WORLD WIDE WEAVE

Large-scale benchmark test at the Bad Salzuflen sewage treatment plant:

Filter belts made of mesh and spirals in tough day-to-day operations

Located to the east of Bielefeld, the spa town of Bad Salzuflen boasts nine saline thermal springs. These are one of the key reasons behind the region being nicknamed *Germany's Healing Garden*. However, the extremely hard, high-chloride water causes bad calcification on the belt presses and makes secondary clarification difficult for the sewage treatment plant in the town that is home to almost 60,000 residents. This is why wastewater manager Robert Erzenjak keeps such a close eye on the throughput and service life of the filter belts used for mechanical sludge dewatering. In comprehensive series of tests performed on two identical filter belt presses operated in parallel, he compared filter belts from the OEM against type 5090 mesh belts with PAD-15 seam and two innovative spiral belt types from GKD – Gebr. Kufferath AG in day-to-day operations. Both spiral belt types – one with round and one with flat filler wires – impressed during dewatering of the problematic sludges. The throughput that is consistently 38 percent higher, coupled with lower maintenance costs for the systems and an unsurpassed service life speak for themselves.

The Bad Salzuflen sewage treatment plant originated in 1914 as an Imhoff tank for clarifying sewage. From the 1960s up to 1993, the current sewage plant was continuously expanded and updated in the course of regional reforms with connections to seven districts, increasingly strict legislation, and advancing development of wastewater technology. The annual cleaning performance is up to four million cubic meters of wastewater and 3,800 tons

of sewage sludge. Since completion of the work to increase capacity to 96,000 population equivalents (PEs), the sewage plant has three cleaning levels distributed over a 100,000 square meter site. To handle upcoming inspections or any potential malfunctions, the rake system, grit collector, aeration basin, and final clarification basins are each arranged in two lines. The Holzhausen district operates a dedicated sewage treatment plant for 8,000 PEs, whose aerobically stabilized sludge is then supplied to the main sewage treatment plant for further processing. The treated water flows into the Werre, a tributary of the Weser. The maximum cleaning performance of the sewage treatment plant is 771 liters per second. In 2018, the average daily treatment was 6,500 cubic meters. The pH value of the water in the inlet pipe is between 7.5 and 8.5. However, the 20 °dH degree of hardness is problematic and causes heavy calcification in the filter belt presses. The perforated rollers typically found in filter belt presses get clogged by the lime contained in the turbid water, which is pressurized to 40 bar. The water then gets inside the machine, where it calcifies the components. The lime deposits cannot be removed from the perforated rollers using high-pressure cleaners. It is also not possible to use acid for cleaning, as it would damage the 22 zinc rollers of the roller register. Without the use of materials to prevent crystallization of the lime, the nozzles get so clogged with lime within just three weeks that they need to be replaced or cleaned at great cost. In winter, the dewatered sludge has a dry matter content of 21 to 22 percent, while in summer it reaches 26 to 27 percent. All of it is composted.

Seven-stage mechanical treatment

In the mechanical cleaning area, the wastewater passes through two fine rakes with five millimeter rod spacing and is then fed to the 30 meter long, 2 meter wide sand and grease trap. The elevator with three screw pumps – one of which acts as back-up, one as the base-load pump with delivery capacity of 220 liters per second, and the third with a flow rate of 440 liters

per second – transports the wastewater to the preliminary sedimentation basin. Due to the poor BOD/COD ratio, the volume of this sedimentation basin was reduced from 1,000 to 550 cubic meters to shorten the amount of time the water spends in the basin in order to achieve the necessary carbon exposure. The second preliminary sedimentation basin that was originally in place is used as a sludge piling container for the turbid water. The two smaller of the four aeration tanks are not used during the biological cleaning stage. Boasting a capacity of 7,600 cubic meters each, the large, rectangular basins offer sufficient volume for the wastewater volume processed. Nitrification and denitrification are performed simultaneously in the special surface-aerated basin. Eight surface aerators with 7.5 meter long rollers, whose rotor blades plunge 25 centimeters into the basin, ensure the necessary oxygenation. The propellers of four Flygt stirrers ensure that the biomass does not settle. In the aeration phases, bivalent iron is added as a precipitating agent to bind the phosphate. The outlet of the aeration tank flows via a distributor structure into the two final clarification basins with diameters of 47 and 35 meters respectively – the latter with a Coanda Tulip. Here, the deposited and thickened activated sludge is raised using two screw pumps and then transported either into the sludge treatment plant or back into the aeration tank. The treated wastewater travels via a serrated weir to the filtration area. Flocculant is added here and the mix is pumped upward using a screw pump, so that it can then flow down and through the eight filter chambers, each with an area of 26 square meters. There are three screw pumps in place on site which are used in weekly rotation. Just one of these is in operation at once, while a second can also be engaged as and when necessary, and the third serves as a back-up. Some 1,500 nozzles in the filter floor, as well as a 60 centimeter thick sand layer and a one meter thick anthracite layer filter the treated water before it is fed to the 25,000 cubic meter fining pond and ultimately introduced to the Were.

Pre-dewatering susceptible to failure

The raw sludge produced – 192 cubic meters per day – is fed to two parallel digestion towers, each measuring 24 meters high, for sludge treatment. The methane gas that forms here is used to generate electricity and heat in the combined municipal heat and power plant on the sewage treatment plant site – following interim storage in a 400 cubic meter balloon-type store and a 500 cubic meter ballast store. This covers the entire heat requirement of the sewage treatment plant. The sludge, which is digested after 26 days, is thickened further in a 340 cubic meter static thickener and then homogenized with compressed air in a reservoir. The Bad Salzuflen sewage treatment plant has been using two filter belt presses for the mechanical dewatering process since 2007. These then dewater between seven and twelve cubic meters of sludge per hour with input moisture of three percent dry matter content to an output moisture level of between 21 and 27 percent dry matter content. Both throughput and dry matter content decline, particularly in winter, as the cooled sludge in the thickener is then tough to dewater. For many years, this situation was compounded further by the high susceptibility to failure of the belts supplied by the manufacturer of the filter belt press. Their bulging rubberized seam already started to display initial creases after just a few months of operation, which then quickly became large folds. Sooner or later, holes then began to appear due to abrasion by the scrapers, meaning that the belts needed to be replaced after just a short period of use. The creasing also meant that the plastic scraper blades had to be replaced two or three times per year, as they were worn down. In addition to this, the scraper blades needed to be cleaned several times a day, which led to additional costs. The lack of contact with the screen belt led to fibers getting stuck, which in turn led to unevenness at the blades.

Proven mesh belt against spirals filled with flat wire

The woven GKD 5090 screen belt with the PAD-15 seam offered initial relief here. After all, this belt has already proven its value in many other sewage plants employing the same filter belt press type. Used as a 1.70 meter wide and 18 meter long upper and lower belt, it also impressed at the Bad Salzuflen sewage treatment plant with its extremely flat seam. At a comparably high throughput, there was therefore far less creasing. "The belt represented a clear improvement. It worked really well from the start, did not suffer any faults, and continued to run for a long time," comments Robert Erzenjak, who used this belt type since 2017. These positive experiences then motivated him to agree to the comparison test proposed by GKD with two new, different spiral belt types offered by the process belt specialists. The spiral fabric belts also produced in-house by GKD excel through their exceptional dimensional stability. This is thanks to the particularly powerful stretching of the belts after joining. This produces notches on the seam wires, just like on a woven belt with the high impact pressure in the loom, which lend the spirals their particularly long life. This specific post-treatment also significantly reduces elongation of the belts, so that – unlike conventional spiral fabric belts – scarcely any readjustment is required by the tension rollers following installation. For Robert Erzenjak, combining the benefits of a seamless, moving dewatering belt with the transverse stability of a woven belt represented a promising alternative for further reducing the susceptibility to failure on the filter belt presses. The wastewater expert was initially somewhat skeptical as to whether his team would be able to mount and close the spiral fabric belt themselves without issues. However, this worry soon disappeared: "The team from GKD installed the first belt, and it was fascinating to note that you simply do not see any woven seam either at the start or the end of the belt," comments Mr. Erzenjak. His team then mounted the second set of spiral fabric belts themselves without any issues. In the first test, a belt press was equipped with type 5090 mesh belts with

PAD-15 seam and the second with the type S20-6508-370 spiral fabric belts made of polyester filled with flat wire. Both presses were equipped in parallel. After three months of use, the results spoke for themselves: thanks to their flat seam, the type 5090 woven upper and lower belts were less prone to failure than the belts previously used, which were provided by the machinery supplier. However, even the GKD belt displayed slight seam distortion. The spiral fabric belts filled with flat wire, on the other hand, are able to equalize the screen warpage, as the belts do not have a rigid seam. With a dry matter content of 21-27 percent, the GKD mesh belt type matched the dry matter content of the OEM belts. The spiral fabric belts performed slightly better than the GKD fabric belts. For Robert Erzenjak, however, the throughput of eleven cubic meters of sludge per hour achieved using the spiral belt type was simply sensational. "We have never hit this figure with the mesh belts supplied by the OEM nor with the GKD mesh belt type 5090," comments Mr. Erzenjak, full of praise.

A direct comparison on flat spirals and spirals with multiple wire filling

He was therefore very keen to see the results of the second test, which compared two different spiral belt types from GKD with one another: the type S20-6508-370 spiral fabric belt that is filled with flat wire and the type S14-6508-460 spiral fabric belt that is filled with four round wires. When examining the results, both spiral belt types displayed equally good performance. "The better dewatering performance of the GKD spiral fabric belts in contrast to the woven belts can already be observed in the feed area," explains Robert Erzenjak. The wastewater manager: "The baffles are intended to distribute the sludge and thereby optimize the dewatering process. In the past, this area always suffered from pronounced puddling.“ Unlike OEM mesh belts, the water drains very quickly with the spiral fabric belts, so the sludge is already significantly dryer at the end of the feed area. Since they were installed, both spiral belt types have been running without

any issues and deliver consistently high throughput: the spiral fabric belts with multiple filling for more than three months, the belts filled with flat wire for eight months – and thereby already more than twice as long as the belts supplied by the OEM. Robert Erzenjak is waiting in suspense to see just how long the spiral fabric belts will last. However, he is already convinced: "I have only positive things to say about these belts," comments Mr. Erzenjak in summary. "No seam distortion, absolutely no creasing, nothing gets torn or ripped," he adds enthusiastically. The fault-free operation also has a positive effect on the service life of the scraper blades, which have not needed to be replaced once since installing the spiral fabric belts. Since clinging fibers are also no longer an issue, the scraper blades no longer require cleaning. This saves a lot of time, as they previously needed to be cleaned several times a day. The throughput has held steady at eleven cubic meters sludge per hour since installation. "This would have been absolutely unimaginable in the past," remembers Mr. Erzenjak. With the previous belts, the throughput always dropped to eight or nine cubic meters per hour within just a few months. Although the operation was able to use backwashing to get the figure back up to eleven cubic meters for a time, the performance quickly dropped off again. This led to a situation in which the filter belt presses had to run non-stop 24 hours a day in order to get through the necessary volumes. "Since installing the spiral fabric belts from GKD, we have consistently been achieving throughput of eleven cubic meters per hour. This has enabled us to return to our regular eight-hour shift operation," comments Robert Erzenjak with a sense of satisfaction. However, the turbid water load is almost twice as high with the spiral fabric belts. For Robert Erzenjak, however, the increased content of sedimentable substances in the turbid water is not a disadvantage, as the water is stored in the sludge piling container and then fed back to the sewage treatment plant daily. He is excited to see the results of the pump test within the scope of the annual inspection and is confident that the lime deposits in the machine have also

been reduced through use of the new belts. As such, he feels certain: "The type 5090 mesh belt with the flat PAD seam is great. For our sewage plant, however, there is currently no better screen belt for mechanical dewatering than the spiral fabric belts from GKD."

14.893 characters incl.spaces

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.

For more information:
GKD – GEBR. KUFFERATH AG
Metallweberstraße 46
D-52353 Düren
Tel.: +49 (0) 2421 / 803-0
Fax: +49 (0) 2421 / 803-227
E-Mail: processbelts@gkd.de
www.gkd.de

Please send a reprint to:
impetus.PR
Ursula Herrling-Tusch
Charlottenburger Allee 27-29
D-52068 Aachen
Tel.: +49 (0) 241 / 189 25-10
Fax: +49 (0) 241 / 189 25-29
E-mail: herrling-tusch@impetus-pr.de