Ultrawaves Wasser- und Umwelttechnologien GmbH
Kasernenstraße 21 21073 Hamburg
www.ultrawaves.de

Improvement of anaerobic digestion by ultrasound technology

Bamberg WWTP, Germany

I. Brief snapshot of the plant

- **Design capacity**

  230,000 PE

- **Actual loading**

  289,000 PE

- **Biological wastewater treatment**

  P-Elimination

  Denitrification

  Nitrification

  Downstream P-precipitation by Fe^{3+}

  Secondary clarification

- **Sludge treatment**

  Primary sludge
  Thickened waste activated sludge

- **Separate waste activated sludge thickening**

  Centifuge

- **Anaerobic sludge stabilization**

  3 Digester
  D 1 2,000 m³, mesophilic
  D 2 3,000 m³, mesophilic
  D 3 2,000 m³, mesophilic
  HRT: 18 days

- **Degradation of volatile solids (VS)**

  34% of VS as per cent of dry solids (2003)

- **Digested sludge dewatering**

  Centrifuge

- **Sludge disposal**

  Incineration

II. Objective of the ultrasound sludge disintegration

- Improvement of the anaerobic digestion to avoid the construction of a fourth digester (initial plan was the construction of a fourth digester (3,000m³) to increase the hydraulic residence time from 18 d to 25 d).

III. Preliminary trial of the ultrasound disintegration system

- Test phase of four months (May – August 2002)
- 30% of total TWAS flow were treated with 2 ULTRAWAVES US units à 5 kW, operating 8 hours per day (Fig. 1)

IV. Results of the preliminary trial

- Volatile solids degradation
  Reduction of the volatile solids (as per cent of DS) from 60% to 54%

- Biogas production
  30% increased biogas production
  Elevated a production of 2,270 m³/d

V. Full-scale Installation

Two ULTRAWAVES US systems à 5 kW are implemented since August 2004. In the beginning the recommended part (30% of the total TWAS flow) was treated at operating 8 hours per day. The thickening process was automated to operating 24 hours per day. Today the treated part amounts to 90% of the total TWAS flow. The results of long-term ultrasound disintegration are represented in form of the Figure 2 and Figure 3 over the period from 2004 to 2007.

VI. Payback time

Based on early results of the full-scale operation the payback time is calculated with three years. The construction of a fourth digester could be avoided.

Contact:

Ultrawaves Wasser & Umwelttechnologien
Kasernenstraße 12
21073 Hamburg
Telefon: +49 (0)40 325 07 203
www.ultrawaves.de

Entsorgungs- und Bau Betrieb Bamberg
Betriebsleiter: Mr. Wolff
Rheinstraße 4
96052 Bamberg
E-Mail: klaerwerk@stadt.bamberg.de
Tel.: +49 (0)951 87 72 70
Fax: +49 (0)951 87 72 07

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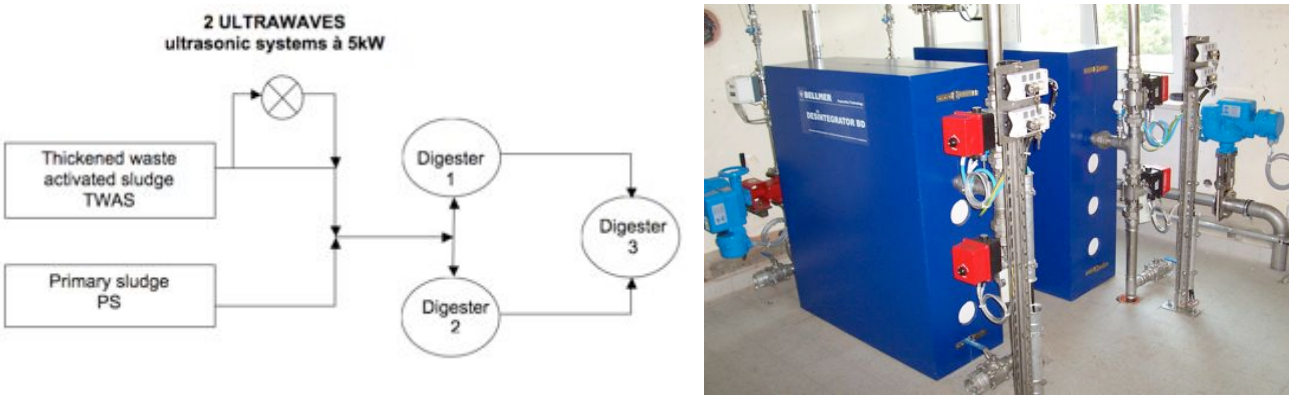

Fig. 1: Scheme of sludge treatment on Bamberg WTTP

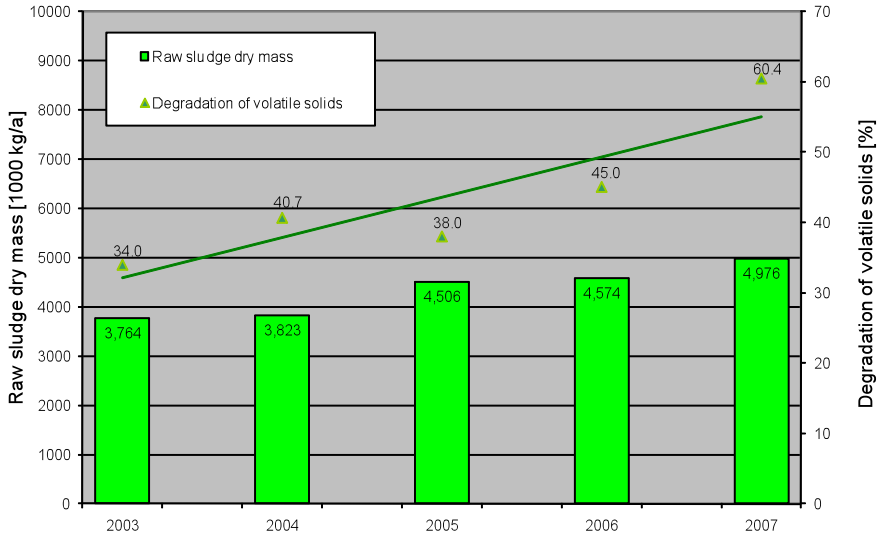

Fig. 2: Sludge feed and degradation of volatile solids

Fig. 3: Total biogas production, biogas production 1st stage, biogas production of 2nd stage and fraction of biogas production 1st stage