product is typically used to make brand specific products such as Heineken bottles etc. Mixed glass cullet is used in the processing of lower quality products where exact brand colouring of the end product is not essential e.g. some food and wine bottles.

9. Mixed glass and colour source separated glass is mixed with virgin glass material in the making of new bottles. The extent of the virgin material used varies depending on the quality of the recoverable cullet – further discussion with glass manufacturers is required for more details on the extent of virgin glass required and the tolerance level of mixed glass.

10. In terms of providing premium feedstock to Glassco the following preferred hierarchy applies:
    1. Clean source separated glass e.g. from Bring Banks
    2. Separately collected co-mingled glass only
    3. Glass co-mingled with other materials.

    The cleaner the source material the less 'cleaning' required and the faster the line can be run. All of this is better from Glassco's perspective, reflecting their preference for glass from Bring Banks.

    Glass collected through a separate wheelie bin system will provide a mixed glass product and processing this material is relatively straight forward. The mixed end product is then sold to the glass market/directly. The disadvantage of this collection system is that contamination with ceramics/ porcelain is common as people think this is glass and put this into their glass bin. There is no aperture control as with bring banks.

    Glass collected through a co-mingled system (with dry recyclables) tends to be the most contaminated of the feedstock and is typically processed by the collector prior to being delivered to Glassco.

In summary, Glassco collect and process colour separated glass and mixed glass products. Premium rates are paid for the colour separated glass while a charge applies to mixed glass, reflecting the quality of the product. It is safe to assume that a consumer availing of a kerbside glass collection will be paying for the service to cover the cost for sorting this material at a Glassco type facility.

The collection of colour separated glass through the Local Authority Bring Bank system generates revenue whereas glass collected in co-mingled systems is more contaminated than source separated products, will need more processing to meet the specification of glass manufacturers and as a result incurs higher costs to process.

The glass collected and processed by Glassco is sent to glass manufacturers only and is made into new glass containers. The percentage of virgin material used with the recovered feedstock will depend on the quality of the feedstock and the end products being produced.

Prepared by Mr. Warren Phelan (07/07/2008)

RPS

Email response from British Glass

Date: 14.56pm, 11th August 2008

Correspondence between:

- Ms. Rebecca Cocking (British Glass Recycling Manager)
- Ms. Katie O'Neill (RPS)

An Industry perspective on current glass collection systems in the UK
There are currently a number of systems for glass recycling these are:

- Bring Banks colour separated and mixed,
- kerbside collections at differently levels,
- colour separated glass,
- mixed glass,
- mixed with one/ two materials and
- mixed with all recyclables (recoverable materials) and
- sorted at a Materials Recovery Facility

Each of these systems has its pros and cons bring banks are seen as the most cost effective and deliver the best quality however the participation levels are not as high as Kerb side collections. Bring banks also require less processing than kerb side collections (removal of lids, labels and ceramics), therefore the cost of the final product is seen as being less than kerb side. (Currently the same price is charged whether it is kerb side collected or bring collected.)

Kerb side systems require more processing as the glass tends to be collected with other materials e.g. plastic and metals. This material will need to be processed to split the various material streams then processed to remove the lids, labels and ceramics and if collected mixed will also need to be colour separated.

When it comes to co-mingled collections that are sent to a Materials Recovery Facility for processing then the glass has to be separated from the other materials (most MRFs that take glass tend to take the glass out last), the material if left until last is of a very low quality as it will have gone through several processes making it too small in size to process for remelt let alone colour separate. Only real use is as an aggregate.

Any recent/imminent development within this sector?
From a UK situation many Local Authorities are relying on co-mingled kerb side collections with processing at a MRF to assist them with meeting landfill diversion targets. This trend has resulted in the amount of material being available for remelt to decline. This switch has led to a number of Authorities moving away from Bring banks, and even those that are collecting kerb side and separating at the kerb there has been a decline in quality.

A study conducted in 2004 showed that from an environmental point of view the best application for recycled glass was back in to new containers (remelt) followed by exporting of recycled glass for remelt and fibre glass. The least environmental benefit was seen when recycled glass is used as an aggregate substitute.

Do British Glass favour a preference for colour separated collection systems at source?
British Glass favours colour separated glass at source because it can easily be returned to remelt. As highlighted above the other practices do not allow material to be returned unless further processing takes place which obviously adds cost to the final material. The price margin between raw materials and recycled glass (cullet) is within £10. Currently cullet actually costs more than the basic raw material equivalents therefore (unlike other materials)

extra processing could result in pricing cullet out of the market for glass manufacture, loosing any environmental benefit associated with it.

If we had to rank our order of preference it would be:
Bring Bank colour separated glass
Bring Bank Mixed glass
Kerb side sorted colour separated glass
Kerb side sorted mixed glass
Kerb side collected with one or two other materials (metals and plastics No paper)
Kerb side collected with processing at a MRF

Any issues currently affecting this industry?

The UK Glass Industry is being hit in a number of ways, increases in energy prices, increases in raw material costs, working towards targets under Climate Change and EU Emissions Trading could all be assisted by using more cullet. As quality and availability of cullet decreases despite the UK increasing its overall recycling the opportunities highlighted are being lost to a low grade application in the form of aggregate. Many might say that aggregate is another form of landfill, whilst the glass industry is looking to quarry more raw materials as production levels continue to see an increase.

In summary, British Glass note from a UK perspective many Local Authorities are relying on co-mingled kerb side collections with processing at a MRF to assist them with meeting landfill diversion targets. This trend has resulted in the amount of material being available for remelt to decline. This switch has led to a number of Authorities moving away from Bring banks, and even those that are collecting kerb side and separating at the kerb there has been a decline in quality.

British Glass favours colour separated glass at source because it can easily be returned to remelt. Other collection methods do not allow material to be returned unless further processing takes place which obviously adds cost to the final material. The price margin between raw materials and recycled glass (cullet) is within £10. Currently cullet actually costs more than the basic raw material equivalents therefore (unlike other materials) extra processing could result in pricing cullet out of the market for glass manufacture, loosing any environmental benefit associated with it.

The UK Glass Industry is being hit in a number of ways, increases in energy prices, increases in raw material costs, working towards targets under Climate Change and EU Emissions Trading could all be assisted by using more cullet. As quality and availability of cullet decreases despite the UK increasing its overall recycling the opportunities highlighted are being lost to a low grade application in the form of aggregate. Many might say that aggregate is another form of landfill, whilst the glass industry is looking to quarry more raw materials as production levels continue to see an increase.

Prepared by Ms. Katie O'Neill (14/08/08)

RPS

Site Visit to the Berryman Facility (South Kirkby, West Yorkshire)

Date: 13th August 2008

Attendees:

- Mr. John Singleton (Dublin City Council)
- Ms. Peter Goodwin (Dun Laoghaire-Rathdown County Council)
- Ms. Sorcha O'Brien (South Dublin County Council)
- Mr. Alain Kerveillant (Fingal County Council)
- Mr. John Daly (Fingal County Council)
- Mr. Warren Phelan (RPS)
- Ms. Katie O'Neill (RPS)

- Mr. John Marley (Berryman)
- Mr Mick Keogh (Berryman)

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1. The Berryman plant is located near Leeds, West Yorkshire. Berryman collect and buy both plate and bottle (container) glass. They deal with paper and metal on a small scale. The glass is processed at their six facilities in the UK, one of which is located on the Ardagh Glass site. This cullet is sold to the container industry (UK and EU markets), the plate glass industry and the aggregate market.

2. In 2007 2.65 million tonnes of glass was generated in the UK, of which 1.52 million tonnes (57.4%) was recovered. The destination of the recovered glass I as follows:

    - 696,000 tonnes - UK container industry
    - 272,000 tonnes - exported
    - 549,000 tonnes - alternative markets

3. Kerbside collection was introduced between 2000 and 2003. This has lead to an overall increase in volume collection but a decrease in the percentage of glass being recycled into glass.

4. The amount of glass consumed by the aggregate market increased from 351,000 tonnes to 549,000 tonnes (36% of the total glass recovered) from 2006 to 2007.

5. The UK is the only EU country who defines the use of glass cullet in an aggregate as recycling. The PRN (subsidy) is paid equally in the UK whether the glass is used in container or aggregate production (i.e. closed or open loop recycling). This has created an economic driver for glass use in aggregates making the aggregate market the largest alternative market in the UK.

6. Glass is recycled to save energy and CO_2, not sand. Bottles recycled in the UK saves a net 314kg CO_2 per tonne glass melted, whereas glass made into aggregate consumes 2kg CO_2 per tonne.

7. A Grant Thorntons report in the UK has stated the following "Beware of investments not linked to the carbon agenda" Berryman note recycling targets may become linked to CO_2 savings in the future.

8. For container manufacture colour separation is preferred in conjunction with the following collection methods:

- Bottle Banks
- Colour separated bin
- Colour separated Kerbside
- Kerbside – mixed

9. Where mixed colours are collected together it is preferable for the glass to be left as whole as possible to allow sorting by colour.

10. During processing the glass is crushed at the final step of the process. It is preceded by a series of other sorting/cleaning steps in order to removed contaminants and meet glass standards.

11. The contamination rate for various collection methods is shown in the table below.

	Glass Content	Size >10mm	Infusibles g/t
Bring Bank	99%	95%	<500
Mixed Kerbside	99%	95%	<1000
Clean MRF	95%	56%	8,500
Dirty MFR (MBT)	65%	56%	117,000

12. Berrymans decide on a weekly basis whether it is economically viable to separate out mixed glass. Key drivers include price for mixed glass and transport costs.

13. The permissible level of contamination is 5g per tonne. This low level of contamination is now possible due to equipment such as x-ray technology.

14. Why do the construction industry use glass as aggregates? The main reason is to promote their green image (recycling). Glass (cullet) being sent to aggregate is a low value option and provides no structural importance to the aggregate mix.

15. Gate fee varies dramatically for glass source separated material and glass extracted from MBT/MRF processes. Berryman pay up to £35/tonne for clear glass (flint). They may charge to take MBT/MRF material depending on the quality.

16. In the 1990s Berryman charged to take mixed glass into their facilities. At this time the aggregate market was the preferred destination for under 5% of the total material handled (from data collected by Berrymans), whereas now it represents ~70%.

In summary, Berryman are at the forefront of glass processing in the UK. They operate six facilities in the UK, one of which is located next to Ardagh Glass. Berryman collect and buy both container and plate glass. The cullet produced is sold to the container industry (UK and EU markets), the plate glass industry and the aggregate market.

Berrymans state that for container manufacture colour separation is preferred in conjunction with the following collection methods: Bottle Banks, Colour separated bin, Colour separated Kerbside, Kerbside – mixed. Where mixed colours are collected together it is preferable for the glass to be left as whole as possible to allow sorting by colour.

In the 90s Berryman charged a gate fee to take mixed glass into their facilities. At this time the aggregate market represented under 5% of the total material they handled, whereas now it represents ~70%. The PRN (subsidy) is paid equally in the UK whether the glass is used in container or aggregate production (i.e. closed or open loop recycling). This has created an economic driver for glass use in aggregates making the aggregate market the largest alternative market in the UK. The UK is the only EU country who defines the use of glass cullet in an aggregate as recycling.

Gate fee varies dramatically for glass source separated down to glass from MBT facilities. Berryman pay up to £35/tonne of clear glass (flint). They may charge to take glass material from MBT or MRF facilities depending on the quality.

Berrymans stress the importance of the carbon agenda in glass recycling. In open loop recycling where recyclable glass is made back into glass, a saving of 314Kg CO_2 per tonne is achieved. In closed loop recycling where glass cullet is sent for aggregate use, there is no saving, but rather 2Kg CO_2 per tonnes is consumed. The equal subsidy does not recognise this environmental difference and Berrymans feel that in the long term the UK government cannot continue to ignore this imbalance.

Prepared by Katie O'Neill (14/08/2008)

RPS

Site Visit to Ardagh Glass: Processing and Glass Manufacturing Facilities (Knottingley, West Yorkshire)

Date: 13th August 2008

Attendees:

- Mr. John Singleton (Dublin City Council)
- Ms. Peter Goodwin (Dun Laoghaire-Rathdown County Council)
- Ms. Sorcha O'Brien (South Dublin County Council)
- Mr. Alain Kerveillant (Fingal County Council)
- Mr. John Daly (Fingal County Council)
- Mr. Warren Phelan (RPS)
- Ms. Katie O'Neill (RPS)

- Mr. John Marley (Berrymans)
- Mr. Nigel Keenlyside (Ardagh Glass)
- Ms. Sharon Crayton (Ardagh Glass)

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1. The Ardagh Glass manufacturing facility is located in Knottingley, West Yorkshire.

2. Ardagh Glass was previously known as the Irish Glass Bottle Company and has its head office in Dublin. Ardagh Glass has expanded considerably in recent years and now has 22 sites across Europe and employs 7,000 people.

3. The Ardagh Glass manufacturing facility has three furnaces with a combined capacity of 650,000 tonnes/year. This facility produces 900 million bottles per year. It is operational 365 days per year, 24 hours per day.

4. At this facility the green glass bottles produced contain ~80% recycled material, and clear glass contains ~40% recycled flint.

5. Branding specification tend to determine the recycled content, colour and shape of the containers.

6. When cullet is used in processing the energy requirement is reduced by typically 25%

7. Ardagh Glass are unable to get enough high quality cullet for use in their facility. Mixed colour glass collections are causing a loss of clear to other streams.

8. Currently 65% - 70% of glass collections in the UK are mixed kerbside. With source separated bring banks accounting for ~20%. The difference is made up of glass from pubs and clubs (mixed). Clear or flint cullet is in high demand in the UK.

9. Ardagh glass use plate glass as much as possible, up to 50% when mixed with bottle bank glass. They also import a small amount of cullet.

10. Ardagh glass believe there is no incentive to separate glass as generally waste management companies deal with the glass collection and disposal for the councils.

11. There is no differentiation between recycling of clear and green glass in the UK.

12. Ardagh believe transport costs and available subsidies fuel the mixed glass and aggregate industry.

13. There are no mixed glass furnaces in the UK. Mixed cullet can be processed to a green colour. It costs between £16 and £20 per tonne to colour separate a tonne of mixed glass.

14. Quality of recovered glass is getting progressively worse in the UK.

15. The cullet facility next to the Ardagh plant is designed to process 400,000 tonnes of glass per year but is currently running about 37% under capacity due to lack of available suitable material.

16. The general public in the UK are very confused about glass recycling, as there are so many different collection systems.

17. The Reuse glass cullet facility, which is located at the same site as the Ardagh glass plant is responsible for producing furnace ready glass i.e. to remove impurities to <5g/tonne, thereby producing a high end feedstock for glass manufacture. The facility does not separate colours. Their material is typically sourced directly from council collections and also from bring banks.

18. The UK may be heading towards producing containers using mixed glass cullet. Specification from the food and drink companies will have to therefore change accordingly.

19. Ardagh Glass believe the public should be encourages to separate glass.

20. Kerbside collection in the UK was introduced in the UK to achieve packaging diversion targets.

21. CO_2 argument is a powerful one in favour of source separation.

22. Cradle to cradle is a new term being used for closed loop glass recycling.

23. Commingled collections where materials are crushed together are pointless. Any glass <12mm cannot be re-used/recycled. This material <12mm may be sent for aggregate use, however the aggregate market is now starting to set its own standards.

In summary, Ardagh Glass an Irish owned company has 22 sites throughout Europe and employs 7,000 people. The site visited houses a glass production plant and a cullet production facility. The cullet facility produces furnace ready glass by removing impurities to <5g/tonne, thereby producing a high end feedstock for glass manufacture. The facility does not separate the glass into colours. This facility has been designed to process 400,000 tonnes per year but is currently running about 37% under capacity due to lack of available suitable material.

The site also houses a glass manufacturing facility which has three furnaces with a combined capacity of 650,000 tonnes/year. This facility produces 900 million bottles per year. It is operational 365 days per year, 24 hours per day. At this facility the green glass bottles produced contain 80% recycled material, and clear glass contains 40% recycled flint. When cullet is used in processing the energy requirement is reduced by 25%. Ardagh glass use plate glass as much as possible, up to 50% when mixed with bottle bank glass. They also import a small amount of cullet.

Ardagh Glass have recognised that the quality of glass is getting progressively worse in the UK. There are countless types of household collection schemes in the UK and the public are very confused about glass recycling. Ardagh believe that the growth in the aggregate market for glass is providing no real incentive for glass collection/recycling companies or the council to separate material, Ardagh cannot source the required quantities of cullet for glass

production. The recycled content in clear bottles and jar (#40%) is vastly different to that in green bottles (~80%) simply because there is not enough clean cullet available. The lack of cullet keeps the costs of running the plant high, as the energy required to melt sand is significantly higher.

Ardagh Glass believes the UK may be producing containers using mixed glass cullet. Specification from the food and drink companies will have to therefore change accordingly.

Prepared by Katie O'Neill (14/08/2008)

RPS

Telephone Conversation: Rehab

Date: 9.45am, 5th August 2008

Conversation between:

- Bob Rowat (Rehab)
- Mr. Warren Phelan (RPS)

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1. Rehab collect Glass from bring bank facilities and the material collected is transferred to their cullet production facility where the colour separated streams are processed to a required specification with contamination removed.

2. The Rehab facility has an operational capacity of 20 tonnes per hour and was commissioned in 1999. Rehab are planning to extend their operations increasing the capacity of the facility and the working hours. The timeline for completion of the new facility is late 2009 to early 2010.

3. Rehab are in favour of the current system of colour separation at bring banks. They first introduced glass banks in Dublin in 1984 and 25 years of education and investment has been made into encouraging the public to separate their glass into specific colour streams and in their opinion it would be a retrograde step to start permitting co-mingling of glass at collection points or door-to-door.

4. Bring bank use has increased significantly in the last 10 years with corresponding increases in the quantities of glass being collected. Pre-sorting contamination levels are dropping each year with current rates approximately: 8% clear glass, 10 – 15% green, and 20% amber.

5. There has been a noticeable drop in the tonnage of glass collected in the Dun Laoghaire Rathdown County Council (DLRCC) area. In the first 6 months of this year (2008) a drop of 28% has been recorded. This is primarily due to the collection of glass at the kerbside by private collections. This is contrary to the national trend where bring bank use continues to increase.

6. The specification requirements of the end-user manufacturer determines the level of sorting and processing required at the cullet facility. Mixed loads are more tolerant of contamination and have higher levels. To produce colour separated streams, contamination levels need to be rigorously met.

7. Collecting mixed glass with other materials is not a good idea as it contaminates other recyclables (paper) and produces a poor quality glass-recycling product generally suitable only for open loop recycling.

8. Mixed glass collections generally produce a mixed glass cullet for the manufacture of mixed (coloured) glass bottles i.e. wine bottles. Mixed glass cullet has a lower economic value compared to clear, green or amber glass cullets. Mixed glass material can be separated into individual colour streams but this reduces the hourly throughput considerably at the cullet facility. Typically a plant which is processing 40 tonnes/hour of colour separated product reduces to a throughput of 16 tonnes/hour when trying to separate out into individual streams a mixed glass feedstock. The economics of doing this generally do not stack up.

9. Markets in France and Germany are different where mixed glass (green and amber) is required for wine bottle manufacture etc. Higher contamination levels can be accepted at the manufacturing plants, as the colour specification of the end bottle is not as important.

In summary,

Rehab collect Glass from bring bank facilities throughout Dublin and the material collected is transferred to their cullet production facility. The Rehab facility has an operational capacity of 20 tonnes per hour and was commissioned in 1999. Rehab are planning to extend their operations increasing the capacity of the facility and the working hours. The timeline for completion of the new facility is late 2009 to early 2010.

Bring bank use has increased significantly in the last 10 years with corresponding increases in the quantities of glass being collected pre-sorting. Contamination levels are dropping each year with current rates approximately: 8% for clear glass, 10 – 15% for green, and 20% for amber. Mixed loads are more tolerant of contamination and have higher levels. To produce colour separated streams, contamination levels need to be rigorously met. Collecting mixed glass with other materials is not a good idea as it contaminates other recyclables (paper) and produces a poor quality glass-recycling product generally suitable only for open loop recycling.

There has been a noticeable drop in the tonnage of glass collected in the Dun Laoghaire Rathdown County Council (DLRCC) area. In the first 6 months of this year (2008) a drop of 28% has been recorded. This is primarily due to the collection of glass at the kerbside by private collections. This is contrary to the national trend where bring banks use continues to increase.

Mixed glass material can be separated into individual colour streams but this reduces the hourly throughput considerably at the cullet facility. Typically a plant which is processing 40 tonnes/hour of colour separated product reduces to a throughput of 16 tonnes/hour when trying to separate out into individual streams a mixed glass feedstock. The economics of doing this generally do not stack up. Mixed glass collections generally produce a mixed glass cullet for the manufacture of mixed (coloured) glass bottles i.e. wine bottles. There is lower economic value in mixed glass compared to clear, green or amber glass cullets.

Rehab remain explicit that the current system of colour separation at bring banks should be retained. Rehab note that 25 years of education and investment has been made into encouraging the public to separate their glass into specific colour streams and in their opinion would be a retrograde or negative step to start permitting co-mingling of glass at collection points or door-to-door.

Prepared by Ms. Katie O'Neill (05/08/08)

Based on notes taken by Mr. Warren Phelan (05/08/2008)

RPS