

IMPROVEMENT OF ANAEROBIC DIGESTION BY ULTRASOUND TECHNOLOGY

Ahrensburg WWTP, Germany



I. Brief snapshot of the plant	
Design capacity	50,000 PE
Actual loading	38,000 PE
Biological wastewater treatment	<ul style="list-style-type: none"> ➤ Street 1 <ul style="list-style-type: none"> • High-performance activated sludge process (C-decomposition) • Slurry tank • Trickling filter (nitrification) ➤ Street 2 <ul style="list-style-type: none"> • Anaerobic tank (P-elimination) • Anoxic tank (upstream denitrification) • Aerobic tank (C-decomposition, nitrification) • Slurry tank ➤ Street 1 + Street 2 <ul style="list-style-type: none"> • Fixed bed reactor (denitrification) • P precipitation by Fe³⁺ • Filtration
Sludge treatment	<ul style="list-style-type: none"> • No primary sludge • Thickened waste activated sludge • Co-substrate
Separate waste activated sludge thickening	<ul style="list-style-type: none"> • Filter band (operating 24 hours)
Anaerobic sludge stabilization	<ul style="list-style-type: none"> • 1 digester, 4,000 m³, mesophilic • HRT: 40 days
Degradation of volatile solids (VS)	<ul style="list-style-type: none"> • 40% of VS as per cent of dry solids (before the preliminary trial)
Digested sludge dewatering	<ul style="list-style-type: none"> • Centrifuge
Sludge disposal	<ul style="list-style-type: none"> • Incineration

II. Objective of the ultrasound sludge disintegration

- Improve volatile solids degradation
- Increase biogas production
- Reduce polymer consumption in sludge dewatering

III. Preliminary trial of the ultrasound disintegration system

- Test phase of eight months (November 2007 – June 2008)
- 50% of the total TWAS flow were treated with 1 ULTRAWAVES US unit 5 kW, operating 24 hours per day (Figure 1)

IV. Results

<ul style="list-style-type: none"> • Volatile solid degradation 	<ul style="list-style-type: none"> • Degradation of the volatile solids was improved from 40% to 46% • Decrease in volatile solids disposal of 170 kg/d
<ul style="list-style-type: none"> • Biogas production (Fig. 2) 	<ul style="list-style-type: none"> • 20% increased biogas production • Elevated a production of 276 m³/d
<ul style="list-style-type: none"> • Reduction of polymer consumption for sludge dewatering 	<ul style="list-style-type: none"> • From 10 kg to 8 kg polymer / t TR

V. Payback time

Based on these results, the payback time for the ultrasound installation is calculated with 3 years.

VI. Full-scale installation

In May 2009 the ULTRAWAVES ultrasonic system was implemented on WWTP Ahrensburg and since is in operation 24 hours per day.

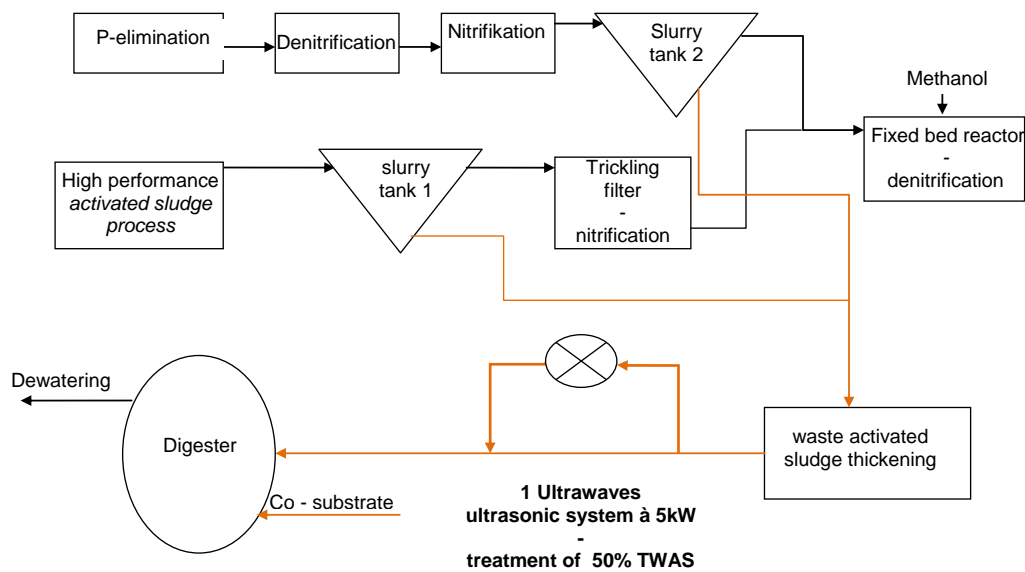


Figure 1: Scheme of sludge treatment on WWTP Ahrensburg

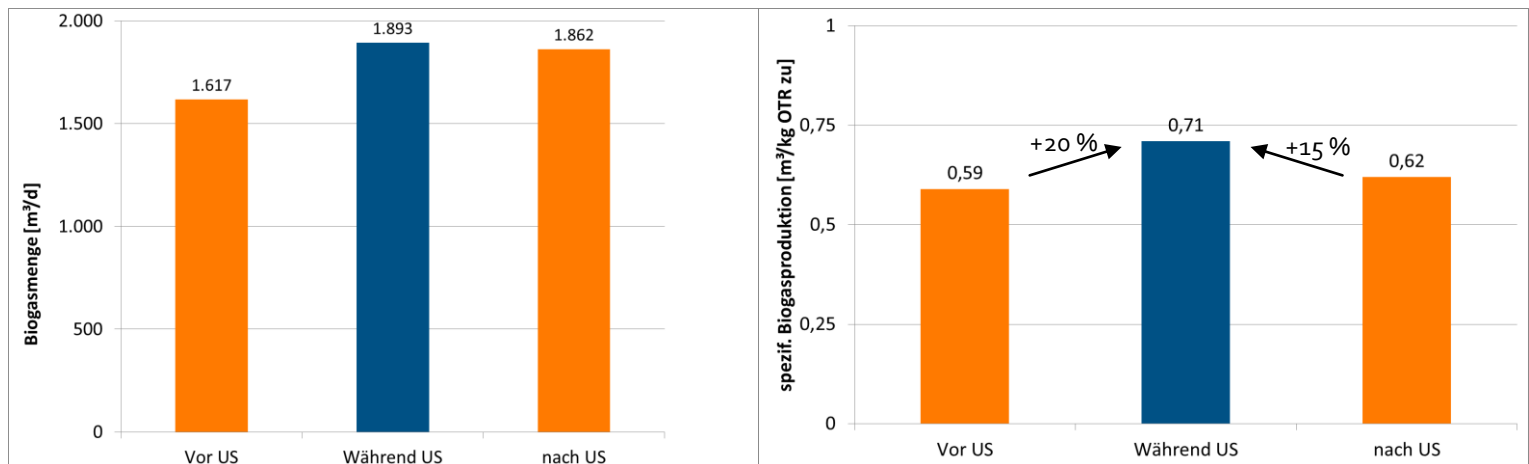


Figure 2: Comparison of total and specific gas production before, during and after the US test

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