

Woven Mesh Filtration Design Determined by Virtual Simulation

- By GKD – Gebr. Kufferath AG / GKD USA, Inc.

The demands on the filtration and separation media made by GKD – Gebr. Kufferath AG - GKD USA, Inc. are as varied as their fields of application. Whether in the plastics, oil and gas, chemical, pharmaceutical or food-processing industry, the woven meshes of the business unit SolidWEAVE are individualized technical solutions custom-designed to increase productivity and to improve quality. To stay abreast of constantly changing demands and increasing cost pressure on the users, GKD has collaborated with the Fraunhofer Institute¹ to further develop its GeoDict simulation software.

GeoDict is an integrated simulation environment for geometric woven mesh modeling and property prediction. The cooperation with GKD has extended the software to include the tool WeaveGeo. This program helps to simulate the structure and behavior of woven metal meshes under specific conditions, and thus configure mesh constructions that precisely meet the demands of the customer. The use of simulation techniques replaces or at least shortens the existing standard, time-consuming tests in which the mesh was first woven and then subjected to experiments and tests in the laboratory. "This saves us and our customers expensive development time and allows us to exactly predict the functional properties of our meshes a lot faster," Markus Knefel, engineer at GKD explains.

¹ Fraunhofer Institut
Techno- und Wirtschaftsmathematik (ITWM) in Kaiserslautern, one of the
research institutes of the Fraunhofer Society

Simulated mesh reality

The WeaveGeo software, which is specialized for meshes, allows the structure and behavior of SolidWEAVE's filtration and separation media to be determined under customer-specific conditions. In this way, porosity, bubble point, retention rate, filter service life and pressure drop can be reliably identified. To make the realistic mapping and simulation of meshes possible, computer tomography was used to develop 3D models of the meshes as the basis for the simulations in WeaveGeo. Relevant variables like wire thickness, pitch, deformation behavior and ovality of the wires are individually defined according to the particular application and mesh type. Stored in the program, these parameters map all GKD standard mesh types, thus enabling flow and filtration properties to be reliably simulated, and the findings to be used to further optimize and customize new mesh constructions.

The results that WeaveGeo supplies are extremely close to reality. Comparisons between results from the simulations and those from classic experiments show a minimal deviation of less than four percent. The mesh virtualization extension of the WeaveGeo tool and the findings it yields are already being used intensively at GKD in other business units. The advantages for the customer are – in addition to a better understanding of process through graphic 3D evaluations – the optimization of the meshes to be used, their precise configuration to the needs of the customer, and substantial reduction in development times and costs.

Promising future for special fibers

Especially for technically more demanding applications in the special fibers sector, the possibility of simulating real processes opens interesting perspectives. For years, GKD has been a leading manufacturer of technical meshes made of metals, plastics and other weavable fibers of all different kinds - as single or combined materials. Now, thanks to WeaveGeo, this wealth of experience can also be successfully transferred to technical meshes made of aramid, teflon, carbon or glass fibers.

Exciting prospects

The collaboration with the Fraunhofer Institute has been running since mid 2008, and will be continued. Extension of GeoDict to cover new fields of application of virtual material design and the calculation of additional properties like deformation of mesh under pressure are already in the development stage. "We see ourselves not only as a supplier of mesh but also as a partner and service provider for our customers, always there for them with advice and assistance in all questions relating to technical meshes and their use," says engineer Markus Knefel.

GKD – Gebr. Kufferath AG

With two divisions – WORLD WIDE WEAVE for technical meshes and CAPITAL EQUIPMENT for capital equipment and engineering – the owner managed technical weaver GKD is the world market leader for metal and plastic woven solutions. The division WORLD WIDE WEAVE comprises the business units SolidWEAVE for filtration and separation media, WEAVEinMotion for process belt technology and CreativeWEAVE for metallic fabrics for the architecture and design sector. The division CAPITAL EQUIPMENT, with its business units GKD-Delkor and KDCompactFiltration, sets international standards in capital engineering for clearly defined markets in the solid/liquid filtration sector. With seven production facilities – two of them in Germany, the others in the USA, the United Kingdom, Spain, South Africa and China – as well as a branch in Dubai, GKD is close to the market all over the world.

For help to optimize your filtration application using GeoDict and WeaveGeo software please contact:

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