

Innovation CAN impact the European Strategy for Plastics

The European chemical industry supports the transition towards a circular economy as part of a strategy to make Europe more resource efficient. This can be achieved both by avoiding unnecessary material and energy losses throughout the life-cycle of products and maximising value by keeping resources circulating in loops, after first usage, many more times than today. Environmental reasons and business arguments suggest doing so. Follow this [link](#) to learn about the Cefic position on Circular Economy. Cefic also developed a position on the issue of [chemical safety in a circular economy](#) in general.

- To transition towards a more circular economy model and explore options for use, reuse, recovery and recycling of plastics, all available approaches must be investigated and developed. At the same time we must ensure keeping the value as long as possible within the different circular economy loops. As different application markets and polymer types will require different solutions to increase the circularity of the materials streams, selected options should be based on case-by-case full life cycle thinking (environmental impact across the full life cycle including biogenic carbons and mass-balance approaches), optimising application performances, technical and economic feasibility, and ensuring the competitiveness of the EU industry. Furthermore, for all applications the safety of the products is a key priority, hence compliance with REACH, CLP and Product legislation needs to be ensured throughout.
- The Commission's Plastics Strategy has a strong focus on mechanical recycling and alternative types of feedstock. To achieve the highest possible resource efficiency within a circular economy model, we should employ a holistic view and explore all options based on a case-by-case analysis. In particular, the potential of **chemical recycling** in complementing mechanical recycling and increasing the overall recycling volumes, is **underemphasised** and should be further highlighted.
- The European Chemical Industry **can offer innovative solutions** to enhance the circularity of materials and accelerate the transition towards a Circular Economy. These go beyond recycling and recovery, and should focus as well on improved maintenance, prolonged use, reuse, refurbishment, increased durability, ...
 - Through upscaling recycling technologies: depolymerization by thermochemical recycling, solvent extraction, gasification technologies, controlled biodegradation, etc...)
 - Through innovative solutions in designing polymers and plastics articles
 - Through exploring alternative types of feedstock (e.g. CO₂, bio-based, methane, waste)

- To realise the full potential of the innovations the chemical industry can bring in a circular economy for plastics, we need:
 - A **progressive policy environment** coupled with **smart regulations** stimulating innovations and **avoiding putting barriers**
 - A continued support through Horizon2020 and the upcoming FP9 for **research** on improved performance, functionality, durability, recyclability in a circular context, **innovation** support to upscale current and new technologies and close **collaboration** of the industry sectors with the waste and recycling value chain and sector specific **pilot** projects
 - **Access to all available funding streams** such as ESIF; EFSI; EIB (e.g InnovFin) and EAFRD to **derisk investments** in the pre-commercial phase.
 - **Access to sufficient streams of possible feedstock/raw material** for chemical recycling

CHEMICAL INNOVATIONS FOR Plastics in a Circular Economy



For more information please contact:
Ann Dierckx, Sustainable Director, Cefic,
+32 2.676.73.93 or adi@cefic.be.

About Cefic

Cefic, the European Chemical Industry Council, founded in 1972, is the voice of large, medium and small chemical companies in Europe, which provide 1.2 million jobs and account for 17% of world chemicals production.

ANNEX: Innovations of the Chemical Industry for Plastics in a Circular Economy

Want to see your example included in the overview? Please contact Ann Dierckx, Sustainable Development Director, Cefic – adi@cefic.be

Part 1.1 Innovations on the Design of Plastics and Plastic Products

- **ALPLA:** An example of recycled content being integrated into the production of detergent bottles. This a project done in Cooperation with Henkel aiming at using sustainable materials in the production of plastics.

<http://pimi.ir/alpla-cooperation-with-henkel-to-produce-detergent-bottles-using-sustainable-materials/>

- **DSM and Niaga:** An example of a collaboration along the value chain is the joint venture between the Dutch material sciences company DSM and start-up Niaga. The joint venture applies a product design philosophy that ensures that the final product is fully recyclable. The first result is a carpet that can be fully recycled into new carpet in a profitable way, again and again. DSM-Niaga recently announced to develop fully recyclable mattresses together with Royal Auping.

<https://www.dsm.com/corporate/science/competences/macromolecular-sciences/dsm-niaga.html>

- **Procter & Gamble:** Cooperating with brand owners to create recyclable shampoo bottles. The potential and value of the chemical industry's innovative designs for plastics can be illustrated in this example

<http://news.pg.com/blog/REWEpartnership>

- **Total:** An example of innovation by creating products that outperform virgin materials

<http://www.polymers.total.com/news-press-releases/synergy-between-circular-economy-and-total-expertise-polymers>

- **Arkema:** An example of innovation in designing for recyclability. Arkema's thermoplastic resin enabling recycling of a wind blade.

<https://www.arkema.com/en/products/product-finder/range-viewer/Elium-resins-for-composites/>

- **DuPont:** Another example of the designing for recyclability. DuPont innovative resin increases the recyclability of agrochemical bottles, which are typically hard to recycle.

<http://www.dupont.com/corporate-functions/sustainability/employee-engagement/articles/recycling.html>

- **DOW: Pack Studios.** Dow's pioneering approach brings experts equipment and testing capabilities, to collaborate and develop innovative packaging solutions.

<https://www.dow.com/en-us/packaging/innovation/pack-studios>

- **Virtuous Circle project.** A new project improves child nutrition in South Africa and shows circular economy in action, were innovative multilayer food packaging pouches designed to preserve both food and water over long periods.

<http://thevirtuouscircle.co.za/>

- **Borealis: Designs for Recyclability.** Borealis is collaborating with value chain partners – designers, retailers, packaging producers and brand owners – to develop material solutions and concepts to improve end-of-life recyclability and the performance properties of recycle material.

<https://www.borealisgroup.com/polyolefins/circular-economy-solutions>

- **Borealis: Exploring new opportunities for end-of-life plastics.** Borealis' mission "Value Creation through Innovation" means utilising expertise to provide innovative solutions that contribute to the sustainability challenges in the automotive market. Waste avoidance and recycling are two of these core global challenges, and Borealis engages and innovates with important value chain stakeholders to address materiality issues. Because plastics are simply too valuable a resource to discard after use, they should be recycled into new products. The new Daplen grades are a prime example of how to better use natural resources and reduce waste by combining PCR and virgin material to produce high-end grades with long-term quality consistency.

<https://www.borealisgroup.com/news/borealis-launches-polypropylene-compound-portfolio-with-post-consumer-recycled-content>

- **EASTMAN:** Preserving sustainability through sealant layers in multilayer film lids and enabling manufactures and brands to produce lighter packaging with fully recyclable PET trays.

https://www.eastman.com/Literature_Center/S/SPMBS5002.pdf

Part 1.2 Innovations based on alternative feedstocks

- **Covestro:** Using CO₂ to produce polymers. Another example of collaboration of the chemical industry along the value chain embracing innovation and using alternative feedstock (CO₂ in this case) to produce plastics

<https://www.co2-dreams.covestro.com/en>

- **Arkema:** Using municipal solid bio-waste fractions and fish waste to create biodegradable plastics

<http://www.dafia-project.eu/>

- **Total Corbion:** An example of collaboration between two chemical companies in using bio-based feedstock to create biodegradable plastics

<https://www.total-corbion.com/>

- **Synvina:** Is a Joint venture of Avantium & BASF, aiming at using bio-based feedstocks for the production of new polymers

<https://www.avantium.com/press-releases/synvina-joint-venture-basf-avantium-established/>

- **AkzoNobel:** Using waste as feedstock. The Waste2Chemistry initiative is an example of collaborative innovation between AkzoNobel, several other Dutch organizations and Canadian firm Enkema, where municipal waste, including plastic waste is used as an alternative feedstock for the chemical industry.

<https://www.akzonobel.com/for-media/media-releases-and-features/waste-chemicals>

- **SABIC:** Using food waste or forestry residues for the production of plastics

<https://www.icis.com/resources/news/2014/06/10/9789706/sabic-takes-first-steps-into-renewable-polyolefins/>

- **PHOENIX INITIATIVE:** A collaborative effort supported by EU Member States (France, Germany and the Netherlands) and Cefic. PHOENIX will function as an umbrella initiative linking national and European RD&I activities with respect CO₂ valorisation, including Chemicals Polymers.

<http://www.phoenix-co2-valorisation.eu>

- **Evonik:** Using bio-based feedstocks for the production of high performance polymers

<http://www.vestamid.com/product/vestamid/en/products-services/vestamid-terra/>

- **BASF:** Biomass Balance Approach. Inspired by green electricity, the approach allows to combine the resource savings of integrated chemical production with a diversification of feedstock

<https://www.basf.com/en/company/sustainability/environment/resources-and-ecosystems/renewable-raw-materials/biomass-balance.html>

- **Neste:** Expanding the knowhow on the circular economy - waste plastics now in focus

<https://www.neste.com/na/en/neste-deepens-its-knowhow-circular-economy-waste-plastics-now-focus>

Part 2.1 Increasing Circularity through recycling

- **LyondellBasell and SUEZ:** Joint Plastics Recycling Venture

An example of innovative value chain cooperation; where the chemical expertise meets, sustainable resource management to create Quality Circular Polymers (QCP), a premium plastics recycling company in Sittard-Geleen, the Netherlands

<https://www.lyondellbasell.com/en/news-events/corporate--financial-news/lyondellbasell-and-suez-begin-jointly-operating-plastics-recycling-venture/>

- **VinylPlus:** The Voluntary Commitment of the European PVC industry to establish a long-term framework for the sustainable development of the industry, where among its objectives, innovation in design and different recycling technologies is pursued to improve the sustainability potential of PVC

<https://vinylplus.eu/programme/about-vinyl-plus>

- **Procter &Gamble:** An example of the innovative potential of the chemical industry to create recycling technologies that restore recycled plastic material into "virgin-like" quality.

<http://news.pg.com/blog/PG-Innventure>

- **Dendro Poland:** An example of chemical recycling of mattresses (main PU foam for mattresses supplier of IKEA)

<http://dendro.pl/en/produkcja/produkcja-pianki/>

- **3M:** An example of the innovative contributions of the chemical industry to create value for waste. The project aims at the upcycling of polymers

https://www.3m.co.uk/3M/en_GB/design-and-specialty-materials-uk/resources/news_and_events/news/full-story/?storyid=1075d7a1-9ebf-4099-9e8a-ade1b3a6f62b

- **Ioniqa:** Innovative recycling solution of de-polymerization that creates colourless monomers to be integrated into the production of plastics

<http://www.ioniqa.com/pet-recycling/>

- **INEOS:** Waste becomes fuel. An example of collaboration of the chemical industry with other process sectors supporting carbon reduction, energy optimisation and cost savings

<https://www.soci.org/news/general-news/industrial-symbiosis-comes-to-hull>

- **PolyStyreneLoop (PSL) Cooperative:** Is the European EPS/XPS industry's closedloop solution for the recycling of polystyrene (PS) insulation foam waste.

<https://polystyreneloop.org/>

- **Repsol's Reciclex:** Focuses on the commercialization of polyolefins that incorporate a percentage of recycled product. This project involves agreements with different members of the value chain to guarantee the supply of homogeneous materials.
- **Repsol's Zero:** Focuses in the chemical recycling of plastics waste streams, that would otherwise end up in landfills, in those cases where the traditional recycling methods are not possible. This project turns waste into an alternative raw material, which then becomes a new resource to be reintroduced into the plastics' production cycle.
Please, take into account that the Zero project is not an internal project but a joint initiative led by Plastics Europe to which Repsol has adhered.

<https://www.repsol.com/en/index.cshtml>

- **Versalis' recycled eco-pallets:** Versalis Innovation allows for the production of a specific pallet made with recycled plastic (eco-pallet), to be used in an industrial rental loop to transport polyethylene resins. The production of the eco-pallets starts from industrial scraps of paper mills, that use paper and cardboard from separate collection. Such stream consists of approximately 35% of plastic material that cannot be recycled with the technologies available until now. The pallet made of recycled heterogeneous plastic material is moulded in a prototype production line, based on an innovative technology, significantly reducing the proportion of scraps sent to landfill and / or incineration, following the principles of circular economy.

<http://www.circularity.eu/project/versalis-eco-pallets/>

Part 2.2: Eliminating barriers to recycling

- **Repsol's Naturep:** which aims to go beyond legal requirements, to eliminate all additives with migration limits from their polyolefins, in order to safeguard people's safety and protect the environment in all applications, while additionally eliminating barriers to recycling.

<https://www.repsol.com/en/index.cshtml>

Part 3: Examples of EU Funded R&I Projects

- Controlled bio-degradation of polymers :
 - [P4SB](#) – From Plastic waste to Plastic value using Pseudomonas putida Synthetic Biology (biotech start-ups)
https://cordis.europa.eu/project/rcn/193263_en.html

- Recyclable Composites:
 - [RECOTRANS](#)
https://cordis.europa.eu/project/rcn/211309_en.html
 - [ECOXY](#)
https://cordis.europa.eu/project/rcn/210279_en.html

- Processes for CO2 valorization
 - [Carbon4Pur](#)
https://cordis.europa.eu/project/rcn/211464_en.html
[Processes for CO2 valorisation](#)
 - [Elegancy](#)
<http://www.act-ccs.eu/elegancy/>

- Recycling
 - [Resyntex](#)
https://cordis.europa.eu/project/rcn/196815_en.html
 - [URBANREC](#)
https://cordis.europa.eu/project/rcn/203390_en.html
 - [LIFE-PSLOOP - Polystyrene Loop](#)
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=6263

- Pilot plants on bio-feedstock
 - [Optisochem](#)
https://cordis.europa.eu/project/rcn/210280_en.html

- Cross-sector industrial symbiosis
 - [EPOS](#)
https://cordis.europa.eu/project/rcn/198353_en.html