Control of household waste sorting by artificial intelligence

Publieke samenvatting / Public summary

Aanleiding

The Dutch government's “Nederland Circulair 2050” strategy aims for a fully circular economy by 2050, with plastics as a key challenge due to their complexity and low high-quality recycling rates (15%). The National Growth Fund programme for Circular Plastics supports innovation in sorting, (chemical) recycling, and market development. Packaging waste, the largest plastic stream, is targeted for improved recovery through object-based sorting. Current sorting methods lack real-time feedback, leading to loss of valuable materials like flexible packaging. The ChowsAI project introduces in-line monitoring and control using AI, to enable real-time quality control, reduce waste, and enhance recyclate value—supporting circularity and sustainability goals.

Doelstelling

The goal is to maximize the value-in-use (VIU) of waste sorting outputs, especially lightweight packaging waste (LWP), by developing key tools. The proposal focuses on: 1. Fully automated material characterization using AI vision and spectral tech for stream composition monitoring. 2. Real-time population balance via AI/HSI-based stream analysis. 3. Predicting quality parameters of plastic outputs for fast, cost-effective VIU assessment. 4. Enhancing asset use by linking real-time data to process control, optimizing sorter settings and reducing disruptions. 5. Demonstrating inline monitoring and control in a digital twin for industrial-scale sorting, enabling continuous

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improvement.

Korte omschrijving

WP1 tests and combines RGB, NIR, MIR, Raman, and XRT sensors to improve waste sorting efficiency and detect process-disrupting objects. It aims to replace manual checks by AI-driven systems and define optimal scanning conditions for recycling cost, speed and accuracy. WP2 uses detailed data from stream analysers and sorting machines to uncover process improvement opportunities. It focuses on identifying quality fluctuation factors and supports the development of a control dashboard and digital twin. WP3 develops a live dashboard to optimise sorting by balancing quality and recovery. It predicts disruptions, advises operators, and improves process stability. Trials at NTCP will guide adaptation for production use, with results translated and evaluated in an industrial plant (Omrin) and shared in a report. WP4 develops a digital twin for NTCP's sorting facility—a real-time, AI-powered platform to showcase process optimisation with the aim benchmark and optimize industrial sorting plants. It will be tested on various waste streams, refined with advanced sensors, and shared via a white paper highlighting key results.

Resultaat

The project aims to advance plastic waste sorting through several deliverables: 1. A technical report comparing AI vision/spectral analysis with manual methods, recommending the extent manual checks can be reduced. 2. End-user validated measurements on three sorted plastic streams. 3. Public report on industrial-scale process data (NTCP, Omrin, LyondellBasell) showing quality and recovery improvements. 4. A process dashboard with sorter settings and alerts for disruptive inputs, demonstrated at NTCP. 5. A pilot digital twin for real-time population balance at NTCP that can be used to optimise industrial plants. 6. A white paper on overcoming technical barriers in sorting to support a mature raw materials market. 7. Demonstration events to showcase project outcomes to stakeholders.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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