eLECTRO
A PROCESSES4PLANET SUCCESS STORY

A Revolutionary Approach to Plastic Waste Recycling

Context

Plastic waste is a major environmental concern in Europe, with millions of tonnes generated annually. Less than 10% of the plastic waste is recycled, while a significant portion is incinerated or landfilled, with serious environmental and health consequences. The remaining plastic pollution contributes to ecological damage, including marine pollution and microplastic contamination.

eLECTRO: A Processes4Planet Project

Funded by Horizon Europe under a **P4Planet** call, eLECTRO (**full title** *Electrified conversion of plastic waste into olefins & downstream integration*), coordinated by Prof. Kevin Van Geem (UGent) is an ambitious project aiming to demonstrate a new technology to turn plastic waste into valuable chemicals, like olefins, while reducing greenhouse gas emissions. The focus is on plastic waste that is not mechanically recyclable, such as mixed polyolefins MPO with higher impurity (which usually ends up burnt or landfilled). The project kicked off on 1st September 2022, with a timeline of four years.

Goals and Vision

The project uses a modular extruder to prepare plastic waste and an electrically heated reactor to break it down into oil. The oil is then used in a steam cracking process to produce light olefins—key ingredients for plastics like PE and PP. The efficiency of the process is increased by the use of a new type of reactor—RotoDynamic Reactor™ —which speeds up heat transfer and improves product quality. **The goal is to show that plastic waste can be used as a renewable resource, reducing emissions by 90% compared to current technologies.**

Testing, Industrial Integration and Potential Impact

The potential impact of eLECTRO is substantial. Initial life cycle analysis (LCA) results indicate that the project **could reduce GHG emissions by up to 90% compared to the current best available technologies (BAT)**. Additionally, its scalable design fosters replicability.
The eLECTRO project aims to demonstrate fully electrified technologies at Technology Readiness Level (TRL) 7, focusing on sustainable pyrolysis oil production. The process is scaled up from pilot plant level (TRL 5 in Pryme's R&D centre in Ghent, Belgium) to demo plant level (TRL 7 in Rotterdam, the Netherlands), explained the scientific coordinator, Dr. ir. Azd Zayoud.

Furthermore, eLECTRO seeks to achieve at least a 60% reduction in GHG emissions in the plastic lifecycle by utilising a 45/55% renewable/grid electricity mix. Ultimately, transitioning to 100% renewable energy could push emissions reductions to an impressive 90%, with the process reaching just 0.2 t CO_2-eq per tonne of olefins.

The innovative technologies within eLECTRO are already undergoing real-world testing across multiple organisations.

- **VTT** is developing the MODIX extruder, which processes MPW (Mix Plastic Waste) into small, impurity-free pieces. This unit will be integrated into Pryme's existing plant.
- **Pryme** has constructed its Pryme One demonstration plant—operational since early 2024.
- **Coolbrook** is leading the RotoDynamic Reactor™ development, successfully completing its first phase of pilot tests.
- **Borealis** will integrate the pyrolysis oil into its downstream plastic value chain at its IHQ facility in Linz, currently undergoing its final commissioning and startup phase.

A Collaborative Success Story Promoting Diversity and Inclusion

'First positive results are already being achieved'

Asked about what makes eLECTRO a success story from her perspective, the Project Manager, Dr. ir. Elisabeth Delbeke from UGent, explains that what makes the initiative stand out is its comprehensive approach and its strong partnership network across the plastic value chain. *'Everyone is committed to the project,'* Dr. ir. Delbeke concluded. The Project Manager also stressed that the project was an ambitious one from the beginning, starting with very high targets. Although still young, the project, which is expected to end in August 2026, is already yielding promising results.

The eLECTRO consortium includes **five SMEs**: Coolbrook, ArtistEng, Pryme, AVGI, and Benkei.
Notably, women lead 43% of the project's work packages, showcasing a commitment to gender balance in leadership roles.

In terms of societal impact, eLECTRO addresses cross-cutting issues in the circular plastics economy by engaging in policy debates and academic discussions. The project coordinator, Prof. Kevin Van Geem, is actively involved in these efforts, particularly with regard to mass balance allocation and scenario planning. Some of the panel debates have been recorded and are available on the project's YouTube channel.

In a nutshell, what makes the eLECTRO project unique and world-class is its ambitious goal to offer real circularity to plastic waste. The project aims to transform plastic waste, which is typically incinerated or dumped in landfills, into valuable products like olefins and polyolefins through innovative technologies. By gathering a dedicated consortium and targeting worldwide impact (including waste streams coming from Asia), eLECTRO demonstrates a scalable and sustainable solution for the plastic waste problem.

A.SPIRE considers eLECTRO an inspiring success story and a significant step towards a sustainable future in Europe. By addressing the pressing issue of plastic pollution with an innovative circular solution and setting bold targets for reducing greenhouse gas emissions, eLECTRO has the potential to make a meaningful contribution to the circular, low-carbon economy, supporting Europe's industrial decarbonisation efforts.

Visit the eLECTRO website for more information.

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