



WORLD WIDE WEAVE

30 months in continuous operation and still no end in sight

GKD: Special twilled weaves lay down a convincing performance in fumaric acid production at ESIM Chemicals

Reducing maintenance costs and increasing process reliability: with these objectives in mind, ESIM Chemicals conducted a detailed analysis of the Funde filters they have been using for many years in their large-scale fumaric acid production. In addition to changes to the technical settings of the apparatus, the screening of the disc filters was re-designed in terms of weave, material and finishing. For this, ESIM Chemicals turned to the experts at GKD – Gebr. Kufferath AG, an internationally sought-after filtration specialist and manufacturer of high-performance filter meshes for a wide range of application fields including the chemicals industry. Since completion of the measures, typical filter lifecycles of four to six months have become a thing of the past. The new disc filters have been in continuous operation for 30 months, and there is no sign of their lifecycle coming to an end anytime soon. The outcome represents a significant improvement in process reliability and a reduction of maintenance expenditure.

ESIM Chemicals has its headquarters at the Linz Chemical Park, one of the biggest industrial districts on the Danube. With two business units, this Austrian company specialises in the production of chemicals for the agricultural sector (excluding synthesis products) and in the manufacturing of so-called intermediates. Of the latter, basic intermediates play a key role. They include products made from maleic anhydride (MAN). The maleic acid required for this is produced from *n*-butane. In turn, an integral part of MAN



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production is the manufacture of fumaric acid. Both MAN and fumaric acid are basic ingredients in high-grade chemical intermediates with a variety of applications. Fumaric acid is used as a component in numerous chemical processes, for example, as an intermediate for paints and lacquers, or as an acidifying agent in the food-processing industry. It is also one of the standard raw materials for animal feed formulas – primarily as an additive in breeding and fattening.

Process availability as the challenge

Maleic and fumaric acid production runs as a continuous process at ESIM. If the filter breaks down, this has consequences for the whole plant. It is not without reason that filters rank as a classic bottleneck for the complete process. ESIM Chemicals has always relied on a Funda filter in this process. A filter pack with 28 disc filters, each one metre in diameter, performs a crucial task. But the management system at ESIM Chemicals, highly focussed on cost control, has long since identified the Funda filter as a major cost driver. Over the years, unsatisfactory process reliability, not to mention high maintenance expenditure, has led to diverse optimisation measures. The external apparatus was completely exchanged, the lower shaft sealing straightened and the container optimised. But this brought with it an increasing load on fumaric acid production at ESIM Chemicals. While, for years, the typical lifecycle of the filter had been three to four months, it shortened further and further until finally achieving a negative record lifespan of just three weeks. In some cases, quality control established the presence of activated carbon in the next stage of the process. Responsible members of staff monitored the correct operation by testing for clouded filtrate at the filter. Whenever the filtration results were bad, the filter had to be taken apart and the filter pack replaced. This led not only to a downtime of several hours but also to additional costs for man hours and materials. Neither replacing



the Funda filter with another apparatus nor procuring a second filter was a feasible option because of the very confined space conditions in the production hall.

A perfect combination of process engineering and filter mesh

The engineers in charge therefore chose a combined approach as a solution to the problem. In addition to the process-related support of a Funda filter expert recommended by the filter manufacturer MAVAG, they decided to have the filter pack optimised by GKD. The complete filter process was subjected to testing. Specialists from MAVAG and GKD discussed questions like opening and closing speed of valves, speed of heat and cooling runs, rotation speed of the disc filters, shaft seal purge or the sealing of the hollow shaft. After thorough examination by the various specialists, all the ideas were evaluated and a plan of action was drawn up. Numerous changes to the technical settings followed. For example, flushing durations were changed and pressure exchangers were removed during switching of the valves. Using detailed descriptions of the filtration process provided by ESIM Chemicals, GKD's experts managed to pinpoint the reason for the increasingly frequent breaches of the stainless steel mesh that had been used in the filter so far. The fumaric acid solution, mixed with activated carbon, is filtered at boiling point – at a rate of about 6,000 litres per hour. Since the filter is operated in batch process, the acid with a pH of 3 regularly resides for a certain period of time in the filter. Before it is centrifuged, the filter cake is dried with process steam at a temperature of about 150°C which is fed in at a pressure of seven bars through the casing of the filter. These aggressive chemical and physical conditions have a massive impact on the twilled dutch weave mesh made of standard stainless steel that was used so far to screen the disc filters. GKD therefore recommended changing to a stronger KPZ mesh with a geometric pore of 60 µm made from a special



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material with a modified weave and finish. Screening of the disc filters with this particular mesh construction requires special know-how, which GKD passed on to the responsible master mechanic at ESIM Chemicals in an intensive training course at the mesh manufacturer's headquarters in Dueren. There he learned the techniques of hot screening and screening with round plates of filter mesh – handwork skills that serve him well in his daily routine at the works in Linz. In view of the available tools at ESIM Chemicals, the Austrian company decided in the end on the procedure of cold screening with folded back outer edges. Instead of flat cuts, ESIM Chemicals now gets already folded back round plates of KPZ-Microdur mesh that only need to be placed on the filter plate and tightened around the edges. Parallel to the process-related optimisation of the Funda filter by the expert nominated by MAVAG, all 28 disc filters were replaced. During the exchange, GKD also renewed the support mesh. The master mechanic carried out the screening of the first disc filters with the new mesh at GKD's headquarters under the guidance of specialists in process-optimised filter media. For the rest of the disc filters, he was able to apply the know-how acquired in Dueren back home in Linz. Within five months, the whole optimisation process had been completed, from first contact right through to start-up of the filter. The result is an impressive confirmation of the efficiency of the measures implemented. The filter pack has been in operation for over 30 months now. The new mesh construction of high-grade stainless steel performs convincingly in terms of stable filtration, efficient cleaning processes and – considering the challenging operating conditions – a record-breaking lifecycle. ESIM Chemicals is more than pleased with the partnership with GKD. The technical expertise demonstrated by the Dueren-based technology provider in designing the filter media to meet the chemical, physical and thermal demands of acid production was a substantial contribution to the success of the project. This, along with GKD's competent



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consulting and support, is a striking endorsement of the value of the long years of positive cooperation.

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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 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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