Federal Ministry of Education and Research

FONA Research for Sustainable Development BMBF

EmiStop – Microplastics in Industrial Wastewater

Plastics in the Environment – Sources • Sinks • Solutions

Industrial wastewater is one of the entry routes for microplastics into water bodies. However, little is known about how many of these tiny plastic particles are actually found in the wastewater of different industrial sectors, how their emission can be avoided and which effective purification technologies exist. The EmiStop joint research project aims to provide answers. For the first time, partners from industry and science want to compile reliable information on plastic types in various industrial wastewaters and their concentrations. In addition, they want to develop measures adapted to the respective industry so that microplastics do not get into wastewater in the first place or can at least be efficiently removed from it.

Detecting Microplastics in Wastewater

Microplastics in industrial wastewater presumably originate mainly from plastic pellets, which serve as a base material for plastic products, and from synthetic fibre abrasion during the processing and washing of synthetic textiles. Therefore, the project partners are initially investigating wastewater from companies that produce, transport or process plastics and from industrial laundries. In addition, other industries are systematically examined and evaluated to obtain a comprehensive overall picture of industrial plastics emissions.

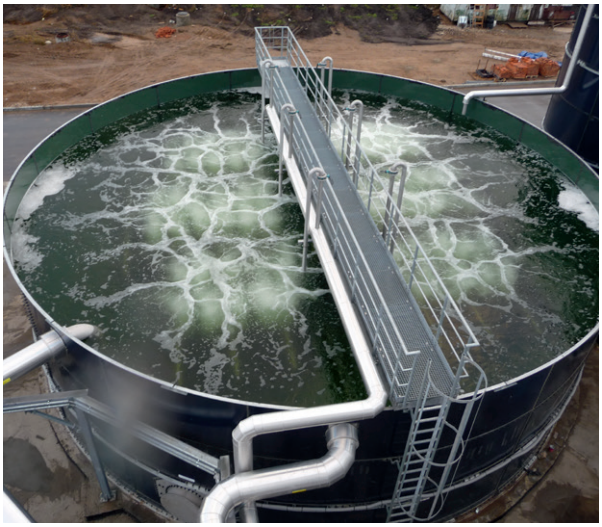
The researchers use two new methods to analyze the wastewater samples. The first is dynamic differential calorimetry, which they use to determine the type of material and the actual concentrations of plastic particles. This analytical method is used as a standard for e.g. quality assurance in plastics production, but at present less so for the analysis of environmental samples. Raman spectroscopy, on the other hand, can be used to simultaneously identify plastic particles and determine the particle numbers and sizes.

Limiting Emissions at the Source

In order to avoid microplastics emissions in the first place, EmiStop first looks at the industrial plant itself. It examines where the particles have the potential to enter wastewater. Together with companies, the project participants are looking for ways to reduce such pathways along the value chain, ideally through an internal recycling of plastics. To ensure that such avoidance strategies and adapted processes for wastewater treatment are actually implemented, EmiStop also engages stakeholders from science, associations and other interest groups. An expert survey is to provide information about technical and regulatory framework conditions that promote or hinder the measures.

Improving Retention in Wastewater Treatment Plants

If emissions cannot be avoided, microplastics have to be removed from wastewater by suitable cleaning processes. EmiStop examines which technologies are suitable for a specific industrial wastewater. For this purpose, established processes for wastewater treatment are analyzed and optimized for the elimination of microplastic particles. In addition, the researchers are developing new flocculants that are adapted to different plastic types and can retain microplastics more effectively in wastewater treatment plants.



Industrial wastewater being treated in an open reactor.

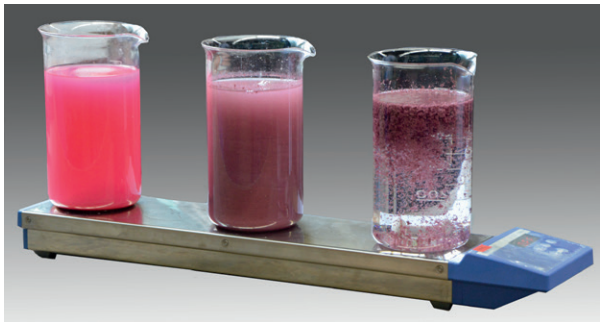
EmiStop

Eine Initiative des Bundesministeriums für Bildung und Forschung

Plastik in der Umwelt

Quellen • Senken • Lösungsansätze

A novel tracer test is used in laboratory and pilot trials to evaluate the existing and developed technologies. The project partners are developing special tracer particles with the properties of plastic particles and an additional magnetizable core. These can then be easily removed from the wastewater using a magnetic separator, and their magnetic properties can be measured in terms of quantity. This way, researchers can demonstrate the efficiency of different purification processes in industrial wastewater treatment plants for the elimination of microplastics. And they can show the significance of industrial microplastic emissions into water bodies. In connection with new findings on the entry routes of microplastics, adapted strategies are needed for individual industry branches to avoid plastic emissions into water bodies. The new and optimized technologies should be applicable in industrial and municipal wastewater treatment plants.



Flocculation of microplastics (left: suspended microplastics; middle: the flocculation process; right: microplastic flakes rising to the surface).

Research Focus
Plastics in the Environment – Sources • Sinks • Solutions

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Identification of Industrial Plastic Emissions by means of Innovative Detection Methods and Technology Development to Prevent the Input into the Environment via the Wastewater Pathway (EmiStop)

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