ISWA INFORMATION

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CLOSING THE LOOP FOR MATERIALS DIFFICULT TO RECYCLE

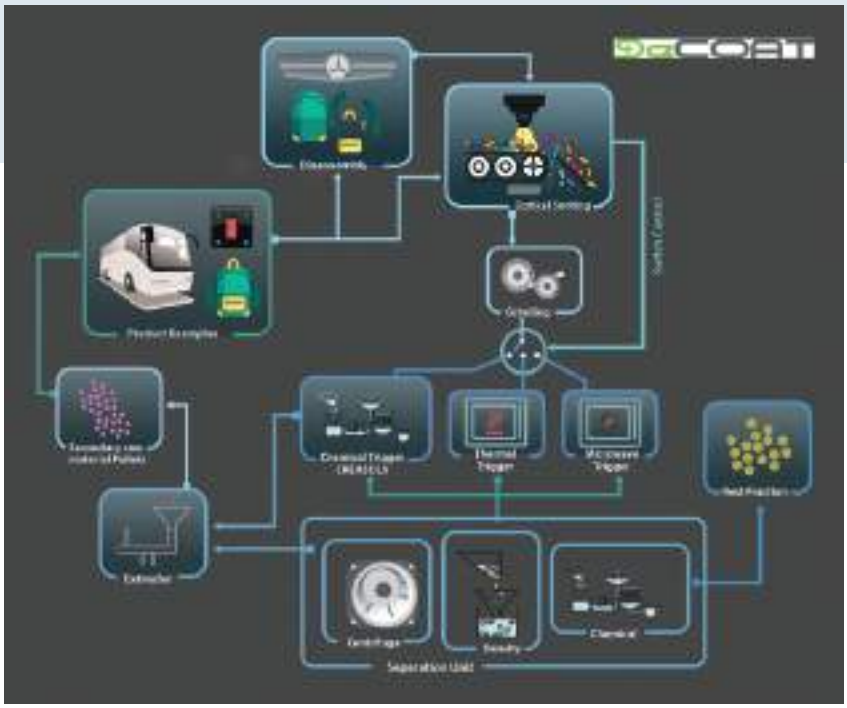
Novel innovations in the European Union to increase recovery and re-use.

With a growing need to reduce greenhouse gas (GHG) emissions, recycling and circular thinking can impact the reduction of GHG emissions significantly. By producers reducing the production of new products, thereby decreasing the demand for virgin materials, this crucial step avoids GHG emissions from the extraction and processing of virgin materials. New innovations supported by the European Union are making strides to increase the circularity of materials deemed 'difficult to recycle.' These projects are supported by the EU H2020 programme, the EU's largest research and innovation funding programme. To facilitate circularity, these projects focus on key innovations in eco-design, end-of-life, new innovations in design, and developing novel monitoring systems to optimize sorting and facilitate repair and re-use.

Launched between 2018 and 2021, ISWA partners in three EU projects: ALMA, DECOAT and MultiCycle which focus on innovation in the recycling sector. Each project brings unique developments focusing on circularity, eco-design, end-of-life and monitoring systems. The ALMA project will develop a novel battery electric vehicle structure for a passenger car with 45% weight reduction potential compared to current baseline at affordable costs. DECOAT focuses on enabling the circular use of textiles and plastic parts with (multi-layer) 'coatings', which are typically not

FOR MORE INFORMATION

This is part of a larger, feature-length article, which will feature on the Waste Management World website. Visit **www.wmw.news** to read the article in full.



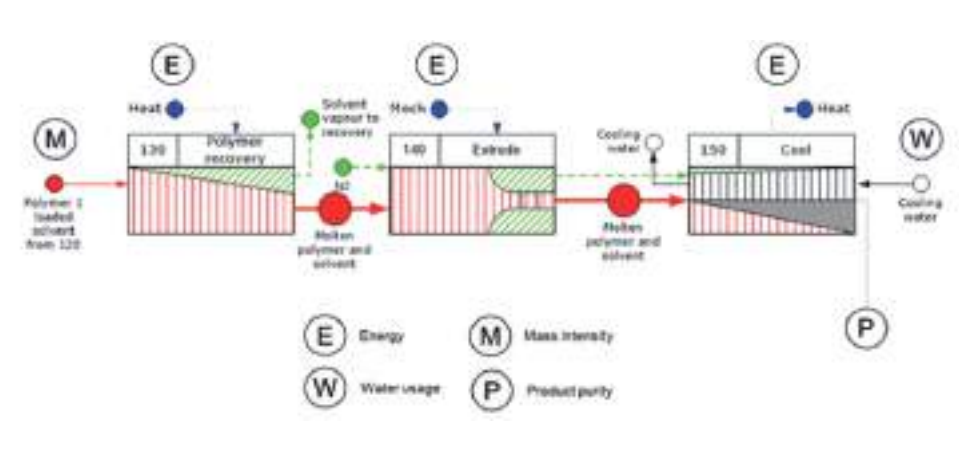
recyclable yet. MultiCycle is demonstrating advanced and sustainable recycling processes and value chains for plastic-based multi-layer packaging and fibre reinforced automotive components.

HOW IS EACH PROJECT WORKING ON ECO-DESIGN FOR THE FUTURE AND IS END-OF-LIFE TAKEN INTO CONSIDERATION?

ALMA focuses on the development of a novel electric vehicle structure for cars with reduced weight and environmental impact thanks to the adoption of an integrated circular approach across the entire life cycle, supported by LCA and LCC tools.

ALMA will contribute to reducing the environmental impact of the production and the end-of-life phase, promoting the remanufacturing and recycling of the vehicle structure. The use of remanufactured parts and components can conserve up to 88% material and 56% energy use compared to new parts. In addition, ALMA's circular-economy approach is tapping into the sustainable development policies and regulations of the EU since ALMA solutions are estimated to contribute to the reduction in greenhouse gas emissions (GHG) and the potential reduction of 40-45% waste to be landfilled or burnt.

For the DECOAT project, in view of a circular and sustainable economy, eco-design is important as 80% of the environmental impact of a product is determined during the design phase. Multiple aspects can be taken into account to lower the footprint, like design for repair, design for recycling, design for (dis)assembly, design for composting, design for longevity etc. Some of these



Simple sustainability driver prompts can act as an early pointer for areas of focus in subsequent detailed Life Cycle Analysis; in this example energy is involved at each step

design principles go hand in hand, while others are more difficult to reconcile (e.g. compostability and longevity).

Within DECOAT, the main focus is on 'design for recycling'. Multi-layered textiles and plastics are currently being incinerated or landfilled as the presence of a coating or paint hampers the recycling process at end-of-life. By removing the coatings or paints, the bulk material can be recycled, enabling circularity.

The project focusses on implementing triggerable additives into the adhesive layer during the production phase (eco-design). At end-of-life, these additives will be activated by a specific trigger (like heat, microwave, steam), leading to separation of the coatings/paints and the bulk material. This trigger-based technology developed within DECOAT could also serve for 'design for disassembly' purposes.
A second approach which is being investigated is the use of a dissolution process (Creasolv®). This process, based on green solvents, allows coating/paint layers to be dissolved or delaminated. This debonding process can be applied to conventional products. By choosing a more easily dissolvable coating layer during the design phase, the debonding process at end-of-life can be facilitated.

From the perspective of MultiCycle, sustainable process and product design thinking needs to take a whole life perspective. It's no use, for example, replacing the environmental harm of plastic waste with emissions from inefficient energy recovery options, or losing value by downcycling plastics to lower grade applications which ultimately fail to prevent further consumption of primary materials. That's why MultiCycle is targeting closed loop recovery of near virgin-quality recyclates from multimaterial plastics: materials whose necessarily complex design (needed for functionality) makes them particularly challenging to recover materials from both technically and economically using existing recycling routes. Designing an industry-ready process to meet this challenge involves combining innovative process chemistry and advanced control systems. To help keep process designers' "eyes on the prize" MultiCycle partner Britest champions the use of visible sustainability driver prompts when building conceptual whole process representations used early in the MultiCycle design thinking. —

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