



INNOVATIVE FILTER MODULE FOR THE SEPARATION OF MICROPLASTICS FROM WASTEWATER

Task

Microplastics are extremely small plastic particles with a diameter of $< 5 \text{ mm}$. They are deliberately added to cosmetic products such as peelings or soaps or result from natural abrasion and erosion, such as from tires. Such microplastic particles make their way into wastewater and cannot be completely separated out by regular sewage treatment plants. For this reason, new innovative water filters urgently need to be developed to prevent microplastics from entering the environment, thus protecting it from their growing threat.

Method

Within the SimConDrill project, a cyclone filter has been modified in such a way that microplastics of up to $10 \text{ }\mu\text{m}$ diameter can be separated from wastewater. To produce this filter, Fraunhofer ILT has developed a laser process with an ultrashort pulse (USP) laser that can drill $10 \text{ }\mu\text{m}$ diameter drill holes into the stainless steel filter elements. In advance, the drilling process was simulated to accelerate its development. Currently, the institute is developing and testing a process monitoring strategy to ensure that the filters are manufactured without defects. Above all, this strategy guarantees that all holes in the filter element are completely drilled through, which is essential for the filter to function efficiently and economically.

Results

Using the successfully adapted USP laser drilling process, the institute can produce suitable drill holes even in materials of up to $500 \text{ }\mu\text{m}$ thickness.

Applications

In wastewater technology, metal filters are not only suitable for filtering small particles, but also for taking samples for analysis. With the technology presented here, the plastic filters currently used can be replaced by laser-drilled metal filters. In addition, the micro-drilling of metal foils is also important for many other applications. Metal sieves and metal filters are used, for example, in biotechnology, medical technology or pharmaceuticals. If the process allows smaller and smaller hole sizes as development progresses, sterilization filters can also be produced.

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3 Schematic diagram of the cyclone filter,
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4 Processing of a metal foil by means
of USP laser drilling.