Introduction to technical solutions: Sludge handling in Lübeck

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Sludge handling in Lübeck - Structure

1. Basics of sludge treatment in Lübeck
2. Primary and secondary sludge
3. Digestion and biogas production
4. Energy production
5. Dewatering and disposal
6. Prospects

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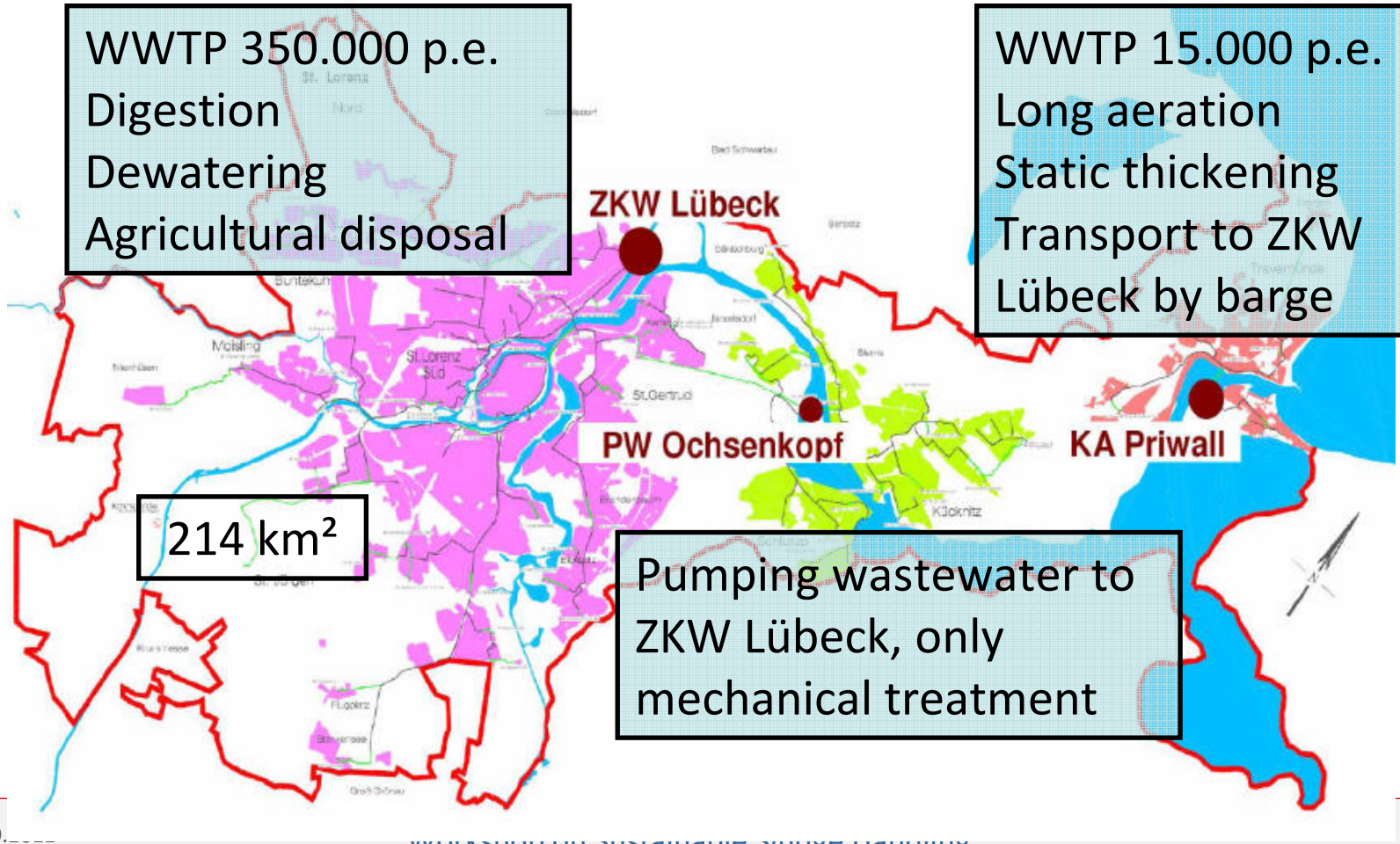
Situation in Lübeck



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Central waste water treatment plant Lübeck (Zentralklärwerk Lübeck)

- In operation since 1967
- Permanently upgraded over the years
- 2-step Filtration 2008
- Low effluent limit values since 2008
- Recently investments in combined power and heating units, central electrical distribution devices, sludge heating, gas tank, …

COD	40 mg/l
BOD_5	15 mg/l
Nitrogen (N_{anorg})	10 mg/l
Phosphorus (P)	0.5 mg/l
Susp. Solids	5 mg/l
(spot samples)	

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Primary and secondary sludge

- Total amount of sludge for digestion app. **700 m³/d**
- **Primary sludge;**
  2 Primary sedimentation tanks;
  hydraulic duration 1-4 houres
  → high amount of sludge
- **Secondary sludge**;
  thickened by belt filters (5-6% TS) in operation since 05/2011
  - low energy consumption
  - polymer consumption < 2g/kg TS
  - saving heat energy (≈ 25%) by increased TS in the digesters

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Sludge Digestion

- In operation since 1977
- Concrete substance still good
- 2x 6,000m³, 2x 3,200m³
- 2-3% TS
- Temperature 36-39°C
- Retention time app. 25 days
- Spiral tube heat exchangers since 06/2010

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Gas production

- App. 10,000 m³/day
- 60 – 62 % Methane
- Low sulfur concentration
  (Fe used for P-precipitation)
- Gas tank 4,000 m³
  (currently under restoration)
- Biogas drying (10/2011)

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Heat exchangers and mixing cylinder

- 4 x 550 kW
- Good cleaning opportunities
  (Former tube heat exchangers were covered with „Vivianit“, an iron-phosphate complex)
- Sufficient sludge heating

- 25m³ Volume
- Temperature layers
- Heat buffer

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Production of Energy

3 Combined heat and power units (CHP)

- In operation since 02/2011
- Electric energy efficiency >40% (41,6%)
- 844 kW el. (835 kW th.)
- app. 10.5 Mio. kWh/a out of app. 4 Mio m³ biogas
- Biogas tank 4,000 m³
- Emergency power with natural gas

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Sludge dewatering (1)

- Current situation:
  - 2 chamber filter presses
  - Chalk-iron conditioning
  - 37 % TS
  - agricultural disposal
- Important aspects:
  - legal circumstances
  - maintenance
  - operation man power
  - flexibility

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Sludge dewatering (2)

- Future demands:
  - Sustainability
  - Cost efficiency
  - Longterm legal certainty
- Decisions to be made:
  - Replacement or repair
  - Choice of technical process
  - Prospects for disposal

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Agricultural disposal vs. incineration

Agriculture

+ Cost-efficient
+ Reuse of Phosphorus as fertilizer
+ Trace elements and humus
– Persistant pollutants
– Complicated legal situation in Germany
(EU as well?)
– Uncertain acceptance

Incineration

+ Final elimination of organic compounds
+ Less soil contamination
+ Ash can be disposed in landfills
– Loss of Phosphorus
– More expensive

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Prospects

- Investments
- Optimization
- Innovation

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Planned investments

- 2012 / 2013 tube mixer for better homogenisation and heat distribution, enhanced biogas production
- 2012 pipe connection to a district heating station (future heat delivering in case of excesses)
- 20?? Replacement of dewatering devices

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Optimization

- High electrical efficiency of all devices is to be achieved
- Saving of both electrical and thermal energy
- 2012 enhancement of the aerobic treatment system (measurement and control technology)

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Innovation

- Tests with various sludge disintegration systems
- Use of still unexploited heat sources
- Phosphorus recovery (from sludge or ashes)

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Lunch break

12:00 – 13:00 Lunch break / Mittagspause
перерыв на обед

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Afternoon program

13:00 Case example: Sludge handling in Bremen
Siegrid Mayer, hanseWasser Bremen, Germany

13:30 Case example: Sludge handling in Bottrop
Dr. Karl-Georg Schmelz, Emschergenossenschaft, Germany

14:00 Case example: Sludge handling (small and mid-size treatment plants)
Dr. Jörn Einfeldt, Privatinstitut für Klärtechnik, Bad Schwartau, Germany

14:30 Coffee Break

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