

# SEVAR

*Drying Technologies*

## 30 Years Belt Dryer Zschimmer & Schwarz

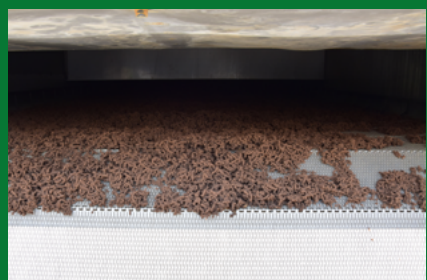
For more than 30 years, the SEVAR Belt Dryer BD 2500/4 has been reliably performing its duties at Zschimmer & Schwarz's on-site wastewater treatment plant. Not least due to the well-versed and dedicated plant operators. At the Zschimmer & Schwarz headquarters in Lahnstein (Germany), with over 500 employees, chemical auxiliaries and specialties are produced for numerous applications.

The head of the wastewater treatment plant, Mr. Clemens Wilhelm, explains the plant in detail during our visit to Lahnstein in May 2023. The wastewater treatment plant currently treats 500 m<sup>3</sup>/d of industrial wastewater generated in Lahnstein during the production of, among other things, chemical auxiliaries for ceramic, fiber and leather products, as well as raw materials for the detergent and cosmetics industries. Sanitary and kitchen wastewater from the plant is also treated. All wastewater is collected in a mixing and equalization tank with a capacity of 1,200 m<sup>3</sup> and fed evenly seven days a week to biological treatment with a cleaning capacity of up to 1,200 m<sup>3</sup>/d. The wastewater passes through a sand and grease trap, neutralization and finally aerobic biological treatment. Due to the small amounts of sanitary wastewater, nitrogen and phosphorus must be added to the biological treatment stage for a balanced nutrient ratio. In the circular secondary clarifier, the sewage sludge sediments and the clean water is discharged directly into the adjacent Rhine.

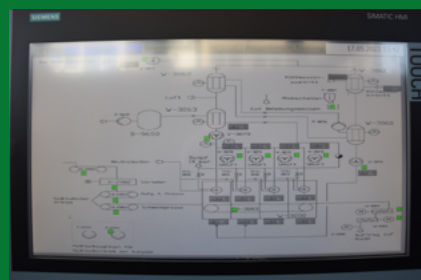
The sewage sludge resulting from the biological treatment is statically thickened in the pre-thickener to a dry residue content of approx. 1.3 %. Mechanical dewatering to approx. 20 % DS for drying takes place by means of a continuously operating belt press. Spiral and belt conveyors transport the dewatered sewage sludge to the belt dryer feed unit. Belt press and belt dryer are in operation five days a week for up to ten hours. The dryer feed unit consists of a distributor/dosing unit and a hydraulically operated swing press in a compact and process-engineered unit. The sewage sludge, which is fed centrally and in an open outlet above the feed unit, is distributed in the distributor over the 2.5 m wide

dryer belt and metered to the swing press in a level-monitored manner. The swing press consists of a die in the form of a perforated plate which is pressed by a swinging beam and forms strands in the form of spaghetti from the sewage sludge. The strands have a large volume-to-surface ratio for good mass transfer of the water contained in the sewage sludge to the hot drying air. The dryer belt transports the sewage sludge very slowly through the four modules to the exit of the single-belt dryer. There, the sewage sludge, dried to approx. 80 % DS, falls from the dryer belt into the discharge screw and is collected in a trough. About 2 tons of sewage sludge are produced daily. The dried sewage sludge is currently transported by truck for thermal utilization for incineration in containers with 36 m<sup>3</sup>, which corresponds to approx. 10 tons of sewage sludge.

To generate the hot drying air, condensed recycled air is passed over heat exchangers installed in the mixing chamber of the four dryer modules. The heat exchangers are fed with steam at a pressure level of 8 bar, which is generated in the Zschimmer & Schwarz boiler house. The humid exhaust air from the dryer is fed to the condenser, which is indirectly operated with cooling water, by means of exhaust air blowers via exhaust air ducts. A water-operated heat exchanger installed upstream of the condenser extracts the heat from the exhaust air. The water circuit preheats the condensed recirculated air before it enters the dryer modules (heat recovery). The amount of leakage air removed from the process as well as the condensate are fed to the aeration basin of the wastewater treatment plant. Thus, there is no need to treat odorous exhaust air and polluting condensates separately. The preheated recycled dryer feed air is further preheated in another heat exchanger, operated with recycled steam condensate at approx. 100 °C. The dryer modules are then connected to the heat exchanger. Within the dryer modules, the supply air circulates at up to 135 °C. Heat recovery and the use of heat from the steam condensate returned to the boiler house significantly reduce the amount of live steam required.



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During the plant tour, many questions concerning the operation of the belt dryer could be answered. For example, we learned that one of the Z&S employees has been responsible for the operation of the belt dryer for over 20 years. At Z&S, the belt dryer is characterized as a robust and solid technology. A low failure rate, an operation free of observation and the maintenance work that can be carried out by the own personnel are characteristics of the dryer that are highly appreciated by the operators. The dryer runs daily in automatic mode. Once a month, the dust accumulated in the modules must be extracted. More recent belt dryers have a floor scraper installed for this purpose. Every six months, the die is removed and reinstalled upside down. This ensures uniform formation of the strands. The dryer is serviced every two years. The hydraulic unit for the swivel press is checked for leaks. Repairs are carried out exclusively by the company's own personnel from the workshop. In 2018, after 25 years of operation, the dryer belt was replaced by the manufacturer. This year, the overhaul of the sealing of the entire dryer is planned. After that, lower steam consumption is expected.

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The belt dryer is operated for two main reasons. The first is to reduce transportation costs and the second is to avoid the emission of odor, which occurs below a DS content of 80%. The industrial sewage sludge develops an unpleasant odor when stored for one to two days in the dewatered state. This can cause problems, especially in summer, as the Rhine River adjacent to the plant site, with its bicycle and hiking paths, is a popular destination for excursions.

Operation of the belt dryer may be discontinued in the future because the cost of generating steam with natural gas has increased enormously. The dewatered sewage sludge with approx. 20 % DS will then be disposed of by incineration. In relation to the mass of sewage sludge, this means an increase of 300 % in the mass to be disposed of. A final decision has not yet been made due to the rapid formation of odors in the dewatered sludge, which makes storage impossible. SEVAR is now asked to maintain and seal the plant and to minimize the consumption of the steam. First, a target/actual comparison is carried out. After implementation of the repair measures, the new actual condition will be evaluated. The possibility of using steam at a lower pressure level, which may be generated as waste heat, will also be explored. This would reduce the specific water evaporation capacity due to the lower drying temperature. The resulting longer drying time is not a problem, since the dryer runs for only one-third of the possible annual operating time, i.e., about 2,600 h.

SEVAR thanks Z&S for the possibility of the interview as well as the photographic recordings from which a film was created, which can be viewed under this link:

VIDEO

