

## New machine to dewater fermentation residues in dry fermentation

The Rhine-Main landfill site Flörsheim-Wicker (RMD), half an hour to drive from Frankfurt airport, is situated in the Main-Taunus district between Hochheim, Massenheim and Wicker. The RMD associates are the Main-Taunus and Hochtaunus districts at 50 % each. Since the early seventies the landfill Flörsheim-Wicker with its approx. 85 ha has served as a site for domestic waste and similar industrial waste from the Main-Taunus district and Greater Frankfurt and has been one of the most important sites in the whole Rhine-Main area.

Due to new recycling management and waste legislation and the implementation of TASI (technical instructions for municipal waste) the possibility of landfilling untreated waste ended on 31 May 2005. Many landfill sites were shut down then. But the question arised how to use these sites in the future. The Rhine-Main site Flörsheim-Wicker can be mentioned as a successful example of how to develop a landfill site accordingly. The RMD slogan from a waste dump to an energy and recycling park underlines this development. In cooperation with private partners RMD operates now on this site plants for construction waste, slag treatment and soil cleaning plants as well as plants for recyclables sorting and production of surrogate fuels. A scrap wood treatment plant with a capacity of 1,000,000 t per year provides the basis for the biomass power plant for energy production with a performance of 15 MW. Several photovoltaic plants installed on the south side areas complete their energy recovery concept. RMD pays however also great attention to landfill aftercare and founded for this purpose in 2007 its own company Rhein-Main Deponienachsorge GmbH (RMN). The main tasks of RMN are wastewater control, aftercare and remediation. Another element of the energy park is the recently built biogas power plant. The conception, tender, overall planning and construction management were in the hands of Ryttec GmbH, Baden-Baden. The investment costs amounted to approx. 18 million €. The biogas power plant, one of the biggest in Europe, is designed for a capacity of 45,000 t biowaste per year and operates according to the dry fermentation principle. The base materials used are separately collected biowaste (Brown Bin waste), green waste, horticultural waste, production waste from food industries, out of date food and liquid biowaste. The biogas produced in the fermentation process is used by two gas motors for electricity generation and heat recovery. Approx. 10.5 MWh power, which is approx. the demand of 4,000 households, and approx. 13.1 MWh heat are produced. After delivery of the solid biowas-

te and green waste these materials are broken up, contaminants are removed and the material intermediately stored. As an option, liquid biowaste can be treated along with the solid waste. Fermentation of the pre-treated substrates takes place in a thermophilic process at temperatures of approx. 55 °C in three horizontal concrete fermenters with a volume of 3,600 m<sup>3</sup>. After having been treated in the fermenters the fermentation residues are dewatered in four HUBER Screw Press units RoS 3 Bio. The dewatered residues are then dried and serve as recultivation material on the landfill. The press liquor produced in the dewatering process is pre-treated by a HUBER Flotation Plant. The "clear" effluent from the flotation plant undergoes secondary clarification in a leachate cleaning plant and after this treatment step has indirect discharge quality so that it can be introduced into the municipal wastewater treatment plant or used in the moisture keeping system of the landfill. Exhaust air scrubbers and biofilters are used to treat the exhaust air flows from the plant of in total 30,000 m<sup>3</sup>/h.

At the end of December 2006 HUBER received the orders for lot 1 "Reception and intermediate storage of liquid biowaste" and lot 3 "Dewatering of fermentation residues and wastewater treatment". Both lots were put out to tender as complete functional units. So, HUBER supply included not only the HUBER machines themselves but also the complete peripheral equipment, such as tanks, pumps, stirrers, precipitant and coagulant stations, pipelines and fittings, switchboards and control panels, and the complete electrical instrumentation and control equipment. The scope of supply for the lot. "Reception of liquid biowaste" comprised the equipment required for tanker vehicle emptying, such as tanker connections, intermediate storage tank as buffer, comminutor, pumps and a 45 m<sup>3</sup> storage tank with stirrer for outdoor installation, the "reception tank". A double pipe heat exchanger installed in a building provides for frost protection of the medium inside the storage tank under low temperatures, or generally heats the medium if required. Via a special feeding regime the liquid biowastes are pumped from the storage tank directly into the fermenter. About 60,000 t fermentation residue per year with a DR content of 20 - 25 % needs to be treated. The feed line to the presses, starting at the three hydraulically operated piston pumps for the fermenter discharge, had to be executed. The pumps discontinuously deliver the fermentation residue into the feed line to the storage tanks installed over the presses. Filltrate and flocculants are added to condition the residues for dewatering in mixers especially

developed by HUBER. The mix flows by gravity into the presses. The HUBER Screw Press units dewater the fermentation residues to > 38 % DR (about 30,000 t per year). Belt conveyors transport the dewatered material to drying facilities. The filtrate with a DS content below 25 g/l flows directly into a 250 m<sup>3</sup> storage tank that is equipped with a stirrer.

Typical fermentation residue dewatering systems (dry fermentation) are two-stage systems. In the first stage, press water qualities of up to 15 % DR are achieved, primarily by presses with coarse screens. The requested dry substance has to be achieved in the second stage by means of centrifuges. The benefit offered by the HUBER Screw Press RoS 3 Bio units installed at RMD is that this is achieved in one treatment step and still better filtrate results. The customer also benefits from low space requirements and reduced investment costs. The excellent filtrate results achieved provides the basis for subsequent clarification and opens up new ways of filtrate disposal beyond the presently prevailing application on agricultural land. Political decisions or a lack of acceptance among farmers can easily limit the scope of utilisation and disposal options. A HUBER Dissolved Air Flotation Plant HDF is used to additionally treat the filtrate. The generated amount of wastewater treated in the flotation plant is approximately 52,000 m<sup>3</sup>/a, with an

initial DS of below 25 g/l. Precipitants and flocculants are added to the press liquor prior to its entrance into the HDF plant. As expected as a result of the nature of the input material, the volume of sediments is unsurprisingly high. The mix of flotated sludge and sediments can be added to the fermentation residues and along with them dewatered in the presses. Optionally, the mix can be pumped into an intermediate storage tank and used for mashing of the fermenter input. The 'clarified' water with a DS content < 3 g/l flows directly into a storage tank installed below for later further treatment in a landfill leachate treatment plant prior to being discharged to the municipal sewage treatment plant or fed into the moisture preserving system of the landfill. After completion of all installation work and the functional test at the beginning of 2008 the hot start-up of the plant took place in May and was followed by a plant operation optimisation phase. In September 2008, after the test operation phase and a performance test that proved the requested data are achieved, the plant was handed over to the operators AWS commissioned by RMD.

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*ROTAMAT® Screw Press RoS 3 Bio units with intermediate storage tank*