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Dust-free Sludge Drying

Sludge drying system – tailor-made rather than off-the-peg

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Drying waste sludge to be disposed of is a clever idea to reduce the horrendously high disposal and transport cost. This idea would be even better if there were not this nasty dust that occurs when the dryer is emptied. Yet, there is a remedy to this problem. A new system design prevents dust before it may even occur.

Drying specialist Harter has developed and built heat pump based drying systems for more than 30 years. From the very beginning, the focus has always been on sludge drying, among others. Companies should be enabled not only to mechanically dewater their waste sludge but also to dry it. “Reduce cost of operation” was the name of the game at that time, an aspect which may have become even more important. Besides the drying process proper, operators are bothered by the dryer emptying operation.

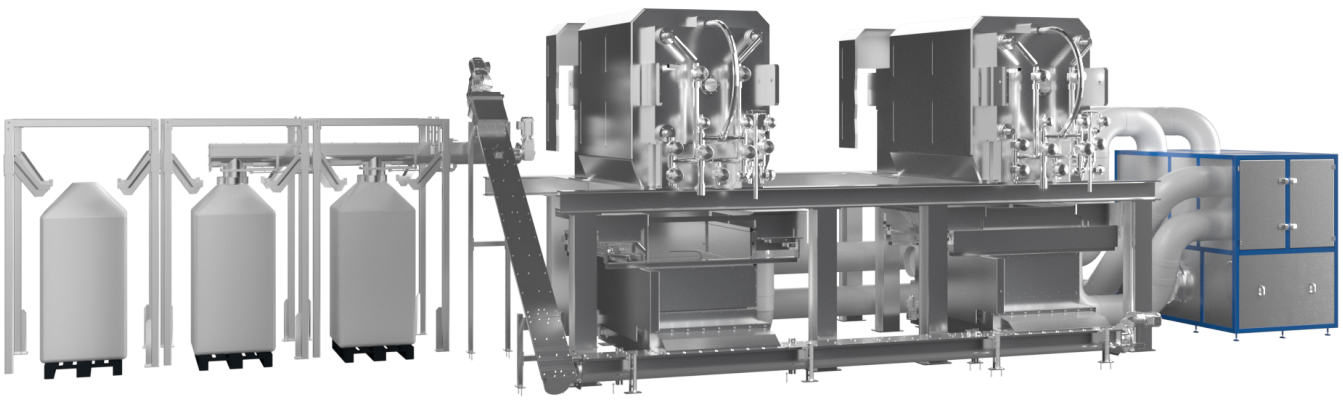
Manual emptying still prevails, and the resulting dust is often reason for much concern. The German company Harter developed a very special solution for a client in Switzerland.

Dry sludge saves transport and disposal cost

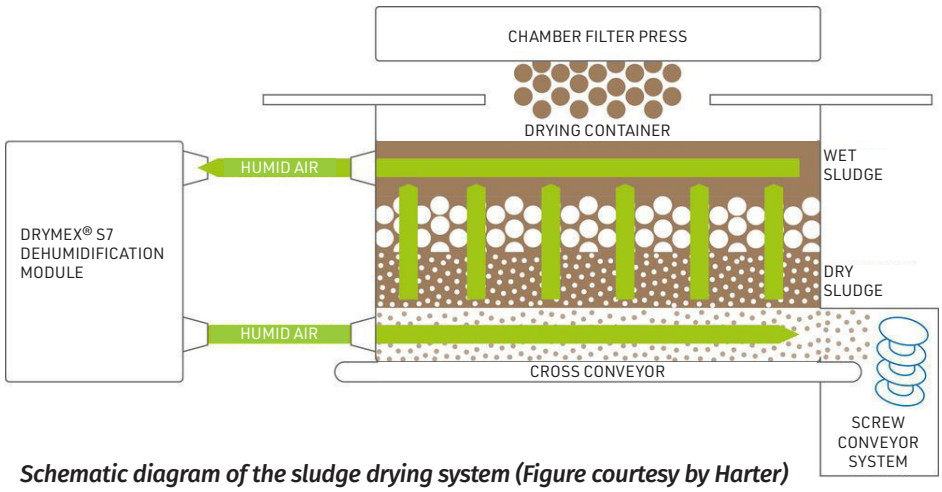
Background – Mechanically dewatered sludge still contains 60 to 70 percent of water. A low energy drying process can save operators as much as 60 percent of their transport and disposal cost. The higher the disposal cost the faster will be the return on investment in a sludge dryer. Harter has advanced their technology over the past three decades using optimised components and developing customised designs such as this facility combining pressing, drying, conveying and bagging.

The long-time Swiss client, who has been using two Harter systems, benefits from this individual approach, too. Harter redesigned the drying system to replace manual by automatic operation. Before, sludge containers were placed below the chamber filter press and, when filled, transported to the dryers using a forklift truck. After drying, again a forklift moved the sludge to and into the transport container. There was some dust pollution involved which should be prevented for the future. So, the operator contacted Harter to offer a new design.

The layout of the new system is as follows. The sludge drying system consists of two special stainless-steel containers with a cross conveyor belt, one Drymex S7 dehumidification module, a screw conveyor system and an emptying station for three big bags. The stainless-steel containers feature a multifunctional intermediate bottom with pivoted fins and a programmable logic control. The whole system is controlled by a programme written for the specific process. The two chamber filter presses were replaced by new automatic ones supported by a steel frame at about two metres above the floor. The two drying containers are placed underneath waiting to be filled.



The two chamber filter presses release sludge to fall into the drying containers underneath. A conveying system automatically transports the dried sludge from the containers to the big bag filling station. The dehumidification module to condition the required process air is shown on the right. *(Photograph courtesy by Harter)*



Schematic diagram of the sludge drying system (Figure courtesy by Harter)

Sophisticated drying containers

When the chamber filter press is full, the sludge is emptied into the drying container. This happens three to four times during each drying cycle. The pivoted fins turn to a defined opening angle so that the process air may flow bottom-up through the container. The drying process is designed such that the bottommost layer of sludge in the container is dried first.

This sludge layer has reached the desired dry matter content long before the next sludge load is dumped from the filter press into the container. But before this may happen, some of the sludge inside the container is emptied. The programmable logic control is used to define the amount of sludge to be removed so that enough space is provided for the new load of sludge dumped from above. The pivoted fins in the intermediate bottom open fully and the sludge falls onto the cross conveyor system to be transported to the screw conveyor right away.

The heat pump integrated in Harter's air dehumidification system is inherently efficient. As new wet sludge is dumped into the container at regular intervals, the dry process air is always offered enough humidity to operate a little bit better. Also, the new wet sludge dumped on top the container load absolutely prevents dust from rising towards the dehumidification module. It should be noted that the containers are connected to the dehumidification module by insulated air piping. The dehumidification module provides the process air required for drying.

Enclosure finishes off dust

The cross conveyor now transports the sludge to the screw conveyor system. The screw conveyor moves the dried matter upwards to the mouths of the big bags. Pneumatic flaps control the selection of the big bag to be filled, sensors monitor the fill level, a signal indicates that the maximum fill level is reached. The screw conveyor is fully encapsulated to retain any dust. There is no dust pollution as a threat to humans or the environment. The drying temperature is about 50 °C. The drying period of sludge drying systems is normally 24 hours. In this case, the drying period is adapted to the chamber filter press operating cycle time. Operators should note that Harter drying systems are energy efficient and carbon saving enough to be eligible for government subsidy in Germany, Austria and Switzerland.

Sludge Drying System Specifications	
Dehumidification module dimensions	LxWxH = 2,600 x 1,800 x 2,400 mm
Container dimensions	LxWxH = 1,500 x 1,500 x 1,500 mm
Energiebedarf	0.4 kWh per litre of water extracted
Container useful volume	3 cubic metres

Daily amount of sludge	3,600 kg approx.
Water extraction	1,800 l approx.
Dry matter content after pressing	30 to 40 % approx.
Dry matter content after drying	75 to 85 % approx.
Drying temperature	50 °C approx.