IMPROVEMENT OF ANAEROBIC DIGESTION AND DEWATERABILITY BY ULTRASONIC DESINTEGRATION

Kleinsteinsbach WWTP, Germany

I. Brief snapshot of the plant

<table>
<thead>
<tr>
<th>Design capacity</th>
<th>32,000 PE</th>
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<tbody>
<tr>
<td>Actual loading</td>
<td>28,100 PE</td>
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- **Biological wastewater treatment**
  - Primary sludge treatment
  - Denitrification
  - Chemical Phosphor elimination
  - Secondary settling stage

- **Sludge treatment**
  - Primary sludge: ~ 45 m$^3$/d
  - Thickened waste activated sludge: ~ 35 m$^3$/d

- **Separate waste activated sludge thickening**
  - Separate filter band thickening of waste activated sludge (~ 10 h/d)

- **Anaerobic sludge stabilization**
  - 1 mesophilic digester, anaerobic (1,000 m$^3$)
  - HRT: 12.5 days

- **Biogas production**
  - Specific biogas production: 200 L/kg VT$\text{in}$
  - 50% of the CHP capacity used

- **Degradation of volatile solids (VS)**
  - 40% (as per cent of dry solids)

- **Digested sludge dewatering**
  - Chamber filter press

- **Sludge disposal**
  - Incineration
  - Costs: 75€/t

II. Objective of the ultrasound disintegration

- Increase biogas production
- Improve volatile solid degradation
- Improvement of dewaterability for the reduction of disposal costs
III. Preliminary trial of the ultrasound disintegration system
- Test phase of five month (March 2009 – August 2009)
- 50% of the TWS flow was treated with 1 ULTRAWAVES US unit 5 kW, operating 8 hours per day

IV. Results
- Degradation of the volatile solids was improved from 30 to 60 %
- 28% increase in biogas production
- Improvement of dewaterability from 31 to 36%

V. Payback time
Based on these results, the payback time for the ultrasound installation is calculated with 2 years.

V. Full-scale installation
In September 2009 the ULTRAWAVES ultrasonic system was implemented on the WWTP.

Figure 1: Scheme of the sludge treatment on the WWTP Kleinsteinbach
Figure 2: Volatile solid in digested sludge.

Figure 3: Specific biogas production January 09 – September 09

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