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Biomethane Trebsen

Contents

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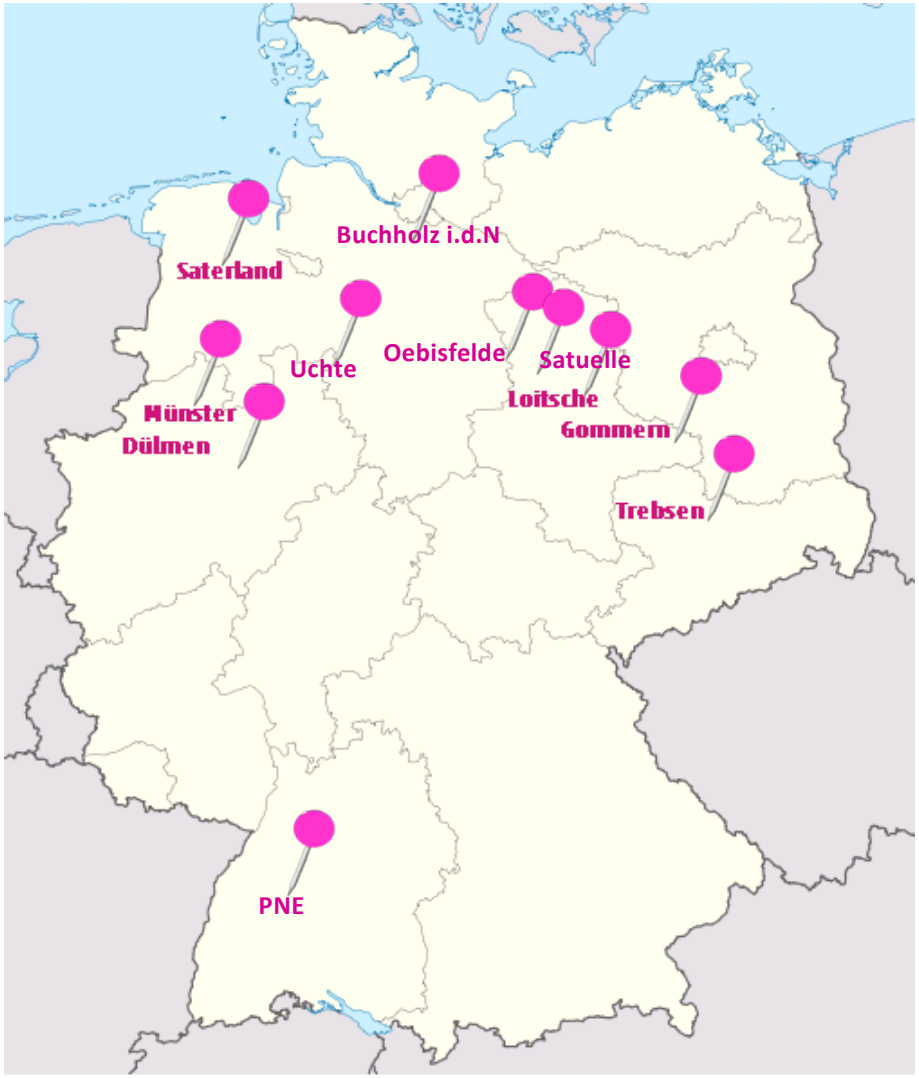
- head office: Münster (Westfalen)
- built, own & operate of biomethane plants
- biomass upgrading and wastewater treatment systems
- biomethane feed into the grid:

2018	approx. 490 GWh
2020	approx. 800 GWh



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Biogas Trebsen
year of construction: 2018
plant capacity : 1.000 Nm³/h

Biogasanlage Gommern
year of construction: 2017/18
plant capacity : 2.100 Nm³/h

poultry profit®
market launch series type 2018
poultry manure upgrading

pb-clean®
market launch series type 2017/18
wastewater treatment systems

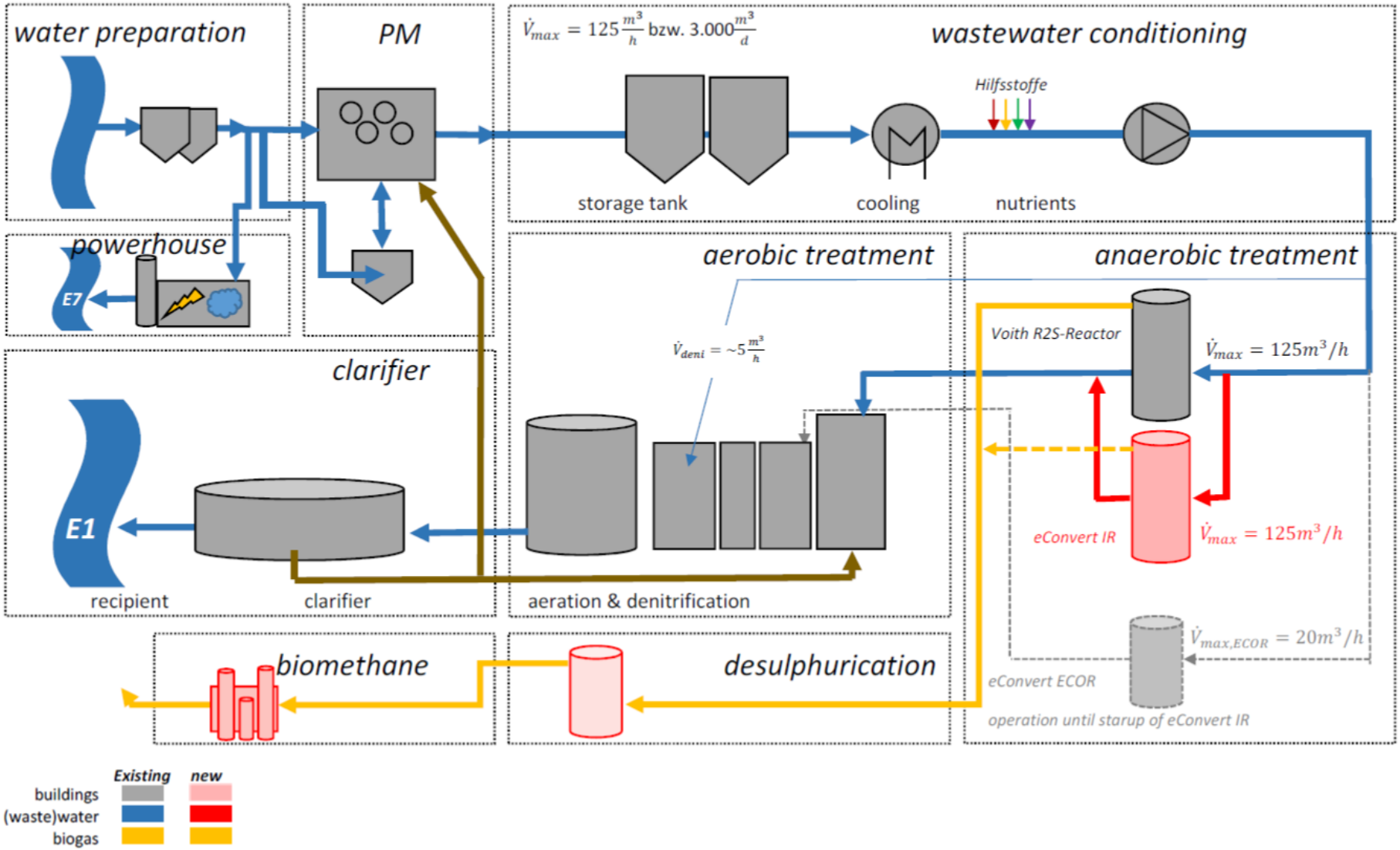
biomethane Trebsen: the paper mill

- Est. 1893 in Trebsen/Mulde
- Independent, family owned company
- Currently 127 employees

- 24/7 operation in a 5-shift-system
- Production of 240.000 t/a of liners, flutings and specialities from **100 % recovered paper**

- 1 paper machine with a width up to 4.300 mm
- Grammages ranging from 120 to 280 g/m²
- Share of export approx. 70 %

biomethane Trebsen: water treatment / biogas production

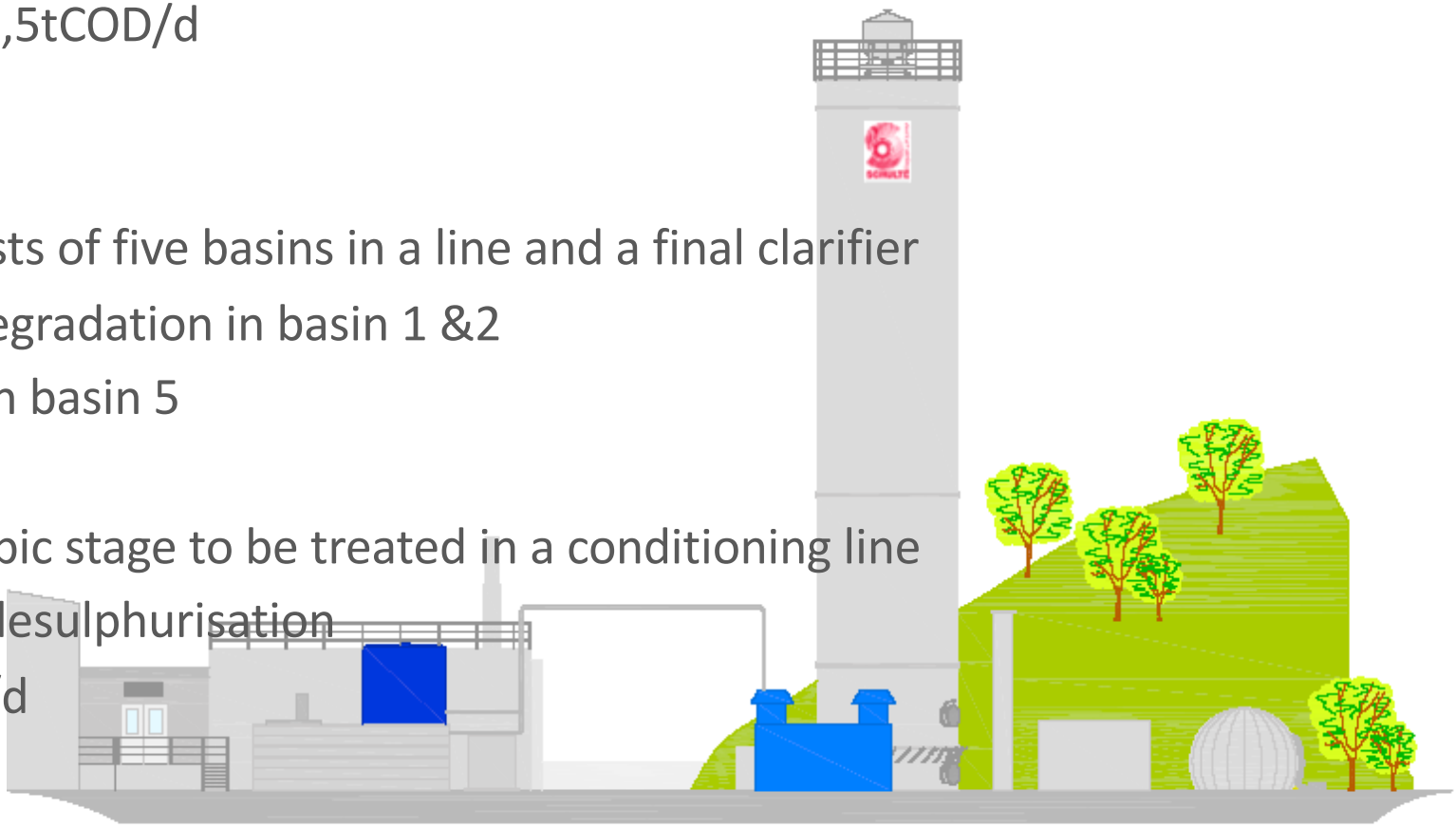


biomethane Trebsen: water treatment / biogas production

- Anaerobic stage consists of two parallel operated reactors
  - Voith R2S for 22,5tCOD/d
  - IR for 30tCOD/d

- Aerobic stage consists of five basins in a line and a final clarifier
  - Major part of degradation in basin 1 &2
  - Denitrification in basin 5

- Biogas from anaerobic stage to be treated in a conditioning line
  - 70% methane, desulphurisation
  - up to 13,000m³/d



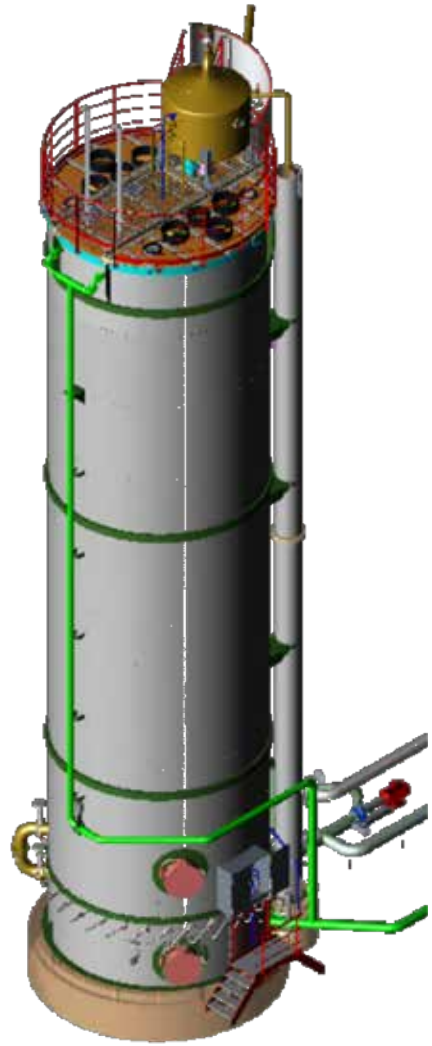
biomethane Trebsen: water treatment / biogas production

- COD of effluent ranges between 6,000 and 9,000mg/l
  →conventional aerobic treatment is limited to max. 2,000mg/l
- Anaerobic first stage advantages:
  - Easy to degrade components, mainly starch and organic acids from its decomposition
  - effective Reduction of COD by >80%, BOD by >>80%
  - HRT ranging between 6-12h
  - good mass balance due to low biomass production → COD-load of up to 22t/d would create huge amounts of sludge if treated aerobically
  - water temperature from paper mill allows operation without additional heating
- Aerobic second stage is still needed to meet regulatory water quality parameters [COD (TOC),BOD, N (Tnb), P]

biomethane Trebsen: water treatment / biogas production

Typical reactors – why choose an internal circulation reactor?

- Wastewater from paper mills is easy to degrade and contains minor amounts of suspended solids
- IC-reactors allow high organic loading rates & low retention times
- high effectiveness leads to low excess sludge production in aeration
- Internal circulation is driven by biogas production, only external circulation path needs energy
- Height of the IC-reactors (up to 30m) cause high solubility of CO_2 in effluent → methane content is very high (up to 80%)



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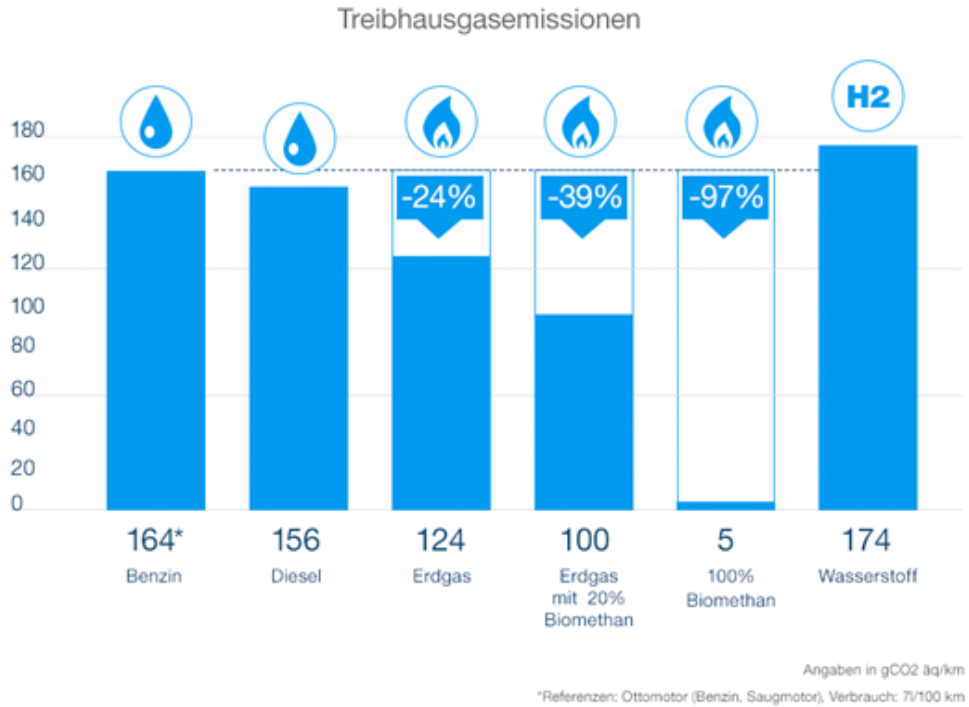
biomethane Trebsen: water treatment / biogas production



biomethane Trebsen: facts and figures

upgrading-plant

injection-plant

biomethane Trebsen: facts and figures

- 1t of paper leads to 0.025-0.035kg of COD, average ~0.028t COD/t
- 1t of COD yields 350m³ of methane
- biogas production rate is variable and quickly changing
- biogas contains between 5,000 and 22,000ppm of H2S

→ **<u>need to get rid of it without adding inert gases</u>**

H2S: **<100 ppm / < 1ppm**

O2: **< 1 Vol.-%**

biomethane Trebsen: facts and figures

year	**2015**	**2017**	**2019**	**2023**	
production	220.000	240.000	262.991	550.000	netto to/a
	230.953	251.948	276.084	577.382	brutto to/ a
production days	355	355	355	355	
reject share	8%	8%	8%	8%	
spez. COB	28	28	28	28	kg/to AP
degration R2S	83%	83%	83%	83%	
spec. Gasproduction	0,53	0,53	0,53	0,53	Nm³/ kg CSB
gasproduction					
year	3.072.266	3.351.562	3.672.628	7.680.664	Nm³/a
day	8.654	9.441	10.345	21.636	Nm³/d
average	361	393	431	901	Nm³/h
top	541	590	647	1.352	Nm³/h
methane					
year	**1.843.359**	**2.010.937**	**2.203.577**	**4.608.398**	**Nm³/a**
day	5.193	5.665	6.207	12.981	Nm³/d
average	216	236	259	541	Nm³/h
top	325	354	388	811	Nm³/h
thermal input					
year	**20.332.253**	**22.180.640**	**24.305.453**	**50.830.634**	**kWh**
day	57.274	62.481	68.466	143.185	kWh
average	2.386	2.603	2.853	5.966	kWh
top	3.580	3.905	4.279	8.949	kWh

biomethane Trebsen: facts and figures

Wastewater from paper mill → revis Biogasanlage → 4.6 Mio. m³ methane/y

→ **Bio-LNG: 3.400 to/a**

12 Mio. transport km/a

minus 14 Mio. to CO_2 d/a

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Thanks for your attention!

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