SLUDGE TREATMENT IN WASTE WATER PLANTS WITH EASY HANDABLE AND RELIABLE MECHANICAL SEPARATION TECHNOLOGY

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Abstract:

Stricter requirements to be met for secondary effluent treatment results in steadily growing sewage sludge volumes. The high water content in the sewage sludge is the main obstacle in realizing ecological, economical sewage sludge disposal. The application of high-performance decanters ensures optimal, low-cost mechanical sludge dewatering and an appreciable reduction in the volume of the sewage sludge to be disposed of. Maximum mechanical dewatering leads to a significant cost reduction in the thermal sewage sludge dewatering process. Sewage sludge drying installations can be smaller on account of the decreased volume due to the high dry substance values in all disposal methods.

In all disposal methods such as agricultural application, dumping or thermal treatment the high-performance decanter offers the optimum dewatering system.

Legal and technical basis for the utilization and disposal of sewage sludge

Increasing legal requirements are being made on sewage sludge disposal with regard to the sludge composition and disposal methods.

In many countries criteria have been defined for

- ⇨ agricultural use - analyse of sludge and soil values – fixed volumes to be spread on land
- ⇨ landfill – organic proportion determined as volatile solids < 10 % resp. 5 %

⇨ incineration – emission values of sludges.

Non-utilizable sewage sludges must be subjected to thermal treatment (incineration / pyrolysis) after mechanical dewatering and, if necessary, thermal drying. No sewage sludge disposal at landfill sites without pre-treatment.

Limits of dewatering

The maximum dewatering of sewage sludges depends on the sludge composition and the dewatering process selected.

Differentiation is made between good, medium and poor sludge dewatering properties, characterized by binding varying specific water quantities. The dewatering properties can be evaluated by comparing different parameters. These include specific filtration resistance, compressibility, solids concentration, organic volatiles, sludge volume index, temperature, pH value and particle size.

It has to be emphasized that today's modern high-performance decanters achieve equally good or better dewatering results than chamber filter presses, assuming they operate under the same conditions, i.e. when the sludge to be dewatered is conditioned with, for example, a polymer flocculent.

Flexible dewatering methods should be chosen that can be quickly and easily adapted to changing conditions. High-performance decanters with electrically adjustable scroll have proved especially suitable for this task because they automatically adjust to the momentary sludge parameters, thereby achieving maximum dewatering of the sludge.

Sludge dewatering with high-performance decanters

Centrifugal decanters have been applied in sewage treatment plants for sludge dewatering for over three decades. The centrifugal force in the decanters is utilized to separate the solids from the water. The use of organic flocculents, the polyelectrolytes, made it possible to coagulate the fines sludge particles to relatively large sludge floc in the centrifugal field so that reliable separation of solids and water could take place. Today, separation efficiencies of approx. 99 % are attained.

The demand for smooth operation coupled with the advantages of continuous feeding in sewage sludge dewatering meant that the decanter was able to establish itself in the market very quickly.

In the meantime, there has been a radical change in the requirements to be met by sewage sludge dewatering. Today, decanters for high clarification efficiencies and highest possible solids dewatering are required. A basic pre-condition for this is a high bowl speed and an enormously high scroll torque in conjunction with a differential speed control that operates proportionally to the solids loading. This is what a typical high-performance decanter looks like.

The design of this high-performance decanter is based on decades of experience in centrifugal separation technology together with intensive research and development.

This high-performance decanter type features a modern design compared to conventional decanters.

The bowl is located in a self-supporting, noise-insulated cast-iron housing. In conjunction with a closed installation, the closed design prevents the emission of aerosols, thereby protecting the health of the operators, and the environment.

For application in industrial and municipal effluent plants the bowl is manufactured from non-corrosive stainless steel.

Scroll flights, solids ejection ports, solids catch chamber and the product inlet area are provided with additional corrosion protection, thereby assuring a long service life.

Location of high-performance decanters in sewage plants

In the process in a municipal sewage treatment plant, the effluent is pumped through the fine screen and the aerated sand trap into the preliminary clarification basin where the heavy solids (primary sludge) sediment. They are pumped into the mixed sludge tank.
The pre-clarified water flows via the nitrification / denitrification stage into the activated sludge process. In the secondary clarification stage the activated sludge (secondary sludge) is separated from the water.

The clarified water is then subjected to phosphate precipitation. The tertiary sludge obtained during precipitation is separated in the downstream clarification

basin. The purified effluent flows into the receiving body of water. Part of the secondary sludge is recycled into the activated sludge process as return sludge.
The so-called surplus activated sludge is thickened together with the tertiary sludge to 5 – 6 % DS in a decanter, then mixed with the primary sludge and anaerobically conditioned in the digesting tower. Polymer flocculent is added to the digested sludge, which is then dewatered with high-performance decanters and sent to further disposal. The optimally dewatered sludge can be used in agriculture, dumped, dried or incinerated.

What results are obtained with high-performance decanters in sludge dewatering?

What do dewatering plants with high-performance decanters look like?

Summary

Mechanical sludge dewatering developed under the pressure of steadily growing sewage volumes. Besides the reduction in volume, higher dewatering levels were also attained with ecological and economical methods.

All these requirements can be met with the benefit of Separators.