HUBER TECHNOLOGY
WASTE WATER Solutions

Industry *news*

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Solutions for industries

You earn your money with the production and sales of your products or generation of energy, e.g. biomass energy. Although the treatment of production wastewater and sludges is not your core business, environmental protection is part of your business philosophy.

You are therefore looking for a partner who is able to develop and implement in cooperation with you economically reasonable wastewater and disposal concepts. We understand your needs!

HUBER SE is one of only a handful of suppliers worldwide who supply not only the equipment for wastewater and process water treatment but also sludge treatment technology. We are able to design complete systems with HUBER machines, in other words: We offer complete systems and assume the process engineering responsibility for these systems. However, wastewater treatment alone is not enough. The next step to take is 'Close The Loop!' The treatment of clarified wastewater to high quality service water for production processes saves expensive potable water and helps to discharge less or no wastewater at all.

Our philosophy of leaving no resource unused includes also production sludge. Treatment and utilisation of generated sludge is a key aspect to be considered with all holistic solutions. This should not only include cost-effective disposal of sludge but also its energetic utilization.

So, you see, there is a variety of approaches to converting a costly wastewater project into a profitable water treatment and sludge utilisation project.

Our industry team are specialists who have acquired their specific knowledge in a variety of successful projects and are pleased to support you with their expertise.

Let us work together with you to develop your projects!

Ralph Teckenberg
Business Unit Industry
Business Unit Manager

New plant for sewer grit treatment with process water recycling

In 2001, the company Bolliger & Co. started to operate at Grenchen in Switzerland a plant for the treatment of sink pit contents that processes about 5,000 t of raw material per year. Some of the treated material is reused as secondary building material. Due to the good experience they have gained with this plant and in view of the huge market potential in the field of sink pit content treatment the company decided to invest into another plant. On 1st May 2010, the first recycling plant for sink pit contents in the Swiss canton Bern was opened at Aarberg. An innovative treatment concept with an optimised use of energy was developed in cooperation with Bolliger. This concept included the same HUBER machine types that have proven their efficiency in the Grenchen project. The new recycling plant at Aarberg is designed for the acceptance and processing of liquid and predewatered sludge from sink pits and road sweepings.

Layout data (raw material in tons):

1.000 t/a road sweepings
7.000 t/a predewatered sink pit contents
1.500 t/a liquid sink pit contents

The aim of the collected material treatment is its separation into the following fractions:

- Gravel / stones / material > 25 mm (washed)
- Gravel / grit 0.2 – 25 mm (washed for reuse)
- Organic / plastic materials
- Sludge

The materials resulting from separation into fractions can be recycled or reused but, most of all, the material volume for disposal is reduced.

- Material acceptance
- Grit treatment / fractionation
- Process water treatment
- Sludge treatment

Smart pump technology arrangement to ensure easy access for maintenance

HUBER Wash Drum RoSF 9 with two subsequent HUBER Grit Washer RoSF 4 units, coarse material washer, ROTAMAT® Rotary Mesh Screen RoMesh® for organics removal and compaction

Material acceptance

The input material, consisting of road sweepings and predewatered sink pit contents, is fed into the system's acceptance and feed tank and mixed by a bucket loader. Due to seasonal variations and different catchment areas also the composition of the delivered raw material can vary greatly. That is why the mixing of material is necessary to ensure a constant plant operation. The liquid materials are at first passed through a 60 mm bar screen to remove coarse matter.

The liquid phase flows then through a HUBER ROTAMAT® Micro Strainer Ro 9 with 6 mm holes from where it is discharged to one of the two acceptance tanks equipped with stirrers. The separated solids are discharged to the acceptance tank with the rest of the material. Also the drainage water from the acceptance point for the liquid raw materials is pumped into one of the two acceptance tanks.

Grit treatment / fractionation

The special feature of this installation is that a fully automatic crane feeds the material to be treated into a dosing station, the HUBER ROTAMAT® Grit Treatment System RoSF 7, from where the material flows by gravity without the need for any additional conveyors or pumps. This significantly reduces the energy demand and wear of conveying units during the process.

The equalised mixed fraction (4-6 t/h) is passed into the HUBER ROTAMAT® Wash Drum RoSF 9 where 25 mm screening takes place and material < 25 mm is washed out of the coarse material fraction. The grit-water mix from the underflow of the Wash Drum flows by gravity via a chute into the two subsequent HUBER ROTAMAT® Grit Washer RoSF 4 units. A static magnet removes metal parts while the mix is flowing through the chute to protect downstream equipment.

The capacity of the two grit washers is approx. 3 t grit / solids per hour. They wash the grit, remove organics, classify and dewater it. Grit washing takes place in a fluidised sand bed that is stirred and kept in suspension by a rabble rake device. Upflowing washwater lifts the separated fine fraction and lighter organic material beyond the sand bed from where these are discharged via the organics outlet and overflow.

The separation grain size is 0.2 mm with a separation efficiency of > 95%. The aim of < 5 % loss on ignition in the washed grit is reliably achieved by the HUBER ROTAMAT® Grit Washer RoSF 4. The 0.2-25 mm grit/gravel

mix is discharged at intervals, dewatered statically and discharged into a tank. The floating organics and fine fraction are discharged along with the water flow. Along with the oversized grain (material > 25 mm), the overflow from the grit washer flows into a coarse material washer where high-intensity washing with wash water takes place and powerful turbulences are generated by means of compressed air. The result from this process is a washed coarse material fraction > 25 mm and a wash water phase with a high organic load. The wash water flows into the subsequent 2 mm HUBER ROTAMAT® Rotary Drum Screen RoMesh® that separates the organics and discharges them to a press that dewaters the material to approx. 35 % DR.

The filtrate is added to the rest of the screened wash water flow and flows along with the wash water into the circulation water tank, which serves as water storage tank but also as settling tank for the removal of most of the fine minerals. A pump delivers the sediments from the circulation water tank into a separate tank where they are thickened by adding flocculants.

The wash water required for preliminary washing in the HUBER ROTAMAT® Wash Drum RoSF 9 at the beginning of the treatment process is taken from the clear phase in the circulation water tank. Due to the use of circulation water after the removal of most of the mineral material the wear of pumps and spray nozzles is significantly reduced in contrast to previous process variants that used the water directly after screening.

Process water treatment

The overflows of wash water from the sedimentation tank and the excess of clear water from the circulation tank flow by gravity into the HUBER Dissolved Air Flotation Plant HDF where the rest of the flocs and suspended particles are removed from the wash water through the generation of micro bubbles.

The wash water is collected in a tank; it has now the quality required for the washing process in the HUBER ROTAMAT® Grit Washer RoSF 4. This quality of water is further intended to be used to wash trucks, as wash water for the spray nozzle bar of the HUBER ROTAMAT® Rotary Drum Screen RoMesh® and as service and wash water in the plant area. The generated flotate and sediment sludge is passed on to the subsequent sludge treatment line while the excess of water from the complete system is discharged to the public sewer system.

Sludge treatment

All sludges generated in the different process stages (thin sludge acceptance tank, sedimentation tank, flotation plant) are collected in two storage tanks that serve as buffer and mixing tanks in which the collected sludges are mixed and dewatered via a decanter to > 60 % DR.
A screw conveyer delivers the dewatered sludge to a storage bunker from where the sludge is loaded onto trucks by wheel loaders and transported to a landfill.

Electrical control

The electrical control system for the entire plant is designed for fully automatic plant operation. Operating staff is only required for raw material feeding and disposal of treated materials. In contrast to conventional plants the electrical control system could considerably be simplified as a large part of the control equipment for pumps could be omitted and due to the smart spatial arrangement of all plant components.

Bernhard Ortwein
Business Unit Industry

HUBER Disssolved Air Flotation Plant for process water treatment

Oil grit treatment with HUBER technology in Daqing, China

The oil fields of Daqing are the biggest oil production facilities in the People's Republic of China. They were discovered in 1959 at the time of the Great Leap Foreward and extend between the rivers Songhua Jiang and Nen Jiang. Oil production at Daqing began in 1963, one million barrel per day have been produced during the past 30 years. The Daqing fields produce about one third of the total Chinese oil production.

Even if, at first glance, one would not expect it because no direct wastewater is generated, the well-proven HUBER technology systems are demanded on this oil field. This is due to the fact that Chinese industry is increasingly faced with international environmental constraints and forced to react. The contaminations generated by oil production on these fields have been a continuous environmental problem for years already.

Our joint venture China supplied and installed the mechanical pre-treatment systems and coarse material and grit separation systems for a treatment plant built to clean oil-contaminated soil and grit from the vicinity of boreholes.

The soil and grit to be treated comes from several different spots from where it is transported to the treatment plant. The soil material from two nearby boreholes shows an oil content of approx. 10-30 %. Also sediments from storage tank cleaning are treated. These have an oil content of approx. 30 %. In addition, contaminated sand bags from oil stops are delivered, which have an oil content of up to 50 %.

Mechanical treatment takes place in two lines and two stages. The material is collected in an intermediate storage tank (type RoSF7 size 2), from where approx. 5 t/h soil material is delivered into the HUBER ROTAMAT® Wash Drum RoSF9 size 1 and washed with approx. 80 °C hot water. Coarse material bigger than 10 mm is washed, transported by a screw conveyor and discharged into a container. The oil/water/sludge mix < 10 mm flows into the aerated HUBER ROTAMAT® Grit Trap Ro6.

To meet the effective grit separation of > 2 mm the mix must be kept at a temperature of at least 45 °C by means of a heat exchanger integrated within the Ro6 unit. In this way, the high viscosity of the crude oil is reduced and a certain pre-clarification of the oil sludge achieved. The grit discharged from the Ro6 shows the requested maximum oil content of approx. 5 %.

These treatment steps are necessary to ensure blocking within the subsequent tricanter that may be caused by coarse material is prevented and wear minimized.

The customer, Beijing Oil HBP Science & Technology Co. Ltd., who started the 400,000 Euro project in cooperation with HUBER and the joint venture in July 2008 followed by start-up in May 2009, is highly satisfied with the equipment supplied by HUBER SE and the operating results achieved. Other plants of the same kind are in the planning stage and some have been ordered already.

Ying Gao
Business Unit International Sales
Thomas Nagler
Business Unit Industry

Oil grit treatment solution in Daqing, China

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 Rytec 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 biowaste 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^3. 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^3/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^3 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 m³ 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 m³/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 flotate 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 too 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.

Thomas Nagler
Business Unit Industry

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

Coarse material and grit separation in a biowaste fermentation plant – the beginning of a success story

Active environmental protection today: Up to 45,000 t solid biowaste per year can be processed in the fermentation plant built in 1999 at the waste management enterprise RECYBELL Umweltschutzanlagen GmbH & Co KG, a subsidiary of Bellersheim GmbH in Boden, Germany. By means of the Bio-Stab process, the plant produces biogas and Bio-Stab soil from the collected organic waste. The whole process is CO_2 neutral.

The first work step after mixing of the delivered biowaste is pre-sorting (e.g. with a metal separator) and primary crushing. In the second work step, the biowaste is mashed in a pulper to approx. 12 % DR and further comminuted. To achieve this, the waste is mixed with hot water (e.g. the HUBER Dissolved Air Flotation Plant being used for service water processing). The approximately 70 °C hot effluent from the downstream hygienisation unit flows into the HUBER ROTAMAT® Complete Plant Ro5 Bio to remove coarse material and grit. The HUBER ROTAMAT® Complete Plant Ro5 Bio is an enormously reinforced version of the standard HUBER ROTAMAT® Complete Plant Ro5 and was especially developed for this specific application. The HUBER ROTAMAT® Complete Plant Ro5 is fed in batches. Each of the 20 m³ batches passes through the plant in approximately 20 minutes. A total of 16 batches are processed during the 12 hours biowaste recycling process, with the Ro5 Bio plant being operated continuously. The first step of coarse material separation is achieved with a special, very sturdy HUBER ROTAMAT® Fine Screen Ro1 Bio 1600 that is equipped with a double rake arm. The screen has a bar spacing of 15 mm and rising pipe diameter of 711 mm (!). Approximately 1.5 – 2.0 m³ coarse material is removed per batch.

The pre-dewatered material separated by the HUBER ROTAMAT® Ro1 Bio plant (pieces of wood, plastic foils, bones, etc.) are discharged into the downstream HUBER ROTAMAT® Screenings Compactor Ro7 with a rising pipe diameter of 711 mm (!) and dewatered to approx. 30-35 % DR prior to being passed on to a composting facility.

Settleable solids, such as grit, glass, bone fragments, etc. are separated in the aerated grit trap of the HUBER ROTAMAT® Complete Plant Ro5 Bio. Also this grit trap was especially optimized for this specific application. The grit trap achieves a degree of separation from the viscous bio-suspension (approx. 8 % DR!) of approx. 90 % > 1.5 mm. Like the screenings, the discharged grit is passed on to a composting plant.

HUBER ROTAMAT® Complete Plant Ro 5 Bio and HUBER ROTAMAT® Screenings Compactor Ro 7 installed at RECYBELL, Boden

The not separated minerals remain within the suspension and eventually end up in the fraction of the Bio-Stab soil. The Bio-Stab soil, a high quality fertilizer, is applied onto the surrounding farmland. The special version of the HUBER ROTAMAT® Complete Plant Ro5 for biowaste treatment was optimized during the run-in phase of the fermentation plant and has been operating without problems since the end of 2000.

It has definitely been worthwhile investing great efforts in the development of the special bio-version of the HUBER ROTAMAT® Complete Plant Ro5 in the fermentation plant at Boden. Any doubts that may have existed initially concerning the feasibility of this project in view of the high requirements and lack of experience could be eliminated owing to the excellent cooperation between HUBER and BELLERSHEIM.

The HUBER ROTAMAT® Complete Plant Ro5 Bio is a special class development that is unique on the solids/liquid separation market. The success story that began at Boden has meanwhile continued on the European market. The plant is available in three sizes and successfully operated on 16 European biogas plants and 13 biowaste fermentation plants.

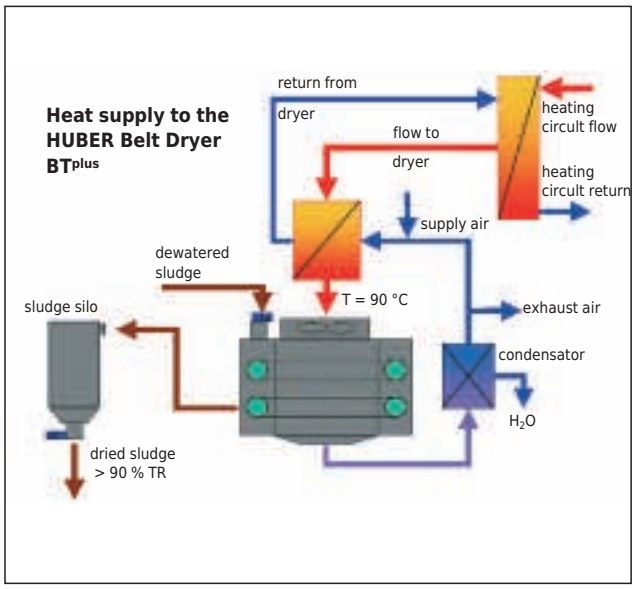
Furthermore, the special HUBER ROTAMAT® Ro1 Bio plant is used for coarse material separation on three biowaste fermentation plants with a total of four installed HUBER ROTAMAT® machines. In two of the systems the sturdy HUBER ROTAMAT® plant Ro1 Bio was even used to replace the previous coarse material separator. Since then, also these biogas plants provide a trouble-free operation of this treatment stage.

Bernhard Ortwein
Business Unit Industry

HUBER ROTAMAT® Fine Screen Ro 1 Bio / 1600 / 15 mm with double rake arm and discharge pipe (711 mm dia.)

Sewage sludge drying with exhaust heat from biogas plants

In addition to electric energy, biogas plants produce heat. The sale of electric energy at a fixed rate is safe for 20 years, whereas the heat is still insufficiently used but would significantly improve the economic efficiency of the plant. Plant operators can earn several thousand Euros a year with the CHP bonus alone. The sale of exhaust heat secures additional income; sewage sludge drying offers a possibility. Sewage sludge is continuously produced on wastewater treatment plants and is normally utilised in agriculture or dewatered to 70 – 85 % water content prior to disposal. This involves high costs for municipalities because it has to be paid fully for the high water content and the sludge needs to be transported over long distances. Drying of sewage sludge produces a high-caloric granulate. The thermal value of this granulate is similar to that of brown coal. Drying reduces the sludge volume to one eighth of the dewatered sludge volume.



Biogas exhaust heat supply to a belt dryer

Generation of heat from biogas plants

Approximately 40 % of the energy contained within biogas is transformed into electric energy and up to 60 % is exhaust heat. A part of the exhaust heat is used internally to heat the fermentation tank, the rest can be used in other processes. Combined heat and power generation guarantees a bonus of 2 ct/kWh. Combined heat and power means the transformation of used energy into mechanical or electrical energy and useful heat. It represents the most efficient solution for the energetic use of fuels, whether fossil or renewable. The application of combined heat and power generation is essential for climate and resource protection. In most cases combined heat and power plants are used to convert biogas into electricity. The heat generated can be used to dry sewage sludge. About 30,000 € per year are paid as CHP bonus for an exhaust heat amount of two MWh. Additional proceeds are generated with the heat for sewage sludge drying – a lucrative business for biogas plant operators.

Sewage sludge drying

Mechanical sewage sludge dewatering represents the most favourable method to reduce sludge volumes and over a long time has been used as the last treatment stage for sludge from sewage treatment plants. Now that some German federal states are about to abandon the agricultural use of sewage sludge and the Sewage Sludge Ordinance has been amended by the EU with more stringent limit values for copper and zinc for example, thermal utilisation of sewage sludge will remain as the only avail-

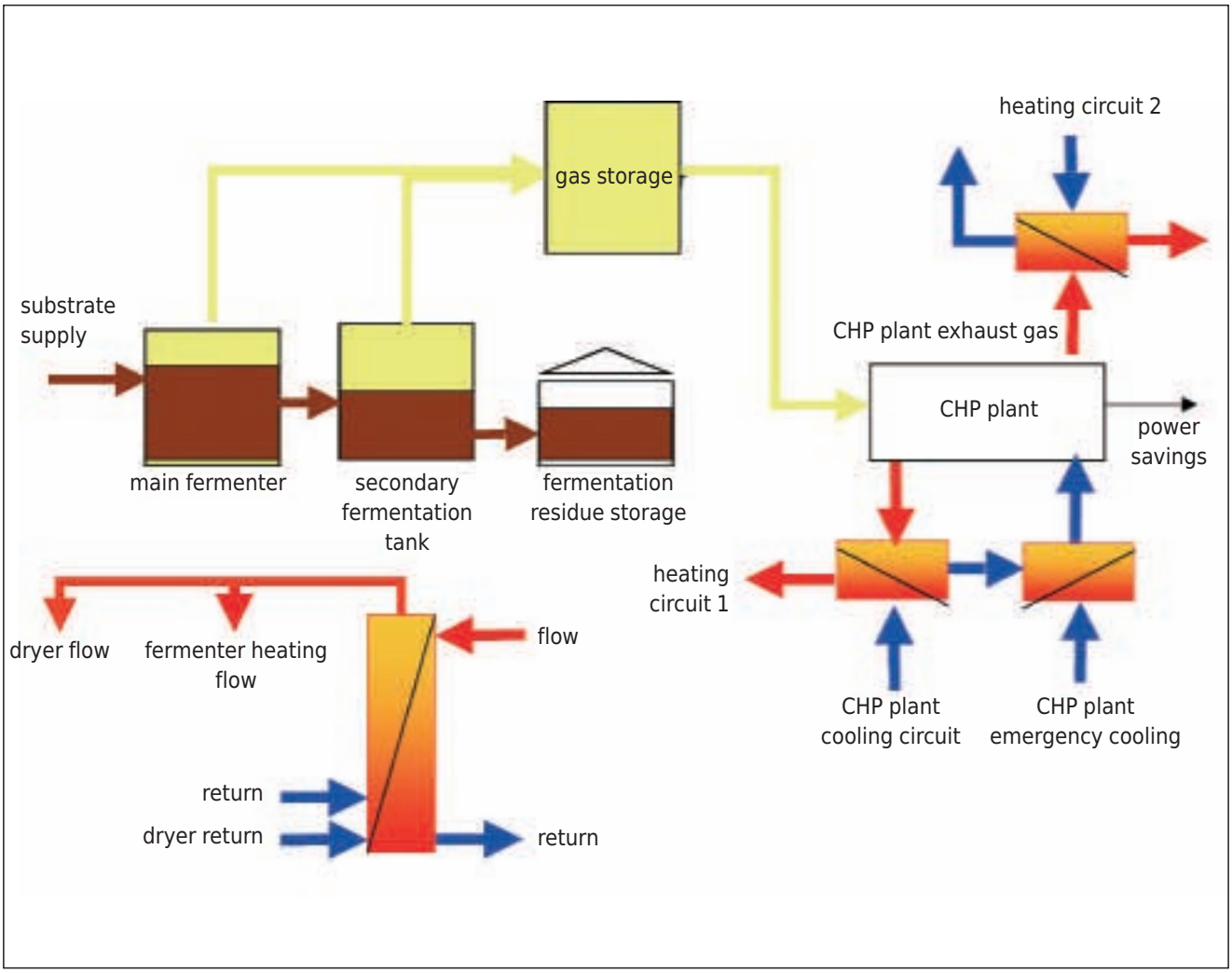
able future disposal option. To minimise the costs for municipalities, the water content of dewatered sewage sludge needs to be reduced. Sludge drying with belt dryers provides for the optimal energetic utilisation of exhaust air. Conventional drum or disc dryers are operated with fossil fuels, whereas belt dryers use the exhaust heat from biogas plants with typical temperatures of 80 – 90 °C. The energy necessary to evaporate in a sewage sludge dryer one ton of water is approximately 800 - 850 kWh. If, for example, 5000 m³ dewatered sludge is generated per year on a sewage treatment plant, about three million kWh heat are required.

Heat exchangers provide the heat for drying by means of 80 °C hot water. Air streaming over the heat exchangers is heated and the heated air passed to the sewage sludge layer on the dryer belts. The water contained within the sewage sludge evaporates into the air. The water-laden air is condensed and re-heated. Such recycling ensures the economic utilisation of heat energy. The generated exhaust air is treated prior to being discharged to the ambient air.

Summary

The design of the HUBER Belt Dryer BT^{plus} has been tailored for the use of exhaust air as generated in biogas plants. The utilisation of heat from the CHP process guarantees the operators of biogas plants an additional source of income over 20 years. The exhaust air is used continuously as prescribed by the legislator as a prerequisite for benefiting from the financial bonus. Sludge volume reduction by drying of sewage sludge reduces transport kilometres to one fifth and actively contributes to CO_2 reduction. Due to the fact that biogas is produced from regenerative resources and the use of the exhaust heat from biogas production for sewage sludge drying a CO_2-neutral fuel is generated for the production of energy in power plants.

Bernhard Ortwein
Business Unit Industry



Circulation of exhaust air from a biogas plant

Each type of waste is different from others – special separation technology for the separation of disturbing material from biowaste

A substantial part of industrial and domestic waste consists of organic substances. These organic fraction contains an enormous energetic potential, the 'organic energy', which has already been utilised in the field of waste treatment for many years but in most cases extensive prior treatment is required. Different countries use different collection systems with more or less differentiated systems for the separation of waste. Accordingly, differentiated processes are required for the treatment of collected (bio-, kitchen) waste, out of date food, etc. to meet the specific requirements of each country and type of waste. Moreover, the scope of treatment steps required differs for continuous dry or wet fermentation. Both processes have one thing in common: separation of disturbing coarse material prior to actual biogas production. The treatment techniques described in the following refer to wet fermentation. Requirements are very specific when it comes to selecting the plant technology for the separation of organics and removal of disturbing material. Making the right choice is crucial for the economic efficiency of the system for energy recovery from waste and for the reusability of the generated residues.

The process

The utilisable part of the waste, after primary crushing and pre-sorting, is treated hydromechanically. Different pulper technologies and crusher techniques transform the fermentable organics into an organic suspension for biogas production. The suspension with a solids content of 5 – 15 % is homogenous and pumpable. Rejects such as oversized floating and settling material can be separated from this liquid suspension. This is necessary in order not to impair the actual fermentation process, prevent disruptions of the course of the process and minimise wear. Irrespective of whether the treatment process is continuous or discontinuous, up to 95 % (depending on separation degree) of the following disturbing materials can efficiently be separated by means of a specially developed HUBER Complete Plant for the removal of coarse, settling and floating matter.

- Coarse material > 6 mm (application-dependent) or > 15 (- 30 mm): stones, plastics, foams, films, textiles, fabrics, wood (branches), etc.
- Settling material: small stones, grit, glass, bones, sometimes metal residues, etc.

HUBER ROTAMAT® Complete Plant Ro 5 Bio

➤ Floating matter: smaller plastic articles, styrofoam, films, wood, etc.

The suspension produced in the pulpers, including the coarse material, flows by gravity through the Complete Plant. The plant automatically and continuously separates the three above-mentioned material flows so that downstream conveyors and other wear-susceptible process technologies only have contact with media that are free of disturbing coarse material. This efficiently minimises sediments and wear.

The individual components

Screening plant with subsequent screenings treatment

Removal of non-decomposable and non-usable material after treatment in the pulpers is perfectly achieved by a fine screen especially developed by HUBER. The screen actually comes from the sewage treatment sector and has proven its efficiency for such applications over many years. Reinforcement of all its essential components makes the screen suitable for continuous operation, i.e. automatic and continuous coarse material removal from (bio-)waste suspensions. The screen is available with bar spacings from 6 to 30 mm (depending on the type of waste to be treated). In this process step, approximately 5 – 15 % of the solids are removed that are contained in the organic suspension produced in the pulpers. The screen offers the advantage of several functions combined in one compact unit: coarse material removal, screenings transport, separation of utilisable organics by means of a modified integrated screenings washing system (IRGA), and pre-dewatering. For additional weight reduction, the screenings are discharged to a screenings press that is designed to perfectly suit the discharged coarse material flow and operates fully automatically. The screenings are additionally dewatered up to 40 % DR. Additional washing of the screenings and removal of still adhering and therefore fermentable substances is possible to a degree that permits to return them to the process. As an option, it can be provided for screenings washing with warm or hot water to achieve an optimal return of organics. The amount / weight of washed out and up to approximately 40 – 50 % DR dewatered screenings in this way is reduced by approximately 20 – 30 %. This offers a potential of saving costs for the disposal of the virtually inert screenings, particularly with regard to ever increasing disposal costs.

Combi grit trap for settling and floating material separation

The grit and glass contained within the waste represent a problem throughout the entire course of the process. If this settling material is not or insufficiently removed, it will settle on the fermenters and in the pipelines and as a result lead to increased wear of pipelines, pumps and stirrers. Even the best stirrer then is unable to loosen such sediments as they bake together solidly and can only be removed with heavy equipment. Efficient grit and settling material separation therefore is applied after coarse material removal and treatment to avoid such sedimentation problems. The aerated longitudinal grit trap especially dimensioned for this process step removes up to 95 % settling material > 2 mm. Separation of the settling material from the viscous organic suspension is achieved through sedimentation. The installed aeration technology control ensures both continuous and discontinuous but always efficient settling material separation even with varying throughputs. The separated settled material is removed by a horizontal screw conveyor installed in the bottom of the trough and transported to the inclined screw conveyor which statically dewaters the settled material while removing them from the system. The organics still attached to the settled material can be removed in a grit washer. The wash water containing the organics is returned to the

In the fine screening plant undissolved solids are removed from the organic suspension (approximately 5 – 15 % of the inflow)

organic suspension or process water storage tank. Washing of settled material, like washing of screenings, reduces disposal costs. Under favourable conditions (e.g. use of warm wash water / suitable input material / grit removal system design) the separated grit / gravel portion can be reused, e.g. as building material. In the same tank, and depending on the input material, aeration may lead to the flotation of smaller, not yet separated light substances. This floating material layer is removed by a screw especially developed by HUBER for this application purpose. This separated floating material can be washed together with the screenings from the preceding screening plant to again reduce disposal costs. Substances that do not float up in this stage of the process will not cause any remarkable problems in the later course of the process. Every day operation of fermentation plants as well as examinations on the occasion of routine inspection of upstream fermentation tanks show that our Complete Plant reliably ensures the effective separation of disturbing material. The screen and grit trap combined in the compact unit are optionally available as individual units.

Removal of disturbing material from organic suspensions without preceding HUBER machines

The different treatment technologies applied to remove disturbing material are not always able to ensure optimal material. Floating layers mainly consisting of light particles (films, fibres, etc.) may form due to flotation effects in the fermenter and cause considerable problems in the fermentation process. If the fermentation residues are dewatered in a decanter, the light particles not separated in the wet-mechanical treatment system, such as foil scraps or other plastics, pass into the centrate and contaminate the process water. If efficient removal of the light materials cannot be ensured by preceding treatment units, they can be separated later in the process. A suspension or fermentation residue screen that can be installed also in a pressure line (approx. 1 bar maximum counter pressure, maximum 1.5 bar process pressure in the pressure line) offers the flexibility of installation at different places. In the same unit the material separated by the screen can be dewatered to up to 35 – 50 %, depending on the type of material. Especially with already existing plants, pump circulation and screening of a partial flow is particularly suitable. Such a screen can be used also in the fermenter outlet, e.g. in the feed line to the decanter or fermentation residue storage. With other dewatering systems, e.g. screw presses, pre-screening is applied to separate films and similar material. Two-stage fermentation systems offer the possibility to remove disturbing material in the organic suspension already after hydrolysis, for example in the overflow from the hydrolysis plant to the fermenter (even without the need for pumps!). Depending on the screen perforation used, inert fibres non-utilisable in the fermentation process and other lignin containing materials are removed. Such screening increases fermenter efficiency or reduces the fermenter volume.

Stainless steel plants for a long product life

Due to different input materials the organic suspension produced is not easy to specify. The use of stainless steel for the above-mentioned plants eliminates corrosion problems. Dead zones in the plants, which would be susceptible to corrosion, are avoided or equipped with washing systems. Plant parts naturally exposed to wear can fast and easily be replaced without hindering the overall process. The use of adapted, flexible systems for the removal of disturbing materials ensures the safe and reliable automatic and continuous operation of (bio-) waste fermentation plants. All essential plant parts are self-cleaning during operation or cleaned by automatically operating washing systems. The manual work required is limited to maintenance and general cleaning work. The right choice of input materials and treatment technology ensures the stable operation of the fermentation process and peripheral equipment.

Bernhard Ortwein
Business Unit Industry

Removal of dewatered disturbing matter from the material separator

Membrane technology for wastewater recycling in textile industry

The situation

Bamberger Kaliko GmbH in Bamberg, North Bavaria, has successfully operated in the textile finishing sector for about 150 years. Their range of products includes textile fabrics for book covers, roller blinds and various technical textiles. Especially in the field of fabrics for roller blinds, Kaliko GmbH is among the leading manufacturers worldwide. They produce about 20 million m² textile, which is a turnover of 30 Mio. € per year.

Bamberger Kaliko GmbH is known for eco-friendly finishing processes without the use of solvent-containing materials, such as chlorine, CFC or PVC. This textile finishing method involves a high process-dependent water consumption of approximately 600 m³/d. The fresh water needed is taken from their own wells and after treatment used in their production. One third (approx. 200 m³/d) of the inflow evaporates. Therefore, only 400 m³/d production wastewater needs to be treated in the company's own wastewater treatment plant before they can reuse the clarified water as service water or discharge it to the municipal sewage treatment plant.

Kaliko have operated their own wastewater treatment plant for 20 years. Previously, their plant existed of a buffer / homogenisation tank, chemical treatment stage, lamella separator, biological treatment stage, sludge treatment stage and collection tank. In the chemical treatment stage upstream of the lamella separator, iron-III-chloride and lime were added to the wastewater flow. The precipitated and flocculated substances contained within the wastewater settled in the lamella separator. The pretreated wastewater was additionally treated in a conventional biological stage.

The limit values for treated wastewater were defined as follows:

COD < 1.000 mg/l
pH: 6 - 7
Temperature < 30 °C

Production conversions, process modifications and increasing volumes lead to overload of the 'old' plant. It was no longer able to meet the required standards. In addition, the municipality increased the surcharge for heavy pollution so that higher wastewater charges had to be paid. There has been a growing trend of rising wastewater charges in general in the course of the past years. Wastewater clarification has therefore become an important location factor with an impact on industries' competitiveness and safe-guarding their location.

Bamberger Kaliko therefore decided in 2007 to upgrade their wastewater treatment plant. The aim was not only to adapt the plant to new requirements but also to verify the reuse of nearly hundred percent of the generated wastewater in order to be in the future totally independent of the scarce resource water, discharge standards and rising wastewater charges.

When looking for a suitable concept for clarification and complete reuse of textile wastewaters, it soon turned out that there would not be a standard solution. It was

Dissolved Air Flotation test plant

therefore discussed with several suppliers how to develop an overall solution on the basis of the following pre-conditions on site:

- Discontinuous production of wastewater over the day / week
- Strongly varying pH from 6 to >13
- Strongly varying pollution degree / load
- High intensity and variation of colour
- Temperatures varying between 25 °C and 80 °C
- Sewage sludge compostability

In cooperation with HUBER SE, Bamberger Kaliko developed a first concept, with a MBR plant as the heart of the system.

A four-month pilot test was carried out to identify the general suitability of the MBR process for this application. During the pilot test phase the design parameters required for the biological process and membrane filtration could be determined as well as the necessary method of pre-treatment.

Another requirement was a quality of the treated wastewater that would not negatively influence later dyeing processes. Particulate COD, iron, salt and water hardness are critical parameters in this respect and must not exceed certain limits.

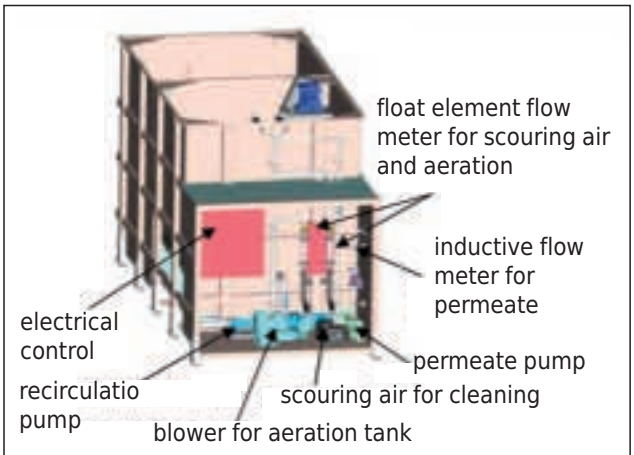
Trial operation and parameters

The wastewater to be tested was taken from the customer's lamella separator. It soon became apparent that solids separation in the lamella separator was insufficient and the precipitated sludge therefore concentrated in the biological stage within a very short time.

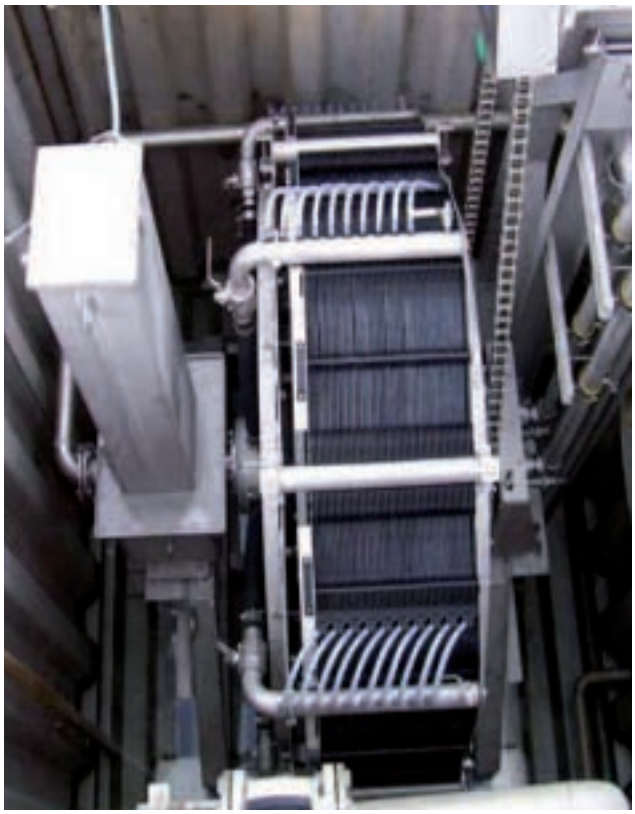
Several preceding settling tanks were added to improve solids separation and generate a virtually solids-free inflow. As this arrangement would not be feasible later with the full scale plant, it was decided after the membrane tests to add a test run with a dissolved air flotation plant.

In case a dissolved air flotation plant is combined with the addition of precipitants and flocculants, colloidally dissolved particles can be flocculated and by means of finest disperse air bubbles separated at the flotation surface. Chemicals dosing and mixing with wastewater takes place in a preceding tubular reactor.

The MBR test plant consists of two chambers, the aeration chamber and filtration chamber. The aeration chamber has a volume of approx. 14 m³. Biodegradation of the biomass takes place in this chamber under aerobic conditions. Via an overflow and circulating pump the aeration



MBR test plant setup



VRM® pilot plant: membrane biology with filtration chamber

tank communicates with the filtration chamber and the rotating membrane modules installed inside.

A "permeate pump" generates an underpressure at the membrane modules with the effect that the permeate is drawn off. Through rotation of the membrane plates and introduction of air bubbles via integrated scouring air lines, a cross flow is generated at the membrane surface that effects membrane cleaning. The VRM® 20/36 with a membrane surface of 108 m² is designed for the average permeate flow of 2 m³/h.

Trial operation and basic results

After some optimisation, both parts of the trials were very successful. The operation with chemical treatment stage and flotation plant achieved not only the separation of solids but also the neutralisation of the frequently varying wastewaters. This created optimal inlet conditions for the MBR plant. The tests were completed after two weeks already. The project engineering phase for the MBR plant was extended to four months to obtain reliable data of biological degradability, membrane tolerance and basic data for scale-up.

HUBER specialists provided intensive support to the local plant operating staff throughout the test phase. The influent and effluent as well as the operating conditions within the integrated aeration chamber were analysed three times a week.

An overview of the analysis results in the form of biological parameters is provided in the table below. Random analysis of the effluent was performed to determine iron, calcium, magnesium and hardness in order to obtain information about the permeate reuse suitability.

Concept for full-scale implementation

After completion and evaluation of pilot testing, scale-up to the real throughput of 400 m³/d began. Individual existing elements, such as the buffer tank and sludge treatment system, were integrated in the final concept. The existing biological wastewater treatment stage, however, was abandoned in favour of the new MBR plant. This is the new plant set-up:

- Mixing and balancing tank (MAB) with 250 m³ volume (existing already)
- Dissolved air flotation plant designed for the maximum flow of 60 m³/h with preceding chemical precipitation and flocculation
- Biological treatment stage (nitrification) with 250 m³ volume
- Two VRM® 20/300 membrane filtration plants with 12.5 m³/h throughput capacity and 900 m² membrane surface each
- 150 m³ permeate storage tank

The existing inlet storage tank has been equipped with a stirrer and serves since to equalize the strongly varying inflow from production. The flotation plant is fed from this tank. The solids-free effluent from the dissolved air flotation plant flows directly into the MBR system. A combined stirrer and aeration system has been installed in a second existing inlet storage tank, which could then be used as the biological treatment stage of the MBR plant. The height of both tanks was increased to create a higher maximum tank volume. The biological sludge flows by gravity from the aeration tank into the two filtration chambers from where the sludge, without the filtrated permeate, is returned to the biological system.

The VRM® membrane units have a membrane surface of 900 m² each. The discharged permeate is collected in the former secondary clarifier and available for further use.

The existing pre-screening system and complete sludge treatment system (for primary and secondary sludge) have been retained unchanged. The new plant was com-

	Unit	COD	BOD_5	NH_4-N	NO_2-N	NO_3-N	PO_4-P
Average inlet values	[mg/l]	2810	700	10.18	1.03	4.36	19.08
Average permeate values	[mg/l]	154	12	0.73	0.28	7.28	8.01
Reduction	[%]	94.5	98	92.9	72.9	n. b.	58.1
	Unit	**Fe II**	**Fe_{total}**	**Fe III**	**Ca**	**Mg**	**°dH**
Average permeate values	[mg/l]	0.30	0.45	0.16	200	16.4	32.3

Inlet and outlet values and reduction rates of the VRM® 20/36 pilot plant

Stirrer / disperser in bio-tank

Biotank (left), mixing & balancing tank (right)

VRM® chamber

Scouring air introduction into VRM® plant

pletely integrated in the overall plant concept.

The technical implementation of the plant comprised two steps. At first, the flotation plant with chemical treatment stage as pre-treatment facility was installed. As an interim solution until MBR start-up, the virtually solids-free flotation effluent was directly discharged into the local sewer network. Already at that time, the effluent quality achieved was far better than that achieved by the old plant so that direct discharge to the municipal sewage treatment plant was possible. This gave all parties involved sufficient time to install the second treatment stage: rebuild the old buffer tank and install the MBR plant. The membrane plant consists of two lines to have a redundant system. Also other key components have been designed as redundant units to ensure maximum plant availability. The plant was put into operation in September 2008.

Operational experience

The new MBR plant has been in service for about 1.5 years. After an optimisation phase, that became necessary due to strongly varying inflows, the plant has very stably been operating to date, producing high-quality service water for reuse in the production process. Special operational experience could be gained and incorporated as plant improvements.

➤ Acidification of the wastewater within the mixing and balancing tank was experienced in the course of plant start-up. This acidification was caused by fractions of coating products within the wastewater that contain starch. The pH was regulated by adding strongly alkaline production wastewater.

- The precipitants and flocculants applied in the chemical treatment stage of the flotation plant have great impact on the performance and economic efficiency of the overall plant. Sufficient time was therefore taken to identify the type and amount of precipitants and flocculants most suitable for Kaliko's specific wastewaters. Aluminium salt was used as precipitant and anionic polymers as flocculants. The consumption and costs of chemicals are meanwhile lower than with the old plant.
- Through optimisation of the volume transfer between the biological and filtration chamber the residence time in the biological stage could be reduced with the result of also reduced COD and BOD concentrations within the permeate and longer intervals between chemical purifications.
- Some of the colourants used for production could not completely be removed and coloured the permeate. Particularly red colourants have turned out to be problematic. The coloured permeate cannot be returned for reuse. Due to the high colour content of approx. 20 m³/d the wastewater is separated into an extra tank and treated in the chemical stage and flotation system to a degree that allows its discharge to the municipal disposal system.

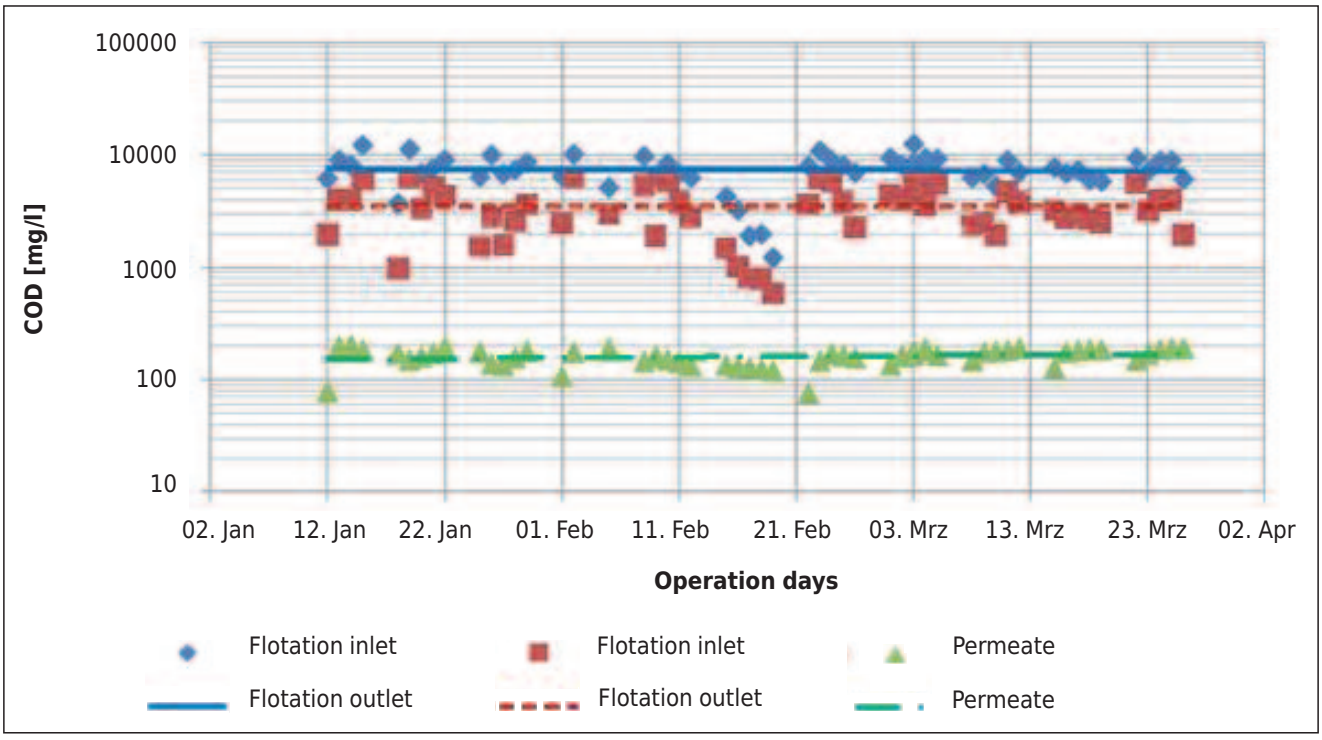
The diagram below illustrates the COD reduction achieved through flotation and the efficiency of degradation provided by the MBR system. Even with the mixing and balancing tank strong COD variations can be observed in the inlet to the flotation and MBR plant, with peaks of 11,000 mg/l upstream of the flotation plant. On average, the flotation plant achieves a COD reduction of 7,500 mg/l to 3,500 mg/l, which is an average reduction rate of 53.3 %.

The MBR plant operates with an activated sludge concentration of 9 g/l and reduces the COD to 170 mg/l on average. The resulting reduction rate is 95 %. The BOD measured in the permeate lies between 8 and 12 mg/l. These measurements and reduction rates give proof of the experience gained from the pilot tests.

Summary

It can clearly be concluded that plant operators benefit from their investment. They benefit financially because they save wastewater discharge fees due to the reduced volumes discharged to the municipal sewer system. In addition, they achieve an image improvement that fits well in their philosophy. They have always placed great value on sustainable and ecological operational concepts. COD values of up to 11,000 mg/l are presently achieved in the plant inlet. These can be reduced to below 200 mg/l in the effluent from the MBR plant. As to the relevant iron concentrations, similar results as in the pilot tests are achieved. Other parameters are currently not determined as they are irrelevant for both discharge and reuse.

Ralph Teckenberg
Business Unit Industry



COD concentration development since January 2010

KUPFER Heilsbronn – A complete wastewater treatment concept for a meat processing company

Hans Kupfer & Sohn GmbH & Co.KG situated in Heilsbronn, Bavaria is one of Germany's biggest meet processing companies. Since their previous own wastewater treatment facilities were not longer capable of meeting increased capacity and clarification requirements, the company decided in 2006 to plan and pilot test a new wastewater treatment plant with the support of Resch engineering consultants and HUBER as equipment supplier. They wanted the new concept to meet higher requirements in terms of capacity and effluent quality, and requested a system that provides state-of-the-art technology in terms of environmental compatibility.

After thorough evaluation of the pilot tests that were carried out with the intensive support of HUBER, it was started to develop a most advanced wastewater treatment system for up to 1,600 m³ wastewater per day (100 m³/h max.). The new system, built in 2007 and successfully put into operation in 2008, consists in a combination of mechanical, physical-chemical and biological wastewater treatment plus additional sludge treatment.

A HUBER RakeMax® screen size 6300/952 with 15 mm bar spacing and two ROTAMAT® Rotary Drum Fine Screen Ro2 units size 1000 with 1 mm aperture and additional high pressure cleaning, installed in parallel, represent the mechanical core components of the preliminary treatment stage and ensure the reliable separation of all important solids loads. After intermediate buffer storage the wastewater is to a high degree homogenized as it is flowing into the following physical-chemical pretreatment stage. This treatment step focuses on the best possible separation of grease and suspended solids to achieve a reduction of COD and BOD loads. A HUBER Dissolved Air Flotation Plant HDF size 10 complete with a chemical treatment is used in this stage. The HUBER VRM® membrane plant for full biological wastewater treatment is at the core of the sewage treatment plant, with three VRM® ultrafiltration units size 30/400 being installed in parallel beside the aeration tank. This plant provides a total membrane surface of 7.200 m² for the most efficient separation of liquids and solids, i.e. water and activated sludge flocks. To meet the requirements of the requested

Flooding of the HUBER VRM® membrane plant

ROTAMAT® Rotary Drum Fine Screen Ro 2 installed next to the HUBER Dissolved Air Flotation Plant HDF

principle of an overall wastewater treatment concept, a ROTAMAT® Disc Thickener RoS2S size 1 with polymer treatment was additionally installed to mechanically thicken the excess sludge. The generated flotate sludge needs no further treatment because it has been sufficiently prethickened by the highly efficient HUBER Dissolved Air Flotation Plant.

The plant worked excellently with a high operating stability very soon after plant start-up so that the predicted clarification results could be achieved and the required effluent standards for direct discharge met without problems.

ject in the field of modern, environment-orientated industrial wastewater treatment that represents an overall treatment concept including reuse options owing to the high effluent quality that allows for direct discharge and providing for secondary sludge utilisation for biogas production due to additional sludge thickening. The project certainly contributed that Hans Kupfer und Sohn GmbH & Co.KG were awarded the Bavarian Environmental Award 2009 donated by the Bavarian Landesstiftung foundation.

Andreas Böhm
Business Unit Industry

Parameter	Influent	Effluent	Reduction
COD - Chemical oxygen demand	1.600 mg/l	32.0 mg/l	- 98.0 %
BOD - Biological oxygen demand	1.100 mg/l	3.3 mg/l	- 99.7 %
N_{total} - Total nitrogen	70 mg/l	(3.1 mg/l)	- 95.5 %
NH_4-N - Ammonium nitrogen		1.0 mg/l	
NO_2-N - Nitrite nitrogen		0.1 mg/l	
NO_3-N - Nitrate nitroge		2.0 mg/l	
P_{total} - Total phosphorus	25 mg/l	0.2 mg/l	- 99.2 %

The sludge thickener not only achieves excellent results but also a significant reduction of the sludge volumes generated so that disposal costs and capacities are minimized. Furthermore, due to the improved solids content of the sludge and high energetic content especially of the flotate sludge, direct co-utilisation in an external biogas plant is possible.

Related to the aspects of operating costs and environmental compatibility of the entire system the possibility to reuse the treated wastewater is of special importance. The high quality of the membrane plant effluent permits the treated water to be discharged into a separate service water network and reused for cleaning, toilet flushing, irrigation of parks, vapour production, etc. to save resources.

In collaboration with KUPFER and their engineering consultants we have been able to establish a reference pro-

ROTAMAT® Disc Thickener RoS 2S

HUBER products for Europe’s biggest slaughterhouse

Europe's biggest pig slaughterhouse Danish Crown, Horsens decided to build the probably most modern slaughterhouse in Europe. In addition to the best state-of-the-art production and slaughtering equipment the management decided to invest also in the field of wastewater and sludge treatment and install most advanced and high quality technology, a complete mechanical and physical-chemical wastewater treatment plant supplied by HUBER SE.

The basic principle is not to combine the wastewater flows of different origin! The wastewater is therefore divided into three individual flows:

- Flow No. 1 is produced in the packing and freezing division (maximum flow: 35 l/s)
- Flow No. 2 is produced in the slaughtering and cutting division (maximum flow: 94 l/s)
- Flow No. 3 comes from the truck washing stand (maximum flow: 15 l/s)

Each of these flows is separately pre-clarified with a specific mechanical screen. Each screen design is adapted to specifically meet the requirements of the individual wastewater flow.

- Flow No.1 is treated with a ROTAMAT® Rotary Drum Fine Screen Ro2, size 780, with 1 mm bar spacing. The screen's main job is to remove packing material residues that consist of paper and pieces of wood.
- Flow no. 2 is more problematic. Slaughterhouse wastewater contains a lot of grease. Solids, such as bristles, pieces of meat or even meat hooks may pass or fall into the machines. The screens to be installed therefore had to be very sturdy and offer a reliable screen surface cleaning system. That is why the ROTAMAT® Rotary Drum Fine Screen Ro2, size 1000, 1 mm bar spacing, with optional hot water cleaning was selected. A main request from the customer was to eliminate the need to disturb or even interrupt the slaughtering processes when maintenance work has to be carried out on the wastewater treatment plant. That is why three screens were installed, so that the main load can safely be handled with two screens and the third screen used as a stand-by unit if and before one screen is shut down.
- The flow No. 3 is dewatered by means of 2 ROTAMAT® Micro Strainers Ro9, size 700, with 3 mm perforated plate. High solids concentrations and at the same time a low flow are characteristic for this wastewater flow. Sawdust and hay are typical materials contained, which the Micro Strainer must be able to handle. In this project, a ROTAMAT® Rotary Drum Fine Screen Ro2, size 2,780, with 1 mm bar spacing is installed after each of the Micro Strainers. This additional treatment step is required as also the wastewater from the truck washing stand flows into the mixing and regulation tank and thus into the flotation plant.

Flotate sludge dewatering with two ROTAMAT® Screw Press RoS 3/3 units with pipe reactor during installation

All wastewater flows flow into a mixing and regulation tank (with approx. 800 m³ capacity) directly after having been screened and without any further treatment. The large storage capacity ensures a regular flow even in the event of hydraulic and load peaks.

In the last step of the wastewater treatment process the pre-clarified and homogenised wastewater is pumped into three HUBER Dissolved Air Flotation Plants type HDF-7 with a hydraulic capacity of 80 m³/h each. (Q_{total} = 240 m³/h) To increase the plant efficiency, FeCl3 and polymers are added to the wastewater. Emulsified grease, blood and very fine suspended material are then precipitated

and flocculated and can be separated by flotation. The chemicals are dosed in at several points in a pipe flocculator with DN 150 diameter.

The flocculator is designed and dimensioned so as to ensure reliable addition of the chemicals and a residence time that is long enough to form stable flocks.

The flotation plants are dimensioned to ensure that two units are able to handle the daily load. But a third redundant flotation unit was installed to again guarantee the high operational reliability and plant availability. In terms of maintenance the slaughterhouse production is thus completely decoupled from the wastewater treatment process.

A big question of the Danish Crown responsibles was the treatment of the produced flotate sludge. But HUBER could provide a technically well-proven solution also for this purpose: flotate sludge dewatering by means of a ROTAMAT® Screw Press RoS3.

Maintenance requirements are low, which has a positive effect on operating costs. Compared to belt filter presses the screw press also reduces the cleaning requirements as there are no filter belts, which might become blocked due to the high amount of grease. This again minimises operating and maintenance costs.

In summer 2005 both the slaughterhouse and wastewater treatment line were put into operation. The results are self-explanatory. The required effluent quality (COD, BOD, SS, grease, etc.) was achieved right from the beginning.

The excellent technology supplied combined with the perfect project processing with our local partners Krueger Denmark convinced the customer. He placed another order for a flotation plant, which was installed in a big Danish Crown plant in Blans in January 2007. Start-up of this HUBER Disolved Air Flotation plant, with chemical treatment stage and for 120 m³/h throughput, took place in October of the same year. Due to our high quality equipment we once again could convince the customer and raise our good reputation.

Alexander Ghazinuri
Business Unit Industry

HUBER Dissolved Air Flotation Plant HDF 7 with chemical treatment stage and sludge tank

Industrial wastewater treatment with HUBER Membrane Bioreactor at GZM Extraktionswerk AG, Lyss, Switzerland

GZM Extraktionswerk AG is one of the biggest slaughtering by-products processing companies in Switzerland with 120,000 tons slaughtering waste and animal carcass per year being processed to meat-and-bone meal and animal grease. The 600-700 m^3 heavily polluted production wastewater is pre-treated in the company's own treatment plant and has until recently been discharged to the local municipal sewage treatment plant. But as high nitrogen and suspended material loads repeatedly caused problems and enormous costs, they decided to install their own industrial wastewater treatment plant.

After a tough competition and intensive technical and economic valuation Picatech-HUBER AG in Kriens, Switzerland received at the end of 2005 the order for two turnkey ready membrane filtration plants VRM® 20/300 including fully automatic electrical control.

Half a year later the installation of the concrete tanks was completed so that the membrane units and mechanical equipment could be installed. The tanks were then filled with clean water and the plant tested for leakage and perfect electrical function.

For plant start-up excess sludge from the WWTP Lyss was filled into the aeration tanks, which were aerated intermittently and fed with wastewater. After only one week the elimination rates exceeded by far the expected values and the effluent values were far below the required standards. More than 99 % of the nitrogen is eliminated.

The clarified wastewater meets the high EU standards for bathing waters and is reused as service water in the production process and on the wastewater treatment plant or discharged into the river Alte Aare.

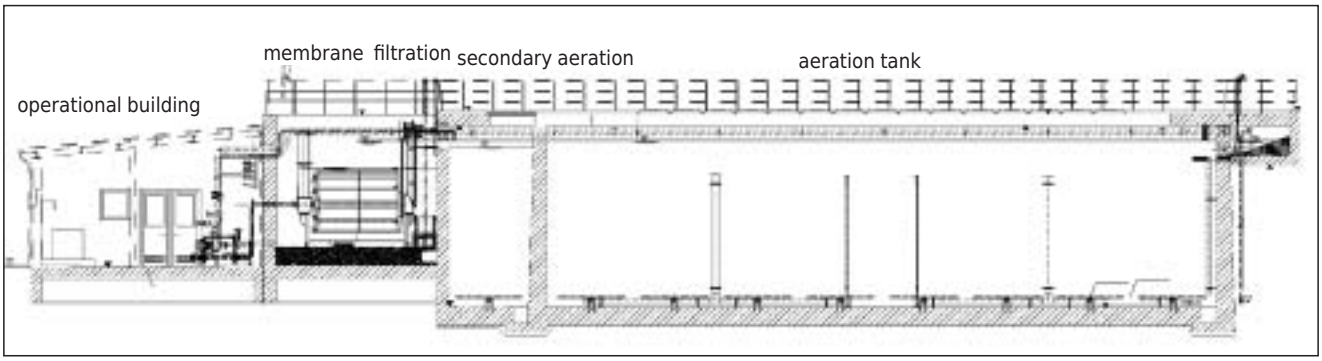
The energy demand of the VRM® membrane filtration plant is only one third of the energy demand for wastewater aeration, which is significantly less than that of other membrane plants.

Johannes Schebesta
Picatech HUBER AG, Switzerland

VRM® Membrane Filtration Plant

Leak control for VRM® bearing

Membrane filtration chamber prior to start-up



Schematic diagram of the Membrane Bioreactor

Parameter	Raw Wastewater	Permeate	Elimination
COD	5.000 mg/l	48 mg/l	99.0 %
BOD_5	3.400 mg/l	4 mg/l	99.9 %
NH_4-N	800 mg/l	0,2 mg/l	99.9 %
N_{tot}	940 mg/l	8 mg/l	99.1 %
Suspended Solids	220 mg/l	0 mg/l	100 %

Successful HUBER overall concept for beverage industry

With a tradition of more than 180 years Jamnica is the biggest mineral water and soft drink producer in Croatia bottling about 350 million litres of mineral water and non-alcoholic beverages per year. In 1993 Jamnica became a member of Agrokor Group and has since developed to one of the most modern enterprises in the European beverage industry due to its careful investment into the modernisation and development of its company. The company focuses on the high quality of its products but also wants to communicate its idea of environmental awareness to its customers. In order to further improve the company's eco-friendly image, Jamnica developed a concept for the treatment of the production wastewater in their Jana and Jamnica factories. At Jana they bottle spring water and produce soft drinks. Mineral water is produced and bottled at Jamnica. In cooperation with LOVECO, partner of HUBER SE in Croatia for more than 15 years, an offer was prepared for two turn-key plants. The scope of the offer included the following machines of the HUBER program that have well proven over many years:

Croatia's biggest mineral water and soft drink producer

- ROTAMAT® Micro Strainer Ro 9
- ROTAMAT® Rotary Drum Fine Screen Ro 2
- HUBER Dissolved Air Flotation Plant HDF
- ROTAMAT® Screw Conveyor Ro 8t
- ROTAMAT® Screw Press RoS 3Q

To meet the high requirements on effluent quality and ensure the problem-free reuse of the treated water as service water, the innovative HUBER VRM® membrane plant was offered in addition. Owing to their extensive experience in the treatment of municipal and industrial wastewater and reputable references HUBER could win the trust of the decision makers and convince them with the well prepared and detailed offer. The purchase contract for the two wastewater treatment plants was signed at Zagreb at the beginning of 2009. In the following phase of detailed technical planning great accuracy was applied to create construction and pipeline plans, building services plans, wiring and cable diagrams. The work on site was predominantly carried out by local companies and coordinated under the lead of LOVECO. The first plant erected was that at Jana. It was successfully put into operation in spring 2010. The second part of the project at Jamnica is planned to be completed in the course of 2011. The major part of the wastewater treated at Jana is production wastewater and wash water from machine and pipeline cleaning but also sanitary wastewater is fed into the treatment plant. The first section of the plant is so-called CIP wastewater treatment. "Cleaning In Place" means that surfaces in contact with the medium are cleaned without the need to dismount the machine. The CIP wastewater is delivered from a pump station into two aerated mixing and balancing tanks where the pH of the cleaning water is adjusted. The pre-treated CIP wastewater, along with the process and sanitary wastewater, is treated in the ROTAMAT® Rotary Drum Fine Screen Ro 2, size 780 with 1 mm bar

spacing. As the production wastewater shows strongly varying inflows and concentrations, the wastewater is passed through the mixing and balancing tank, which is equipped with a stirrer and aeration system. As an option, phosphate and nitrogen may be added to the mixing and balancing tank to ensure perfect bacteria mass formation in the following biological treatment stage in order to obtain a balanced nutrient ratio.

The biological sludge is pumped from the aeration tank into two membrane chambers. Each of these chambers is equipped with a HUBER VRM® ultrafiltration membrane plant, size 30/320. These membranes provide a total filtration surface of 1,920 m³. Due to their fine pore width of 38 nm not only sludge is physically separated from the wastewater but also retained are virtually all bacteria and germs. The permeate from the membrane plant is solids-free and crystal-clear. After a four-week run-in phase excellent COD effluent values of below 30 mg/l could be achieved, which is a reduction in excess of 97%! Part of the treated wastewater is reused as wash water for cleaning purposes and as wash water for the HUBER machines. The part of the effluent not reused can without problems be discharged to the receiving water course. The excess sludge generated in the biological treatment stage is discharged discontinuously into a storage tank with stirrer for sludge equalization to ensure constant feeding of the ROTAMAT® Screw Press RoS 3Q, type 280. Prior to being fed into the screw press the sludge is conditioned with polymer to obtain a stable macrofloc that is very easy to dewater. After detailed preparation of the offer and thorough planning, successful supply, installation and start-up performed by HUBER in cooperation with LOVECO, the plant was “handed over” to the well instructed and competent operating staff at Jana. The wastewater treatment plant concept with well-proven HUBER machines and innovative membrane technology has been implemented to the full satisfaction of the customer. Owing to Jamnica’s far-sighted investment policy, they substantially contribute to environmental protection and communicate their idea of ecological awareness to their employees and customers.

The goal is to reinforce the company’s eco-friendly image

Elke Dambeck
Business Unit Industry


Mixing and balancing tank, bio-tank and HUBER MBR system

HUBER wastewater treatment technology for the biggest factory of the milk processing company Berglandmilch

Berglandmilch reg.Gen.m.b.H. is one of the biggest food processing companies in Austria. After its fusion with Landfrisch dairy about 1,050 employees process approximately 930 million kg milk per year on nine different production sites. Besides, Berglandmilch Group cooperates with about 12,500 suppliers who are at the same time company co-owners.

Berglandmilch operates six factories in Austria (Geinberg, Feldkirchen, Garsten, Aschbach, Voitsberg, Klagenfurt) and since 1999 one in Bavaria (Rottaler Milchwerk). Together with Landfrisch-Werke in Wels and Rohrbach, Austria, Berglandmilch is one of the biggest dairies in Central Europe. Traditional Berglandmilch brands are 'Schärdinger', 'Desserta', 'Jogurella', 'Berghof', 'Alpi', 'Rottaler Milchquell', and also Landfrisch's brands 'Landfrischkäse', 'Rollino' and 'Streichgenuss' are well known beyond the Austrian borders.

On Berglandmilch's biggest production site Aschbach (Lower Austria) up to 1 million litre of milk are processed per day. With Austria's most modern high rack storage and bucket conveyor system, the Aschbach factory focuses on the production of butter, cream cheese and the complete 'white palette' (from fresh milk to fruit yoghurt). To be able to still meet higher requirements as a result of ever increasing production figures, they expanded the capacity of their own wastewater treatment plant in 2009.

Up to 1,800 m^3 wastewater per day, or up to 110 m^3 per hour, flows to the wastewater treatment plant. Its pH can vary greatly depending on its source of generation in the production process. This made it difficult for the old plant to effectively clarify the water. As the clarification capacity of the biological treatment stage was insufficient, the treated wastewater would flow via the intercepting sewer to the municipal WWTP Amstetten with its discharge value limitations. A capacity expansion concept was worked out by the civil engineers HiPi GmbH, Dipl. Ing.re Hitzfelder + Pillichshammer, that included preliminary mechanical wastewater treatment by means of a 3 mm perforated screen, intermediate (existing) buffer tank to compensate variations in wastewater quantity and quality (pH), and a new chemical-physical wastewater treatment stage consisting of a dissolved air flotation plant to reduce the load on the customer's biological treatment system. The sludge treatment line design took into account locally available sludge utilisation possibilities and their requirements on sludge quality. The concept provides for the disposal of the generated sludge to the digestor of the municipal sewage treatment plant of GAV Amstetten where cost-effective disposal of about 18 m^3 viscous sludge per day is possible.

After a strict selection process with the focus on quality, cost-effectiveness and overall economic efficiency HUBER SE finally received the order to supply, install and commission the mechanical equipment for the three main components of the new wastewater treatment concept: wastewater screening, dissolved air flotation and sludge thickening.

HUBER Disc Thickener RoS 2S size 1

As pre-screening system, a ROTAMAT® Pumping Stations Screen RoK 4 size 700 with 3 mm perforated plate was installed directly in the customer's pumping station to the wastewater treatment plant. The screen reliably retains and removes packaging residues and other undesired solids to provide for the sufficient operating reliability of all downstream system components (flotation and biological treatment but also valves and pumps). Furthermore, pre-screening prevents clogging with solids of the downstream wastewater buffer.

Subsequent chemical-physical wastewater treatment is achieved with a HUBER Dissolved Air Flotation Plant HDF size 10 designed for the maximum throughput of 110 m^3 per hour. By using a chemical pre-treatment stage, including pH correction, precipitation and flocculation, the flotation plant is able to reduce COD by about 80% of the initial load. In the long run, an average load of only about 500 to 550 mg/l COD flows to the downstream biological treatment system, instead of previously 2,950 mg/l COD. This solution considerably reduces the load on the biological treatment stage at Aschbach, which consists of a mechanically aerated diversion trench and secondary clarification tank. The customer benefits from new reserves and additional safety.

A ROTAMAT® Disc Thickener RoS 2S size 1 is installed to treat the sludges generated in the biological treatment stage and flotation plant to ensure the sludge quality required for disposal is reliably achieved. Surplus and flotate sludge are collected separately and sludge-specific flocculants added before the sludges are treated alternately in the Disc Thickener. With throughput rates of 4 – 10 m^3 per hour the solids contained within the surplus sludge can be increased from 1- 1.7 % DR to 5 – 6.5 % DR and the solids content in the flotate sludge from 4 – 7 % DR to even 8 – 11.5 % DR. This means that sludge transport costs are more than halved.

In cooperation with HiPi engineers HUBER SE could significantly improve plant operating reliability with the expansion and refurbishment of Berglandmilch's wastewater treatment plant at Aschbach described above. Installations in other Berglandmilch factories and other internationally operating milk companies (such as Müller Group) give proof of HUBER's competence in the treatment of dairy wastewater.

Andreas Böhm
Business Unit Industry

HUBER Dissolved Air Flotation Plant HDF 10 during start-up

HUBER ROTAMAT® Pumping Stations Screen RoK 4-700-3 with insulation

HUBER pre-treatment systems for optimised operation of Kronospan's wastewater treatment plant

Kronospan AG is a company of the Krono Group, Switzerland. Its products are marketed under the trade name KRONOSWISS. The family-owned business is a holding company and one of the most important market players in the field of manufacture and finishing of timber products.

Kronospan AG, like all other Krono Group companies, is run as an independent profit centre. Their production facilities located at Menznau in the beautiful natural hinterland of Lucerne were erected in 1966. The timber products manufactured there are of Swiss quality and marketed worldwide.

What are MDF fibreboards? MDF boards are medium density fibreboards that consist of glued wood fibres. It today seems impossible to do without fibreboards in the field of furniture and internal construction. The production of fibreboards comprises of three main process steps:

During chipping the wood is moulded into the desired shape. After this process, chips still display different sizes. Smaller parts end up in the top layer of the board while larger bits go into the core. The chips must not be damp for the next steps involved in the manufacturing process. For this reason, drum dryers extract moisture from the wood. This is followed by the sifting process where rough and fine chips are separated; sorting plants then remove any sand or metal particles. During the pressing process, glue is added to the chips. The materials are mixed and form a so-called "chip cake". At 250 °C and under high pressure, a press ensures the required composition. The panels are then allowed to cool in large star coolers.

In the process of MDF fibreboard production, wastewaters with high pollution loads are generated at different places. Most innovative wastewater treatment technology is applied to treat the wastewater as perfectly as possible to make it available to be reused in the MDF

ROTAMAT® Screw Press RoS 3 units and HUBER Dissolved Air Flotation Plant HDF 5 with chemical treatment stage

production process or for exhaust air cleaning. Approximately half of the total wastewater is generated in washing processes and during pressing of the chips before these are introduced into the drum dryer. The other half of the wastewater is generated in the exhaust air treatment process that consists of a wet electric filter with integrated washer and a biofilter. Normally, the exhaust air from the drum dryers is treated in this way.

Kronospan AG contacted our subsidiary Picatech Huber AG to urgently save their problems with their wastewater treatment plant. Their previous biological treatment plant was not longer able to cope with the ever increasing requirements and production volumes. The very high solids concentration of 4,000 mg/l and the COD load of approximately 12,900 mg/l give proof of Kronospan's problems. Under these high loads their biological treatment stage was no longer able to achieve the required effluent values. In addition, the energy consumption of the aeration system for COD reduction was very high. They wanted us to drastically reduce COD and solids loads to ensure a stable plant operation and save energy for the biological treatment stage.

From December 2007 to January 2008 pilot tests were carried out to convince Kronospan AG of the efficiency of our machines. For the first test series, a HUBER HDF pilot plant was installed, but unfortunately turned out to have been overloaded with solids. The plant is designed for a throughput of 5 m^3/h but could only be fed with 2 m^3/h because the generated flotate sludge could no longer be removed. Due to the high load of very fine particles in the wastewater also the consumption of precipitants (PAC) was much too high with 3 litre effective substance per m^3. We therefore tried to find a solution how to reduce the majority of solids even prior to flotation.

Fortunately, our RoS 3 test unit was available at that time and could immediately be installed at Kronospan for additional tests. The tests soon showed that pre-screening with the RoS 3 with the addition of flocculants is very well suitable to efficiently remove the solids from the wastewater. The RoS 3 press reduced the COD to 7,200 mg/l and solids to 1,500 mg/l. The filtrate could be treated in the Dissolved Air Flotation Plant without an increase in precipitant consumption. Impressed by the high efficiency of our machines Kronospan AG ordered at the end of May two RoS 3 units for pre-screening and a HDF 5 plant for filtrate treatment.

After installation and successful start-up in July 2008, the plant has proven its efficiency in achieving the required guarantee values. Each of the RoS 3 units is presently operated with a wastewater throughput of 10 – 15 m^3/h. The inlet DR of about 0.4 % is increased to an outlet DR in excess of 30 %. The filtrate from the screw presses is collected in a 160 m^3 storage tank prior to being feed to the HDF flotation plant with chemical treatment stage.

The feed is constantly 25 m^3/h. The effluent from the flotation unit has a COD as low as 3,400 mg/l and is almost free of solids (below 100 mg/l). The flotation plant effluent is finally treated in the customer's biological treatment stage which now can be operated with increased stability due to the significantly reduced loads.

In June 2009, Kronospan AG decided to test another HUBER solution. The basic idea was to reuse treated wastewater as boiler feed water. Our VRM® test unit 20/36 with 108 m^2 membrane surface was installed to further treat the flotation effluent in order to achieve the water quality necessary to be fed into the boilers. The VRM® unit achieved a solids concentration below 1 mg/l in the permeate effluent. The inlet and outlet parameters are listed in the table below.

The effluent from the VRM® unit (permeate) is treated in a subsequent reverse osmosis plant to prevent an increase of salinity in the process water. With its semi-permeable membrane and through a pressure increase this physical treatment method is able to separate molecules. The generated concentrate (retentate) has to be vaporised prior to disposal. The effluent from the reverse osmosis plant can be returned to the water cycle. With this additional treatment step it would now be possible to recycle virtually 100 % of the process water flows.

	Unit	COD	DS	P_{total}	N_{total}
Inlet	mg/l	6247	100	6.5	480
Outlet Permeate	mg/l	346	< 1	2	30
Reduction	%	94 %	> 99 %	69 %	94 %

Due to our extensive experience in the treatment of industrial wastewater we have been successful in implementing another reference project at Kronospan AG, Switzerland in addition to our multiple other reference installations.

Alexander Ghazinuri
Business Unit Industry

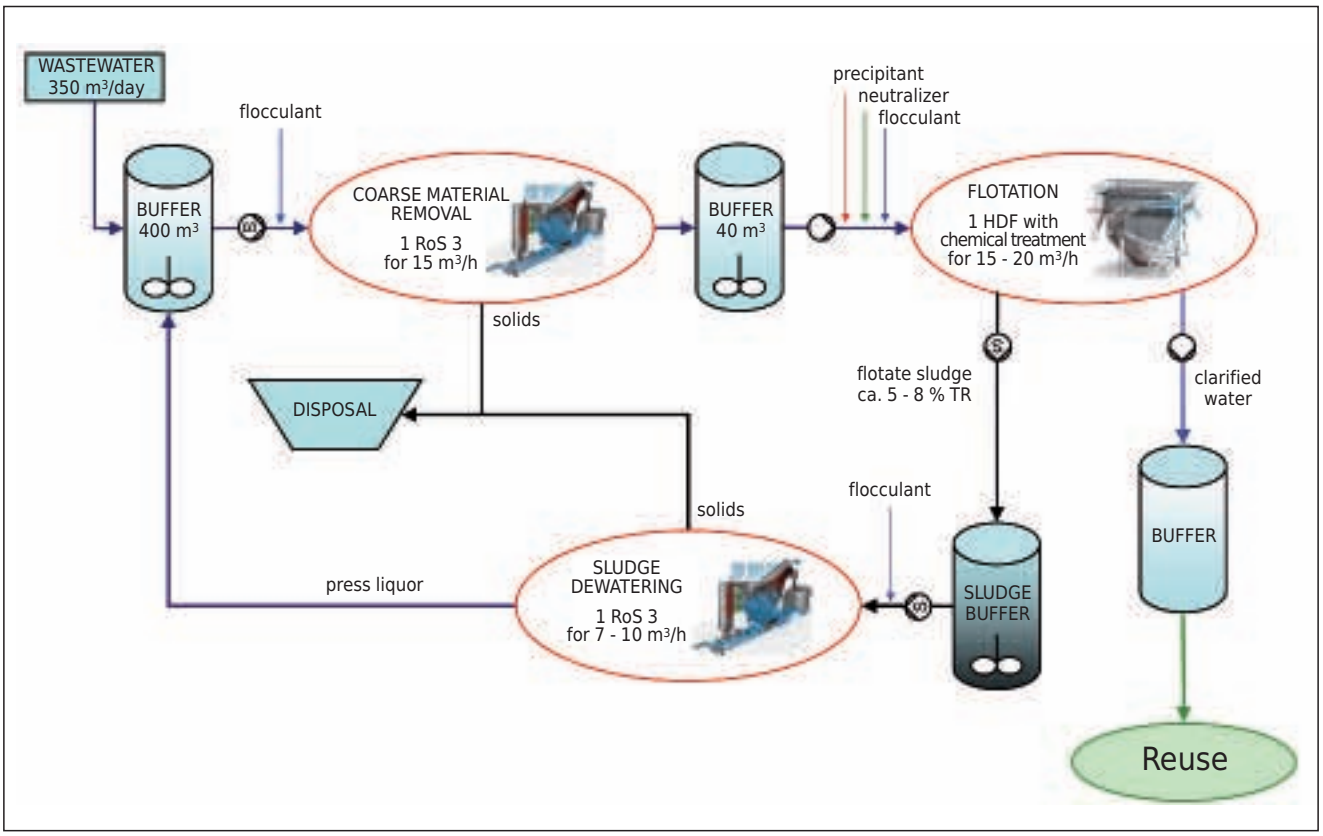
Another reference installation in a wood industry company: Pfleiderer AG, North America

Pfleiderer AG with its 5,600 employees at 22 locations in North America and Western and Eastern Europe produces HDF and MDF products for furniture industries, specialized and do-it-yourself trade and the interior construction market. Pfleiderer supplies a wide range of carrier materials and surface finishing products to customers in more than 80 countries worldwide. Pfleiderer's subsidiary Uniboard has moved from La Baje, Canada to Moncure in North Carolina, USA with the aim to become the US market leader in the manufacture of laminate floorings. At its new location, Uniboard has production capacity for more than 1,600,000 m^3 chipboards and medium and high density fibreboards per year. About 1,400 employees are working for Uniboard at Moncure.

In the process of MDF fibreboard production, wastewaters with high pollution loads are generated at different places. These wastewaters show very high solids concentrations (DS) of 4,000 mg/l and COD load of more than 15,000 mg/l. Most innovative wastewater treatment technology is applied to treat the wastewater as perfectly as possible to make it available to be reused in the MDF production process or for exhaust air cleaning. Approximately half of the total wastewater is generated in washing processes and during pressing of the chips before these are introduced into the drum dryer. The other half of the wastewater is generated in the exhaust air treatment process that consists of a wet electric filter with integrated washer and a biofilter. Normally, the exhaust air from the drum dryers is treated in this way.

Pfleiderer Schweiz AG, Switzerland contacted HUBER at the end of 2008 with the request to cooperate in developing a concept for the treatment of different process flows from a refiner (defibrator), press water and exhaust air treatment. Their focus was on reuse and recycling of process water to minimize their consumption of fresh water. Due to the excellent experience made in

HUBER ROTAMAT® Screw Press RoS 3



Wastewater treatment concept

the treatment of similar wastewaters at Kronospan, Switzerland, the treatment concept was clear very soon:

The wastewater flow of approx. 15 m³/h is prescreened by a curved screen prior to being passed to a 400 m³ mixing and balancing tank where the flow with its different freights and pH values is equalized.

The RoS3 Screw Press is fed with the constant equalized flow. By addition of flocculants, COD values can be reduced to approx. 8,250 mg/l and DS to approx. 1,600 mg/l. The Screw Press effluent flows by gravity into a 40 m³ storage tank from where a constant volume flow of approx. 15 – 20 m³/h is pumped into the dissolved air flotation plant HDF 3 with chemical treatment stage. This chemical treatment includes precipitation with FeCl3 followed by pH correction. Flocculants are added after the pH raise to 7 to generate macrofloc from the colloids and flotate them by means of micro bubbles in the dissolved air flotation plant. The flotate sludge produced is dewatered by another RoS3 Screw Press unit. The dissolved air flotation plant with chemical treatment stage allows to reduce COD to 4,125 mg/ and DS to below 110 mg/l. The virtually solids-free flotation effluent is introduced into sandfilters prior to being treated in a reverse osmosis plant. The treated process water can now be reused in the MDF manufacturing process, for example in the gluing process, wood chip washing or exhaust air treatment. With this wastewater treatment concept, Uniboard is able to operate its production with zero discharge of water.

A major benefit of our solution is the reduced consumption of chemicals. Pretreatment with the Screw Press RoS3 reduces solids by 60 % as mentioned above. Otherwise, precipitant consumption would be very high as the fine suspended matter would cause the precipitant to be reacted to exhaustion. Another advantage is the small design of the flotation plant. Due to pre-treatment with the Screw Press RoS3, a smaller flotation plant is sufficient, as the limiting factor with flotation is the solids feed per m² and hour.

After installation and successful start-up in April 2010, the plant has proven its efficiency in achieving the required guarantee values.

Due to our extensive experience in the treatment of wastewaters generated in wood industries, we have been successful in implementing another reference project at Pfleiderer AG, USA, in addition to our multiple other reference installations.

Alexander Ghazinuri
Business Unit Industry

ROTAMAT® Screw Press RoS 3 – an international success in paper industry applications

Wood and paper industry is deemed to be one of the biggest industry markets with the highest levels of turnover. The down sides of its success are the need for huge production and storage facilities and frequently no less significant are the problems caused for the surrounding environment. Particularly a high water demand and more stringent environmental standards require ever increasing efforts when it comes to wastewater treatment and clarification, which is also reflected in the high amounts of sludge generated.

For easy and cost-effective disposal of these sludge volumes, the best possible dewatering solutions are of special interest. But it is also economic efficiency that counts, in addition to the actual dewatering results achieved by the applied technology.

It shows that the HUBER ROTAMAT® Screw Press RoS 3 is among the internationally leading suppliers when it comes to dewatering secondary sludge (biological surplus sludge) and primary sludge (fibrous sludge). References all over the world give proof of our thoughtfully designed, easy to operate and highly reliably products.

KCPM - KIEVSKIY CARDBOARD AND PAPER MILL, Kiev (Ukraine)

Site:	Ukraine (installed in 2002)
Machines:	3 x 2 RoS 3 machines installed in parallel
Application:	Dewatering of primary sludge (fibrous sludge)
Throughput:	50 - 60 m³/h total throughput
Inlet DS:	1.8 – 3.6 %
Final DS:	32.8 - 49.5 %

In 2002 already, six ROTAMAT® Screw Press units for sludge dewatering could be sold to the Ukraine via local sales partners. These machines were installed successfully in one of the country's biggest paper factories. Preliminary tests with a mobile containerised RoS 3 unit were the basis for this sales success. KIEVSKIY CARDBOARD AND PAPER MILL was convinced of the excellent operating results but equally important for them was the operating reliability and economic efficiency of the complete dewatering system. The special arrangement of the installation (three of two parallel units) guarantees the continuous treatment of the generated sludge without quality or quantity losses even during maintenance or in the event of unexpected failure of a machine. In order not to unnecessarily waste energy and operating media particularly in phases with low throughput, each of the ROTAMAT® Screw Press units can be switched on and off individually to permit quick reaction to varying inflows.

TRAKIA PAPIR, Pazardzhik (Bulgaria)

Site:	Bulgaria (installed in 2006)
Machines:	2 RoS 3 units installed in parallel
Application:	Primary sludge dewatering (fibrous sludge)
Throughput:	15 - 35 m³/h total throughput
Inlet DS:	1.5 - 3.0 %
Final DS:	44.1 - 46.9 %

TRAKIA PAPIR belongs to the DUROPACK Group and, with almost 70% market share, is the leading manufacturer of cardboard packages in Bulgaria. Until 2006, the fibrous sludges generated during paper processing were treated in almost 30 year old vacuum presses. Due to their old

3 x 2 ROTAMAT® Screw Press RoS 3 units installed in parallel (Ukraine)

age and technical principles in general the customer was not satisfied anymore with the dewatering results achieved (about 30% final DS). The use of two ROTAMAT® Screw Press RoS 3 units significantly increased dewatering efficiency and drastically reduced the amount of sludge generated so that the costs for sludge disposal could be cut by one third. HUBER machines also excel with their low operating and maintenance costs as their special design reduces energy and operating media demand. Furthermore, their susceptibility to wear is reduced compared to vacuum presses.

2 ROTAMAT® Screw Press RoS 3 units installed in parallel (Bulgaria)

INTERNATIONAL PAPER, VCP Trës Lagoas (Brazil)

Site:	Brazil (installed in 2008)
Machines:	4 x 2 RoS 3 units installed in parallel
Application:	Primary sludge dewatering (fibre and drinking water sludge)
Throughput:	100 - 103 m³/h total throughput
Inlet DS:	2.5 - 2.7 %
Final DS:	> 40.0 %

Our successful cooperation over years with INTERNATIONAL PAPER, the worldwide biggest paper processing company, brought us the biggest individual order ever received for paper sludge dewatering. In 2005, we already had sold and installed four ROTAMAT® Screw Press RoS 3 units for sludge treatment in one of their many manufacturing bases in Brazil. These machines have been operating without any problems to date. Impressed by their performance and excellent operating results combined with high economic efficiency and cost-effectiveness, INTERNATIONAL PAPER ordered another eight ROTAMAT® Screw Press RoS 3 units for their production site VCP TRÊS LAGOAS. These machines are used to dewater a mix of fibre-containing primary sludge and chemical sludge from the precipitation stage of the factory's water treatment system. They were delivered, installed and commissioned in summer 2008. Due to our extensive experience over many years with such kinds of applications the required dewatering results and polymer consumption did not represent a problem and were even better than demanded. The well-proven functional principle of the ROTAMAT® Screw Press RoS 3 shows excellent functionality, especially with regard to the dewatering results achieved with the precipitation sludge admixed to the fibrous sludge. Moreover, the enclosed system minimizes the potential for environmental contamination with chemical sludge.

Andreas Böhm
Business Unit Industry

4 x 2 ROTAMAT® Screw Press RoS 3 units installed in parallel (Brazil)

Efficient filtration required for the nuclear power plant Gösgen

The treatment of process water demands a lot of the filtration process. The nuclear power plant Gösgen, located between the Swiss cities Aarau and Olten, takes its cooling water from the river Aare. The water therefore shows high turbidity loads during storm events or during the snowmelt period.

The majority of the extracted river water is used as cooling water while a small part is passed to an ion exchanger to obtain service water. Lime is added for decarbonisation to maintain the high efficiency of the susceptible ion exchanger and minimise regeneration intervals. The solids produced in this process settle in the following sedimentation tank but about 10 – 20 mg/l solids (finest calcium carbonate) remain in the effluent. The ion exchangers are unable to cope with such high rates.

As the operators wanted to modernise their pressure sand filter they decided to carry out pilot tests with the HUBER CONTIFLOW® Sandfilter. During the continuous filtration process in the 2 m sand bed and at the same time discontinuous sand washing taking place even finest turbidities remain in the sand bed, with even an increased separation effect. Sand washing starts automatically when a defined degree of contamination has been detected by a pressure probe. In addition to the increased separation effect the wash water demand is reduced from about 7% to 2%. After six weeks the pilot tests finished with convincing results. The filtrate quality achieved ranged from 0 – 0.6 mg/l solids.

Two HUBER CONTIFLOW® Sandfilter CFSF 50 C units were installed in autumn 2009; start-up took place in spring 2010 after a scheduled inspection.

This installation does not stand out of the number of HUBER Sandfilter installations due to its size but excels with its high efficiency in separating finest inorganic material of < 1 ppm filterable solids – a clear proof of the advantage of deep bed filtration over two-dimensional disc filters.

High filtration efficiency with moderate investment and operating costs as well as high manufacturing quality and professional cooperation during the pilot tests were the facts that convinced the nuclear power plant operators.

Bernhard Ortwein
Business Unit Industry

Aerial photo of the nuclear power plant Gösgen

Crystal-clear effluent from the sandfilter

HUBER STEP SCREEN® Vertical for cooling water screening in South Africa

From 2001 to 2004, we could sell to Sasol in South Africa 65 units of our STEP SCREEN® Vertical SSV, size 4300 x 776 x 3, for river water screening. The second delivery in 2002 with 28 SSV screens, size 4300 x 776 x 3, still is the biggest individual order ever received for mechanical step screens. Sasol is a worldwide active oil and gas company with extensive chemical activities. Based in Johannesburg, Sasol is one of South Africa's five most important companies listed on the stock exchange. About 30,000 employees worldwide generate an annual turnover of more than 11 billion US $.

South Africa does not have any oil resources of its own and has to find solutions how to avoid complete dependence on oil imports. In 1950, South African Synthetic Oil Limited (SASOL) was founded. SASOL mainly uses local coal deposits to produce fuel, kerosene, waxes and other hydrocarbons by means of the Fischer-Tropsch synthesis (developed in Mühlheim a.d. Ruhr, Germany in 1925). This synthesis process operates at about 160 to 200 °C. This reaction and other treatment methods require exact temperature control at any time, for example through cooling which is ensured by means of heat exchange processes in the cooling tower operation. SASOL operates several cooling towers on its three production sites in South Africa and compensates their water losses with river water. The water throughput per cooling tower is up to 55,000 m³/h. The installed heat exchangers and pumps are protected against coarse pollution by 7 / 14 SSV screens. Before installation of the HUBER screens (STEP SCREEN® Vertical) simple sieves with high cleaning requirements were used for pump protection. Moreover, they were not efficient enough to clarify the river water so that sediments frequently led to blockage in the area of the heat exchangers in the cooling system. Any failure of a heat exchanger causes costs and loss of production of millions.

The HUBER SSV screens represent an automatic, low-maintenance separation technology that reliably prevents blocking of both the heat exchangers and pumps. Since installation of the screens, Sasol has been very satisfied with their operation and ordered another four SSV 4300 screens for one of its sites to facilitate maintenance work. They plan to order additional replacement machines and keep them in stock to have them immediately available as standby without having to interrupt the cooling systems in case one of the screens installed in the cooling process needs to be dismounted. This allows for convenient maintenance of the dismounted screen.

Stockkeeping of replacement screens combined with a HUBER service contract ensures the required virtually 100 % availability of the screens in the cooling process.

Bernhard Ortwein
Business Unit Industry

Seven HUBER STEP SCREEN® Vertical units installed in the inlet to the cooling tower

HUBER Service substantially contributes to ensuring plant availability

In the biogas power plant Flörsheim-Wicker biogas production is followed by another treatment stage in which the generated fermentation residues are dewatered in four HUBER screw presses, type RoS3 Bio. The press liquor generated in the dewatering process is pre-treated in a HUBER Flotation Plant. The effluent from the flotation plant is clear water. After the successfully executed plant start-up experienced HUBER service technicians optimized the supplied products and peripheral equipment on site. The plant operators RMD Rhein-Main-Deponie GmbH had then to make another decision.

It was of great importance for the operators to sustainably secure the high quality of the applied technology and high availability of the plants. They therefore concluded a HUBER Service and Maintenance Contract. In view of the enormous requirements on the equipment required to handle the difficult to treat material the operators examined beforehand in detail the features of the different types of the HUBER Service Contracts (HS1, HS2, HS3).

Major reasons for decision were regular checks for wear and securing high machine availability within quarterly executed routine maintenance. These criteria are covered

HUBER Dissolved Air Flotation Plant HDF for press liquor treatment

by the HUBER contract type HS3. The main features of the contract are the following:

Maintenance:

- Regular check-ups of all machines and peripheral equipment on the basis of check lists.
- Evaluation of the status of each relevant machine area including accurate examination for wear and according data recording.
- Lubricant replacement
- Replacement of spare and wear parts that are identified to be at the permissible wear limit within the scope of regular maintenance to ensure plant availability until the next regular maintenance.

Special guarantee:

- Functional and operating guarantee between maintenance intervals.

Hotline service:

- Call-back guarantee within 8 hours after receipt of the fault report, even on Sundays and holidays.

48-hour trouble shooting service:

- Guaranteed visit by a HUBER service engineer within 48 hours after confirmation by the HUBER Service Centre.

Product optimisation package:

- Check-up of the overall function and process of the machines including upstream and downstream processes.
- Inspections according to HUBER-equipment-specific HS3 check sheets. The HS3 check sheets are evaluated in the HUBER service centre.

After we had received from RMD the order for a type HS3 service contract for lot 3 (dewatering of fermentation residues and wastewater treatment) and type HS2 for lot 1 (reception and intermediate storage of liquid bio-waste), we could for a second time prove our expertise in the execution of maintenance and the high benefit for the customer. Together with AWS, the operators commissioned by RMD, we contribute to ensuring operating reliability and hence continuous problem-free operation of the complete biogas power plant. HUBER service contracts keep you on the safe side. Different versions are available that meet your individual requirements. I would like to take this opportunity to thank Mr. Lahnstein of RMD and Mr. Quack of AWS for their confidence and look forward to a long-term successful cooperation.

Hubert Stadler
Business Unit Global Service

A commitment to customers – availability of maximum service expertise at any time

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Visit our international sales partners under www.huber.de.

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