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FGD gypsum dewatering on vacuum belt filter systems

The biggest power stations in the world rely on VACUBELT filter belt technology

The future belongs to renewable energies. Experts agree notwithstanding that up to the year 2040 non-renewable energies will have 80 percent of the energy mix worldwide. After petroleum coal is in this context the world's most important fossil energy source. In the year 2015, it covered 29 percent of global primary energy consumption¹, in Germany more than 40 percent of domestic power generation. In 2014 every fourth kilowatt hour of power consumed in Germany came from brown coal². Domestic mineral coal production is on the decrease due to the expiration of subsidies in 2018. By contrast, significantly more mineral coal than brown coal is being produced globally. The flue gas formed by every coal burn is being scrubbed in an ecologically responsible way in flue gas desulphurisation plants (FGDP) inter alia. FGD gypsum emerges as a byproduct of this process – about 7 million tonnes annually just in Germany³. This base material is required in the construction and cement industry in very large quantities, e.g. in the manufacture of drywall. For FGD gypsum dewatering in vacuum belt filter systems the largest coal power stations in the world rely on filter belts of the VACUBELT[®] type from GKD – Gebr. Kufferath AG. Virtually every well-known plant manufacturer relies on the efficiency of these filter cloths too.



Benefits of state-of-the-art environmental standards

In the year 2015, 6.7 gigatonnes (= 6.7 billion tonnes) of hard coal (hard brown coal, mineral coal, anthracite coal) and 1 gigatonne of soft brown coal were produced across the world. The three countries that produce the most hard coal are China with (3.4 gigatonnes), followed by the USA (0.75 gigatonnes), and India (0.64 gigatonnes)⁴. Parallel to the constantly increasing production volumes, newly constructed power stations, station expansions and renovations are booming. It is the goal of these activities to increase the efficiency of the conversion of coal into electricity and to continue to decrease emissions through improved technologies for dedusting, denitrifying and desulphurising flue gases. One of these power stations of the future was unfolding in 2012 in Neurath in the form of two new brown coal power station blocks. Each of these power station blocks has a gross output of 4,414 megawatts and an efficiency factor of more than 43 percent. Its optimised plant technology is basically in line with the concept of the blocks already in place but takes much better advantage of the fuel used. As a result, they increase their efficiency by about 31 percent compared with the hitherto existing plants. Consequently, they greatly decrease gas and dust emissions as well. In this way, in the flue gas desulphurisation plant, for instance, more than 90 percent of the sulphur dioxide is separated and transformed into gypsum slurry. The subsequently condensed, 60-65 degrees Celsius hot gypsum suspension is dewatered in vacuum belt filters in a continuous process. This operation imposes tough demands on the mechanical, thermal and chemical capacity of the filter belt used.

Confirmed in a direct comparison

The core of the system for FGD gypsum dewatering in the brown coal blocks with optimised plant technology in Neurath consists of two 35 metre



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long and 3.50 metre wide vacuum belt filter installations from the international plant manufacturer FLSmidth. With a total filter surface area of 93 square metres each they are counted among the largest FGD belt filters in the world. For many years now FLSmidth has been relying on FGD gypsum filter cloths in VACUBELT[®] belts from GKD. This is why the two new blocks in Neurath were specifically equipped with the double-layered VACUBELT[®] 2025 filter belt. In this case, a twilled two-ply mesh made of polyester monofilaments with staple fibres is involved, whose reliability and efficiency Thomas Triebert, Senior Sales Manager Power/FGD, had already learned to appreciate at several other power stations. Still in the installation phase, however, as one of the belts at Neurath became damaged due to an accident in the plant, he selected the new VACUBELT[®] 2015 belt type made entirely of polyester monofilaments as a replacement. Thomas Triebert had been wanting a belt of this kind for a long time. When GKD was presenting the VACUBELT[®] 2015 at the ACHEMA 2009, he was one of the first plant manufacturers to put the technology to use, in a power station project at Tušimice in the Czech Republic. The mesh design with more pores per square metre with a smaller opening at the same time proved itself to be especially efficient even during this initial application. With greater air permeability, faster dewatering and the fact that the mesh did not block up and was easier to clean, the VACUBELT[®] 2015 outperformed the performance of conventional belts by far. This is why for Thomas Triebert the installation of this type of belt as a replacement at Neurath too was obvious. The test run of the systems began in 2011. There the gypsum suspension with 15 percent solids content is condensed in hydrocyclones and then with a solids content of 50 to 60 percent spread on the giant vacuum belt filters. The belt filters extract moisture at more than 90 percent from 81 tonnes of gypsum an hour – and doing so operating non-stop. The filtrate purity realised is under 0.5 percent with dry matter of



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eight percent. An efficiency which Thomas Triebert confirms in his estimation that the all-monofilament VACUBELT® 2015 has set new, groundbreaking standards for vacuum filter belts.

A trend recognised at the right time

An assessment that Detlev Stroncsek, Head of Sales Power Plant-Processing at ThyssenKrupp Fördertechnik (TKF), also shares. For him the VACUBELT® 2015 is "the state-of-the-art filter cloth which GKD, a highly innovative firm, has put on the market". Consequently, he too has been using this belt type in various vacuum belt filters for FGD gypsum dewatering since 2009 already: in the Rheinhafen-Dampfkraftwerk Karlsruhe, Datteln 4 and Maasvlakte (Netherlands) mineral coal power stations and in the Belchatov (Poland), Turcini (Romania) and Maritza II (Bulgaria) brown coal power stations. And he adds: "GKD not only introduced the innovative belt several years ago, but also impressed with extremely good results at competitive prices."

A host of operational advantages

Good reason for him to consider using this kind of belt at the Belchatov power station, for instance. With 12 blocks, this largest brown coal power station in the world supplies a total output of 4,400 megawatts of electricity. ThyssenKrupp Fördertechnik had already equipped six of the blocks in years past, of them four with complete belt filter systems and two with hydrocyclones. So it was not surprising that the leading firm in the FGD gypsum dewatering systems industry worldwide was commissioned with equipping the 13th block which is to produce another 850 megawatts of electricity. Three vacuum belt filters with 55 square metres of filter surface area each were installed here in 2011. TKF equipped all three with VACUBELT® filter belts. The 2015 belt type impressed Detlev Stroncsek



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immediately for several reasons: In addition to the high air flow rate and the dewatering effect optimised as a result, the polyester monofilament's thermal resistance is particularly significant. He cites the cross-stability and smooth belt surface as another advantage, whereby the belt can be easily cleaned by spray pipes in the integrated cleaning unit. Moreover, the smooth surface texture reduces the possibility of confusion because the cloth can be applied from either side. Thanks to its extreme mechanical sturdiness the VACUBELT® 2015 can be adjusted to a speed of operation in line with demand. An advantage that proves its worth with major flexibility in throughput times and nominal thickness as regards non-contract specific feeding quality for gypsum suspension in particular. Immediately the continuous density measurement detects aberrant solid matter concentrations in the flue gas scrubber, the system will automatically run faster or slower in order to achieve unalteredly good results. The spreader vanes typical of TKF systems in suspension feeding also ensure uniform spreading of the gypsum suspension and unvarying dewatering efficiency even at different speeds. Belt filters equipped with VACUBELT® 2015 belts reduce residual gypsum moisture permanently to under 10 percent and at Belchatov produce 45 tonnes of drier per unit per hour.

Established all over the world

With the exceptional efficiency of its VACUBELT® 2015, GKD was able to convince a considerable number of power stations in other leading coal producing countries too. In the USA more than 15 power stations with an output volume between 1 to 2.7 gigawatts are equipped with over 35 VACUBELT® belts on average every year. The all-monofilament VACUBELT® 2015 in the most common belt size there is 50 metres long and 3 metres wide and is an overwhelming favourite at the American coal power stations. But the two-ply belt types of the successful filter belt family



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are being used in the USA as well: The VACUBELT[®] 2025 with staple fibres and the VACUBELT[®] 2035 with multifilament weft wires are still sought-after solutions in America. In South Africa another top power station relies on GKD's belt technology: The Kusile mineral coal power station, located there at 100 kilometres east of Johannesburg, was equipped with high-performance VACUBELT[®] 2015 belts in 2011. With 4,800 megawatts of rated output, Kusile is ranked among the largest coal power stations in the world.

This mesh design has, for a few years now, established itself as a key element of FGD gypsum dewatering systems wherever state-of-the-art technology is used for maximum efficiency and process reliability. Leading plant manufacturers and operators opt for GKD's VACUBELT[®] 2015 vacuum filter belts even as original equipment. Consistently unvarying filter performance and stability without blocking up guarantee long service lives. Even with variable gypsum volume or quality the results remain unvaryingly good. High cross-stability even at large widths is essential for continuously efficient operation and guaranteed residual moisture. With that said, the all-monofilament VACUBELT[®] 2015 belt type is the belt of choice.

10,449 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



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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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FGD gypsum dewatering – the new generation

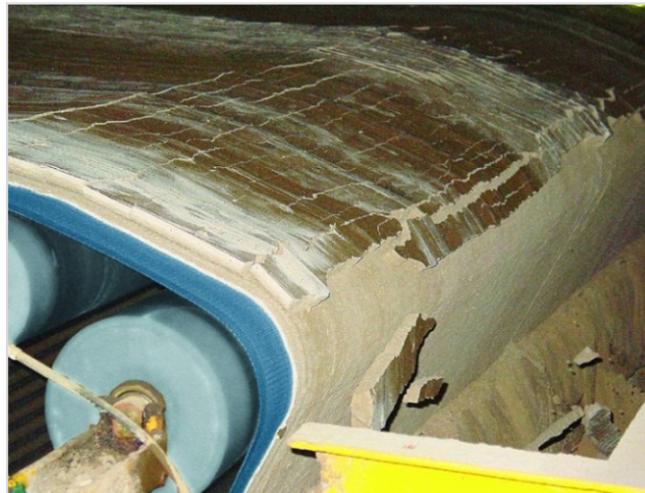
The biggest power stations in the world rely on VACUBELT filter belt technology



Picture 1-2: FGD gypsum dewatering system in Belchatov, Poland, with VACUBELT filter belts by GKD.



Picture 3: Belt filter for the new brown coal power station blocks with optimised plant technology in Neurath, Germany.



Picture 4: The dewatered gypsum dissolves from the belt.

Picture 1,2,7 © ThyssenKrupp Fördertechnik
Picture 3, 8 © FLSmidth
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Picture 6 © GKD/Rudi Böhmer

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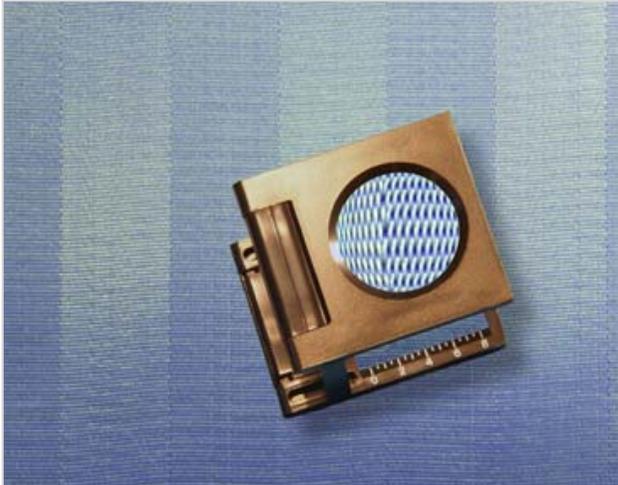
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FGD gypsum dewatering – the new generation

The biggest power stations in the world rely on VACUBELT filter belt technology



Picture 5: The new **Vacubelt®** 2015 has set new, groundbreaking standards for vacuum filter belts.



Picture 6: Visible from afar, the white plumes of power station cooling towers.



Picture 7: Detlev Stroncsek,
Head of Sales Power Plant-
Processing, ThyssenKrupp
Fördertechnik



Picture 8: Thomas Triebert,
Senior Sales Manager Power /
FGD, FLSmidth

Picture 1,2,7 © ThyssenKrupp Fördertechnik
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