

# 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**
  - Street 1
    - High-performance activated sludge process (C-decomposition)
    - Slurry tank
    - Trickling filter (nitrification)
  - Street 2
    - Anaerobic tank (P-elimination)
    - Anoxic tank (upstream denitrification)
    - Aerobic tank (C-decomposition, nitrification)
    - Slurry tank
  - Street 1 + Street 2
    - Fixed bed reactor (denitrification)
    - P precipitation by  $\text{Fe}^{3+}$
    - Filtration
- **Sludge treatment**
  - No primary sludge
  - Thickened waste activated sludge
  - Co-substrate
- **Separate waste activated sludge thickening**
  - Filter band (operating 24 hours)
- **Anaerobic sludge stabilization**
  - 1 digester, 4,000 m<sup>3</sup>, mesophilic
  - HRT: 40 days
- **Degradation of volatile solids (VS)**
  - 40% of VS as per cent of dry solids (before the preliminary trial)
- **Digested sludge dewatering**
  - Centrifuge
- **Sludge disposal**
  - 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 5kW, operating 24 hours per day (Fig. 1)

## IV. Results

- Volatile solid degradation  
Degradation of the volatile solids was improved from 40% to 46%
- Biogas production (Fig. 2)  
20% increased biogas production  
Elevated a production of 276 m<sup>3</sup>/d
- Reduction of polymer consumption for sludge dewatering  
From 10kg to 9kg 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.

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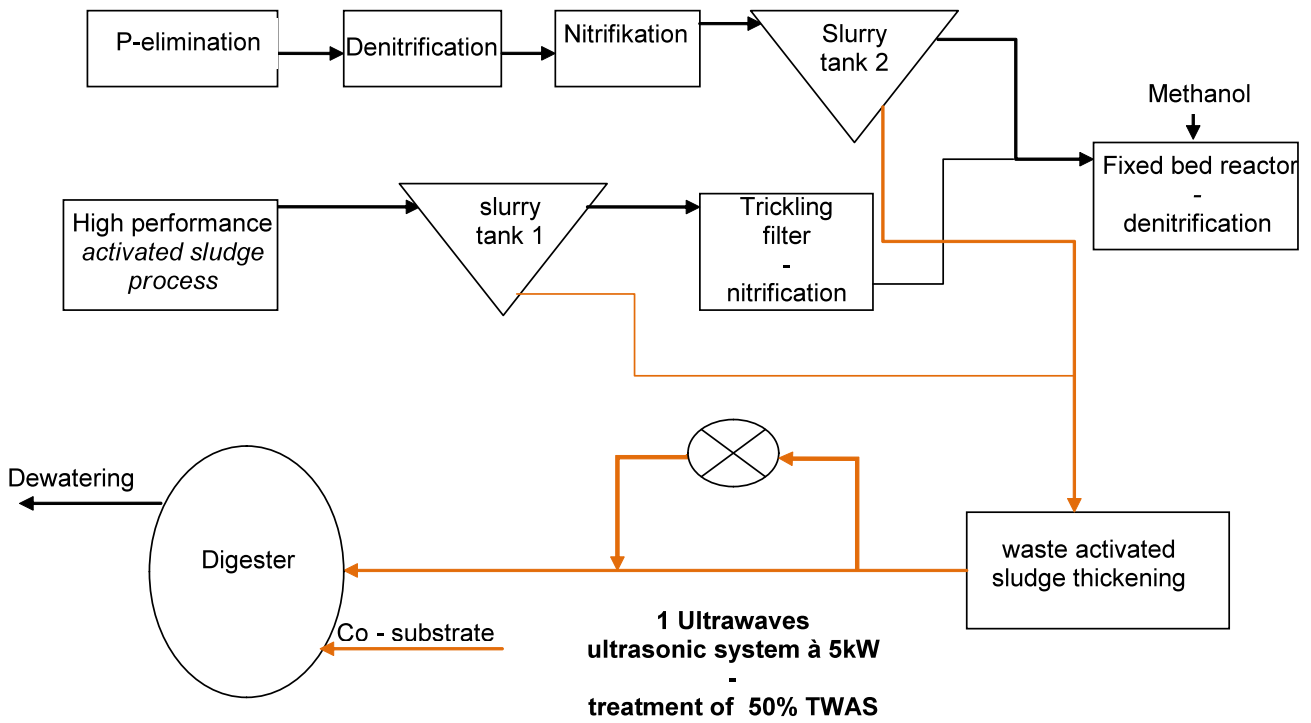


Fig. 1: Scheme of sludge treatment on WWTP Ahrensburg

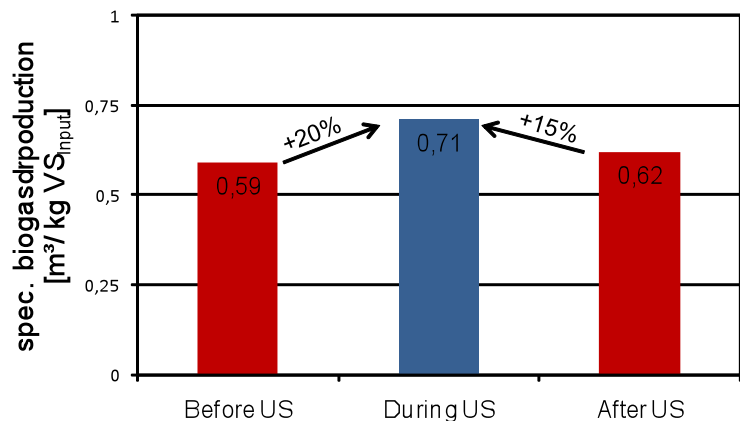
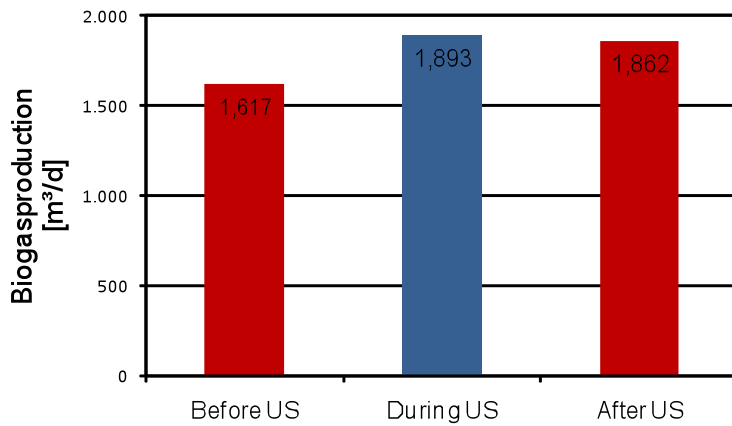


Fig. 2: Comparison of total and specific gas production before, during and after the US test