It's all in the mix: wire mesh as composite mesh

The future belongs to intelligent material combinations

by Hans Schlebusch

The chemical, pharmaceutical, automotive, aerospace and offshore industries: efficient filtration technology is a vital part of complex production and processing in almost every sector. However not everyone is aware that the required efficiency and reliability in complex filtration processes are often only possible with wire mesh. Wire mesh is often associated solely with its best-known application - *screening*. The world-leading technical weaver GKD - Gebr. Kufferath AG – was one of the first to recognise the potential of woven media for critical tasks in process technology. As a result they specialised in the development of optimised process-specific woven media as high-tech structures. Process industries worldwide are increasingly utilising the significant advantages of made-to-measure filter media which are making processes a great deal simpler, more efficient and more reliable thanks to new material combinations and weaving technology.

The received wisdom is that wire or sieving meshes are woven structures made of monofilament metal wires and used for screening processes. Textile meshes, it is thought, are made of synthetic or natural fibres. Metal generally has no place here. The traditional

weaving machine technologies and fields of application are correspondingly diverse. Therefore the substitution of textile meshes by wire meshes or vice versa is often impossible. For a long time processing companies at the planning stage could only choose between these two starting materials and their specific advantages. In practice, however, the ideal was more often a combination of the properties of both materials and weaving technologies. An insight that quickly matured at GKD and was further developed into cutting-edge technological solutions based on wire mesh as a composite mesh.

Mesh up and running

As early as the 1960s GKD got this concept up and running with a combination of monofilament wires and stainless steel cables. This resulted in the creation of flexible meshes that soon became indispensable as conveyor and process belts in numerous applications. The basis for this innovation were the decades of accumulated know-how as wire weavers that successfully met the challenge to weaving technology set by the extremely varied behaviours of wires and cables. The machine technology and above all the weft insertion systems had to be adapted to the very divergent behaviours of the media with regard to the flexibility and stretch performance. Almost simultaneously GKD developed a weaving technique for synthetic monofilament wires made of polyester and polyamide and thereby also broke new ground for a metal weaver. For these meshes synthetic monofilaments were woven with the diameters common for stainless steel wires of between 0.2mm and

1mm. Here too the very different material behaviour with regard to stretching and stability – compared to metal wires of the same diameter – demanded the development of a suitably-adapted weaving technology.

A woven contradiction: flexible and stable

With the development at the start of the 1970s of Duofil-mesh made of monofilament wires and rods of stainless steel and polyester or polyamide, GKD achieved the next milestone in filtration and process technology. As endless filter belts for dewatering applications they were the first to combine the material advantages of synthetics such as flexibility and surface smoothness with the mechanical stability and transverse rigidity of stainless steel meshes. This combination leads to radically improved service lives despite the load on fast-running plants caused by constant flexural fatigue and narrow roll radii. The design of polyester wires in the warp direction and high-strength stainless steel wires in the weft direction ensures reliable flatness without creasing and allows very open structures with a high open screen surface. Compared to purely synthetic meshes of a similar size the substantially increased through-flow improves the belts' efficiency in gravitational dewatering.

An intelligent combination: mono- and multifilaments

The continual assessment of materials and their specific possibilities led GKD to develop its YMAX® filter media at the end of the 90s. Up until then mechanical robustness and excellent filtration rates were considered irreconcilable, as high retention rates require mesh

geometries with very thin wires. As a result GKD developed a completely new kind of mesh structure made of mono- and multifilaments. Its multi-layered woven structure of stainless steel wires and metallic fibres made possible hitherto-unknown filter rates up to 3 µm in applications with high mechanical stress such as large-scale backflushing filters or centrifuges. Porosity up to 60 per cent, mechanical stability, flexibility, high throughput rates with minimal differential pressure and absolutely uniform pore distribution makes the new fibre-wire structure the universally-deployable filter medium for solid/liquid separation in the 20-30 µm range. Shorter filtration times and reduced use of filter aids are further advantages of YMAX® filter media. The success of these two- and three-ply structures made solely of metal materials was transferred to a growing range of utilised materials. A constant range of new high-performance textile fibres such as PTFE, glass, aramide, ceramic or basalt fibres has been combined by GKD with the stainless steel wire basic structure by means of correspondingly adapted weaving technology. The technical weaving mill is now looking to incorporate all weavable materials into a composite mesh. As a result they are devising application-specific solutions that were considered impossible just a few years ago. For example GKD is developing cost-effective mesh designs using intelligent material combinations. Material combinations using PTFE are proving themselves in high-corrosion applications. Within the high temperature range designs featuring heat-resistant metal and ceramic materials are showing great potential. The combination of conductive stainless steel media and non-conductive polymer materials is yielding important results, the

significance of which is often greatly underestimated: these material combinations open the way for filter media which are not electrostatically charged and can therefore be used to handle problematic filtrations such as solvents in particular. Furthermore these electrostatic properties improve the filtration and flow mechanisms in liquid and gas filtration.

Progress in new directions

The consistent expansion of the material range, new structures and the constant adaptation of the weaving technology to the associated challenges are characteristic of the integrated solution expertise of GKD's SOLIDWEAVE business unit. As a developer and manufacturer of high-precision meshes, optimised for the individual customer, the business unit is a world-leader in the most varied sectors and fields of application. Close cooperation with the customer and technical requirements result in tailor-made high-tech woven solutions which are far removed from the classic sieve: technical mesh with intelligent added value through efficiency and progress in new directions.

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GKD – WORLD WIDE WEAVE

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, 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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