WORLD WIDE WEAVE

GKD: Playing a key role in the retention of microplastics

ODW 6 stainless steel mesh proves indispensable in both research and real-world applications

Whether by car, on foot, during daily personal grooming, or when doing laundry: plastic microparticles find their way into sewer systems and then into the oceans via rivers and lakes. According to estimates, some 2.5 million tons of microplastics – i.e. plastic particles less than five millimeters in size – are flushed into the oceans every year. In the battle against this global environmental problem, Germany's Federal Ministry of Education and Research (BMBF) initiated one of the largest research programs in the world with 18 projects on the topic of plastics. The aim is to research the origin, distribution, and effects of the microscopic plastic particles and have solutions developed to avoid their entry into bodies of water by 2021. In several of these projects, optimized dutch weaves (ODW) from GKD – Gebr. Kufferath AG, technological leader in the field of woven filter media, play a key role in terms of researching microplastics. They are proving to be a highly efficient solution, not just at sewage plant outlets but also for filtration of both mixed water and street runoff water.

60 years after the development of plastic, according to a current study undertaken by the International Union for Conservation of Nature *IUCN*, some 300 million tons of plastic are being consumed worldwide each year. In Germany alone, the annual per capita quantity of plastic waste is 25 kilograms, some 4 kg of which comprise microplastics. Abrasives in cosmetics, detergents, and cleaning products, as well as the fiber abrasion that occurs during washing and drying synthetic textiles, are also making a significant contribution to this. The abrasion of shoe soles is another key

source of microplastics. However, by far the greatest polluter in Germany is tire abrasion with 110,000 tons per year. Around a quarter of all microplastics that find their way into the oceans come from the outlets of sewage plants, while two thirds come from street runoff. The TU Berlin, together with a range of project partners, is addressing both of these routes of entry in two research projects. GKD is the only company from the processing industry to be integrated as a development partner in both of these projects. In the project entitled *Optimized materials and processes for removing microplastics from the water cycle* (OEMP), GKD is not only technology partner, but also project manager. To improve retention of microplastics in municipal waste water treatment operations, the key was to develop new filter media that can retain particles larger than 5 to 6 µm and also maintain the flow rates required at sewage plants. Due to their characteristics, the plastic media predominantly used here offer a maximum pore fineness of 15 µm – albeit with tolerances from 4 to 5 µm.

Real-world test at a sewage plant outlet passed with flying colors

On the basis of the tried-and-tested stainless steel optimized dutch weaves, which have also been in use in the water industry for quite some time, GKD developed versions of this metallic mesh range with filtration rates in the micro-filtration range that boast apertures of 8 and 6 µm. For example, ODW 6 achieves an absolute pore size of 6 µm with its woven pore structure. This allows system operators to reliably prevent any spherical particles larger than 6 µm from entering surface waters. Despite the impressive performance on offer, this ultrafine filter medium still guarantees the requisite water flow rate. Following numerous laboratory tests, these innovative high-performance meshes are successfully demonstrating their filtration efficiency for microplastic retention in real-world pilot systems at the Ruhleben sewage treatment plant in Berlin. According to studies, previous systems at modern sewage plants retained 98 percent of plastic particles. However, disc filters

with ODW fitted can significantly reduce the remaining proportion. When using the standard mesh ODW 20, the proportion of particulate material in the outlet water is already reduced to two milligrams per liter of dirt load. The ODW 6 meshes then reduce this by a further 50 percent, while maintaining a comparably high flow rate. This means that only one milligram of these filterable materials are then contained per liter of dirt load. Similar results were also achieved with measurements taken in combined sewage tanks at the Berlin waterworks, whose mix of street runoff water and untreated household wastewater represents the most demanding type of wastewater. The single-layer mesh design combines this excellent particle retention with a high degree of dirt holding capacity, low clogging tendency, good backwashability, and rugged mechanical strength. Unlike the plastic filters previously used, the ODW meshes produced from stainless steel wire are also insensitive to process-based abrasion, meaning that they do not cause any contamination due to abrasion.

99 percent particulate matter retention rate in storm sewers

The engineering and manufacturing expertise demonstrated by GKD in the OEMP project even provided sufficient motivation to incorporate the Düren-based filtration experts again in the follow-on project entitled *Tire abrasion in the environment* (RAU). Here, GKD took on the task of developing a sampling basket to facilitate investigation of the formation, nature, and entry of tire abrasion into street runoff thanks to defined fractionation of particulate material. This basket was modeled on the leaf collecting baskets used in standard street drains, which ensured its universal usability. Using the same dimensions, GKD developed a sampling basket whose core element is an integrated filter cascade. These "sieve stacks", each comprising up to six sieve pans that employ filter media of various pore sizes, make it possible to automatically record and test the various fractions of a complete rain shower – from a light drizzle, all the way up to real downpours – thanks to integrated

online measurement functionality. The ODW 6 mesh plays a key part here as well, as it secures retention of all particulate material larger than 6 µm. In total, GKD is making 40 of these sieve stacks available for the RAU project for testing in Berlin – on a six-lane highway that is used by 30,000 trucks and passenger vehicles every day, as well as on the test circuit of tire manufacturer and project partner Continental or on the runway at Berlin airport.

Cross-project expertise required in research and industry

Since these sampling baskets allow scientifically substantiated and thereby comparable sampling of the entire street runoff water to be guaranteed for the first time, various other companies and institutions have already turned to their inventor, GKD. With these sieve stacks, the filter specialist is also supporting the project entitled *Representative investigation strategies for an integrative understanding of systems used for specific entry of plastics into the environment* (RUSEKU) under the leadership of the Federal Institute for Materials Research and Testing (BAM) in Berlin. A well-known household appliance manufacturer also relies on these sieve stacks in its research activities for modification of its own devices and their processes.

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As a privately owned technical weaver, GKD - Gebr. Kufferath AG is the world market leader in metal, synthetic and spiral mesh solutions. Four independent business divisions bundle their expertise under one roof: Industrial Mesh (woven metal mesh and filter solutions), Process Belts (belts made of mesh and spirals), Architectural meshes (façades, safety and interior design made of metal fabrics) and Mediamesh® (Transparent media façades). With its headquarter in Germany and five other facilities in the US,

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South Africa, China, India and Chile – as well as its branches in France, Spain, Dubai and worldwide representatives, GKD is close to markets anywhere in the world.

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