I. Brief snapshot of the plant

<table>
<thead>
<tr>
<th>Design capacity</th>
<th>40,000 PE</th>
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<tbody>
<tr>
<td>Actual loading</td>
<td>54,000 PE</td>
</tr>
</tbody>
</table>

- **Biological wastewater treatment**
  - P-elimination
  - Alternating nitrification and denitrification at a sludge age of about 22 days
  - Addition of methanol as external carbon source
  - Secondary clarifier

- **Sludge treatment**
  - No primary sludge
  - Thickened waste activated sludge

- **Separate waste activated sludge thickening**
  - Belt press (operating 24 hours)

- **Anaerobic sludge stabilization**
  - 2 digester, mesophilic
  - HRT: 40 days

- **Digested sludge dewatering**
  - Centrifuge

- **Sludge disposal**
  - Incineration

II. Objective of the ultrasound sludge disintegration

- Use of disintegrated TWAS as an internal carbon source for the improvement of the denitrification process.

III. Preliminary trial of the ultrasound disintegration system

- Test phase of four months (March 2006 – June 2006)
- 50% of the total TWAS flow were treated with 1 ULTRAWAVES US unit 5 kW, operating 24 hours per day and feed in denitrification basin (Fig. 1)
### IV. Results

- A significant reduction of the nitrogen concentration in the effluent (N < 3 mg/L)
- Avoid of methanol as external carbon source
- Waste activated sludge: Reduction of the sludge mass by 13%
- Reduction of the organic fractions
- Improvements in dewaterability of the sludge by 2%
- No foaming or bulking sludge in the activated sludge tank

### V. Payback time

Immediately, because of reimbursement in form of reduced public sewage fees as a result of decreased nitrogen concentrations in the effluent of the plant and cost savings of avoided methanol.

### VI. Full-scale installation

In September 2006 the ULTRAWAVES ultrasound system was implemented on WWTP Bünde. And since is in operation 24 hours per day. WWTP Bünde bought a second ULTRAWAVES ultrasound system for the improvement of anaerobic digestion in 2007.

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*Figure 1: Scheme of sludge treatment on WWTP Bünde and Ultrasound system with thickener*
Figure 2: Comparison of N-concentration in effluent before (2005) and during (2006) the US test, and Volume of sonicated sludge fed in denitrification basin.

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