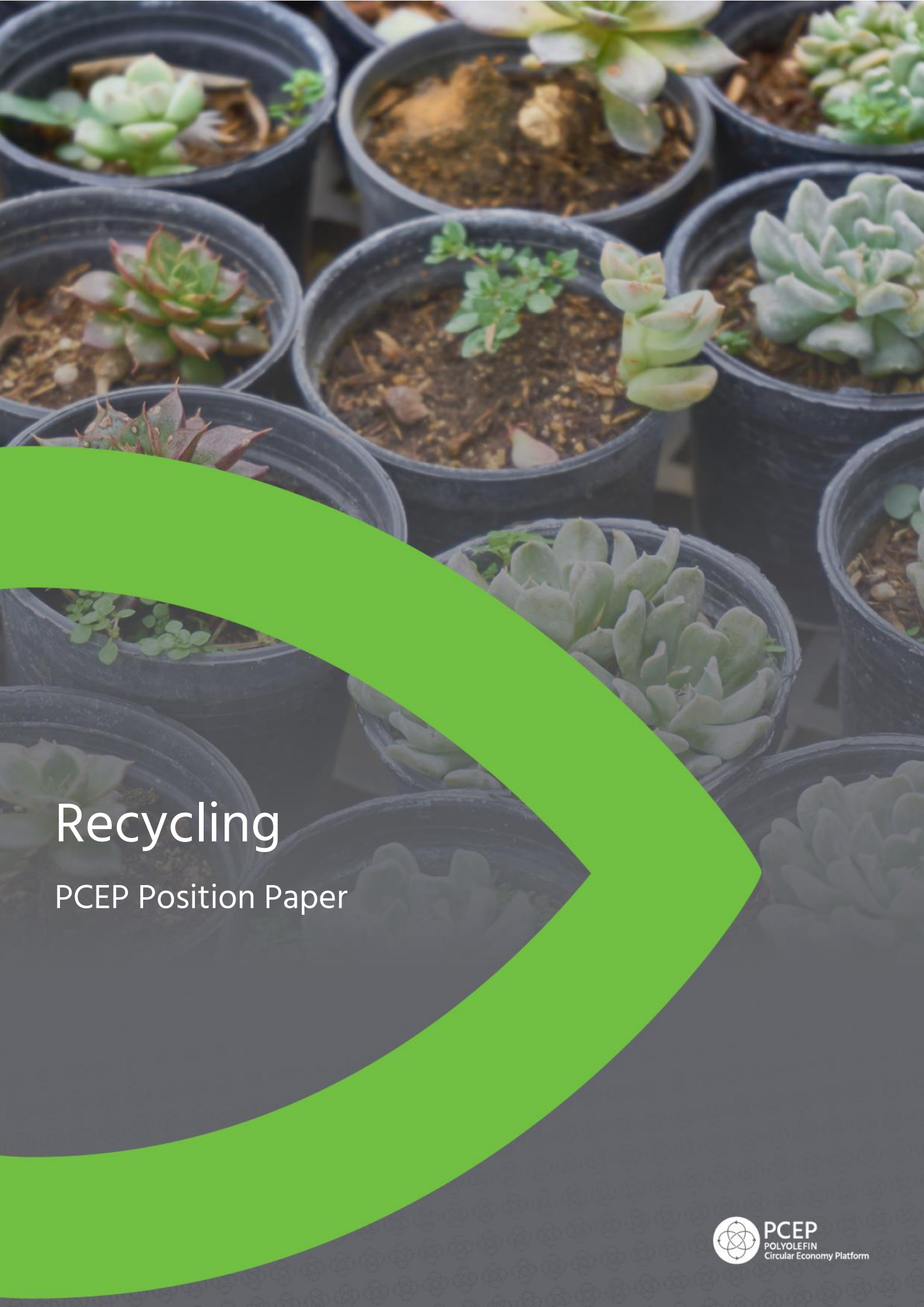

Recycling

PCEP Position Paper

PCEP
POLYOLEFIN
Circular Economy Platform

Introduction

PCEP (the Polyolefin Circular Economy Platform), brings together actors from across the polyolefin value chain, united in a common mission to drive the transition to a circular economy for polyolefins – the most commonly used family of plastics. 71.4% of plastic packaging in Europe is made of polyolefins and they account for 71% of the plastic waste collected for recycling. This material goes on to be transformed into 84.7% of the post-consumer recycled polymer used today in European products across sectors including building and construction, packaging, agriculture, automotive, and electronics. PCEP supports the EU Green Deal objectives to achieve a climate neutral and circular economy by 2050.

To successfully reduce the amount of waste and enable a functioning market for secondary raw materials, it is necessary to leverage on the complementary strength of different recycling technologies.

Mechanical recycling is an existing technology that uses mechanical / physical processes and does not change the chemical structure of the plastic waste. Chemical recycling converts polymeric wastes by changing its chemical structure to produce substances that are used as products or as raw materials for the manufacturing of products. Products exclude those used as fuels or a means to generate energy[1]. However, they include precursors, monomers and oligomers[2] that can be used to make new plastic. Chemical recycling technologies broadly fall into two categories, firstly those that break down certain polymer types, primarily polyolefins[3] and styrenics, into mixed hydrocarbons either in the form of an oil and / or gas. This group of technologies includes pyrolysis, hydrothermal conversion and gasification. The second category are those technologies that use depolymerisation processes, often referred to as chemolysis or solvolysis, that break down certain polymers, such as PET or PU, into specific monomers or oligomers. This paper focuses on the first category due to these technologies being used to treat polyolefins. For polyolefins, there is no known technology that falls into the second category where monomers can be produced for use solely in the polymerisation of new polyolefins.

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[1] European Coalition of Chemical Recycling definition.

[2] Monomers are molecules that can react together to form longer polymer chains. Oligomers are low molecular weight polymers consisting of a few monomer units. Both are used to make plastic.

[3] Polyolefins are a widely used family of plastics that include polyethylene (for example LDPE and HDPE) and polypropylene (PP).

Mechanical and chemical recycling both typically use pre-treatment technologies to remove contamination and non-target polymers from input waste streams as well as treat the waste to facilitate consistent feed rates into the main recycling operation.

PCEP support the complementary use of recycling technologies.

Mechanical recycling is a proven and existing technology. Strengths of mechanical recycling include the relatively low environmental impact of the process and high yields of recycled plastic. Mechanical recycling typically is an efficient solution for well-defined mono-material plastic waste streams.

Chemical recycling based on pyrolysis is an emerging complementary technology that enables recycling of mixtures of different polyolefins back into virgin like polymers while guaranteeing the possibility of satisfying all applications, even the most complex. Research has shown that chemical recycling is a preferable environmental option to energy recovery[4].

Different recycling technologies have different strengths and so policy should facilitate each being deployed strategically and in line with market needs. A strength of chemical recycling is that it produces virgin like quality recycled polymer that can be used in all applications where the virgin equivalent is used, including in food contact and medical applications. Producing contact sensitive recycled polymers from mechanical recycling of polyolefins is more challenging and the approval process takes many years. However, there is much ongoing work in this area which PCEP supports. There are currently several approvals for the use of mechanically recycled polyolefins in contact sensitive applications at a national level in the UK and US. Some mechanical recycling operations are also being registered as *novel technologies*[5] in the EU with a view to getting approval from the European Food Safety Agency (EFSA) for their use in producing recycled plastic for food contact applications. From a perspective of what waste can be recycled, a strength of chemical recycling is that it can be used to produce individual PE and PP polymers from mixed polyolefin wastes (including laminates) as well as effectively recycle, with pre-treatment, degraded or contaminated streams of polyolefins.

[4] Environmental and economic assessment of plastic waste recycling: a comparison of mechanical, physical, chemical recycling and energy recovery of plastic waste. JRC 2023.

[5] As defined in Regulation (EU) 2022/1616 on recycled plastic materials and articles intended to come into contact with foods.

Given that both technologies have their own advantages, PCEP advocates for chemical recycling to be used in a complementary way to mechanical recycling with regulatory drivers set accordingly. As recycling technologies have been developed to address different waste streams and the resulting recycled plastics are suitable for potentially different applications, we support the principle of a hierarchy of recycling technologies where mechanical recycling is the preferred option for waste streams that are sorted into the different polymer types and where the outputs from the recycling process can reach the required technical and regulatory requirements of the market. In particular, we endorse the model of complementarity developed by Plastics Europe.[6]

The correct choice of feedstock for chemical recycling

PCEP support the use of chemical recycling for waste polyolefin feedstocks that cannot be transformed into high quality recycled polymer using mechanical recycling. High quality recycled polymer replaces fossil-based virgin and is of sufficient quality to be used in a wide range of end use applications. For polyolefins, target feedstocks for chemical recycling should be those streams currently going to landfill or energy recovery and that are difficult to separate by polymer or can only be mechanically recycled to produce recycled polymer qualities with low market demand. Example polyolefin feedstocks where chemical recycling can add value are from:

- Residual fractions generated from sorting centres.
- Polyolefins diverted from mixed unsorted waste destined for energy recovery or landfill.
- Residual fractions from mechanical recycling.
- Those diverted from complex mixed polymer commercial and industrial packaging fractions.

A need for legislation that supports investment.

A balanced portfolio of policy measures should be used to encourage the development of *all* recycling technologies required to reach circularity targets for polyolefins whilst at the same time maintaining complementarity between the different technologies to maximise the overall environmental benefits. The legal status and regulatory approach for chemical recycling should be consistent across the EU, for example with respect to

[6] https://plasticseurope.org/wp-content/uploads/2022/08/Decision-tree-MR-CR-July-2022.pdf

[7] Conditions are that (a) the substance or object is commonly used for specific purposes (b) a market demand exists for such a substance or object (c) the substance of object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products and (d) the use of the substance or object will not lead to overall adverse environmental or human health impacts.

definitions of recycling and the end of waste status of different outputs such as pyrolysis oil. The end of waste criteria for waste plastic should be consistent with Article 6 of the Waste Framework Directive, which defines end-of-waste status, and set at a point where the conditions[7] shown in this article are first met. We support the fuel use exempt mass balance methodology where monomers and chemical products can be allocated in recycled content calculations as this will create the necessary conditions for investment in chemical recycling capacity. The transformation of plastic to fuel should not be considered recycling.

Support for recycled content targets

We support the use of mandatory recycled content targets in products and packaging. This will facilitate investment in both mechanical and chemical recycling capacity. Targets and other regulatory measures should be set to obtain high quality polymer suitable for the application in which it is used. Chemical recycling should be used when mechanical recycling cannot achieve the demands of the market for specific applications so ensuring a complimentary approach is taken. Recycled content from both chemical and mechanical recycling should be certified by recognised bodies using European or international standards. Recycled content in products or packaging produced from chemical recycling where a mass balance methodology is used should always be communicated clearly and transparently to consumers in order to avoid misleading environmental or product claims.

Optimising the mix of different recycling technologies and the need for investment

When developing European recycling capacity and choosing the optimal mix of recycling technologies the type of polyolefin feedstock, demand for specific qualities of recycled polymer and maximising environmental benefits should be taken into consideration.

Recycling figures speak for themselves: out of the post-consumer polyolefin waste that is collected in the EU+3, only 36% is recycled,[8] while the remainder is used for energy recovery or landfilled. We believe there is a need for significant investments in all recycling technologies, as well as sorting technologies for both separately collected and mixed unsorted waste, if we are to reach our circular economy goals.

[8] PO waste collection and recycling in EU27+3 countries 2021