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Industry	
Plant Eng.	● ●
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Function	
Planners	● ● ● ●
Operators	● ● ● ●
Buyers	● ●
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Tests are conducted in the HARTER pilot plant station to determine the drying response of the sludge and the drying parameters to be used.



Drying filter pressed waste sludge to save cost

Low Energy Drying

Much money may be mined from sludge. Unfortunately, this message has not found widespread attention so far. Mechanically pre-dewatered sludge, when transported to the waste disposal site, still contains some 60 to 70 percent of water. To put it simply, the operator spends the better part of their disposal cost on water.

With disposal cost soaring, sludge drying becomes economically attractive. The more so if a low energy drying technology may be used.

Drying Tests as a Springboard

A renowned electroplating company wanted to test sludge drying in order to calculate its cost effectiveness. They contacted drying system manufacturer HARTER of Stiefenhofen, Germany. The latter had developed the so-called heat pump based condensation drying technology more than 25 years ago and has since implemented their technology in various applications. The electroplating company had a sample of their sludge tested in HARTER's pilot plant station. The test demonstrated that after no more than seven hours of drying the weight of the sample was reduced by 71 percent and its volume by 60 percent. The electroplating company invested in a Drymex M4 standard drying system including two drying containers with a useful volume of 1 m³ each.

Following pressing in a chamber filter press the sludge is dumped in one of the two drying containers. The container is then transported to and loaded into the sludge dryer using a fork lift truck. The doors of the compact dryer are closed and the drying process started. While this load of sludge is being dried, the second container is waiting below the chamber filter press to be filled with filter cake.

1,000 kg of sludge with a dry matter content of between 25 and 30 percent are accumulated in the company each day. The dry matter content rises to about 85 percent after 20 to 24 hours of drying. When the set dry air level is reached a humidity measuring device automatically turns off the system. The drying containers can be tipped so that they may be easily emptied. The dried sludge is dumped into a transport container and brought to the disposal site.

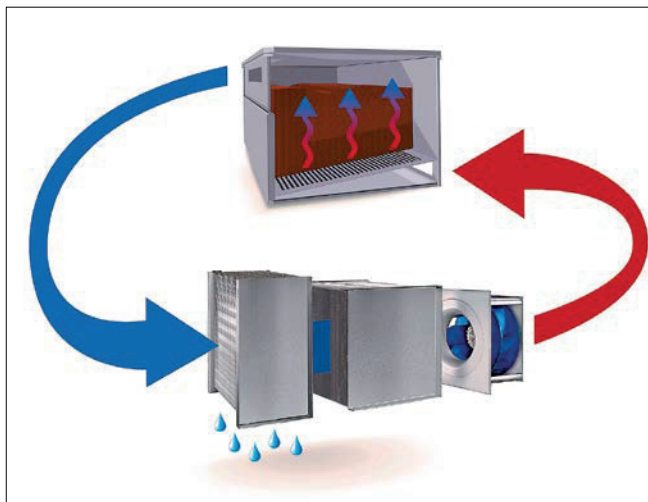
Prerequisite for Recycling Valuable Substances

The drying temperature is as low as 50 °C. The water extraction rate is about 500 litres per 24 hours. 0.4 kWh are required to extract 1 litre of water. Using this drying system the electroplating company could reduce their disposal cost considerably. Other such projects have shown that sludge, when dried, may be reclassified profitably, and that drying may open up more cost saving opportunities. Also, drying is a prerequisite for recycling valuable substances contained in the sludge. Money may be made from materials such as zinc, nickel or others.

The use of a low energy process is reasonable to optimize cost savings and energy efficiency. Heat pump based condensation drying is also a high quality solution featuring perfect air routing to ensure that the sludge is dried in an absolutely uniform manner. The heat pump technology employed is efficient and carbon saving enough to be subsidized by the government.

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After drying, the sludge has about 70 percent less weight.

Drying process schematic. The dehumidification module conditioning the required process air is shown below, the filter cake through which the dry air passes is shown above. Dehumidification takes place in a closed energy circuit.

Photographs courtesy of Harter

Air Dehumidification and Air Routing

The core of all HARTER drying systems is the dehumidification module. It largely dehumidifies the air and heats it. The resulting air, extremely dry and unsaturated, is passed through air pipes and/or an air ducting system into the drying container with the sludge to be dried. Having little relative humidity the inlet air can absorb the moisture of the filter cake. Drying starts. The moist air is returned to the dehumidification module and cooled there. The water condenses and is drained off the system. The dry air is reheated using the waste heat of the heat pump and passed to the container, again. This is a closed air circuit so that there is no exhaust air and no impact by the ambient environment.

The driest air, however, is of no avail unless it is directed to the point where it is supposed to absorb humidity. This is where the second factor – adequate air routing – comes into play. For sludge drying, the unsaturated air must be routed such that uniform airflow throughout the filter cake is ensured. This is achieved using a purpose developed aeration bottom in the drying container and a customized air routing technique. The powerful fans used for sludge drying are custom types designed and built by the drying system manufacturer and their

suppliers. It is the combination of dehumidification and air routing which enables uniform aeration of higher fill levels such that the sludge is dried uniformly and completely.

The dry matter content is between 75 and 90 percent as applicable to the type of sludge and as desired by the operator. Owing to its physical approach the non-exhaust air condensation drying method can operate at low temperatures. Temperatures are normally between 40 and 50 °C. Heat pump based condensation drying is a flexible method. It may be used for both batch and continuous operations of various sizes. ●

Decision-maker facts

- Mechanically pre-dewatered sludge has a high water content on average. Operators pay the better part of their disposal cost for water.
- The drying system implemented at the electroplating company can rise the dry matter content to about 85 percent.
- Drying takes place using pre-dried air at a relatively low temperature and optimized air routing. It is thus very energy-efficient.

HARTER
drying solutions

ENERGY-SAVING SLUDGE DRYING
FOR SAVING DISPOSAL COST