WORLD WIDE WEAVE

Porometric mesh: the pore is the key

Three-dimensional high-performance woven metal mesh for more throughput at lower local pore velocities

In the framework of a comprehensive experimental study, the erosion behaviour of filter media for sand control in well pipes was investigated. Using supplementary CFD simulations, the global technology leader for woven filter media, GKD – GEBR. KUFFERATH AG, demonstrated the relationship between inlet face velocity and distribution of pore velocities. The insights gained through this computer modelling – that through higher volume porosity of the deployed filter media the local flow velocity in the mesh pore can be reduced – provided the impetus for GKD to develop a completely new mesh filter: Porometric mesh. The outcome is a very open three-dimensional mesh construction that, while maintaining a constant volume flow rate, further reduces local pore velocity by up to 40%, with throughput increasing by a similar factor. Properties like these represent unprecedented advantages for efficient oil and gas exploration.

A major factor for the profitability of crude oil and gas production is the ratio between production rates and well pipe life cycles. Typical weak points are the filter media deployed for sand control in the pipes, because the development of higher local pore velocities is most pronounced where the filter mesh has the smallest openings. As the inlet face velocity increases, so does the mechanical impact on the surface of the filter media due to the sand particles contained in the fluid, resulting in erosion through material abrasion. In the laboratory test, the erosion behaviour of plain dutch weave, twilled dutch weave and KPZ mesh (reverse twilled dutch weave) – each sample

having a pore size of 150 µm – was compared in terms of pressure drop, material loss and pore size. The plain weave mesh was not at all able to withstand the mechanical strain, and the twilled dutch weave failed – at a specific erosion level of 0.63 percent – when sand began to penetrate the screen. Only the single-layer KPZ mesh held out for the full duration of the test, indicating a service life cycle expectancy of five years in the field. The reason for the success of the KPZ mesh was the higher volume porosity of its specific construction, which leads to a correspondingly lower flow velocity.

Double the permeability thanks to rectangular pores

On the basis of these findings and the tried and tested qualities of meshes from its YMAX® product family, GKD used computer simulation and design studies to develop a new mesh weave with significantly more porosity and air permeability: Porometric mesh. With a pore size of 150 µm, this new mesh type achieves an air permeability of 4,800 l/m²/s at a pressure of 200 Pa. In contrast, a plain weave with the same pore size only manages an air permeability level of 2,500 l/m²/s at 200 Pa. In other words, at the same volume flow rate, the significantly more open structure of the new mesh type almost halves the local pore velocity. The secret of this performance capacity is Porometric's innovative construction. Thanks to its 3-dimensional slot-shaped structure with rectangular pores, particles above the required cut point are quickly and reliably separated. At the same filter fineness, Porometric's higher porosity gives it a degree of permeability almost twice as high as other comparable mesh types. This unparalleled performance is also evident in the comparison with other filter screens available on the market. In spite of its high porosity of over 70 percent, this 3-dimensional mesh is extremely stable. Its open structure also offers advantages in terms of weight. For customers, the 30 percent lower grammage means significant savings, as the reduction in material consumption is reflected in lower production costs. Using CFD simulations, GKD configures the Porometric

mesh to match the specific operating conditions of each individual well. For example, in the case of particularly abrasive operating conditions, GKD uses abrasion-resistant materials instead of standard 1.4401 stainless steel in custom-configured hybrid constructions of Porometric mesh.

One layer less thanks to 3D structure

Due to the specific weaving process, Porometric has a ribbed structure which, in the specific case of deployment in oil and gas exploration, yields an additional advantage. In the conventional structure of the basepipe – four layers consisting of a drainage layer, the filter screen, a second drainage layer as a spacer, and, finally, a perforated plate – Porometric also takes over the function as the spacer upstream from the perforated plate. In the laboratory test, GKD demonstrated that, when Porometric is deployed as a filter media instead of plain dutch weave mesh, the drainage layer between the filter screen and the perforated plate can be dispensed with – without in any way compromising the permeability of the array. For customers, the cost saving which results from dispensing with the intermediate drainage layer is further convincing proof of the high efficiency of Porometric mesh for sand control in oil and gas exploration. With these multiple advantages, GKD's high-porosity Porometric mesh relegates all plain dutch weaves to the rear of the field.

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GKD – GEBR. KUFFERATH AG

The owner-run technical weaver GKD – GEBR. KUFFERATH AG is the global market leader for metal and plastic woven solutions as well as transparent media facades. Under the umbrella of GKD – WORLD WIDE WEAVE the company combines three independent business units: SOLID

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WEAVE (industrial meshes), WEAVE IN MOTION (process belt meshes) and CREATIVE WEAVE (architectural meshes). With its six plants – including the headquarters in Germany and other facilities in the US, South Africa, China, India and Chile – as well as its branches in France, Great Britain, Spain, Dubai, Qatar and worldwide representatives, GKD is never far from its customers.

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