

## Recycling PET by Numbers

5 PET bottles provide enough fibre to make one extra large T-shirt or to fill one ski jacket with insulation.

11% of recycled PET was used to make new plastic strap-ping tape in 2008.

20% of recycled PET was used to make new bottles and jars in 2008.

22% of recycled PET was used to make sheet and thermoformed containers in 2008.

45% of recycled PET was used to produce fibre for filling, textiles, and non-wovens in 2008.

46% of PET bottles were collected for recycling in Europe in 2008.

100% of PET is recyclable.

# PET Profile

## Petcore Fact Sheet on Polyethylene Terephthalate

Issue 1

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## The Reason for PET's Success

### Benefits to Brand Owners

PET encourages novel package design and enhances brand differentiation;

PET has crystal clear transparency for visible display of "premium products";

The toughness of PET protects the product and the consumer;

The low weight/contents ratio of a PET package leads to favourable distribution economics. This saves fuel and reduces the carbon footprint of the package.

### Benefits to the Filler/Packer

PET packages do not break thus reducing product loss and at the same time as ensuring operator safety;

PET containers ensure reduced noise on filling lines, benefiting occupational health;

PET is lightweight yet tough for ease of handling;

PET promotes automated collation of multi-packaging.

### Benefits to the Retailer

PET promotes high product visibility;

The high barrier performance of a PET container seals in the product's flavour giving a longer shelf life;

PET's impact and burst resistance ensures



Source: Alpha

safety in-store and product integrity;

PET's light weight facilitates shelf stacking.

### Benefits to the Consumer

A PET package is lightweight and portable;

A PET bottle is resealable for efficient on-the-go hydration;

PET is an inert material and does not affect the product's taste;

PET is 100% safe.

### Benefits to the Environment

PET is the most recycled domestic packaging polymer;

In 2008 46% of PET was collected for recycling in Europe;

The PET industry's drive for sustainability is leading to higher and higher rates of PET recycling;

Greater demand for PET will continue to drive down Europe's carbon footprint.

## What is PET?

The function of packaging is to protect the product contained so that the contents remain fit for purpose.

PET (polyethylene terephthalate) is a major polymer used in the packaging industry and is used to package both carbonated and non carbonated drinks by an injection moulding and stretch blow moulding process. It is also used to make other packages by sheet extrusion followed by thermoforming.

The increase in PET demand has been substantial. In the EU27 ca 2.9 million tonnes

were used in 2008 compared with 1.9 m tonnes in 2001. This was an average annual growth rate of about 6%.

PET is the polymer of choice to pack a wide variety of products from food and drinks to cosmetics, household chemicals, toiletries and pharmaceuticals. Packaged drinks include soft drinks, waters, fruit juices, wine, spirits and beer. Packaged foods include edible oils, vinegars, fruit, meat and fresh pasta. PET is also used to manufacture tough, clear industrial sheet which can be thermoformed.

## How is PET Made?



PET Granules and Flake

Source: Erema

In common with other polymers, PET is derived from crude oil. The basic PET raw materials, pure terephthalic acid (PTA) and monoethylene glycol (MEG), are chemically reacted with a small amount of co-monomer via a "polycondensation" process to form a base polymer.

The resultant polymer is a polyester that is commonly used to make films and fibres. In the case of PET production, this base polymer undergoes solid stating which crystallises the polymer to

aid processability and toughens the product. The solid stating process also purifies the product by ensuring that all extractable products of reaction are removed. This material is then suitable to produce packaging.

Before being placed on the market however, the final PET package has to undergo the various migration and extraction tests required by the authorities to comply with stringent food contact regulations for safe consumer use.

### PET PROFILE

**"Globally PET captures 0.0016% of the world's annual oil consumption"**

## Resource Consumption

Globally PET captures 0.0016% of the world's annual oil consumption. A typical PET bottle is equivalent to around 25g of oil.

Over the last 10 years a typical PET bottle has reduced in weight by 35% and major brand owners are driving further reductions.

We are reaching the practical limitations of lightweighting in terms of cost performance but packaging designers, together with the whole PET value chain will continue to find ways of reducing the environmental footprint of PET.

## PET Recycling—The Success Story



Rucksack and hat made from recycled PET

More than 1.26 million tonnes of PET were collected in Europe for recycling in 2008.

Petcore statistics collected from 1993 confirm that collection growth has increased at an impressive average annual rate of 20%.

The Packaging and Packaging Waste Directive (PPW) stipulates that the EU27 should have recycled 22.5% minimum of plastics by 2008. Legislation is being updated and future targets are likely to be higher.

PET is a leading polymer in helping to achieve these targets.

80% of European countries have a higher PET recovery rate than that required by current packaging waste regulations.

## PET Bottle to Bottle Recycling

Bottle to bottle recycling has grown steadily. In 2003 the PET industry recognised the need for a harmonised, “recycled-plastics-back-to-food-contact” regulation and a cross industry group, chaired by the PET industry, proposed recycle legislation to the EU Commission. This resulted in the Recycled Plastic Material and Articles intended to come into Contact with Foods Regulation EC No 282/2008 which was published on 27 March 2008.

The primary function of both PET and RPET packaging is to protect the packaging contents from damage and con-

tamination so that they are fit for consumption. The driver for recycle legislation is to ensure that recycle content resins have the same quality and inbuilt safety as virgin resins.

All EU manufactured PET resin placed on the market for packaging applications is food contact approved. Recycled resins are accepted only on the condition that a challenge test has been passed. This means that an individual recycle facility has proved it is able to reduce any contamination of the plastic input to a concentration that does not pose a risk

to human health.

The Quality Assurance system for plastics recycle suitable for food contact applications is controlled by the European Food Safety Authority (EFSA) who recommend the EU approves individual, total, recycle processes following a compliance audit.

Only plastics that have been recycled mechanically are covered by the recycle back to food contact regulation. Chemical recycling and the use of in-house scrap are not covered by this Regulation.

**“ ..... the legislation is to ensure that recycle content resins have the same quality and inbuilt safety as virgin resins.”**

## Alternative Recycling Options for PET

There are many coloured PET bottles on the shelves, driven by the marketing impetus for product differentiation and branding. Applications for mixed coloured recycle include strapping tape, fibres, injection moulded parts and coloured sheet for eg fruit and vegetable packaging. Coloured recycle does not command the premium price of clear/pale blue RPET used to produce containers and clear sheet.

Some feedstock recycling techniques, known collectively as chemical recycling, can unzip PET back to basic feedstocks and are able to deal with coloured bottles. Also RPET flake is used to produce polyester polyols, an ingredient in the production of

polyurethane foam.

The cost/benefit ratios however have to be evaluated for each individual process.

An alternative is to utilise the calorific value (comparable to coal) within the polymer and burn the PET to recover the energy to generate heat, power and fuel.

PET can be part of the waste mixed plastics feedstock that helps fuel electric furnaces for steel production or in replacing fossil fuels in cement kilns.

In this way the PET value chain is borrowing the calorific value from the oil in the manufacture and lifetime of the polymer and then recovering the high energy content.



**PET Preforms**  
Source: Alpla



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Petcore — PET Containers Recycling Europe — is a non-profit European trade association based in Brussels. Its mission focuses on sustainable growth for PET collection. It supports all key PET recycling processes as an integrated part of European Plastics Waste Management initiatives. It validates and supports innovative PET solutions from a recycle perspective.

For more information please E-mail the Secretary General at the address shown.

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