ULTRAWAVES - HIGH-POWER ULTRASOUND SYSTEMS FOR WATER AND ENVIRONMENTAL ENGINEERING
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EEN COMPANY MISSION - CHENGDU VISIT

Dipl.-Ing. Gunnar Klingspor



ULTRAWAVES Water & Environmental Technologies

- Spin-off-Company from Hamburg University of Technology
- Founded 2001
- 15 technical employees, 12 part-time workers & students
- Managers: Dr. K. Nickel, Prof. (em.) Dr. U. Neis
  - Research group „Ultrasound in Environmental Eng.“ (Prof. (em.) Dr. U. Neis)
    - 20 years experience in ultrasound applications
    - 100 publications
    - International conferences: 1999, 2002, 2005

ULTRAWAVES WATER & ENVIRONMENTAL TECHNOLOGIES

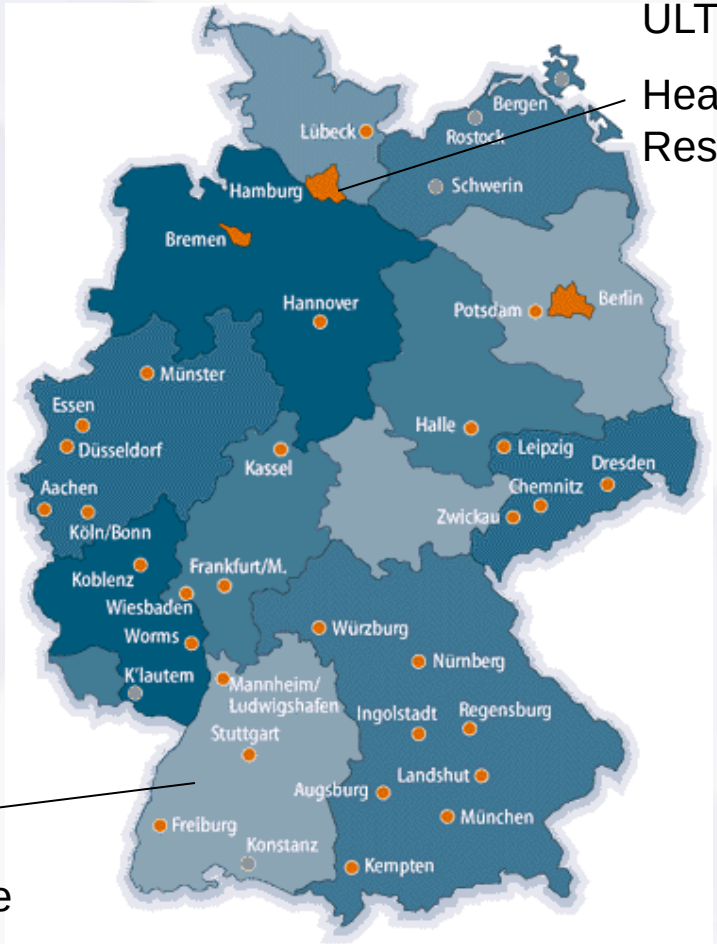
We offer

- Planning
- Design & Development
- Production

of high-power ultrasound (HPUS) systems for environmental applications (for municipal and industrial environmental engineering), especially for the treatment of

- water
- wastewater
- biomass (sludge)

ULTRAWAVES Water & Environmental Technologies



ULTRAWAVES-Hamburg:

Headquarter: Management, Research & Development

ULTRAWAVES
WASSER & UMWELTTECHNOLOGIEN GMBH

ULTRAWAVES-Karlsbad:

Development and Manufacture

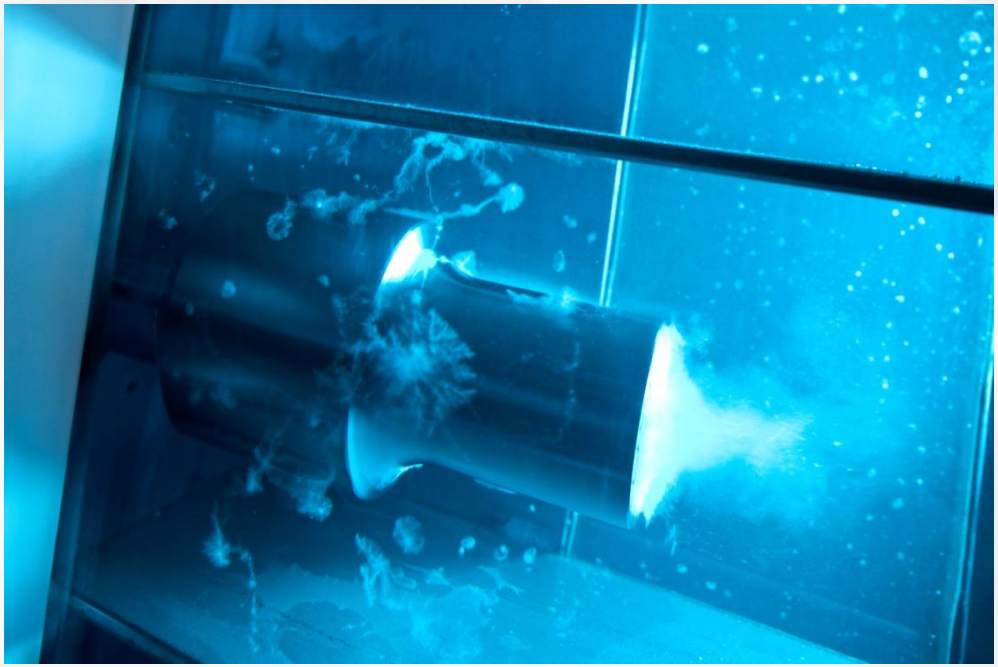
SONOTRONIC
ULTRASONICS TECHNOLOGY

ULTRAWAVES
WASSER & UMWELTTECHNOLOGIEN GMBH

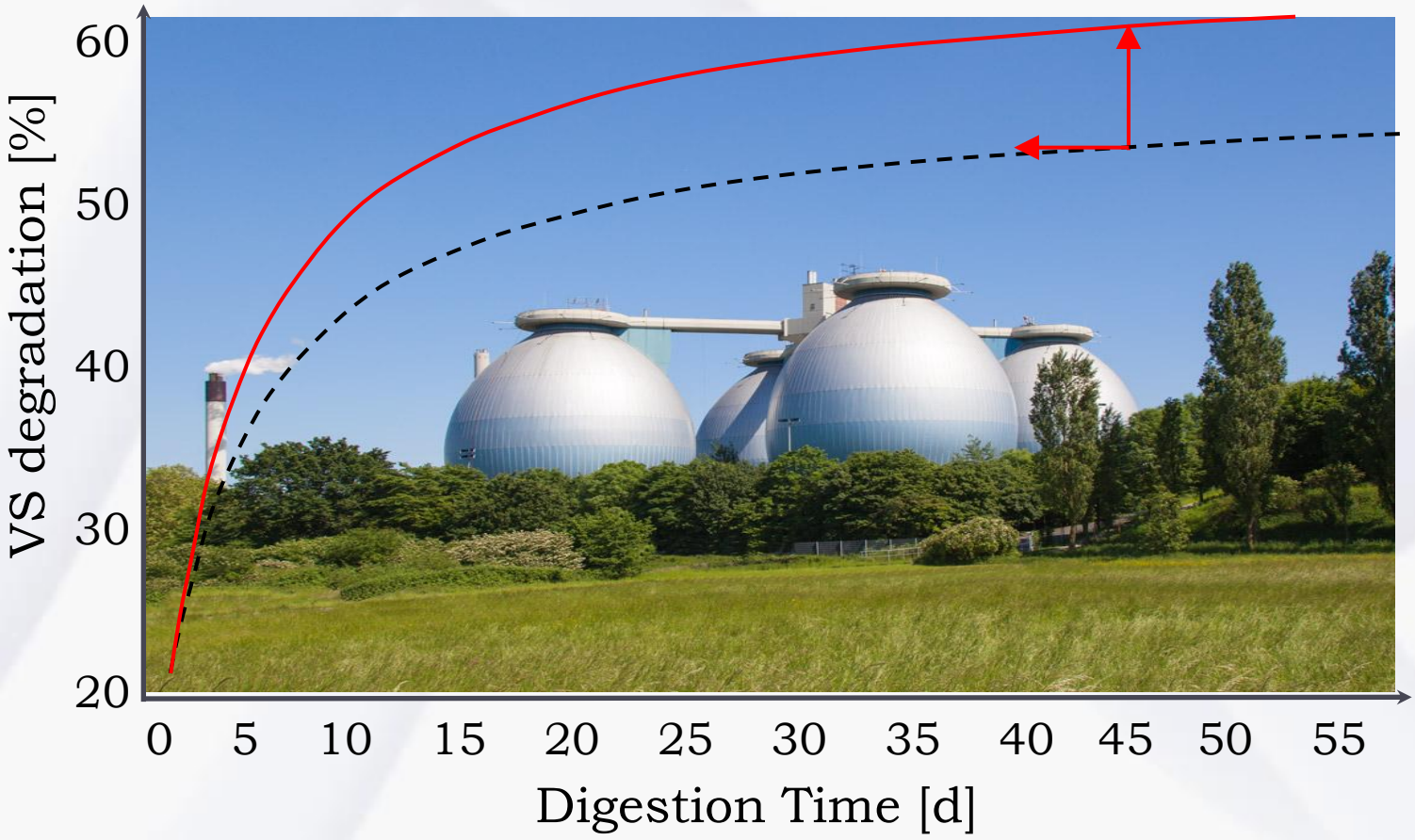
ULTRAWAVES INDUSTRY PARTNER SONOTRONIC NAGEL GMBH

- German leading supplier of high-power ultrasound equipment
- Founded 1975
- 450 employees
- Manufacturer of high-quality sonotrodes and generators
- Substitutions in Germany (headquarter), Italy, Spain, UK, USA, Brazil, China, Hong-Kong, South Africa

Disintegration of Biomass by High-Power Ultrasound (HPUS)



Overcoming the Limitations of Anaerobic Degradation with ULTRAWAVES HPUS



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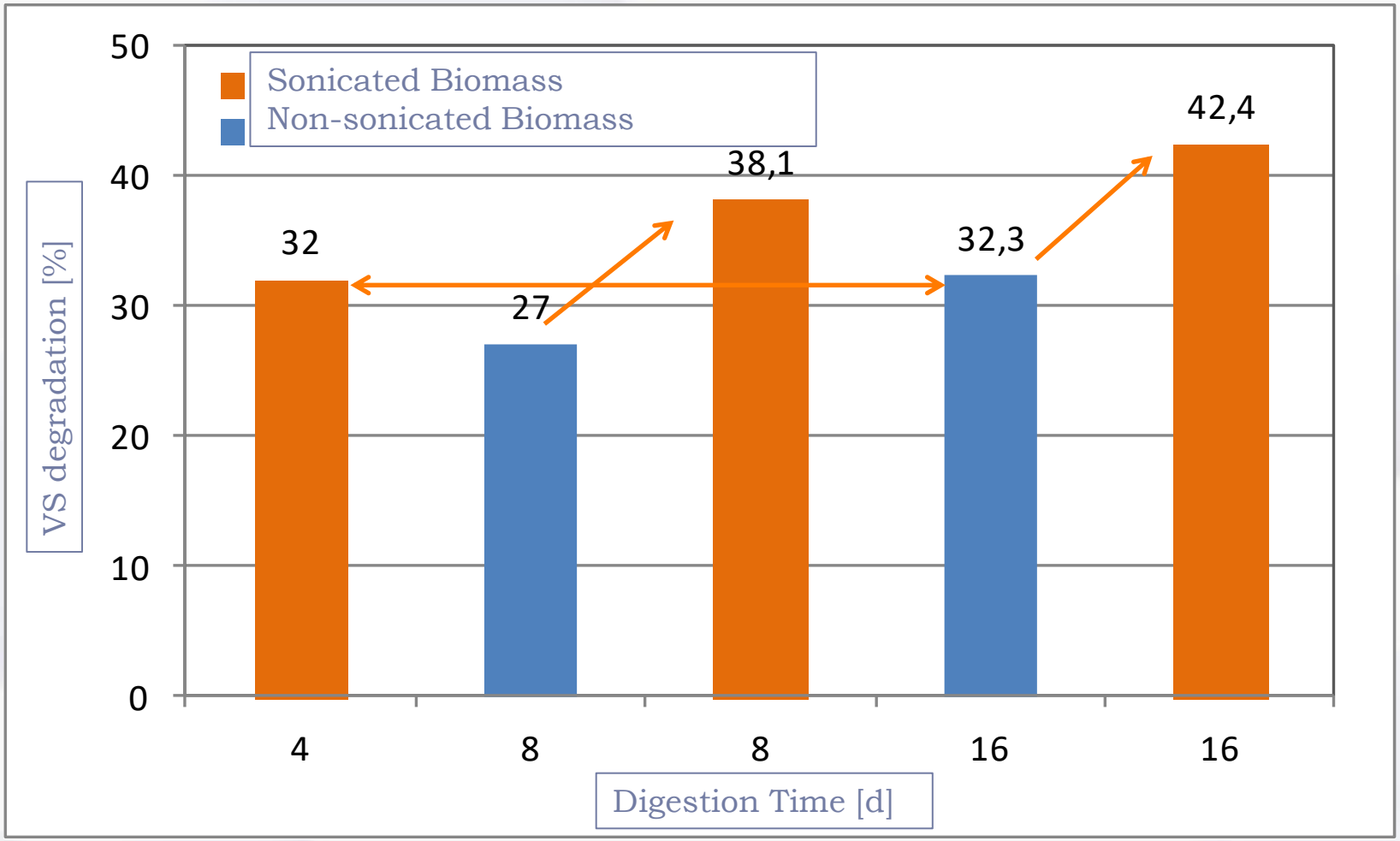
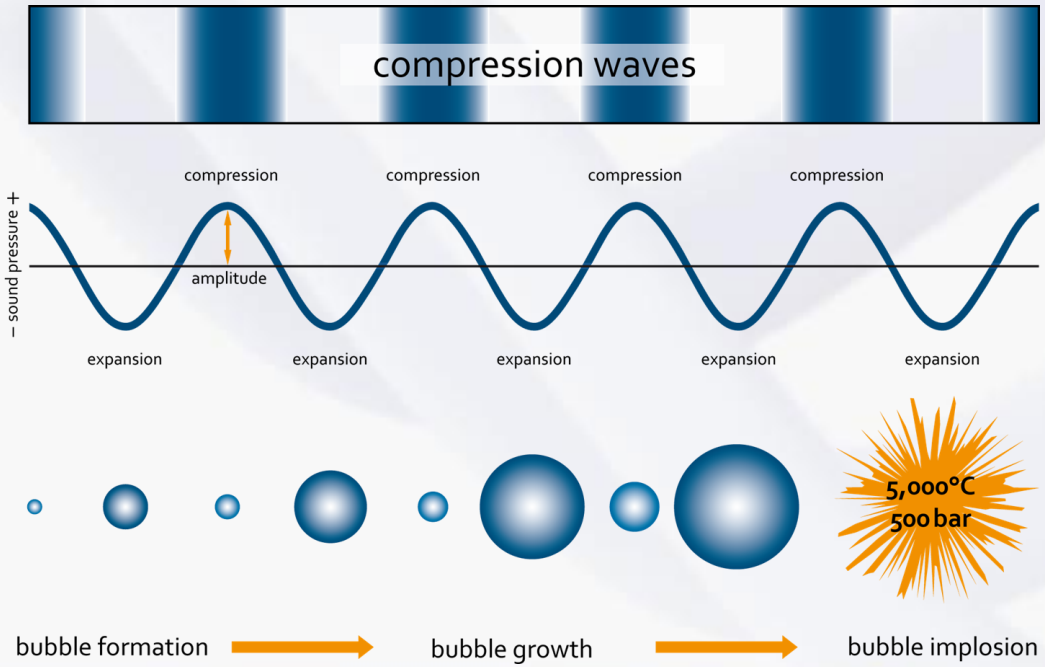


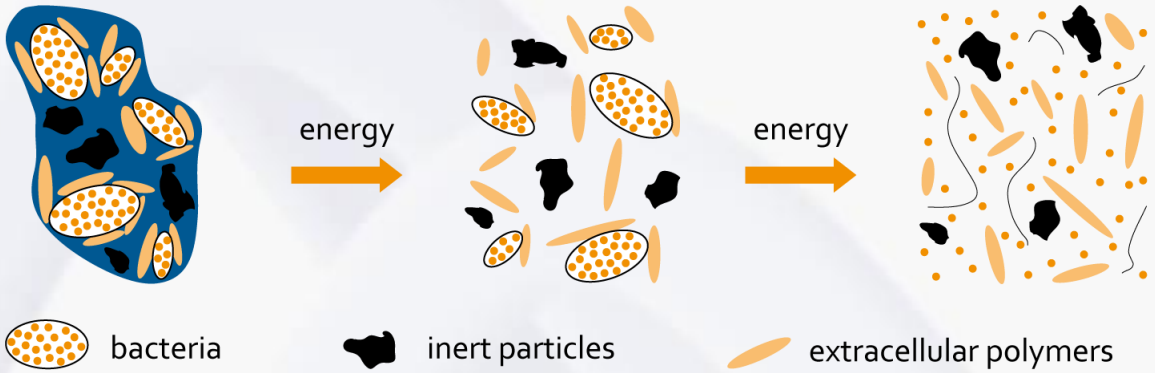
High-Power Ultrasound (HPUS)

- At right frequencies and intensities (≥ 20 kHz & 25 to 50 W/cm^2) high-power ultrasound (HPUS) produces ultrasonic cavitation

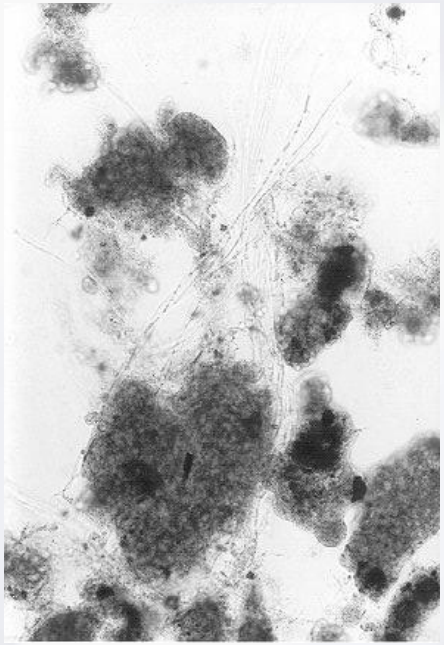
- Cavitation effects:
  - High mechanical shear forces
  - Radical reactions



Disintegration of Biosolids by HPUS

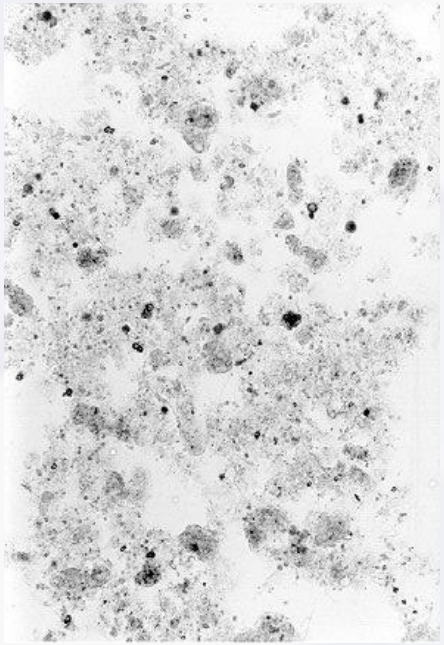


Light-microscopical Analysis



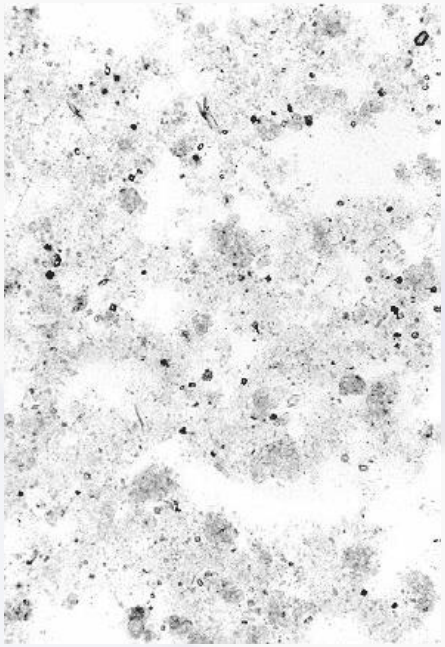
untreated WAS

energy



30s sonicated

energy



90s sonicated

Overcoming the Limitations of Anaerobic Degradation with ULTRAWAVES HPUS

Digester 1 without HPUS:

Lower biogas production

Higher viscosity

Digester 2 with HPUS:

Higher biogas production

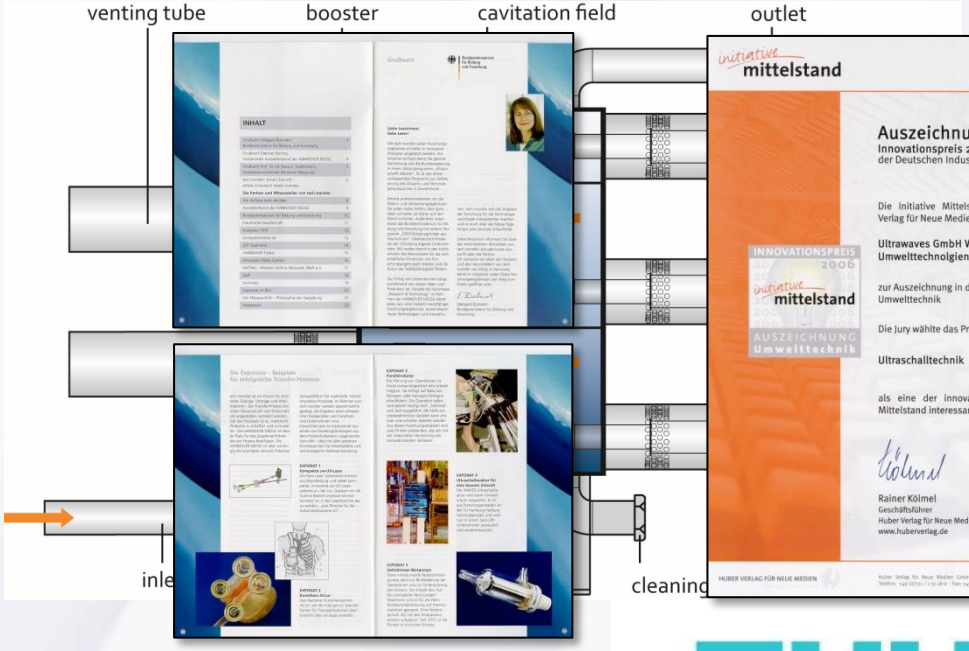
Lower viscosity

Full-scale ULTRAWAVES High-Power Ultrasound System 2006

Technology Transfer Innovation 2002

Innovation Award German Industry 2006

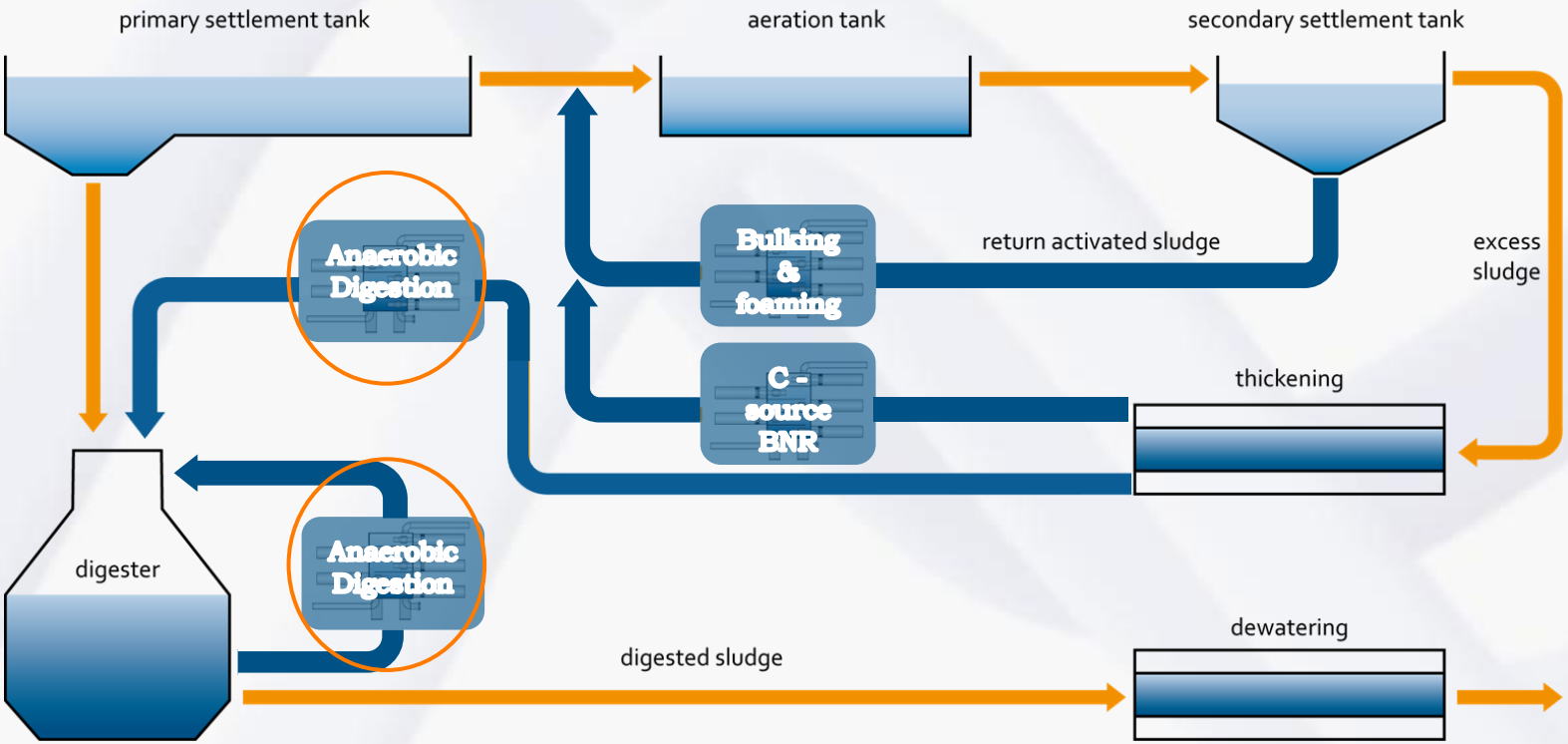
Innovation Award Baden Württemberg 2007



- Reactor volume: 30 L
- wer co kW
- ntinu
- . of os
- equen
- tensity m²
- nicati min
- nicati kWh/m³

TUHH
Technische Universität Hamburg

Options for Biosolids Disintegration

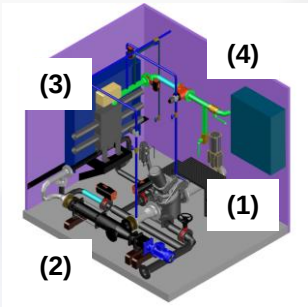


BIOSONATOR COMPACT: P&P-SYSTEM

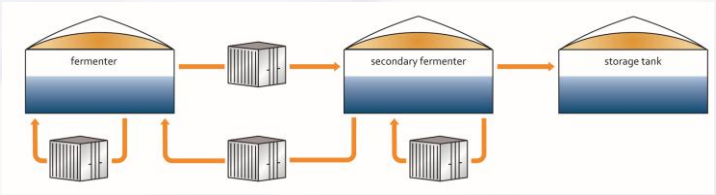
BIOSONATOR compact

BIOSONATOR: P&P-SYSTEM

BIOSONATOR



- Components:
  - Macerator (1)
  - Modified Excentric Screw Pump (2)
  - HPUS (3)
  - Volumetric flowmeter (4)



- Completely automated (24/7) & simple integration

ULTRAWAVES HPUS TECHNOLOGY: WORDWIDE REFERENCES

ULTRAWAVES – A Worldwide Connection

ULTRAWAVES – A WORLDWIDE CONNECTION

Thank you for your attention!

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Any questions?