

Energy-saving sugar beet pulp drying sweetens the production cost balance

Low temperature belt dryer with Conducto[®] belts in the sugar industry

Beet sugar production is a seasonal business. In just four months of each year, large-scale industrial plants process about 1.6 million tons of sugar beet. After the sugar has been extracted, the leftover beet pulp is dried and sold as animal feed. The dewatering process is extremely energy-intensive, and steeply rising energy costs are driving producers to look for innovative dryer solutions. The AGRANA sugar factory in Leopoldsdorf, Austria, has halved its energy consumption for beet pulp drying by switching over to a low-emission, low temperature belt dryer produced by the company Swiss Combi. This highly efficient dryer exploits previously unutilized waste heat from the sugar extraction process and thus cuts primary gas consumption for pulp drying by half. To ensure that their belt dryers are optimally efficient and gentle to the product, Swiss Combi uses woven mesh process belts manufactured by GKD – Gebr. Kufferath AG (GKD).

Once the sugar beets are sown in spring, the weather and soil conditions during the following months determine the sugar content of the beets. From September onward they are harvested and processed according to a very strict schedule, as downtimes cost money and, due to the enormous supply volumes, quickly lead to impossible storage problems. During the so-called sugar beet campaign, which goes from harvesting right through to pressing the beet pulp, the Austrian sugar producer AGRANA processes around

13,000 tons of sugar beet per day, or 25 truckloads per hour. On arrival at the factory, the sugar beets are washed and then cut into thin strips in slicing machines. The beet strips are mixed to a mash and heated to 70 degrees Celsius to extract the sugar content using water. The remaining beet pulp is then dried and pressed into animal feed. The huge energy consumption involved in this stage, about 50 MW, was reason enough for the operators of the Austrian plant to search for alternative dryer solutions. They found exactly what they were looking for in the low temperature belt dryers (LTD) proposed by the company Swiss Combi, which is headquartered in Dintikon, Switzerland. Since its foundation in 1959, this Swiss engineering company has specialized in the development, design and construction of industrial drying equipment for biomass. Depending on the specific application, they use drum dryers with indirect drying, low temperature belt dryers, or a combination of the two procedures. The first Swiss Combi LTD to be deployed in the sugar industry was installed eight years ago in France and, since the turnaround in energy policy, has been acclaimed as a particularly efficient solution. The configuration of this type of drying plant is always tailored specifically to the individual customer's needs. Customers also benefit from a special strength of the Swiss company, namely its ability to identify previously unexploited sources of energy in their processes and to use these to replace the primary energy for drying. Following in the footsteps of the wood-processing industry, sugar producers are now increasingly switching over to this procedure.

Flue gas instead of primary energy

Previously, the whole beet pulp drying process in the factory in Austria was performed in three drum dryers. To reduce the enormous energy consumption involved, the operators decided to replace one of the drum dryers with a completely encased LTD with three serially connected belt

dryers. About 250 tons of steel went into the construction of the dryer with its enclosure, which measures 15 meters wide by 60 meters long by 22 meters high. The dimensions of the three GKD Conducto[®] 5065 process belts for the drying of the beet pulp are on the same scale. They run one above the other in three storeys and each of them is 93 meters long and 7.20 meters wide. For the drying process, Swiss Combi exploits hitherto unrecycled process heat and boiler exhaust gas. A complex flue gas ducting system into the dryer structure is made possible by plant components developed by the Swiss company itself. Per hour, conveyor belts transport 100 tons of pressed beet pulp with a residual moisture content of about 70 percent into the dryer. There, feeding screws ensure that the pulp is evenly spread across the whole width of the belt with an overall height of several centimeters. The drying air, at about 60 degrees Celsius, is led through the layer of product and the woven polyester mesh belt. The air cools down and becomes saturated with moisture. Energy recovery is achieved using a condenser that Swiss Combi developed itself. Unlike in conventional processes, the substrate only passes through the LTD once, leaving it with a residual moisture content of about 45 percent. The pulp is then dried further to a residual moisture content of ten percent in a downstream drum dryer heated by natural gas. Residence time in the LTD, from entry to exit of the beet pulp, is about 10 minutes. The speed of the automatically controlled belts adapts itself to the volume of pulp being dried. To maintain the long-term efficiency of the plant, the belt is continuously brushed clean and regularly treated to high-pressure cleaning with 40 degrees Celsius hot process water in a belt washing device positioned above the belt.

Woven mesh structure ensures efficiency

The special mesh structure of the GKD Conducto[®] 5065 dryer belts makes a substantial contribution to the efficiency of the LTD. In spite of their small mesh aperture, the belts are extremely air permeable. Nevertheless, they can be relied on to retain dust. In combination with the excellent sealing of the plant enclosure, this particular belt property frees the sugar factory in Austria from any need for additional dust emission control. “That's a real bonus, seeing as emissions control in sugar production is a really significant cost factor,” explains André Wicki, the highly experienced product manager for low temperature belt dryers at Swiss Combi. To meet the stringent standards for noise protection, for example, a separate acoustic insulation was required that called for the installation of a silencer in the vent stack. The sheer size of the dryer is a real challenge for process belts. However, the endless, air permeable GKD polyester mesh belts with bronze wires woven in along their length have a structure that is robust enough to withstand the high level of continuous mechanical stress, even on the edges. “In spite of their enormous woven width, the Conducto[®] belts have excellent lateral stability, tensile strength, directional stability and long service life,” says André Wicki in praise of GKD's product. He also attributes their durability to the fact that they go through an additional thermal fixation stage during their production. Furthermore, their abrasion resistance and their easy cleaning, thanks to their good retention properties, guarantee many years of continuous use without downtimes. Another important aspect for the sugar factory was that the belts are suitable for use with animal feed.

Savings of several million Euros on energy costs

André Wicki has been collaborating with GKD for a very long time now and only has good things to say about Conducto[®] belts. “Our excellent results

with this type of belt in wood chip drying were the decisive factor for using it in low temperature belt dryers for the sugar industry.” The current soaring demand for the LTD for beet pulp drying has intensified the business relationship between Swiss Combi and GKD. “The quality of the belt and the attractive price-performance ratio speak for themselves,” says André Wicki, summarizing his experience with the product. His colleague Stefan Szymkiewicz, the project manager responsible for handling two LTDs in Austria and a further one for a German sugar producer from conclusion of contract right through to turnkey handover, adds: “Also in terms of adherence to deadlines and good delivery times, GKD sets new standards.” He is also very positive about GKD's feeder for the initial installation of belts, and sees this as yet another standard that GKD is setting. All the same, the team from Dueren insisted on being present in Austria during installation in order to deal with any problems that might crop up. In product manager André Wicki's view, there is yet another important aspect that enhances GKD's status as their preferred supplier: “GKD welcomes suggestions from the world of practice and comes up with fitting solutions. That's what a good business relationship should be like!” The Austrian sugar producer AGRANA is also completely satisfied with its new LTD. Through the reduction of primary energy consumption for beet pulp drying it is already saving several million Euro a year in energy costs compared to what it was previously spending on this process.

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GKD – Gebr. Kufferath AG

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