European Isocyanate Producers Association

Fact Sheet

RECYCLING AND RECOVERING POLYURETHANES

BING

EUROPUR

Polyurethanes in Perspective

OIL USAGE (WEST EUROPE)

Over the past fifty years, the oil and chemical industry has converted selected oil products of the oil refining process into polymers. These valuable resources have contributed greatly to our quality of life. The amount of oil diverted to polymer production is 4%. Compared to the 86% which is used to generate energy in one form or another, this is a small amount for a product which makes such a large contribution to our daily lives. (Figure 1).

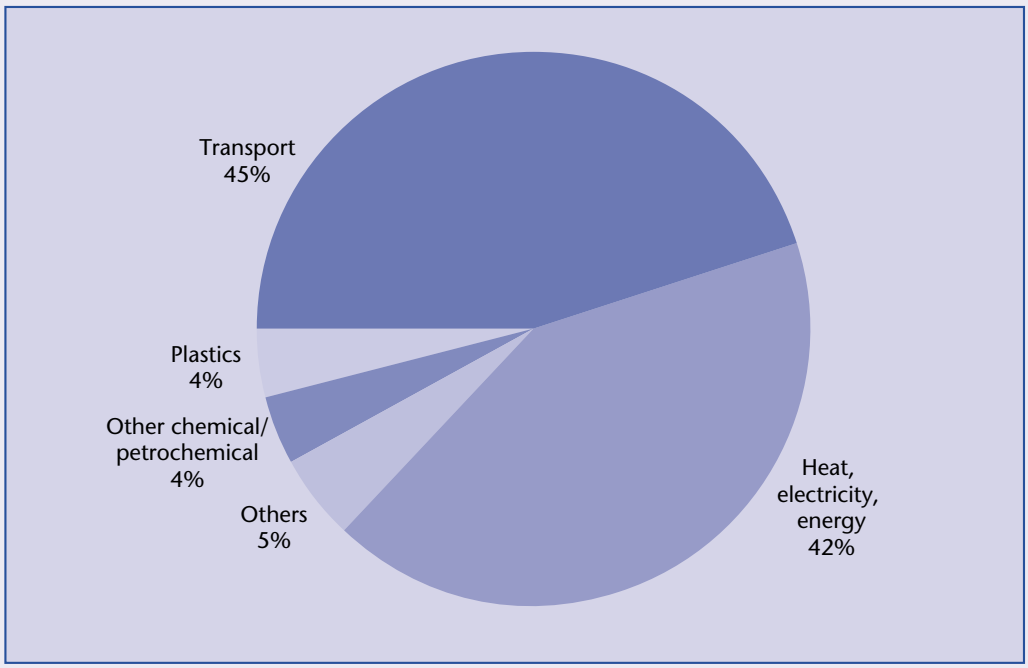

Figure 1: Oil usage in West Europe (Source: APME)

THERMOPLASTIC AND THERMOSET POLYMERS (WEST EUROPE)

The annual consumption of polymers in West Europe is about 39 million tons (1998) and falls into two categories (Figure 2):

1 Thermoplastics - materials such as polyethylene, polypropylene and polystyrene
2 Thermosets - materials such as polyurethanes and epoxy resins

Of thermosets, polyurethanes represent about 30% and of all polymers, about 5%.

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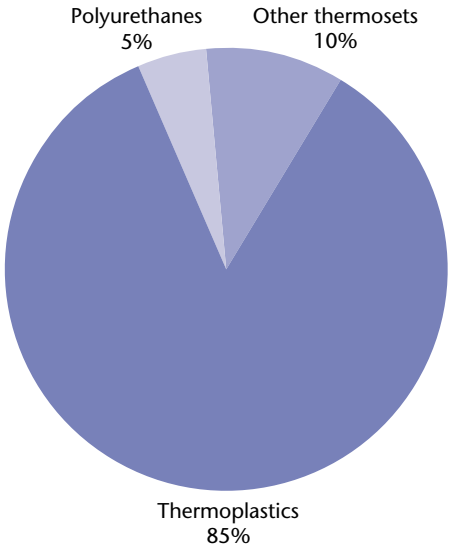
POLYURETHANE APPLICATIONS PRODUCT LIFETIMES (WEST EUROPE)



Polyurethanes exist in many forms and have increasingly been used during the past thirty years. Key to their growing success and increased usage has been their ability to fulfil the high consumer expectations: comfort, value for money, energy saving insulation products, improved safety and environmentally sound products. One of the remarkable features is their durability, which contributes significantly to the long lifetimes of many products which contain them. The extension of product lifetime - and resource conservation - are important environmental considerations which favour the selection of polyurethanes (Figure 3).

Figure 2: Distribution of thermoplastic and thermoset polymers in Western Europe (Source: TN SOFRES Consulting for APME (1998))

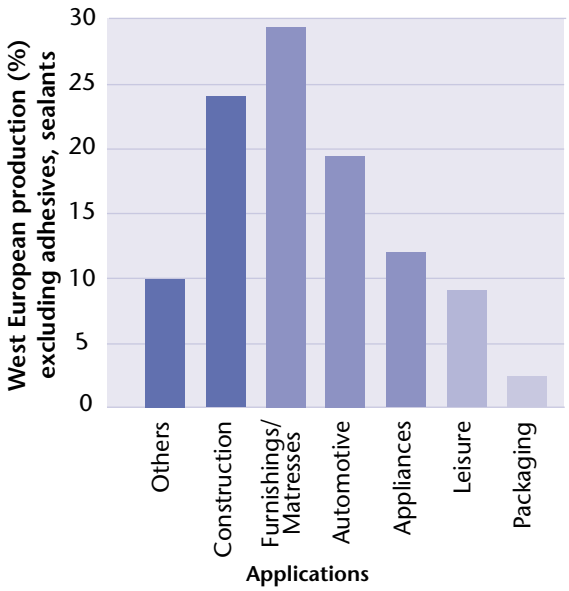


Figure 3: Polyurethanes applications product lifetimes (West Europe)

The long lifetimes of polyurethane-containing products, sometimes exceeding 30 years, means that the return of these products as post-consumer waste materials is a slow process.

Indeed, in the construction industry, which uses rigid foam panels and laminates, waste has yet to reach 50% of production and in the automotive industry, waste products account for only two thirds of consumption.

Similarly, PU accounts only for about 3% of plastics in municipal solid waste, while it represents about 5% of consumption (APME).

Service life
- more than 20 years
- more than 10 years
- more than 1 year
- less than 1 year

CONTRIBUTION OF PLASTICS WASTE TO MUNICIPAL SOLID WASTE (WEST EUROPE)

Polyurethanes make up around 5% of all plastic waste. This should be seen in the context of the overall contribution of plastics to solid waste - less than 1% (0.6% by weight) - and as a constituent of municipal solid waste 7%, with an equivalent of 30% of the energy of the MSW (Figure 4).

The use of readily accessible trim foam from the manufacturing process into rebonded foams has been an established practice for the last three decades and increasingly, new activities in the area of post-consumer polyurethane foam waste are emerging: e.g. grinding and re-use, particle bonding, energy recovery and others. After its useful life, most polyurethane post-consumer waste in the European Community finds its way, if uncollectable or unidentifiable, into the municipal solid waste (MSW) stream. Until now this MSW was either landfilled or incinerated with or without energy recovery

(Figure 5). Although polyurethanes are not harmful to the environment, they will probably be excluded from landfill practice like other wastes in the future because of the organic content and/or stability requirement of the landfill sites. Resource optimisation should therefore aim at optimal utilisation of the valuable raw materials and their energy content. The optimal route for re-use, recycling and recovery will be different for each of the various polyurethane application areas.

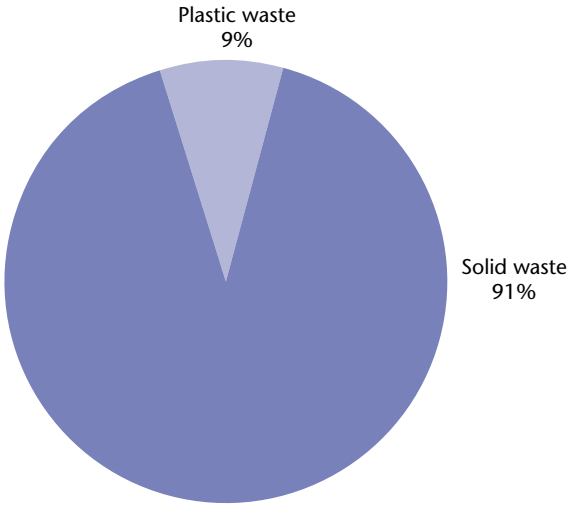


Figure 4: Contribution of plastics to municipal solid waste in West Europe (Source: TN SOFRES Consulting for APME, 1998)

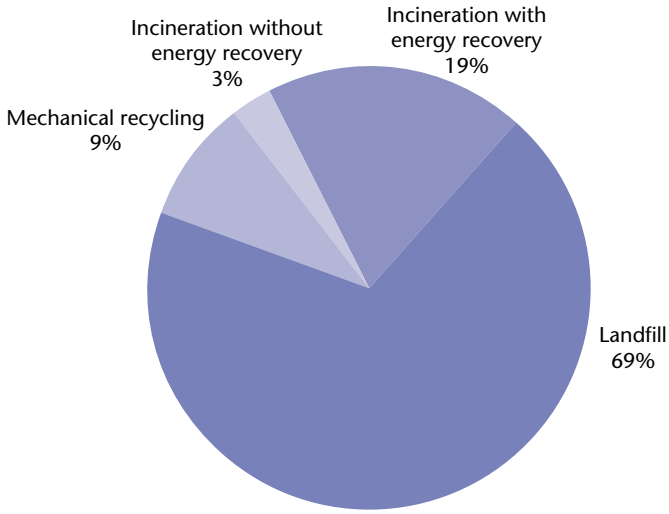


Figure 5: Destination of post-user plastics waste in West Europe (Source: TN SOFRES Consulting for APME, 1998)

CONCLUSION

Polyurethane products have become an essential part of our modern life bringing many benefits to improve the quality of our lives. For example, in the energy, emissions, material and costs savings achieved through the use of polyurethane foams in transportation, construction, food distribution and storage.

It is vital to plan the most efficient and integrated recovery and recycling of the polyurethanes that enter the waste stream. Moreover, recycling cannot be a goal by itself. It must be a step towards a sustainable development, guaranteeing that current needs are met without compromising future requirements. Costs will largely determine the viability of any option in a defined application. The continued development of recycling technologies, investment in infrastructure necessary to support them and the establishment of viable markets as well as participation by industry, government and consumers will ultimately determine how maximum economical and environmental value is derived from post-consumer PU waste.

The greatest environmental benefit will result from a planned, integrated approach to polyurethanes waste management, based on:

- avoidance of unnecessary waste
- environmental product design
- recycling, as product, on an economic and resource-efficient basis
- feedstock recovery where chemistry and economics favour it (e.g. mixed plastics waste streams)
- energy recovery, as part of the MSW, or with plastics as a fuel
- controlled landfill as a last resort.

Some schemes to recover post-consumer waste have been in use for some years now; others are increasingly being developed. The experience gained over the last few years is a basis for sound resource integration plans for each type of polyurethane in the different application areas. Current practice with the re-use of regrind flexible foams, recovery of rigid polyurethane foams from appliances and construction demolition waste only form a few examples of the approach to improved recovery of polyurethanes resources.

European Isocyanate Producers Association

ISOPA has produced a brochure and a series of fact sheets on polyurethane recycling options.

The following are now available :

Recycling Polyurethanes (Brochure)

PU in Perspective

Densification/Grinding

Re-use of Particles

Rebonded Flexible Foam

Adhesive Pressing/Particle Bonding

Regrind/Powdering

Compression Moulding

Chemolysis

Feedstock Recovery

Energy Recovery

Energy Recovery from Flexible PU Foams

Recovery of Rigid Polyurethane Foam from Demolition Waste

Options in Practice

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ISOPA - the European Isocyanates Producers' Association - is an affiliated organisation within the European Chemical Industry Council (CEFIC).

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