

Plastics – the Facts 2010

An analysis of European plastics production,
demand and recovery for 2009

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**Solar Impulse: the first solar aircraft designed to fly day
and night powered by solar energy without any fuel**

Solar Impulse partners:

Solvay: Main Partner

Bayer Material Science: Official Partner

Picture copyright: Solar Impulse / Pool Reuters Christian Hartmann

Who we are?

Picture courtesy of INEOS



The European plastics industry contributes significantly to the welfare of Europe. Plastics drives innovation, improves quality of life, and facilitates resource efficiency and climate protection. More than 1.6 million people work in over 50,000 companies – many in SMEs (small and medium-sized enterprises) for the conversion sector – generating turnover in the region of € 300 billion per year.

PlasticsEurope is the organisation representing Europe's plastics manufacturers. It networks with European and national plastics associations and has 100 member companies, producing over 90% of all polymers across the 27 EU Member States plus Norway, Switzerland, Croatia and Turkey. PlasticsEurope is a leading European trade association, with offices in Brussels, Frankfurt, London, Madrid, Milan and Paris.

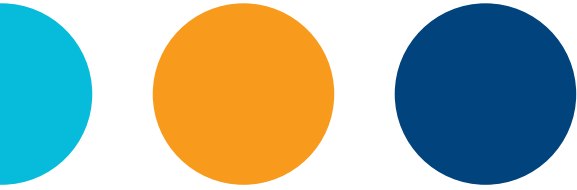
EuPC – the European Plastics Converters – is the professional representative body of plastics converters in Europe. Their activities cover all sectors of the plastics converting industry, including recycling. Their main objective is to defend and promote the European plastics converting industry's interests by:

- Voicing industry opinion to European and international institutions and NGOs (non governmental organisations)
- Maintaining relationships with corresponding European and global organisations
- Conducting surveys, studies and research projects covering all areas of the plastics processing industry

EuPR – the European Plastics Recyclers – is the professional representative body of plastics recyclers in Europe. EuPR promotes plastics mechanical recycling and an environment that encourages profitable and sustainable business. They provide a platform for members, who represent 85% of Europe's recycling capacity, processing over 5 million tonnes of collected plastics per year.

EPRO – the European Association of Plastics Recycling and Recovery Organisations – is the association of the national organisations responsible for organising and promoting recycling and recovery in Europe. EPRO provides a unique forum for leading European specialists in plastics waste management to exchange learnings, develop integrated plastics packaging waste strategies and support technological development.





Structure of the report

This report on 2009 production, demand and recovery is an annual publication by the European plastics manufacturers and their partners. This is the 19th edition of this report.

The aim is to provide definitive facts about the plastics market; from development and production, through their many uses, to the advances made in recovering plastics at the end of their life.

Data is collected by a partnership involving PlasticsEurope, EuPC (the European Plastics Converters), EuPR (the European Plastics Recyclers) and EPRO (the European Association of Plastics Recycling and Recovery Organisations).

PlasticsEurope's Market Research and Statistics Group (PEMRG) provided input on the production of and demand for plastics raw materials. Consultic Marketing & Industrieberatung GmbH helped assess waste generation and recovery data.

All figures and graphs in this report show data for EU27+ Norway and Switzerland – referred to as Europe. Any other group of countries is specifically mentioned.

Official statistics have been used for recovery and trade data, where available, from European or national authorities and waste management organisations. Research or expertise from consultants has been used to complete any gaps.

Figures cannot always be directly compared to previous years due to changes in the estimates of both market demand and the waste generated. Some estimates from previous years have been revised in order to track progress, e.g. for use and recovery of plastics across Europe in the past decade.

Navigating the crisis

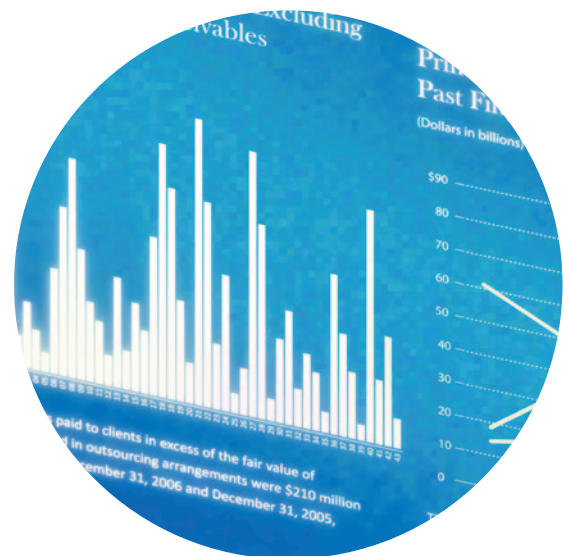
The global financial crisis caused unprecedented difficulties for many and the global plastics industry was no exception. 2009 continued to be a challenging year. Demand slowly came back but from a very low level and at a very slow pace.

With consumer spending much reduced resulting in low demand in customer industries such as automotive, construction and electronics – sales for many plastics companies was very low in the beginning of 2009. This trend was seen across the plastic industry – producers, converters and machine manufacturers.

Cost efficiency and restructuring programs continued in 2009 to help cope with the economic difficulties.

2009 Performance quarterly highlights

- The global polymer industry showed a weak performance in the first quarter. There was a large year on year sales decline driven by extremely low volumes and low selling prices. Global demand improved slightly in January through March from very low levels for the first time after the collapse early 2008.
- Global plastics demand showed first signs of stabilisation at low levels in the second quarter.
- This demand continued into the third quarter with encouraging signs for the future.
- Fourth quarter 2009: once again better than third quarter, but mainly driven by Asia.



2009 Performance summary

- Global plastics production fell back from 245 million tonnes in 2008 to 230 million tonnes for 2009 as a consequence of the continued economic slowdown.
- Europe produced 55 million tonnes and remained a major region contributing 24% of the global total.
- Plastics long term growth is expected to be around 4% globally, higher than global GDP growth. Average consumption is significantly below the level of 'mature' industrial regions so there is room for future growth.
- Demand from European converters fell back 7.2% to 45 million tonnes in 2009. Volume share of all countries remained largely unchanged.
- Polyethylene (PE-LD, PE-HD, PE-LLD) and polypropylene (PP) account for around 50% of demand with polyvinyl chloride (PVC) being the third largest polymer at 11%.
- Packaging is the largest end use market segment with 40.1% share. This is followed by building and construction (20.4%) and Automotive (7.0%).
- Seven of the EU Member States plus Norway and Switzerland recover more than 84% of their used plastics.
- The EU Member States plus Norway and Switzerland treated 24.3 million tonnes of post consumer waste in 2009. This results in an overall recovery rate from post-consumer plastic waste of 54%, up 2.7 percentage points compared to 2008. The mechanical recycling rate up 1.2 percentage point to 22.2% and the energy recovery rate is up by 1.5 percentage points to 31.5% and landfill rate is down by 2.7 percentage points to 45.8%.

1

Industry overview
Our contribution to wealth and life



Plastics enable us to produce more with less

Picture courtesy of EVONIK

Plastics – providing a safe and sustainable life

Plastics meet the growing needs of society

Plastics are a crucial part of 21st century life. Not only do they provide us with useful, lightweight and durable products, but they play a key role in the sustainable development of our world.

Plastics enable the eco-efficient manufacture of products including packaging and electronic devices. Lighter plastic components enable safety and resource efficiency solutions for cars and aircraft. And plastics help to insulate buildings and save lives in healthcare applications.

‘Plastics protect the climate and enable resource efficiency’

Plastics have a positive effect on climate protection

12% to 15% of a modern car is made of plastic to help to reduce weight, save fuel and reduce emissions. Plastic components impact fuel efficiency saving approximately 2.5 litres of fuel per kg used (equivalent to 6kg of CO₂ emissions) over the lifetime of the vehicle. High performance plastic composites in the today’s aircraft similarly reduce weight and fuel consumption.

Lightweight plastic packaging reduces the weight of transported goods and the amount of waste created – both of which reduce greenhouse gas emissions. If all plastics used in packaging were substituted with alternative materials it would be equivalent to adding another 25 million cars to European roads.

Nearly 40% of all energy consumed is used in buildings. Plastic insulation helps our homes to stay warm or cool in a sustainable, eco-efficient way.

Plastics enable the blades in wind turbines to be longer and, therefore, more effective. Plastic components in solar panels increase their efficiency and make them more affordable.

Paradoxically, the more plastics we use, the less resources we need

Results from PlasticsEurope’s report from Denkstatt AG (The impact of plastics on life-cycle energy consumption

and greenhouse gas emissions in Europe, June 2010), confirm that without plastic packaging it is estimated that the tonnage of alternative packaging would increase by a factor of almost four. Greenhouse gas emissions would rise by 61% and energy consumption by 57%.

Plastic packaging protects food as it travels from farms to supermarkets and then into our kitchens. In the developing world, 50% of food is wasted during this journey whilst only 2-3% gets wasted in Europe. At the supermarket, losses of unpacked fruit and vegetables are 26% higher than for pre-packed produce. 1.5g of plastic film can extend a cucumber’s shelf life from 3 to 14 days. 10g of multilayer film for meat extends shelf life from a few days to over a week. The amount of CO₂ used to produce a single portion of meat is almost 100 times more than that used to produce the multilayer film used to package the meat.

The innovative use of plastic in modern washing machine drums reduces water and energy consumption by 40-50% compared to older models. Plastic pipes ensure efficient, safe and leak free transportation of drinking water and sewage, avoiding waste or contamination, and reduces the energy required for pumping.

Plastics protect us and can help save our lives.

Car airbags, motorcyclists’ helmets and protective clothing are made of plastics. Firefighters rely on flexible plastic clothing to protect against high temperatures and plastic equipment provides life-saving ventilation.

Plastic packaging protects our food and drink from contamination. Plastic flooring and furniture are easy to clean, preventing the spread of germs and bacteria.

In healthcare, plastics are used in a variety of ways: for blood pouches and tubing, artificial limbs and joints, contact lenses and artificial corneas, absorbable sutures, splints and screws that heal fractures. New innovations will see nanoparticles/membrane permeability carrying medicines directly to damaged cells and micro-spirals will combat the symptoms of coronary disease.



Plastics saving lives

The plastics industry plays an important role in our 21st century economy

Plastics are a global success story. The industry has grown continuously for over 50 years. Production increased from 1.5 million tonnes in 1950 to 230 million tonnes in 2009. This growth is around 9% a year on average.

This annual growth was, however, hit hard by the global economic crisis. Plastics manufacturers witnessed a drastic decrease in demand in particular in Europe and this bottomed out at the beginning of 2009.

With the slow recovery rate it will still take several years for the plastics manufacturing industry to reach the peaks of previous years.

In the long term, the plastics success story is expected to continue as plastics have far from tapped all substitution potential which comes on top of GDP growth. Global per capita demand is growing at a long term trend of 4%. Despite high growth rates, per capita consumption in Asia and Central Europe is significantly below the levels of mature industrial regions. Mature industrial regions are also expected to see growth rates slightly above GDP. Thus there is room for further growth.

Plastics production

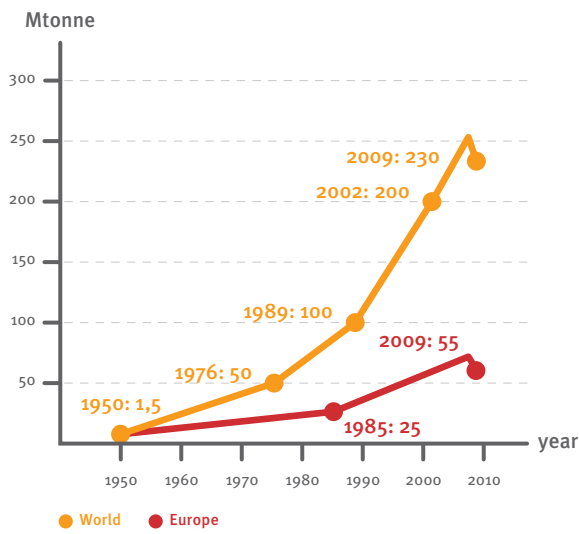


Figure 1. World Plastics Production 1950-2009
Source: PlasticsEurope Market Research Group (PEMRG)

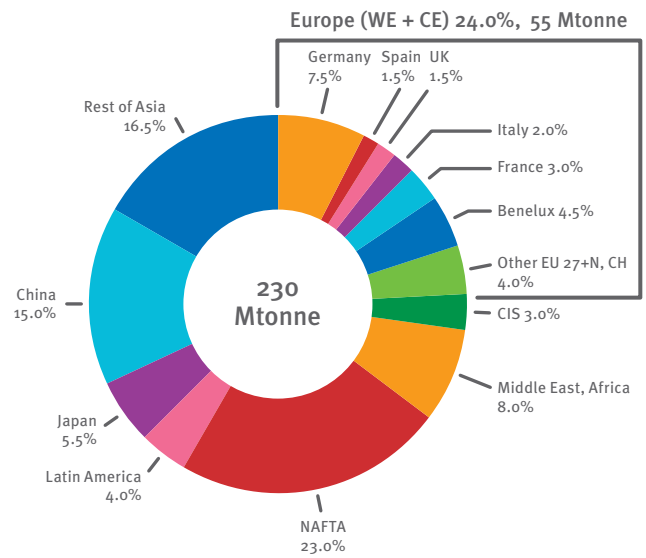


Figure 2. World Plastics Production 2009
Source: PlasticsEurope Market Research Group (PEMRG)

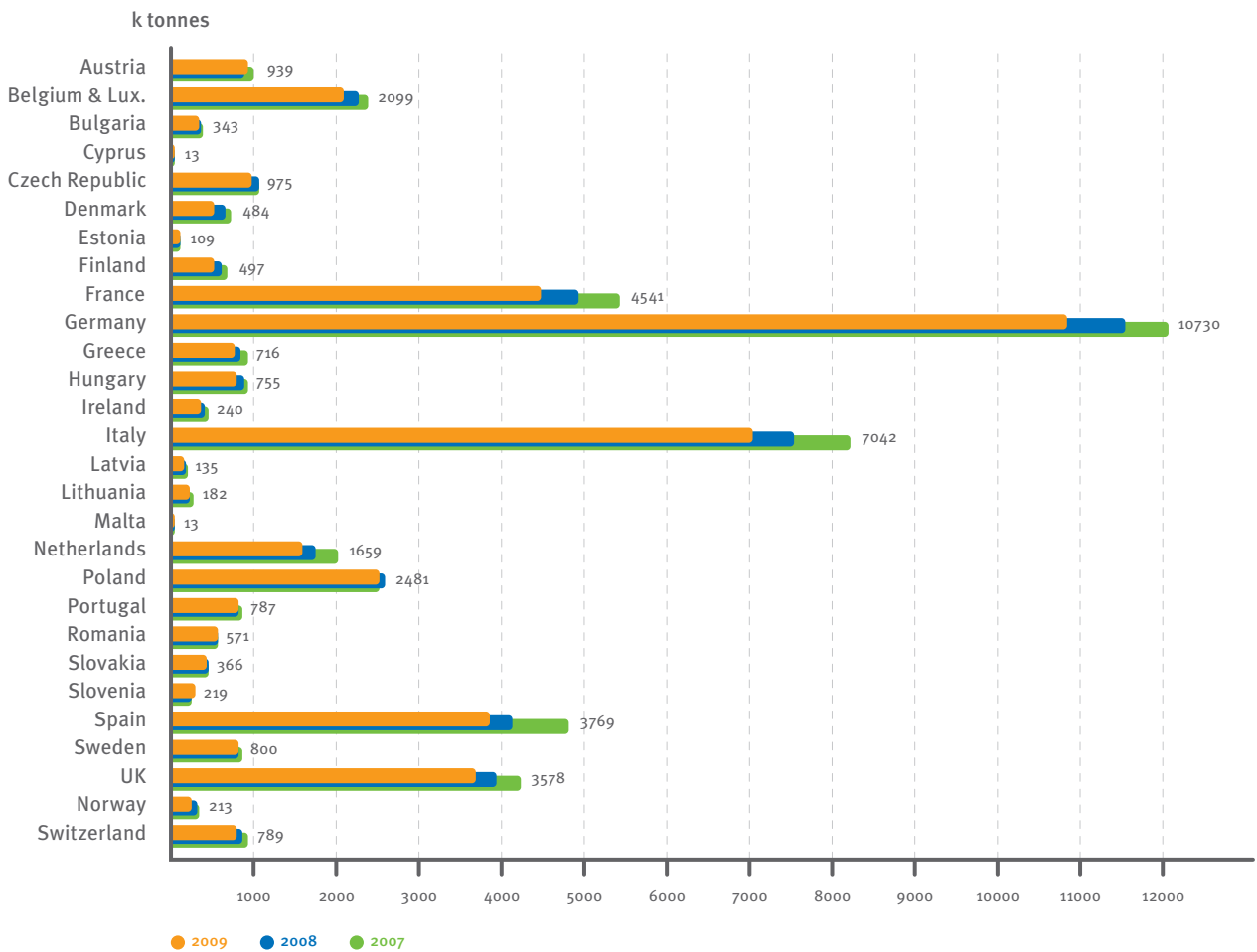


Figure 3. Europe Plastics Demand by Countries (kt)
Source: PlasticsEurope Market Research Group (PEMRG)

Plastics applications



The different application sectors

Demand from European converters fell back 7.2% from 2008 to 45 million tonnes in 2009. The market share of end use applications remained stable with packaging the largest segment representing 40.1% of overall demand. This is followed by Building and Construction (20.4%), Automotive (7%) and Electrical and Electronic equipment (5.6%). Others include different small segments like sport, leisure, agriculture, machinery engineering etc.

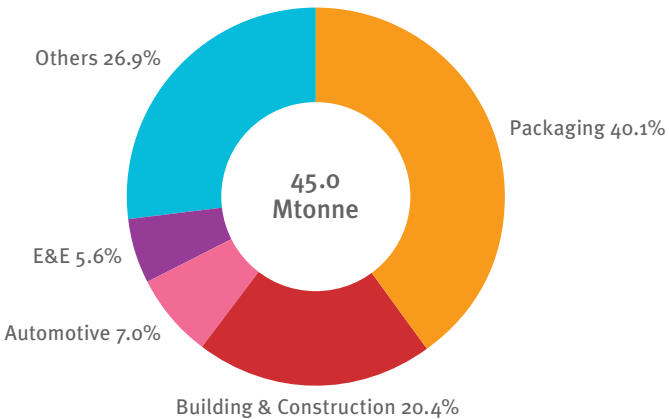


Figure 4. Europe Plastics Demand by Segments 2009
Source: PlasticsEurope Market Research Group (PEMRG)

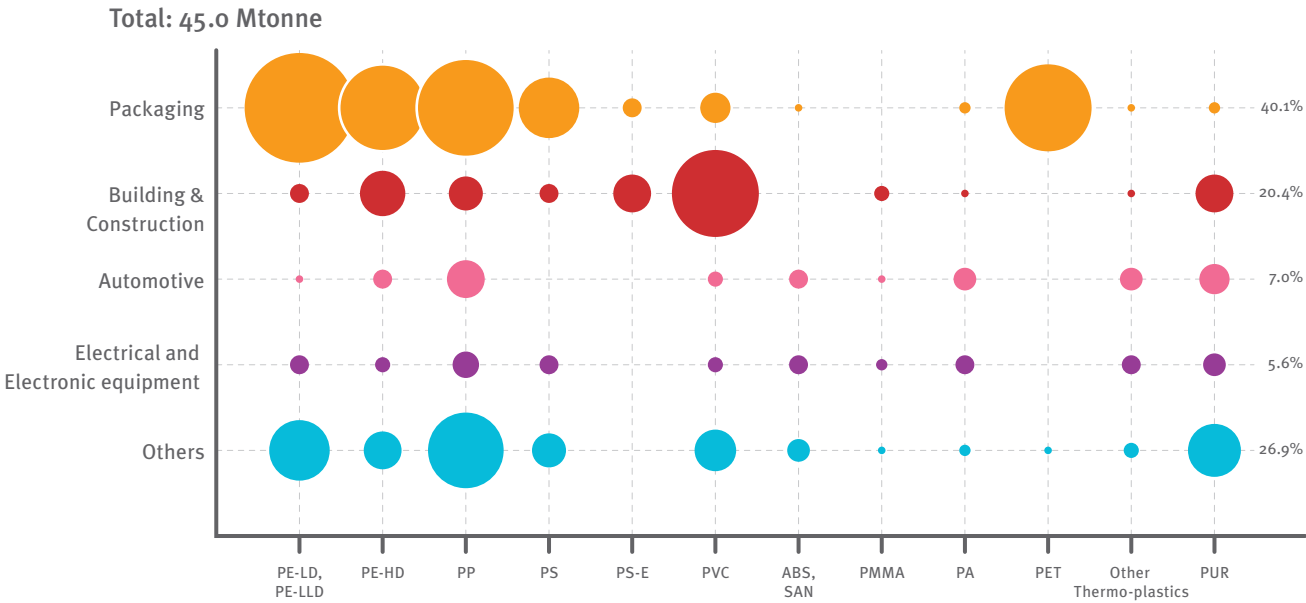
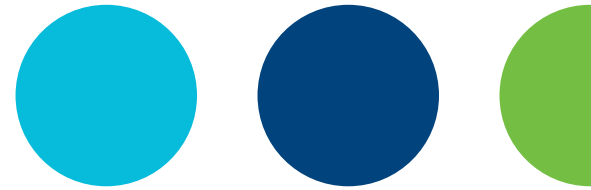


Figure 5. Europe Plastics Demand by Segments 2009
Source: PlasticsEurope Market Research Group (PEMRG)



The different types of plastics

There are around 20 distinct groups of plastics, each with numerous grades available to help deliver specific properties for each different application. There are five high-volume plastics families; polyethylene, including low density (PE-LD), linear low density (PE-LLD) and high density (PE-HD)), polypropylene (PP), polyvinyl chloride (PVC), polystyrene (solid PS and expandable PS) and polyethylene terephthalate (PET). Together, the big five account for around 75 % of all European plastics demand. The most used resin types are polyolefins (PE-LD, PE-HD, PE-LLD and PP) which account for around 50% of all plastics demand. PVC is the third largest resin type at 11%.

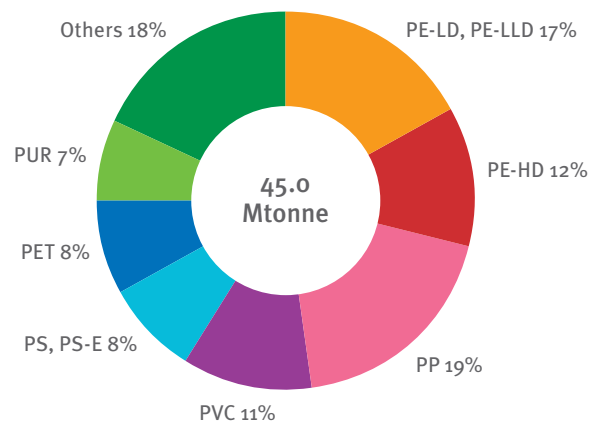


Figure 6. Europe Plastics Demand by Resin Types 2009
Source: PlasticsEurope Market Research Group (PEMRG)

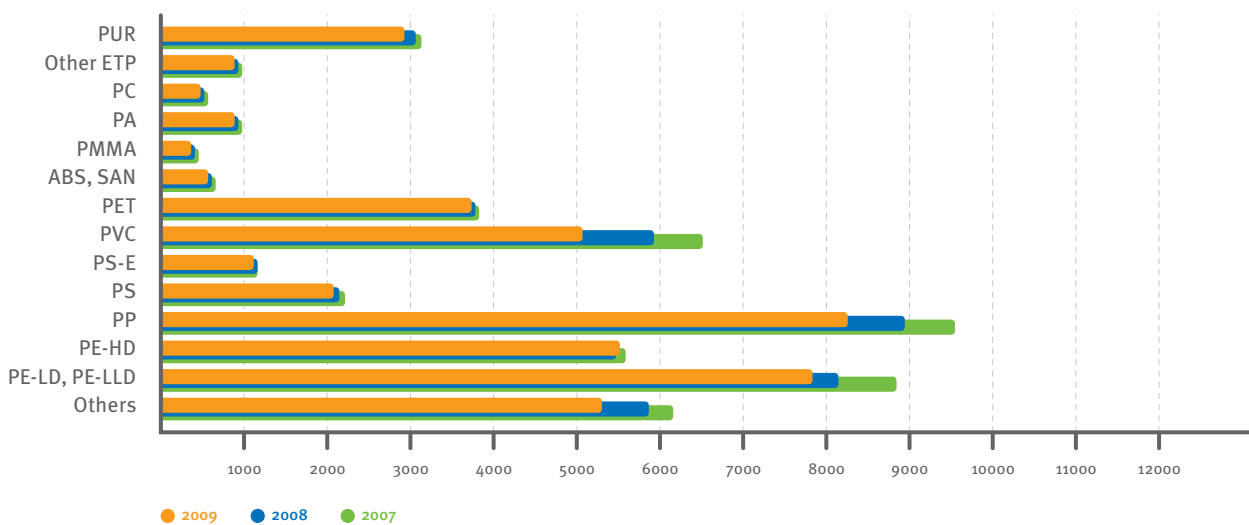


Figure 7. Europe Plastics Demand by Resin Types 2009
Source: PlasticsEurope Market Research Group (PEMRG)

Global imports and exports

The European Union was traditionally an important net exporter of plastic products (plastics and converted products). This export rate grew by over 100% between 2000 and 2009 reaching a high of € 13 billion.

For plastics materials the biggest export markets remains China (incl Hongkong), Turkey and Russia. For converted products EU exports primarily go to three countries; USA (12.2%), Russia (11.6%) and China (5.4%). The main products exported are plastic plates, sheets, films, foils, tapes and strips. This represents 36% of all EU plastic exports.

However, since 2008, this situation has changed. Fuelled by an economic boom, China has become a significant exporter of plastic products, accounting for 33% of all global exports in 2009. Additionally, only 2% of the total exported plastic products are converted products.

This situation must be monitored closely by EU institutions if Europe is to remain a plastics exporter.

Exports for recycling

As with all materials, once plastics are sorted and prepared ready for recycling they are available for the recycling market. This market has, as with other recycled raw material, developed into a global market.

A significant amount of secondary raw materials are recycled within Europe. This is due to a well developed recycling industry and the fact that many recyclates are used in the production of new products. A good example is the plastic bottle. Automated processes during sorting and recycling and a high demand for bottle users to incorporate recycled content in bottle manufacturing, means that most of Europe's bottles are recycled within Europe.

Recycling in Europe prevents the export of valuable secondary resources and stimulates the local recycling industry. However, where a labour intensive recycling process is necessary, much plastic is still sold to recyclers in Asia, particularly China. The demand for plastic is high and during 2008 China imported 7.07 million tonnes of used plastic from all over the world.

The plastic industry is fully aware of the environmental, economic and social responsibilities associated with the recycling of plastics, both in Europe and overseas. All recycling partners outside the EU must fulfill the necessary legal quality standards to ensure that recycling conditions are "broadly equivalent" to those applied in Europe.

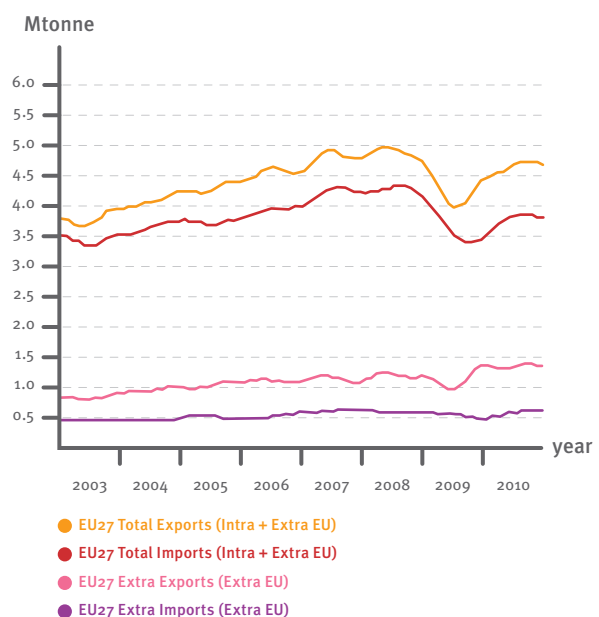


Figure 8. Trends in EU27: Trade with Primary Plastics, trend cycle

Source: PlasticsEurope Market Research Group (PEMRG)

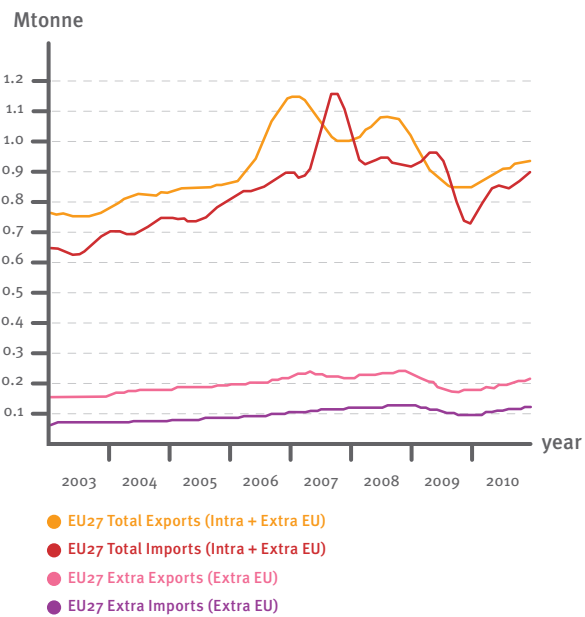


Figure 9. Trends in EU27: Trade with Plastics Products, trend cycle

Source: PlasticsEurope Market Research Group (PEMRG)

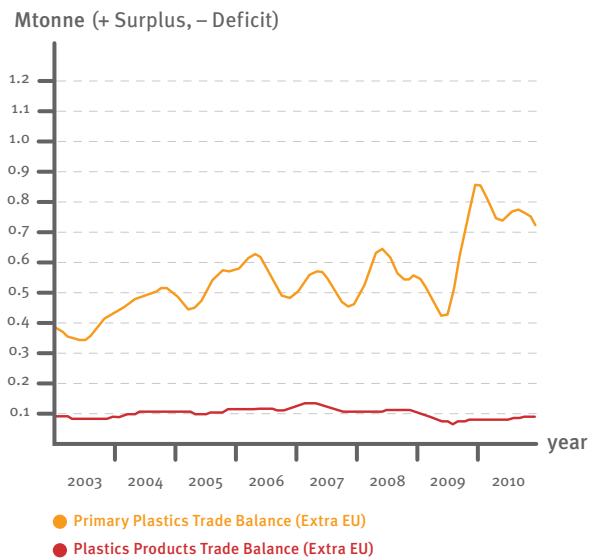


Figure 10. EU27 Plastics Industry: Trade Balance with Non-Member Countries, trend cycle

Source: PlasticsEurope Market Research Group (PEMRG)

2

End-of-life Is there life after?



Plastics too valuable to throw away

Our vision

Our vision is for a forward looking resource management approach that:

- Takes into consideration the overall lifecycle impact;
- Minimises the disposal of valuable plastics in landfill;
- Uses a mix of recovery options for the best environmental and economic results – in every situation;
- Ensures that the treatment and recovery of waste meets defined environmental standards.



Stylish fashion recycled from durable flexible PVC

The four R's – Plastics' significant contribution to the sustainable use of resources

Reduce

Plastics reduce energy use and CO₂ emissions.

If all of the plastic used in Europe each year were substituted with a mix of alternative materials then an additional 50 million tonnes of crude oil would be required annually. Using plastics instead of other materials effectively reduces the amount of CO₂ produced in Europe by some 120 million tonnes each year. This amounts to 38% of the EU15 Kyoto target for 2000-2012.

Plastics also reduce waste. Across their life-cycle, plastics consume less and require less raw materials compared with other materials. Products packaged with plastics, from food and drink to computers and TVs, last longer and are less likely to be damaged.

Reuse

Plastics are reused in many ways from soft drink bottles to supermarket carrier bags. Transport and display trays are another example of reused plastics, providing a hygienic, robust and cost-effective way of transporting fresh food from retailer's depots to their shops.

Recycle

Plastics recycling tonnage has been increasing annually by approximately 11% per year over the past 10 years. In 2009 this growth fell back to just 3.1% on the back of the economic crisis.

It is not only bottles and industrial film packaging which drive the growth. Initiatives, which include the PVC industry's Recovynil system (covering pipes, window frames, roofing membranes and flooring), and mixed packaging plastics recycling, are also contributing to the increase of plastics recycling.

This important development must continue. The full potential of existing recycling streams must be realised and new eco-efficient streams developed.

Recover

There will always be a part of end-of-life plastics that is only eco-efficient to recover through an energy-from-waste plant or process into a fuel that can be used as an energy resource by industry. With a similar calorific value to fuel oil, plastics can readily be used as a substitute for primary fossil fuels.

Plastics are simply too valuable to throw away.

Plastics, value chain during its lifecycle

The diagram below (figure 11) shows the lifecycle of plastics – from converter demand to finally recovery and disposal.

As the data below highlights the converter demand is 45 million tonnes, but only little more than half of this currently ends up each year as waste (24.4 million tonnes). 2009 was the first year when the generation of plastics waste fell from the previous year. The drop was smaller than the reduction in plastics demand at 2%.

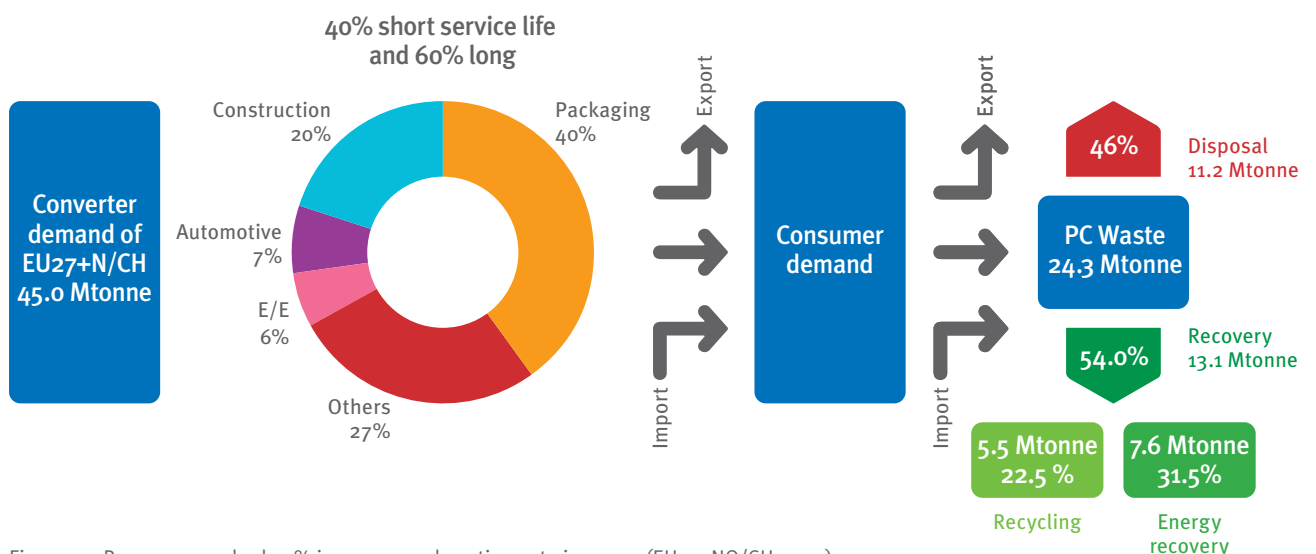


Figure 11. Recovery reached 54% in 2009 – and continues to increase (EU27+NO/CH 2009)

The 27% Others in figure 11 refers to furniture, leisure, sport and medical applications.

Less and less used plastic is going to landfill each year

Consumption of plastics has been steadily growing over the past decade with a consequent 3% increase in post consumer end-of-life plastic waste. However, landfill amounts are not in fact increasing, as plastic end-of-life management improves yearly. For 2009:

- Total 2009 plastic production in Europe was 55 million tonnes, a decrease of 8.3% over 2008
- The converter/processing industry demand was 45 million tonnes, a 7.2% decrease
- Post consumer waste was 24.3 million tonnes, a decrease of 2.6% over 2008. Of this, 11.2 million tonnes were disposed of and 13.1 million tonnes were recovered.
- Mechanical recycling quantity increased by 3.1% because of stronger activities of some packaging collecting and recycling systems as well as through stronger exports outside of Europe for recycling purposes.
- Energy recovery quantity increased 2.2% mainly because of stronger usage of post consumer plastic waste as alternative fuel in special power plants and cement kilns.
- Overall this represents an increase of 2.5% in total recovered quantity over 2008.

Progress towards capturing the full value of used plastic

There is no right or wrong way to recapture value and no single route to achieving this. End-of-life waste management solutions vary from country to country, depending on their circumstances, strategy and available technologies. For many countries there will also be more than one solution in place as conditions vary from urban to rural areas.

Part of the solution has to be an acceptance by society to use resources efficiently and that valuable materials should not be allowed to go to landfill. It is no coincidence that the top nine performing countries in figure 12 all have tight restrictions on landfilling. Such restrictions will create strong drivers to increase both recycling and energy recovery which has taken overall recovery rates above 80%.

Countries with a high rate of diversion of valuable post-consumer waste from landfill combine a high recycling and energy recovery performance. A strategy which includes energy recovery is, therefore, not contradictory to achieving good recycling results. Post-consumer plastic waste is both suitable as alternative fuel in special power plants or cement kilns and in traditional EfW (Energy from Waste) plants using municipal solid waste.

The graph also shows that whilst recycling performance is in most countries between 15 and 30 %, the utilisation of energy recovery varies between 0 and 75%. Countries which currently landfill valuable end-of-life material have an opportunity to reduce the climate impact, address their energy deficit and use resources more efficiently through quickly expanding their energy from waste network.

The progress in capturing the value from plastics waste is, on average, slow. The recovery rate increase is approximately +2 percentage point per year. Many EU member states need to make greater efforts, to bring their recovery rate to 80 % and more by 2020.

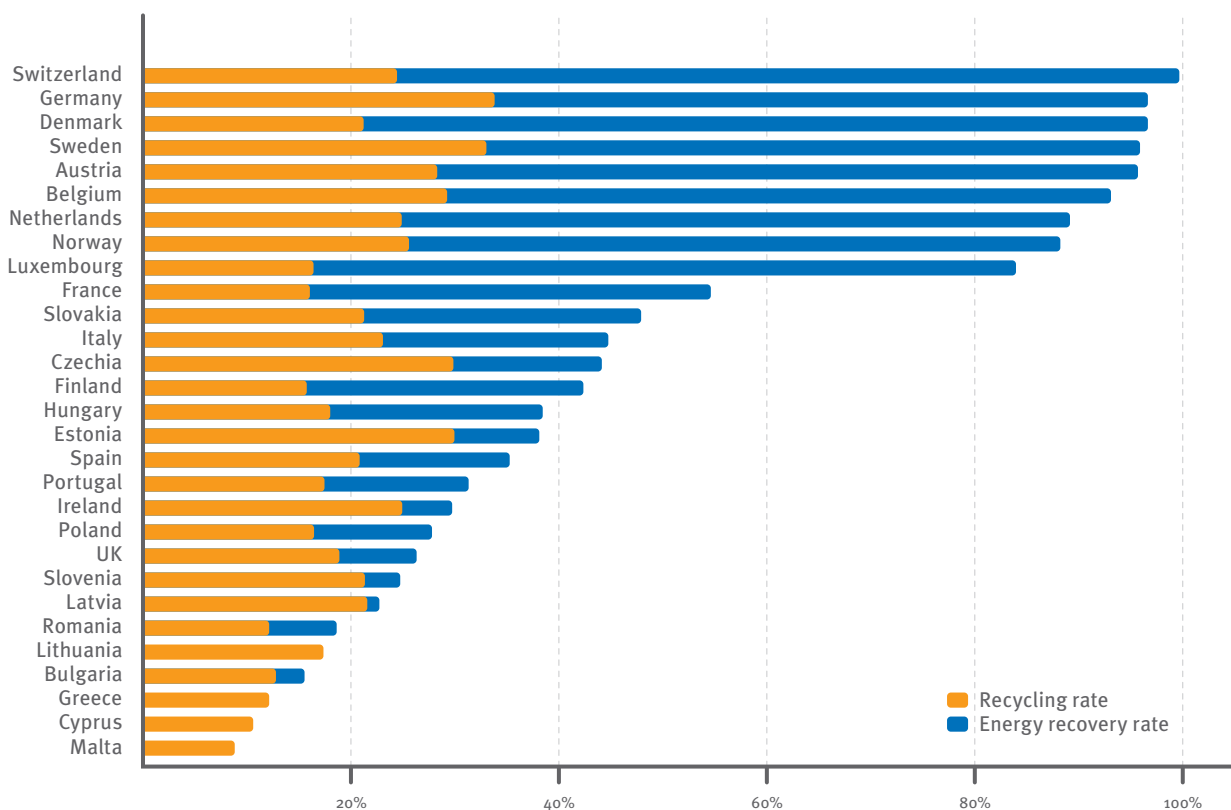


Figure 12. Total Recovery Ratio by Country 2009
(referred to Post-Consumer Plastic Waste)

Award for the best recycled product

Consumers are often unaware that the high-tech products they buy consist of a significant amount of recycled plastic which has similar mechanical properties as virgin material. EPRO introduced the inaugural 'Best Recycled Product Award' in 2009, receiving over 70 entries from a range of sectors across 13 countries.

The award is presented for products made from at least 50% recycled plastic and aims to highlight the use of recyclates in open-loop applications (i.e. those which use recycled plastic in a different way to how it was initially used). Additionally, the award was designed to stimulate the use and quality of recyclates to help encourage plastics recycling.

An eight-strong judging panel from across Europe selected four products for the top three prizes.

The competition was a great success and is being run again during 2010 (in co-operation with EuPR and PlasticsEurope). For more information visit <http://bestproduct.epro-plasticsrecycling.org/>

First prize went to Team-Tex of France for an innovative child's car seat. This chair contains more than 50 % recycled used polypropylene and polyethylene high density, while maintaining optimal safety results, as proven during crash tests.



Second place was awarded to Pilot of France for its "Bottle-to-Pen" (B2P) pen, the housing of which is made from recycled bottle material.



Third place was jointly awarded to Linpac Packaging's Rfresh trays for food and The Nobody Chair, designed by Komplot in Denmark and produced in Sweden from source material (recycled from plastic bottles) by Wellman International.



Tale of 3 countries with high plastics packaging recycling rates

The three EU Member States Belgium, Germany and Sweden all achieve high recycling rates for plastics packaging through different systems.

However there are also some common features:

- They have invested more than others to inform, motivate and stimulate recycling.
- They started early and have all uniform national systems for collection of plastic packaging (e.g. “blue bags” in Belgium).
- Their national legislation discourages landfill and promotes recycling and energy recovery.

When comparing the 3 countries there are some important differences.

Concerning household packaging, Belgium concentrates on bottles only and collects plastics bottles, metal cans and beverage cartons in the same blue bag in a uniform, national, kerb side scheme. Germany collects all plastics packaging from households including bottles, rigid packaging and films in mainly kerb side collection. Sweden uses bring stations for all plastics packaging and some kerb side collection for households.

Whilst Germany has nine different “green dot schemes”, Belgium only uses one national scheme for household packaging. In Sweden and Germany new competing systems are challenging the original national scheme for all packaging materials.

In Sweden, the commercial film stream has no national collection scheme and no green dot fee as it is fully self-sufficient and still reaches high recycling rates. In Belgium, VAL-I-PAC is the system for industrial packaging, with specific recycling incentives for those unpacking to increase the recycling of industrial plastic packaging waste.

In Germany packers and fillers can adhere for instance to a system that allows their clients to return the plastic packaging free of charge to a collection point.



The collected plastic packaging from households is transported to plastics recovery facilities (PRF) in Sweden and Germany designed to deal with a mixed plastics stream. In Belgium the sorting takes place in a material recovery facility (MRF) designed to sort the components of the blue bag.

Depending on the material which is collected, and the infrastructure of the sorting centres, each organisation has its own mix of secondary raw materials which are sold.

Other organisations sell the material by tendering to recyclers and in this way take an active role within the market. This is the case for household packaging in some countries. A third model used in many countries is based on agreements and financial support, without being involved as a buyer or seller.

From the above we can see that how to collect, what to collect and how to refine the collected stream is very different in the three countries – and still they all achieve between 40 and 44% recycling rate. The conclusion is therefore that there is “not one solution fits all”. The winning formula is to develop a system tailored to the national legislation, the packaging mix present and the business culture; combined with a joined up infrastructure of collection, sorting and reprocessing and thorough and repetitive communication to citizens.

EU Member States embark on implementation strategies for the revised Waste Framework Directive

With the revised Waste Framework Directive due to come into force on 12 December 2010, EU Member States are busy planning how to deliver the requirements set out in the directive.

It is clear that the collection method and the choice of and expansion of infra-structure for sorting and reprocessing will be critical for the requirements to be achieved.

Collection can be based on one bag for everything or separated streams for different materials. The Waste Framework Directive sets out a preference for separate collection but other means can be chosen if it is technically, economically and environmentally practicable to achieve the necessary quality standards.

Based on the earlier example from Belgium, Sweden and Germany it is clear that good results can be achieved with different systems. However, it is important that the collection, sorting and reprocessing are complementary.


So what are the infrastructure options available to EU Member States when they embark on their diversion of plastics from landfill crusade?

- **Material Recovery Facility (MRF)** is a sorting technology traditionally used for metal, glass and paper but can also handle plastics if appropriately designed. This technology sorts recyclates into their components for further reprocessing elsewhere. An MRF residual stream will typically leave non-sorted



material which is either used for Energy from Waste or disposed of in landfill. The residual plastics in such stream provide significant part of the caloric content for waste incineration without which fuel will have to be added.

- **Autoclave (or Mechanical Heat Treatment)** is an alternative technology to treat unsorted Municipal Solid Waste (MSW). It treats MSW with steam under pressure to produce material which can be sorted into type and then directs it to recycling or recovery. This process leads to more plastic being recoverable from the MSW but requires further reprocessing for use as a secondary raw material.
- Plastics sorting is required for mixed plastic rich streams such as separate kerb side or bring station collection. The rapid technology development in sorting plastic allows smaller and more pieces of a particular plastic (e.g. PP, PS or PVC) to be sorted individually from a mixed plastic stream. A plastics recovery facility (PRF) is suitable to further refine the plastic stream from an MRF or an Autoclave. Besides sorting plastics into separate types, sorting systems will sometimes reprocess the material by cleaning and homogenising the material so it is suitable as alternative feedstock to virgin plastics. Whilst some countries – like Germany – have already a significant PRF capacity, other Member States rely upon foreign providers of this service. Generally more capacity is needed across the EU. As with an MRF, it is not possible for all plastics to be sorted into separate types. However, the residual stream is an excellent input for feedstock recycling or potentially used for solid recovered fuel (SRF).
- **Mechanical Biological Treatment (MBT)** is a technique to treat MSW after sorting out targeted recyclables by drying and partially removing the easily degradable components. The output from such technology is approximately halved in weight, dry and with a higher calorific value than the MSW and can be reprocessed into Solid Recovered Fuel (SRF). Significant amounts of difficult-to-recycle waste streams are turned into this specified fuel across the EU if the quality limits can be met. It is suitable for co-combustion replacing fossil fuel in cement production or for power and heat generation as well as being used with bio mass. SRF has huge potential and plastics play a key role because of their high calorific content.



2 litre house - leading the way in energy efficiency

Picture courtesy of ECVM

Vinyl 2010

The Voluntary Commitment of the European PVC industry was signed in 2000 by;

- **ECVM** (the European Council of Vinyl Manufacturers)
- **EuPC** (the European Plastics Converters)
- **ESPA** (the European Stabiliser Producers Association)
- **ECPI** (the European Council for Plasticisers and Intermediates).

It is a 10-year plan to sustainably improve product stewardship across the lifecycle of PVC in Europe and is registered as a Partnership with the Secretariat of the UN Commission on Sustainable Development.

The voluntary commitment, which is monitored by an independent committee including representatives from the EU Parliament, the EU Commission, European Trade Unions and Consumer Associations, includes specific targets and initiatives. These are aimed at minimising the

environmental impact of the PVC production, promoting responsible use of additives, supporting collection and recycling schemes, and encouraging social dialogue between all of the industry's stakeholders.

Despite generally difficult market conditions, the Vinyl 2010 partnership maintained its determination to pursue its sustainability targets and objectives in 2009 and has been able to report that it is still on track to meet the commitments set out in its 10 year programme.

The highlights of its achievements for 2009 were the recycling of 190,324 tonnes of post consumer PVC (thanks to the ongoing consolidation of national collection/sorting schemes under the industry funded pan-European Recovinyl system); and the ongoing phase-out of lead-based stabilisers, which is now well-ahead of schedule.

For full details visit www.vinyl2010.org.

Mechanical recycling of plastics

Mechanical recycling is the reprocessing of end-of-life plastics into a re-usable material through a physical rather than a chemical process. Physical processing essentially does not break down the original polymer chains and molecules within the original material. The material is able to be re-formed into useful new products whilst leaving the material's original structure and properties intact.

Mechanical recycling typically comprises the separation of pure fractions of specific polymers into commercially saleable, ready for processing, plastic pellets that the converting industry can use to make new products. The treatment process consists generally of shredding old products down to small pieces, separation units to extract specific sizes or materials from the main material flow (e.g. magnetic drums to separate ferrous metals and sophisticated sorting techniques, like infra-red scanning, to differentiate by colour); and mills and extruders to convert the separated plastics fractions into new machine-ready granules.



Mechanical recycling of production (“industrial”) waste (off-cuts etc) has developed in parallel with the development of the plastic converting industry. Mechanical recycling of post-consumer waste (end-of-life products) began in the 80s and took off in the 90s, spurred by legislation mandating minimum recycling rates of certain waste streams (e.g. packaging), separate collection schemes and progress in sorting technologies.

The key success factors for eco-efficient mechanical recycling are:

- clean and homogeneous waste streams;
- processes that produce recyclate of a quality that can replace an equivalent weight of virgin resin;
- ensuring that the market will accept products containing recyclate.

More effective catalysts drive development of feedstock recycling

Feedstock recycling – a method to convert the hydrocarbon chain into shorter blocks which can then be rebuilt into new polymers – has been in use for the past 25 years.

Developed after the oil crisis in the 1970s, the first generation feedstock recycling converted plastic rich waste streams such as household packaging, and industrial plastics into fuel.

Subsequent developments included the use of gasification and thermal cracking for mixed plastics and chemical depolymerisation technology for specific polymers.

More recently technology developing companies have focused on feedstock recycling by using commercially available catalyst and processing technology. This recent initiative is not yet proven in large scale operations.

Many lifecycle assessments show that feedstock recycling from mixed plastic waste has at least as good environmental performance as mechanical recycling.

The key success factor will be to achieve high yield and selectivity in polymer conversion to produce the right raw materials. Higher oil prices will also make feedstock recycling more attractive.

Energy from Waste

With its 2020 energy conservation and climate protection goals the EU targets to reduce EU greenhouse gas emissions by at least 20% below 1990 levels. This will be achieved through a

1. 20% of EU energy consumption coming from renewable resources.
2. 20% reduction in primary energy use compared with projected levels.

Plastics will contribute to the overall reduction goal as one of the leading materials during use phase in most all applications. Furthermore waste plastics in MSW can be recovered in energy from waste plants (EFW) and plastics in SRF can be recovered in industrial production plants such as pulp and paper, cement, lime and brick.

Significant contribution to CO₂ reduction is secured. By diverting mixed MSW from landfill, where it otherwise would decompose and form methane and CO₂. Also through replacing fossil fuels like coal with SRF, considerable CO₂ reducing is being secured.

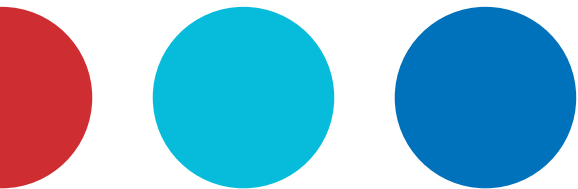


The striving to increase efficiency has been promoted through several legislative initiatives like the new Waste Framework Directive with the 60 / 65 % minimum energy recovery efficiency target. The plastics industry supports all high efficiency energy recovery operations.

To achieve energy efficiency above 80 % a high quality SRF fuel is required. Plastics is the key calorific content provider. Such fuel requires high quality and a standardized specification is being progressed in CEN.

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Innovation



Plastics reduce the environmental
impact of transportation

Picture courtesy of © Renault communication / RENAULT DESIGN

Transportation

Car components

Innovative uses of plastics in cars include replacing glass in headlight lenses, bezels and windscreens as well as replacing steel for fenders, spoilers and dashboards. Plastic components impact fuel efficiency saving approximately 2.5 litres of fuel per kg used (equivalent to 6kg of CO₂ emissions) over the lifetime of the vehicle.

Car production efficiency

The latest Smart Car – Smart ForTwo – benefits from a pioneering polymer-based compound.

This latest innovation offers significant advantages – improving Smart Car production efficiency, vehicle safety, environmental performance, running costs and aesthetics. It has a high dimensional stability and material tolerance which makes the car 15% lighter than previously, thus lowering fuel consumption and CO₂ emissions, transportation and vehicle costs. Additionally, only one layer of paint is required and a smoother finish is achieved. This means lower paint repair cost for drivers.

The 100% plastic car – no longer an imaginary concept

Automotive designers and engineers have long dreamed of making a car that is super-efficient, safe and light. Now it might not be too long before an all-plastic car that meets these criteria is mass-produced.

The first plastic car was made by Ford in 1941. Using plastic that was 70% cellulose, the car was light: weighing 30% less than its metal counterparts. But cheap post-war steel and inexpensive gasoline made these plastic cars unattractive.



Picture courtesy of BASF

When one thinks of the structure of an automobile, the metal that makes up the frame, chassis, nuts and bolts, rivets and screws comes to mind – providing stability, form and safety to the vehicle and its occupants. However, plastics are increasingly substituting metals in auto manufacture today, and meeting, if not surpassing, the stability, form and safety requirements.

Although high-end automobiles increasingly use glass fibre and other non-metals, their frames are still made of metal. The challenge that the plastics industry has is with the chassis which tends to be the high-weight section of a vehicle. However, the last few years have seen substantial investments in research into the use of carbon-fibre auto parts targeting chassis and body applications. When successfully adapted, this would be a great leap forward for automotive engineering, and another step towards the 100% plastic automobile.

Consumers are prepared to spend more when a car comes with an eco-friendly or fuel-saving label. Some luxury automobile makers have recently turned to carbon composite fibres for structural and interior body parts. However, the high raw material costs of carbon fibre is still a key determining factor. If cost were not an issue, cars could be made completely of carbon fibre. The cost of metal still remains a tenth of that of carbon fibre, even though carbon fibre costs have dropped ten-fold in the last decade. But all that is set to change...

The drive for innovation and higher fuel efficiency requirements will without doubt result in the increased use of plastics in automobiles. Already more than 50% of a typical vehicle's volume is composed of plastics and polymer composites and these account for only 10% of the total vehicle weight.

But other progressive changes are taking place in the automobile industry. For example, fuel economy standards are getting stringent. A 10% reduction in vehicle weight (about 100 kilos), which can be achieved using lightweight materials like plastic, results in 5% fuel savings or 2.5 litres per kg of plastics used over the average lifetime of a vehicle. Also, the use of polycarbonate windows, in development for over 10 years, and now ready for mass-adoption, can reduce window weight by up to 50%.

Another key advantage of plastic is that it is moulded and not stamped. Moulds can create complex shapes that are difficult to create with stamped steel, and multiple parts can be moulded at the same time. Today, smaller, niche vehicles are using moulded plastic parts more and more.

Soon the automotive industry will acknowledge and recognize plastic as the preferred material for production. Plastic will not only meet, but in many cases set, future automotive performance and sustainability standards.



Plastics in aircraft

Weight is everything in aircraft – and body weight can be significantly reduced by using plastic composites. The next generation of passenger aircraft benefits from plastic innovations. 22% of the components in the Airbus A380 are made from plastics. In new planes like the Airbus A350 (due 2013) and the Boeing 787 Dreamliner this proportion of plastic used in the construction will increase to 50%.

Solar energy

The first round the world flight in a solar airplane has been made possible by the innovative use of plastics. The Solar Impulse project, the brainchild of Bertrand Piccard and André Borschberg, aims to develop the first manned flight around the world during both the day and night propelled with only solar energy.

The prototype airplane has the wingspan of a large airliner (63.40 meters) and the weight of a midsize car (1,600 kg). Over 12,000 solar cells cover its surface. They run four electrical engines and store the energy for use at night in 400 kg of lithium batteries.

High-tech polymer materials used on the plane include polyurethane rigid foams for paneling in the cockpit and engine, and extremely thin yet break-resistant polycarbonate films and sheet for the cockpit glazing. Carbon nanotubes help increase battery performance, improve structural components and reduce weight.

Building and Construction

Innovative plastic insulation for buildings provides greater energy efficiency over traditional materials. Plastic insulation panels, which can be used on walls, roofs and flooring, are easy to install, come with climate friendly foaming agents and result in a reduction in leakage from buildings. They also mean that thinner walls can be constructed in buildings because the panels insulate more efficiently. Over the lifetime of a building, just 1kg of plastic can save up to 755 kg of CO₂ emissions.

Plastic piping for water transport

The latest generation of plastic materials enable fast and economical pipe installation. The durable pipes are strong enough to be installed in very demanding conditions, thus reducing the overall infrastructure costs.

New generation plastic pipes offer maximum protection against surface damage during transport and laying, the point loads caused by sharp edge stones and bedding, and the stress in the pipe wall generated by external loads such as traffic or earth settlement.



Electrical & Electronic equipment

Plastics play a pivotal role in the development and progress of technologies such as OLED (organic light emitting diode) displays and lighting, organic solar cells, smart packaging or conductive nanoinks.



One cutting-edge advance is the printed electronic circuit board for which the plastics industry continues developing its nanomaterials. The nanoink is based on carbon nanotubes (CNTs) and silver nanoparticles.

The CNT ink is specifically targeted at the printed electronics market, offering conductivity and good adhesion to plastic films for flexible substrates which would result in electronics that are easier, cheaper and simpler to integrate than ever.

One of the applications could be a solar bag integrated with plastic and printed cells to harness energy including indoor or at low light conditions. The energy collected would then be transferred to a battery to charge electronic devices such as cameras, mobile phones or e-readers.

Picture courtesy of Amcor



Packaging

Reclosable packaging means responsible packaging

Modern innovations in plastic packaging design for food offer consumers numerous benefits – from convenience to reducing waste and improving hygiene.

Cheese board packaging enables different types of cheese to be individually portioned but packed in one pack. The packaging consists of a tray with separate cavities with a sealed lid. Contour perforation technology on the packaging means that consumers can either peel the lid open completely or push an individual cavity to get the piece of cheese they desire. This helps to keep the food fresh and avoid waste.

New packaging for sliced meat enables consumers to open and then reclose packaging with an adhesive flap. Other meat packaging has two compartments on top of each other separated by an interlayer. This means one compartment can be opened and consumed whilst the other compartment can be opened later, thus keeping the food fresher for longer.

Innovative packaging can help to reduce product weight and the associated transport and storage costs. Plastics containers for fruit and vegetables are easily stackable. A leading UK supermarket uses these containers in place of trays to reduce the packaging weight of their blueberries by 75%. Retailers are already using heat sealed plastic peelable lids in place of clip on lids on their trays of strawberries, saving tonnes of plastic per year.

Other innovations include zip bags with solid bottoms which can be re-sealed (these replace glass jars for tea and coffee) and side gusset pouches for a range of foods. These fold flat before filling, thus reducing freight and storage space and associated costs, and use 75% less plastic than rigid containers. Side gusset pouches also offer longer shelf life without refrigeration.



Leisure and sport

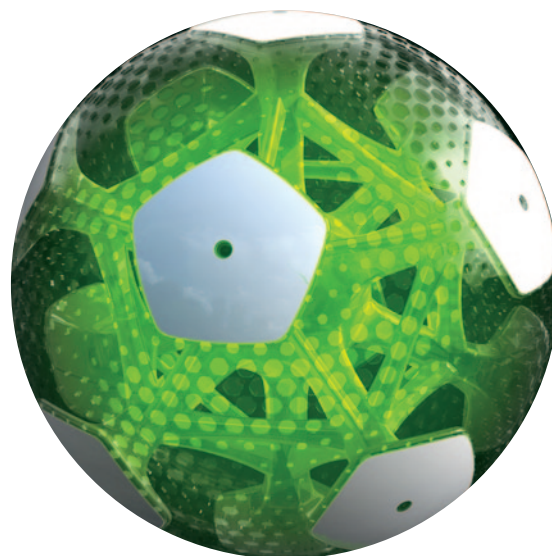
Plastic football which changes colour

A revolutionary new football, currently in development, is being made possible via the use of innovative synthetic plastics.

The light inside CTRUS football changes colour from green to purple according to where the ball is situated on the football pitch, assisting the referees to make more accurate decisions.

The ball has an internal 'skelle-core' and a synthetic plastic outer skin made of elastomers which helps it to emulate traditional inflated pneumatic footballs but

with the added advantage of not requiring air. A GPS chip situated inside the ball can be programmed to change colour once it crosses the goal line or goes out of play. Additionally, the chip can calculate ball speed or the power with which the ball is struck.



Healthcare

Plastic in healthcare

Plastics are being increasingly used in healthcare applications. People are living longer, but the incidence of allergies and epidemic viruses continues to rise. This means more hygienic disposable healthcare products are required which reduce the risk of contamination.

Plastics are used in medical devices (e.g. tubing, blood bags, syringes and insulin pens) and pharmaceutical and diagnostic packaging (e.g. bottles and ampoules for intravenous (IV) sterile liquids, tubes and blister packs for tablets).

They have a number of advantages. They are transparent, have a high chemical resistance, are easy to sterilize, provide an excellent barrier to water vapour and are non-harmful when incinerated.

Sensory wristwatch

A polymer based wristwatch currently in development in Germany is able to detect medical problems before they become an emergency. The diagnostic watch combines several biomarker sensors into one device and can monitor the wearer for signs of dehydration or fluctuations in blood sugar levels.

Advances in polymer electronics and sensors mean that this type of 'lab-on-a-chip' watch could, in future, enable high risk patients to have a constant stream of biofeedback on their health, helping them to avoid life-threatening incidents.

Snapshot 2010

The annual growth pattern of the plastics industry was hit hard by the global crisis early 2008, bottomed out in early 2009 and has since been on a slow recovery path.

After a tight market situation in the second quarter of 2010 there are signs of a stabilisation of the market for the rest of the year.

The background for this could be:

- China is slowing down their growth
- Several EU member states are on tough budget cut back policies which will reduce consumption

Consumption by EU plastics converters is expected to increase by 3-5% over 2009 leaving still a long way up to where demand was before the crisis. This is driven both by a return in consumer confidence and a continued substitution of alternative materials by plastics in a number of applications.

With China and the Middle East building huge plastics production capacity European plastic producers will both face increased competition from imports in Europe and on exports markets. Also the converting industry faces huge pressure from lower costs countries.

To remain competitive the European plastics industry needs to focus on continuous improvement and innovation along the supply chain.

The EU legislators also need to find the balance between on the one hand the need to lead the world in sustainable development and on the other hand to economic growth in the EU to secure jobs and social welfare.

With converter consumption of plastics increasing again we can expect the generation of used post-consumer plastics to increase by 2-5% in 2010 over 2009.

Recycling is expected to continue increase but with still a significant part of the quantity being exported for reprocessing in the Far East. The first effects of this situation can already be seen on the recycling markets. As a matter of fact, due to a shortage of available material the first months of 2010 have shown a considerable price increase of the collected plastics.

Also energy recovery is expected to increase on the back of activities in a number of Member States.

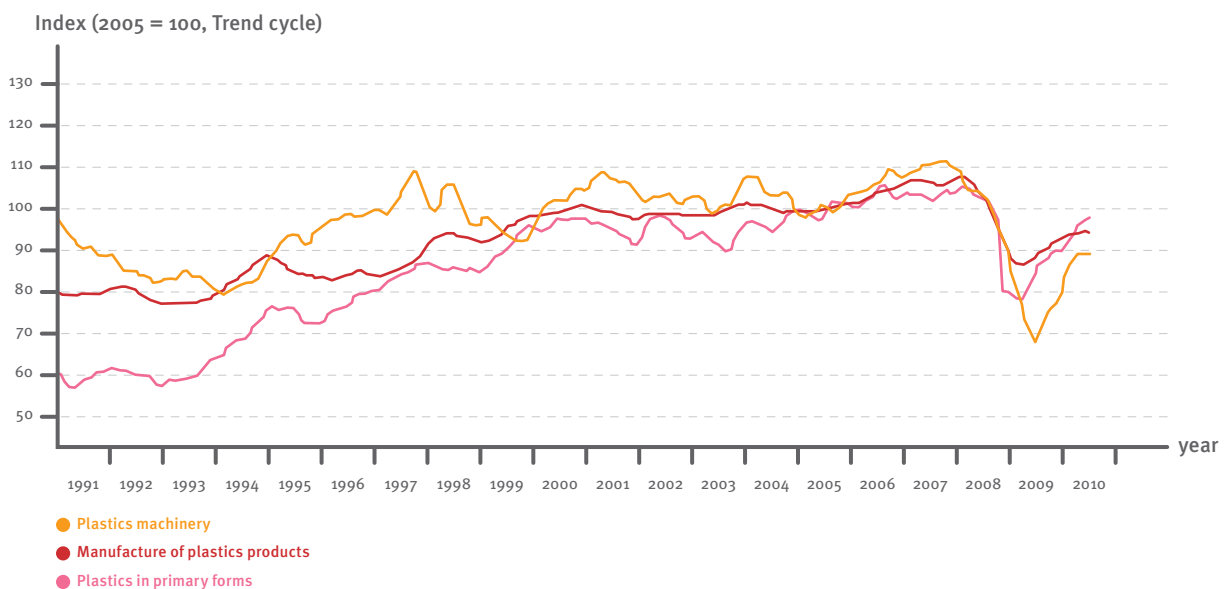


Figure 13. Plastics industry production in EU27

Source: Eurostat / PlasticsEurope Market Research Group (PEMRG)

Glossary of terms

ABS	Acrylonitrile-butadiene-styrene plastic
CE	Central Europe
CEN	The European Committee for Standardisation
CNTs	Carbon nanotubes
CO ₂	Carbon Dioxide
ECPI	European Council for Plasticisers and Intermediates
ECVM	European Council of Vinyl Manufacturers
EfW	Energy from Waste
EPR	Extended Producer Responsibility
EU	European Union
EuPC	European Plastics Converters
EuPR	European Plastics Recyclers
EPRO	European Association of Plastics Recycling and Recovery Organisations
ESPA	European Stabiliser Producers Association
E&E	Electrical & Electronic equipment
GDP	Gross domestic product
GPS	Global Positioning System
GPCA	Gulf Petrochemicals and Chemicals Association
IV	Intravenous
Kg	Kilogramme
Kt	Kilo tonnes
MBT	Mechanical Biological Treatment
M tonne	Million Tonnes
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
NGOs	Non governmental organisations
OLED	Organic light emitting diode
PA	Polyamide
PE	Polyethylene
PE-HD	Polyethylene, high density
PE-LD	Polyethylene, low density
PE-LLD	Polyethylene, linear low density
PEMRG	PlasticsEurope Market Research Group
PET	Polyethylene terephthalate
PUR	Polyurethane
PMMA	Polymethyl methacrylate
PP	Polypropylene
PRF	Plastics Recovery Facilities
PS	Polystyrene
PS-E	Polystyrene, expandable
PVC	Polyvinyl chloride
SAN	Styrene-acrylonitrile plastic
SMEs	Small and medium sized enterprises
SRF	Solid Recovered Fuel
TV	Television
UK	United Kingdom
UN	United Nations
WE	Western Europe
WRAP	The Waste & Resources Action Programme





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