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ReVise-UP – Recycling of plastic waste through intelligent material flow management

Resource-efficient Circular Economy – Plastic Recycling Technologies (KuRT)

The "ReVise-UP" project consortium is using sensor technology to accurately track the recycling of post-consumer plastic packaging. The aim is to develop perspectives and incentives for improved collection and recyclate quality. It also aims to increase process efficiency: sorting, processing, and plastic conversion processes shall be better adapted to fluctuating material flow characteristics, and the entire life cycle shall be optimized both ecologically and economically.

The project is part of the funding initiative "Resource-efficient Circular Economy – Plastic Recycling Technologies (KuRT)". "KuRT" is part of the BMBF research concept " Resource-efficient Circular Economy" and is aimed at high-quality recycling of plastics.

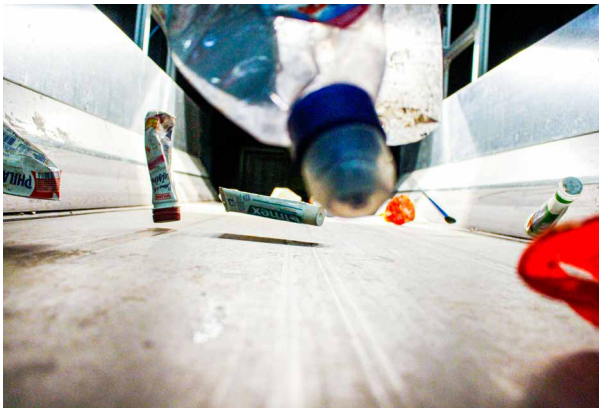
Innovative sensor technologies

At 3.2 million tonnes per year, post-consumer packaging waste is the largest plastic waste stream in Germany. However, the recycling rate is low: In 2021, only around 27 percent of post-consumer plastics were converted into recyclates, while only around 12 percent were used to substitute virgin plastics. One of the main reasons is that the recycling process often lacks information on process-relevant material flow characteristics. This is due to the high cost of manual, sampling-based material flow characterization.

The "ReVise-UP" researchers are using in-line sensor technology to automatically characterize post-consumer material flows. The aim is to improve collection and recyclate quality through more accurate material flow characterization; to efficiently adapt sorting, processing, and plastic conversion processes to fluctuating material flow characteristics and to create a solid database for a holistic assessment of plastic waste to better allocate technical investments, where they create the largest environmental and economic benefits.

Increasing transparency

"ReVise-UP" seeks to develop sensor-based monitoring for various process steps in plastic recycling. Using near and mid-infrared spectroscopy in combination with artificial intelligence methods, researchers in "ReVise-UP" aim to enable an automatic inline material flow characterization. In contrast to traditional, sampling-based characterization methods, the aim here is to achieve continuous monitoring of pre-concentrates from sorting plants. Based on this monitoring data, the aim is to promote optimized sorting and ultimately contribute to an improved overall quality of the plastic recyclates.



Plastic packaging is detected by sensors.

Higher yield through adaptive process parameterization

In addition, the researchers in ReVise-UP aim at developing the first prototypes of adaptive process parameterization in sorting, processing, and plastic conversion plants. Improved process feeding and adaptive parameterization of preconditioning units shall increase process efficiency in sorting plants. In addition, sensor-based material flow monitoring in plastic processing plants shall enable more precise addition of additives and optimized fine-tuning during compounding.

With view to the entire life cycle, it is being investigated which sorting and processing depths in sub-processes

– for example, sensor-based sorting – are ecologically and economically advantageous. A particular focus will be on how the targeted coordination of processes can minimize the overall energy consumption and operating costs. The researchers are also interested in the influence of product design on the respective process. In addition, "ReVise-UP" will develop an incentive model to implement the optimization steps throughout the value chain.

The "ReVise-UP" research project, coordinated by the Department of Anthropogenic Material Cycles at RWTH Aachen University, involves eight partners from academia and industry.

ReVise-UP increases the recycling of post-consumer plastic packaging waste.

Funding initiative
Resource-efficient Circular Economy – Plastic Recycling Technologies (KuRT)

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