

Sludge Drying Reduces Cost - Efficient Drying Technology

P. Schlachter, R. Specht*, R. Weber**

Sludge treatment and disposal regulations are strict. Not only for producing companies but also for waste management companies. What applies to either of them – Low energy drying of pre-dewatered sludge from industrial waste water plants can considerably reduce transport and disposal cost.

Introduction

Chiresa AG, a Swiss waste management company, found a low energy way of drying their customers' pre-dewatered sludge. And they could substantially reduce running cost by investing in such a sludge drying system. When dried, sludge is drastically reduced in weight and volume, sometimes by as much as 60 percent. Less sludge means less volume to be transported and to be disposed of, regardless of whether the sludge is transported to the disposal site straight away or to a recycling company first, where materials such as zinc, cadmium or copper can be recovered from the dried sludge.

Heat Pump Based Condensation Drying

Chiresa AG, a specialist in integrated waste management, had first learned about heat pump based condensation drying at the Niederurnen, Switzerland, based KVA Linth waste incineration plant. The plant uses such a drying system after flue gas cleaning and fly ash washing. The technology is capable of drying aqueous sludge and substrates of any kind. It uses extremely dry air and operates at low temperatures in an energetically closed system. The method is used for filter-pressed sludge with a water content of some 60 to 75 percent after pressing.

* **Petra Schlachter, Reinhold Specht**
 Harter GmbH
 Harbartshofen 50
 88167 Stiefenhofen
 Tel.: +49 (0) 8383 9223-15
 E-Mail: Petra.Schlachter@harter-gmbh.de
 www.harter-gmbh.de

** **Ralf Weber**
 Chiresa AG
 Landstr. 2
 5300 Turgi, SCHWEIZ
 Tel.: +41 (0) 56 20170-80
 E-Mail: weber@chiresa.ch
 www.chiresa.ch

If such sludge is dried subsequently, its weight and volume may be reduced by as much as 60 percent.

The decisive factor for investing in a drying system is the prospect of reducing cost considerably. This applies to both producing companies and waste management companies. Harter GmbH of Stiefenhofen, Germany, developed the heat pump based condensation drying technology more than 25 years ago and has been optimizing it ever since. The owner-managed company has established its reputation on various markets with its low temperature drying systems. Sludge drying is one of Harter's several drying applications. It has been experiencing a boost again in recent years, mainly as a result of rising disposal cost, stricter regulations and recycling issues.

Drying in the Transport Container

Sludge must first be dewatered mechanically to be dried afterwards. More and more companies turn to using diaphragm or chamber filter presses – a precondition for subsequent drying. The drying system installed at Chiresa AG (established in 1977) is an in-container type. This is to say that drying takes place in two combined drying and transport containers with a useful volume of 22 m³ each. Attached to either of these containers is one Drymex[®] S9 dehumidification module (ref. fig. 1). This module features a water extraction rate of an ideal 200 to 240 litres per hour, depending, of course, on the type of sludge being dried. The system processes 1,200 tons of hydroxide sludge a year. The drying procedure is as follows. Filter cake is loaded in a container by a wheeled

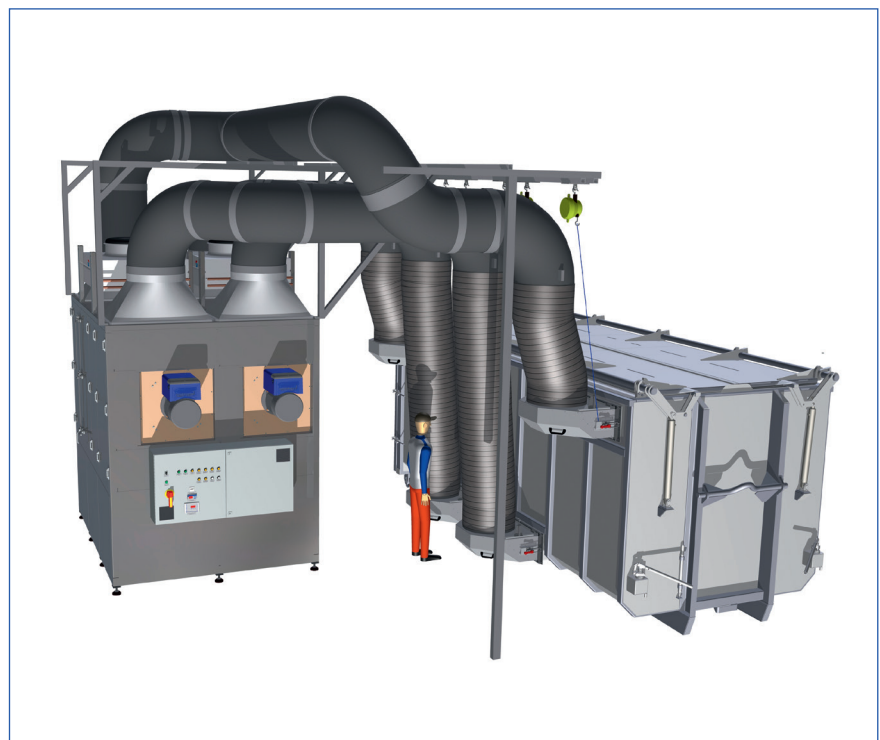


Fig. 1 – The drying container attached to the dehumidification module (left) also serves as a transport container. The process air is conditioned in the dehumidification module.



loader. The dry matter content of the cake is 25 to 30 percent. When full, the container is moved to the drying station. There, it is connected to the Drymex dehumidification module through air ducts. The drying process starts. The drying temperature ranges between 40 °C and 45 °C. Drying is completed after about 48 hours. A humidity sensor senses and reports the residual moisture, and the system is shut down automatically when the desired dry matter content is achieved. The target dry matter content is 85 percent maximum, as applicable to the type of sludge being dried. Some 8,000 to 12,000 litres of water need to be extracted to reach the target content. The sludge drying results vary with the various types of sludge Chiresa processes for its customers. The amount of water which may actually be extracted from the sludge depends on the properties of the sludge as well as the substances and the amount of water contained in the sludge.

A Perfect Match – Air Dehumidification and Air Routing

Two components are essential for Harter’s heat pump based condensation drying to be fully effective and for reliable drying large volumes of filter cake in a container. First, the core of each drying system – the Drymex dehumidification module. It supplies extremely dry and thus unsaturated air to the container. In a physical process, the air quickly absorbs humidity from the filter cake, thus drying the cake. The humidity laden air is cooled, the moisture condenses and is drained off. Subsequently, the air is reheated and returned to the container in a closed air circuit (ref. fig. 2).

This alone, however, does not suffice to ensure adequate drying. The second critical factor is air routing. The dry air must be routed exactly to the place where it is supposed to absorb humidity. In the case of sludge drying, this place is everywhere in the filter cake. The air must be passed uniformly through the filter cake and out again. To ensure this, each container features a purpose-developed perforated bottom and customized air routing provisions. The powerful fans used for in-container drying are also purpose-made. The

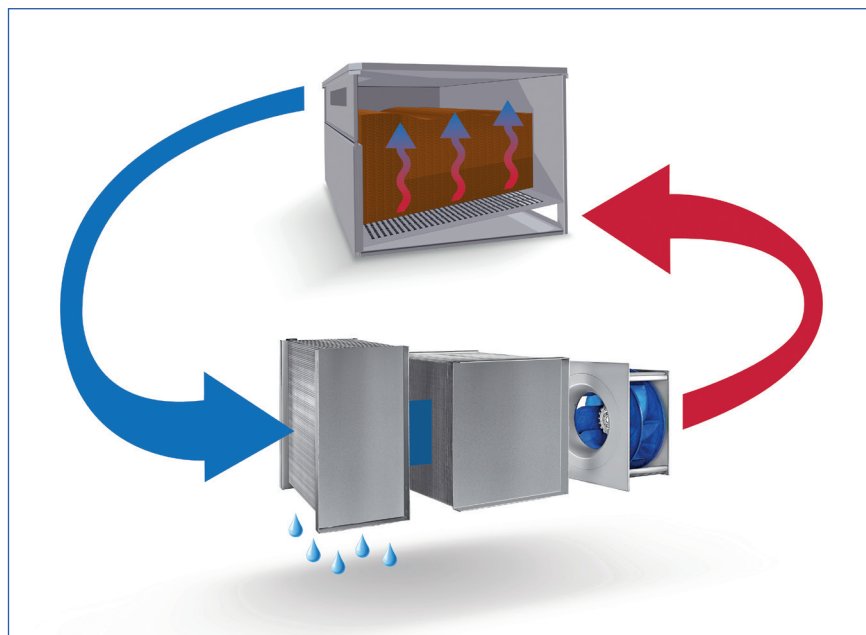


Fig 2. - The humidity laden air is cooled in the Drymex® dehumidification module (front), the moisture condenses and is drained off. Subsequently, the extremely dry air is reheated and returned to the drying container.



Fig. 3 – Extremely dry air combined with appropriate air routing ensures uniform drying of the sludge. Drying can reduce sludge weight and volume by as much as 60 percent.

containers also feature a hydraulic hinged lid system. The lids are open for filling and closed for drying. Only in this way can air pass evenly through 1,600 mm high filter cake such that uniform and reliable drying is ensured (ref. fig. 3). The cost for investment in the sludge drying system is more than offset by a considerable reduction in

running transport and disposal cost resulting from as much as 60 percent sludge weight and volume decrease. Heat pump based condensation drying is an energy-saving and sustainable technology. It is thus currently eligible for government subsidy.