Wastewater treatment plants

Intensified sludge treatment by ultrasound

Reduction in greenhouse gas emissions
Positive CO₂ balance due to ultrasound

Electricity produced from biogas is climate-neutral, which is particularly positive for the greenhouse gas balance. Therefore, by using the Ultrawaves ultrasound systems, the CO₂-neutral energy production can be further increased.

“Significantly lower CO₂ emissions.”

One of our first installations has been in operation on the Bamberg wastewater treatment plant since 2004. The plant is equipped with two ultrasound systems (5 kW each), which sonicate an excess sludge volumetric flow of around 80 m³ daily. On the long-term average, we have recorded an average specific energy consumption as low as 2.4 kWh/m³.

This remarkably low value shows that use of our ultrasound equipment is far more economical in practice than is often assumed, and is not comparable to often published data from experimental laboratory tests.

Installation of the ultrasound systems

Ultrawaves ultrasound systems can be very easily integrated into municipal and industrial wastewater treatment systems. The standard ultrasound unit (5 kW) is very compact with a footprint of only 4.5 x 0.45 m and therefore requires little space. On-site, it is only necessary to provide inlet and outlet connections as well as an electrical and water connection. The ultrasound units usually operate 24 hours a day.

Practical results

Bamberg wastewater treatment plant – one of the first reference plants

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“Permanent positive development of biogas production and degradation rate of the wastewater treatment plant in Bamberg.”

The mathematical model drawn up by Ultrawaves calculates the emission reduction achieved by using ultrasound, as the following example shows: In a wastewater treatment plant with 300,000 p.e. ultrasound achieves a 10% relative increase in anaerobic sludge degradation. As a further consequence the dewaterability of the digested sludge is increased by 4% (relative). These effects result in a reduction in the annual greenhouse gas emissions by 2.49 t CO₂ equivalents per p.e. This corresponds to a reduction of around 170 tonnes CO₂ equivalents per year for this wastewater treatment plant.

Further and more detailed descriptions of case studies as well as our reference list are presented on our website.

The advantages in summary

Sludge treatment

- Improved degradation of the organic fraction of sludges
- Reduced biogas production
- Less residual sludge
- Better dewaterability
- Safe, reliable operation even with short retention time
- Reduction in bulking sludge and foams
- Prevention of bulking sludge and foams

Wastewater treatment

- Optimized nitrogen degradation
- Reduced quantity of sludge at disposal
- Disinfection of highly turbid waters

Development of biogas production and anaerobic sludge degradation on Bamberg wastewater treatment plant

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<th>Operating time of the ultrasound systems [year]</th>
<th>VS degradation [%]</th>
<th>Biogas production [1000 m³/a]</th>
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Ultrawaves GmbH develops and markets innovative high-power ultrasound systems for wastewater treatment and biogas plants, and systems for other and industrial applications. The company was founded in 2001 as spin-off company from Hamburg-Harburg Technical University (TUHH) and since then has worked closely with research facilities and industrial partners. Through our extensive sales and partner network we are represented internationally and offer a worldwide service.
Ultrasound systems on wastewater treatment plants

Areas of use and advantages

Ultrasound high-power ultrasound systems can be used for a large number of applications in both municipal and industrial wastewater treatment plants. These primarily include sludge treatment, but also wastewater treatment in the form of controlling bulking sludge and foaming.

Sonication of a small quantity of the return activated sludge or thickened excess sludge biomass is more readily available for the subsequent biological enzymatic degradation process. The entire digestion process is intensified and the organic fraction is further degraded. An important advantage from this is a significantly increased production of biogas and reduction in the quantity of residual sludge to be disposed of. As a result of the smaller quantity of residual organic matter, the dewaterability of the digested sludge is also facilitated (less flocculent addition) and increased (higher degree of dewatering). This disintegration of the sludge floc structure and medium. Ultrawaves has proven that this process causes filamentous micro-organisms to particularly suffer and therefore forces them to release more volatile solids degradation of 50% are rarely achieved.

With the help of ultrasound technology, digestion which are at the limit of their capacity can easily continue to be operated long-term. In new installations the digesters can be designed with a shorter retention period. With the help of ultrasound technology, digesters which are at the limit of their capacity can easily continue to be operated long-term. In new installations the digesters can be designed with a shorter retention period. With the help of ultrasound technology, digesters which are at the limit of their capacity can easily continue to be operated long-term. In new installations the digesters can be designed with a shorter retention period. With the help of ultrasound technology, digesters which are at the limit of their capacity can easily continue to be operated long-term. In new installations the digesters can be designed with a shorter retention period.