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Grit Recycling at the Largest German WWTP



Pair of 20 m³ slurry receiving tanks with Ro 8 screw conveyors



Two ROSF 9 wash drums with WAP screenings presses for the removed and washed coarse solids



One of two big grit washers RoSF 4, size 3

The hydraulic capacity of the wastewater treatment plant Emschermündung is 30 m³/s. This is a gigantic flow, larger than of any other German, perhaps even European, wastewater treatment plant.

The wastewater arrives at the plant not via conventional sewers, but its inflow is the river Emscher. The treated effluent of the plant enters the river Rhine. This is the reason why the plant's name is Emschermündung, meaning "mouth of the Emscher". The river Emscher flows through the northern part of the old industrial heartland of Germany, the Ruhr region. The Emscher river is in fact used as an open sewer, serving several big cities and many towns located along this river.

The Emschergerossenschaft (Emscher River Wastewater Association) has started a giant renaturation project by constructing sewers parallel to the river Emscher, starting upstream down, but it will take many years to complete this project down to the Emschermündung plant.

Since the plant's inflow is an open river, it has to treat a storm water flow of up to 30 m³/s. And one can easily imagine the huge freight of debris, leaves and grit arriving within a few hours after storm events.

Giant bar screens are provided at the plant's headworks. The first stage screens have a bar spacing of 60 mm, that of the second stage screens is 20 mm. The screened inflow enters a very large settling basin with a surface area that easily exceeds that of a sport stadium. Then the wastewater flow is distributed to several smaller parallel settling tanks with a length of 50 m. Bottom scrapers push the sediment back into the large basin. The combination of these basins serves as a giant grit trap. The large basin is provided with a pair of bottom scrapers, each provided with four air-lift pumps. The total grit slurry flow from the basin is 400 m³/h. Of course, this flow does not only contain grit, but also rocks, debris, silt, sludge and much water.

The management of the Emschergerossenschaft decided to provide a grit treatment system, and they want to recycle their large amount of grit as construction material, e.g. for pipe or road bedding. This is only possible if the grit is washed, its organic content reduced to well below 5 % and dewatered. The problem was that such a giant grit treatment system, removing such huge freights of debris and sludge, has never been built before. No standard grit treatment system was available in the market for this purpose. In addition, the Emschergerossenschaft wanted to add some more grit slurry from other wastewater treatment plants, sewer flushing and gully cleaning.

Planning of the entire grit treatment system was commissioned to the consulting engineering firm Dr. Sixt. As the result of a public tendering procedure, the Emschergerossenschaft selected the HUBER concept because of its obvious advantages in respect of functionality, operational reliability and cost effectiveness. Detailed design of the system began during autumn 2004, after we were awarded the contract for the supply of the system's core equipment.

For operational reliability our grit treatment and recycling concept includes redundant key components. It comprises the following main process steps: Up to 400 m³/h grit/sludge slurry flows through a channel to screw pumps with 540 m³/h capacity. After the slurry is lifted, it flows by gravity through the entire treatment system. First the slurry flows through a DN 800 channel to a pair of ROTAMAT® wash drums RoSF 9. Additional slurry from other plants, sewer flushing and gully cleaning is lifted from 20 m³ slurry receiving tanks into this channel by means of ROTAMAT® screw conveyors Ro 8 (See Figure 1).

Course solids > 10 mm are retained and washed in the ROTAMAT® wash drums RoSF 9, while the finer slurry drains through the drums' perforations. The washed course solids drop at the end of the wash drum into WAP screenings presses where they are dewatered, compacted and discharged onto belt conveyors for discharge into containers (see Figure 2).

The screened slurry drains from the wash drums into an aerated concrete grit chamber underneath. The grit settles while most of the organic solids and silt is returned into the wastewater treatment plant for further treatment. The settled grit is removed with an air-lift pump that forwards a flow of about 60 m³/h grit slurry through an elevated channel. At the end of the channel the flow is distributed to a pair of COANDA® grit washers RoSF 4 (See Figure 3). We provided our largest size grit washers that can each handle a 30 m³/h flow with 1.5 t/h of grit. Within the grit washer tanks, in a fluidized bed, the grit is washed from organic solids. The organics in the wash water overflow at the top and are returned to the plant. The washed grit is removed at the bottom of the grit washer tanks and dewatered in an inclined screw. At the end of the screw the clean grit, containing less than 3 % organics and less than 10 % water, is discharged into a container. The clean grit product is then reused as construction material.

The grit treatment and recycle system was started up during fall 2005. During the following weeks we had to do some optimization work. In the meantime, the system operates reliably and to the customer's satisfaction. It has proven well capable to handle even the extreme grit freights that the Emscher river carries into the plant.

by Wolfgang Branner, Product Manager Business Unit Mechanical Treatment

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