

## Plastics Briefing Paper

This paper summarises the Plastics opportunities in Hampshire required to meet the Vision of the MRS.

This is based upon the best information that we have available. An initial paper was prepared for the Workshop on 31 March 2004 following discussion with industry experts and detailed research into the topic. The paper was refined following input from a group of sector experts and volunteers at a sector specific workshop in May 2004. Details of these volunteers and experts are set out at the end of this paper.

The Opportunities outlined below are the results of. This research is summarised in the following pages.

The Information contained within this briefing paper will develop following this consultation into one section of the Material Resources Strategy.

This paper also links to the follow other papers:

- **Construction & Demolition Waste**
- **ELVs**
- **WEEE**
- **Agricultural Waste**

*Plastics* refers to a range of different polymeric materials. These can be broken down into thermoplastics and thermosets. Thermoplastics represent 95% of the plastics used and can be softened and melted on heating and can be recycled into new products. Thermosets can't be mechanically recycled in the same way but can be ground and used as filler or used in energy recovery. Many thermoplastics used in packaging material are classed as polyolefins. This group includes polystyrenes, polyethylene and polypropylene.

### **The main opportunities to meet the MRS Vision**

#### **Within Hampshire:**

- Trial and compare options for kerbside collection of mixed plastic packaging via: Existing co-mingled recycling system (MRF route)
- Separated collection system
- Augment household collections through inclusion of collections of post-consumer plastic packaging from the commercial & industrial waste stream.
- Development of automated mixed plastic sorting and chipping facilities, ideally close to Docksides.
- Develop a range of end markets for process scrap and post consumer recovered plastics.
- Promote public sector procurement of recycled plastic products.

- Implement a programme of projects to demonstrate best practice.

**Regionally:**

- Development and investment of infrastructure in the South East.
- Develop a range of end markets for recovered plastics.

**Nationally:**

- Develop solutions for perceived barriers created by regulation and legislation and associated practices.
- Development of specifications to maximise the potential use of secondary and recycled plastics.
- Support development of polymer cracking project through demonstrating viability of collection systems.
- Increased collection of bottles via kerbside collection
- Increase the amount of recyclate in retail packaging
- Development and investment of infrastructure within the UK.
- Develop technologies for the efficient mechanical recycling of plastics.
- Develop a range of end markets for recovered plastics.
- Stimulate improved competitiveness of the UK-based reprocessing industry.
- Increase the cost of disposing of plastics waste, i.e. application of higher landfill tax.
- Improve the regulatory framework to monitor best practice protocols and to regulate the packaging recovery note system.
- Develop practical guidance for waste producers to promote maximising use of recycled plastics.

**European:**

- Develop a range of end markets for recovered plastics.

**What is the current Plastics resource situation?**

**Current Trends**

Plastics use has grown substantially over the last 50 years and plastics are found in a wide range of applications encompassing a wide variety of polymer types. The industry is worth £18billion and the UK uses about 4.5 million tonnes of plastic per annum in an extremely wide range of applications; packaging 36%, Building/construction 21.7%, Electrical 8.1%, transport 7.3%, furniture/housewares 7.1%, Agriculture 7%, others 12.9%. Packaging represents the largest single sector of plastics and approximately 1.64 tonnes were used in packaging applications in 2000

There are three key categories of waste plastic - that derived from the household waste stream, that originating from the commercial sector and that originating from the agricultural sector. Waste plastics also form part of other types of waste e.g. WEEE. Whilst these figures have been included in this section so as to provide a composite figure for plastics, care must be taken when looking at the wider picture because there is an inevitable element of double counting.

### **Estimated Arisings**

Using statistics derived from the Association of Plastics Manufacturers in Europe (APME), the DTI estimate that the UK uses around 5 million tonnes of plastic each year, of which 2.8 million tonnes arises in the UK waste stream. By apportioning this total according to population, a crude calculation can be made as to the total quantity of waste plastic arising in the study area i.e. 2.8 million tonnes of waste plastic ÷ UK population (59 million) x Hampshire, Portsmouth and Southampton population (1.6 million) = 73 932 tonnes. This figure, however, which should include commercial waste plastic, is lower than that calculated in Table 1 above.

Alternative work conducted by Viridis on behalf of SEEDA (January 2003) concluded that total arisings of plastic in the South-East region was in the order of 1.6 million tonnes per annum and 26.5% of this was derived from household waste. This equates to 83KT in Hampshire's household waste, which is in line with Table 1 (below).

Reliable statistics covering the municipal element of waste plastics in the study area have been available via the County Council's monthly waste returns and their Waste Volume Service Plan. Moreover figures have been available from the Environment Agency's SWMA for the South East relating to the quantities of plastic waste thought to be generated by the agricultural sector. Unfortunately, however, figures covering the arising of waste plastic from the commercial sector have not been available.

Viridis estimate there is 320KT of plastic in the Hampshire waste stream, just over half (179KT) arising from the General Commercial stream. This appears to be at odds with the APME figures on UK consumption.

Table 1 below shows estimated quantities of waste plastics generated in Hampshire, Portsmouth and Southampton from 2000/01 to 2002/03.

**Table 1 Plastics Arisings in Hampshire, Portsmouth and Southampton 2000/01 - 2002/03 (tonnes)**

	<b>2000/01</b>	<b>2001/02</b>	<b>2002/03</b>
Plastics Arising at HWRCs	117	175	156

and Bring Sites

Plastics Arising from Kerb-Side Collections <sup>1</sup>	70 838	71 497	72 608
Agricultural Plastics <sup>2</sup>	1 100	1 100	1 100
WEEE Plastics <sup>3</sup>	5 901	5 901	5 901
Other Commercial Plastics <sup>4</sup>	Unknown	unknown	Unknown
ELV Plastics <sup>5</sup>	6 006	6 006	6 006
<b>TOTAL</b>	<b>83 962</b>	<b>84 679</b>	<b>85 771</b>

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(Source: Hampshire County Council Waste Management, 2003; DTI; SWMA for the South East, Environment Agency, 2000).

1 - Calculated using the results of the 1999 Hampshire Household Waste Compositional Study, which estimated that 12.72% of household waste collected from the kerb-side was plastic (by weight).

2 - For calculation purposes, agricultural plastics arisings have been assumed to be constant from 1998 (the only year for which such data is available).

3 - Figure is an estimate for 2000 (derived from WEEE compositional data) and for calculation purposes has been assumed to be constant from this year.

4 - Total consumption is unknown, but an estimated 8,800 tonnes of commercial waste will have been recycled from commercial and industrial premises, including pallet wrappings etc.

5 - Figure derived from ELV compositional data and has been assumed to remain constant.

The intended life-span of plastic products varies from several months (packaging items) to over 50 years (building & construction components). All plastics can be recycled, however, the extent to which they are recycled depends on both economic & logistical factors.

There are 214 UK Councils that offer plastic bottle bring banks for recycling and 165 offer some type of kerbside collection for plastic but, collectively, less than 20,000T of plastics from domestic sources are recycled in the UK annually. Analysis shows that the capture rate is higher when the kerbside collection is associated with alternate weekly collection of refuse and that they outperform bring schemes. The UK Environment Agency has accredited 92 established recyclers for plastics packaging. There are 30 accredited exporters of plastics packaging (as of 2001).

Plastic waste that arises from processing ELVs can be produced at the shredder as shredder fluff (where the plastic content is difficult to recover for recycling) or at the dismantling stage. The removal of plastic components prior to shredding is labour intensive and costly. Plastic recycling is affected by a number of factors and essentially depends on the plastic waste arisings

being clean, segregated by polymer type and in relatively high volumes to allow recycle to compete with virgin polymer.

### **Current Legislation**

- **Packaging & Packaging Waste Directive (94/62/EC)** covers all packaging placed on the market in the Community and all packaging waste, whether it is used or released at industrial, commercial, office, shop, service, household or any other level, regardless of the material used. It sets targets for recycling and recovery of packaging materials and requires that specified minimum standards of design are achieved.
- **Producer Responsibility Obligations (Packaging Waste) (Amendment) (England) Regulations 2002, SI 732** implements the above directive and requires any business or group of businesses with an annual turnover of more than £2million and handling at least 50 tonnes of packaging a year to take steps to recover and recycle specific packaging waste tonnages.
- **The Packaging (Essential Requirements) Regulations 1998** cover the manufacture and composition of packaging and the reusable/recoverable nature of packaging. They apply to packaging placed on the market in the UK as packed or filled packaging and require that safety and hygiene standards are met, noxious/hazardous substances are minimised, the packaging must be reusable/recyclable and that heavy metals are limited.
- **End of Life Vehicles Directive (2000/53/EC)** applies to plastics as they contribute to approximately 10% of the weight of an ELV and this is increasing as car manufacturers continue to use lightweight materials to improve fuel efficiency.
- **Waste Electrical & Electronic Equipment Directive (WEEE) (2000/96/EC)** applies to plastics as they are used in a wide variety of applications due to their durability, lightweight, resistance to corrosion and insulation properties. They contribute to 22% of the WEEE waste arising. The Directive aims to increase the re-use and recycling of WEEE by setting recovery and recycling targets and by introducing producer responsibility for disposal.
- **Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) (2000/95/EC)**

### **Estimated Recycling Element**

At present, there is little publicly available data to illustrate how much waste plastic derived from the commercial and domestic waste sectors is recycled in Hampshire.

### **Approximate Capacity for Handling Waste Plastic in Hampshire**

Waste plastics from commercial, domestic and other sources could potentially be handled by the MRFs and numerous waste transfer and recycling facilities located across the study area. (Although, it should be noted that these facilities do not represent a **final point of management** - simply handling and transfer.)

The waste licence data and information available on planning permissions and applications set out in the *“Minerals and Waste Planning in Hampshire*

*Annual Report 2002/03* provides no evidence of there being any plastics reprocessing facilities within the study area. As such, it is believed that all material presently goes outside the study area for re-processing.

### **Environmental issues**

There is potential for noxious and hazardous substances in plastics that can become a risk in the form of emissions, ash and leachate from incineration and landfill. Heavy metals are used in some forms of plastic as individual components, e.g. lead, cadmium, mercury & hexavalent chromium.

**What is being recovered now and what infrastructure is in place?**

### **Current Disposal Options**

In 2000 approximately 2.8MT (source: Association of Plastics Manufacturers) of waste plastic required disposal. In 2002 approximately 330KT tonnes of plastic (source: WRAP Business plan 2004) packaging was recycled in the UK under the Packaging Waste Regulations. In Hampshire Waste that was not recovered was disposed of to landfill or, from 2003, a proportion is incinerated with energy recovery.

Only small quantities of waste plastics from end of life vehicles such as battery cases and bumpers are recycled, the rest of the waste is disposed to landfill.

The wide range of appliances and polymer types involved makes plastics recovery from WEEE a challenging task and currently all waste from this sector is disposed to landfill.

Currently plastic waste produced by the construction and demolition waste sector is either buried below ground (pipes etc) and is unlikely to be removed for disposal or can only be recovered through demolition.

### **Current Standards**

European & British standards for plastics (approx 2500 British Standards).

### **Current Specifications**

Plastics are used in a wide variety of applications across a number of industry sectors.

### **Current Costs**

Currently the costs of running a bring scheme for plastic bottles is between £150-£300 per tonne of bottles recycled. Locality, household density, contractor availability, collection method and material market value all influence the overall cost per tonne. The true kerbside collection costs of plastics are difficult to establish as plastics are invariably collected along with other materials. Average collection costs for kerbside schemes tend to be

around £40-£50 per tonne, however the design of the scheme is important to ensure maximum recovery. Inclusion of plastic packaging into a kerbside collection scheme could lead to increased contamination of recycled waste collected, reduced performance of bring sites and the requirement of a greater number of household waste recycling sites due to additional volume. These issues need to be trailed.

### **Current Benefits**

By diverting plastic waste from landfill the costs for Landfill Tax will be reduced. It will also increase density of landfill, thereby extending life of sites. Polymer cracking and/or other recovery or recycling will reduce extraction of fossil fuels and associated haulage costs.

### **Codes of Practise:**

WRAP survey of applications, markets and growth opportunities for recycled plastics in the UK.

BRE guidance on Materials tests and Product Standards.

Recoup guidance for preparing plastic bottles for sale.

### **Current Key players**

<b>National:</b>	BRE	University of Brighton
	Bolton Institute	Intruplas
	Euro-Projects Ltd	University of Bradford
	Recoup	Linpac
	Bowman Process Technology	Coca Cola
	British Polythene Industries	
	Environment Agency	
	Material Engineering Research Laboratory	

**Hampshire:** Plasti  
Delleve

### **Plastics sector support**

**Waste & Resources Action Programme** is a not-for-profit company supported by funding from DEFRA, the DTI and the devolved administrations of Scotland, Wales and Northern Ireland. It is working to promote sustainable waste management by creating stable and efficient markets for recycled materials and products.

**British Plastics Federation Research Council** is the leading trade association of the UK Plastics Industry (representing approximately 80% of turnover), a springboard for industry action, exploiting common opportunities and resolve shared problems. Provides support network for additives, bottle blowers, cellular PVCU, composites, EPS building & packaging, Fluoropolymer processors, moulding, packaging, pipes & fittings, plastic & rubber equipment, polymer distributors, compounders & producers, rotamoulding, sheet & coated fabrics, specialist processors, vinyls & windows. **Association of Plastics Manufacturers in Europe.** Represents the industry at European level and promotes the benefits of plastics in every aspect of life. It co-operates with other industry sectors to provide effective solutions to

plastics - related issues through scientific fact and environmental and economic data.

**Recoup** is the UK's technical centre for post-consumer plastics recycling. Their work improves the opportunities to recycle plastic through the development & dissemination of practical information as well as providing guidance & specialist resources for local government, packaging supply-chain and waste management professionals. This organisation also works to help recycling scheme planners, investors & operators in the UK to extend household plastics recycling facilities.

**Valuplast Ltd** is a 'not for profit' plastic materials organisation that represents the UK plastics packaging industry. This organisation facilitates the recovery and recycling of all used plastic packaging in the most economical and environmentally sensible way. It acts as a crucial link with Government on packaging waste regulations & implementation.

### **Examples/Case Studies**

#### **• National:**

- Building products containing recycled plastics & composites.
- Acoustic underlay made from recycled carpet waste.
- Development of thermoplastic panelling to compete with plywood.
- Investigations into the use of recycled plastics in large water filtration units and industrial waste units.
- Investigations to assess recycled mixed plastics to assess degradation in performance after 10years.
- Investigations to analyse the long term durability of blending degraded polypropylene with recycled or virgin polypropylene.
- Development of coil carriers made from a blend of mixed plastics & fibreglass for use in the steel industry.
- Investigation into properties & new markets for materials produced from PVC rich post consumer & post industrial waste.
- Commercial & Industrial film collection.

#### **Hampshire:**

- Use of recycled plastic products in highways maintenance and construction.
- Kerbside and bring site collection schemes for plastic bottles throughout Project Integra partnership.

**How is this likely to change by 2020?**

### **Future legislation**

A proposal to regulate plastics waste coming from the construction and demolition waste sector is expected soon. Approximately 800,000 tonnes of plastic is produced by this sector in a number of applications.

### **Future Trends**

Consumption growth is predicted as 4% per annum. Sector specific targets will be set to increase the recycled content of products in order to create a significant increase in plastics recycling.

There has been limited investment in technological improvements to increase efficiency and capacity of reprocessors as well as a lack of sustained competitive pricing for recyclates compared to virgin polymers.

The greatest potential for increasing recycling exists in:

- polymer cracking and
- generating polymer streams from plastic shredder residue.

There is also a need to identify new and efficient technologies to produce composite products using recycled resins with wood or rubber. Because of the different types of polymers associated with plastics used in electrical items this area should be focused on in order to increase recycling in this sector – ***links with WEEE resource paper.***

### **Future Disposal Options**

The various Directives that are being implemented will ensure that a greater percentage of waste plastic is recovered and reused or recycled through target achievement and by promoting sustainable design. It has also been predicted that the amount of plastic recovered from bring sites will decrease as kerbside collection initiatives increase.

### **Future Measures for Reduction**

The ELV Directive, WEEE Directive and RoHS Directive will minimise the environmental impact of the hazardous elements of plastic waste.

### **Option 1 – Status Quo**

- PI will consider trial methods for collection and extraction of polyolefins from waste stream without diverting PET and HDPE away from current high value market.
- PI will also be developing a communications and awareness strategy that aims to boost capture and quality of kerbside collected material.
- Some PI authorities will trial co-collection of commercial recyclate from SMEs alongside household recyclate. Material would be MRF sorted.
- The above options might be expected to bring very modest increases in the tonnages of bottles (NB a doubling of current performance would only net 4KT per annum) over the next 3-5 years.
- **New Infrastructure Required: New Infrastructure Required:**
  - Collection – Small scale trial involving one or two vehicles.
  - Handling – Use existing depot or MRF facilities to sort
  - Processing – material collected during trial likely to be exported pending polymer cracking demonstration facility.

- **Impact on Recycling Rate** – negligible, but volume/visual impact for participants should be significant.
- **Impact on Residual Waste** – improves densification of residual waste for landfill.

## **Option 2 - Stretching Best Practice**

- Capturing 50% of household plastic packaging via kerbside collection could yield an estimated 35KT a year, equivalent to a third of the feedstock required for a UK polymer cracking plant. This could be augmented using the same resources to collect post-consumer plastic from SMEs.
- The impact on facilities in terms of separately handling this volume of material would need to be assessed.
- This level of recycling would have a limited effect on tonnages but could reduce *volumes* of residual household waste significantly, thus visually reinforcing the impact of recycling to householders.
- The reverse of this is that additional capacity would be required throughout the process stream for storage, transport and sorting, especially if collecting packaging plastics via the co-mingled (MRF) route. The alternative is to collect as a separated stream in sacks. One option may be to collect separately at the same time as glass. This would require greater education and commitment from householders. While this system is likely to be more cost-effective on a per tonne basis, the volumes collected may be lower unless incentives are given.
- The reduction in volume would also extend the life of landfill sites. Although the Hampshire Household waste strategy is to use landfill as a last resort, this will continue to be the main sink for commercial waste.
- **New Infrastructure Required: New Infrastructure Required:**
  - Collection – Could require either vehicles for separate collection or increase to existing RCV fleet picking up mixed dry recyclate.
  - Handling – MRF capacity, automated sorting facility to extract PET and HDPE, facility to chip and load ships, dockside facility for transshipment to remote refinery.
  - Processing – Single process for UK, likely to be a long distance to Hampshire initially. If the process proves successful, polymer cracking process could be licensed to other refineries eg Fawley in due course
- **Impact on Recycling Rate** – Recycling rate would only increase by 4% if 50% of household plastic packaging is captured. However this would dramatically reduce volume of household waste and the perceived impact by householder could be significant as householder has more impression of volume than weight.

- **Impact on Residual Waste** - improves densification of residual waste for landfill.

<b>Further Information</b>
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