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EuPhoRe-Process – Experiences and deployment's Potential

Essen & online, 22 - 23.09.2021 | Phos4You final conference

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EuPhoRe-Process – Experiences and deployment's Potential

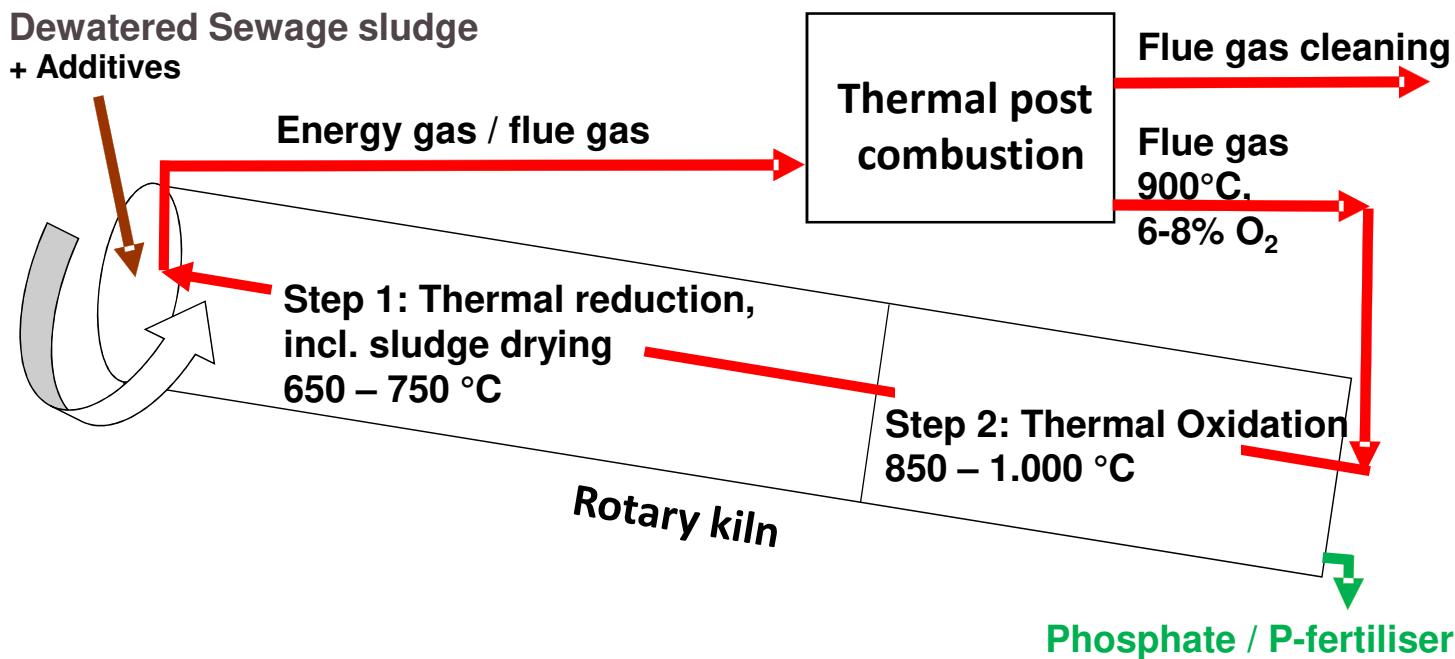


Content

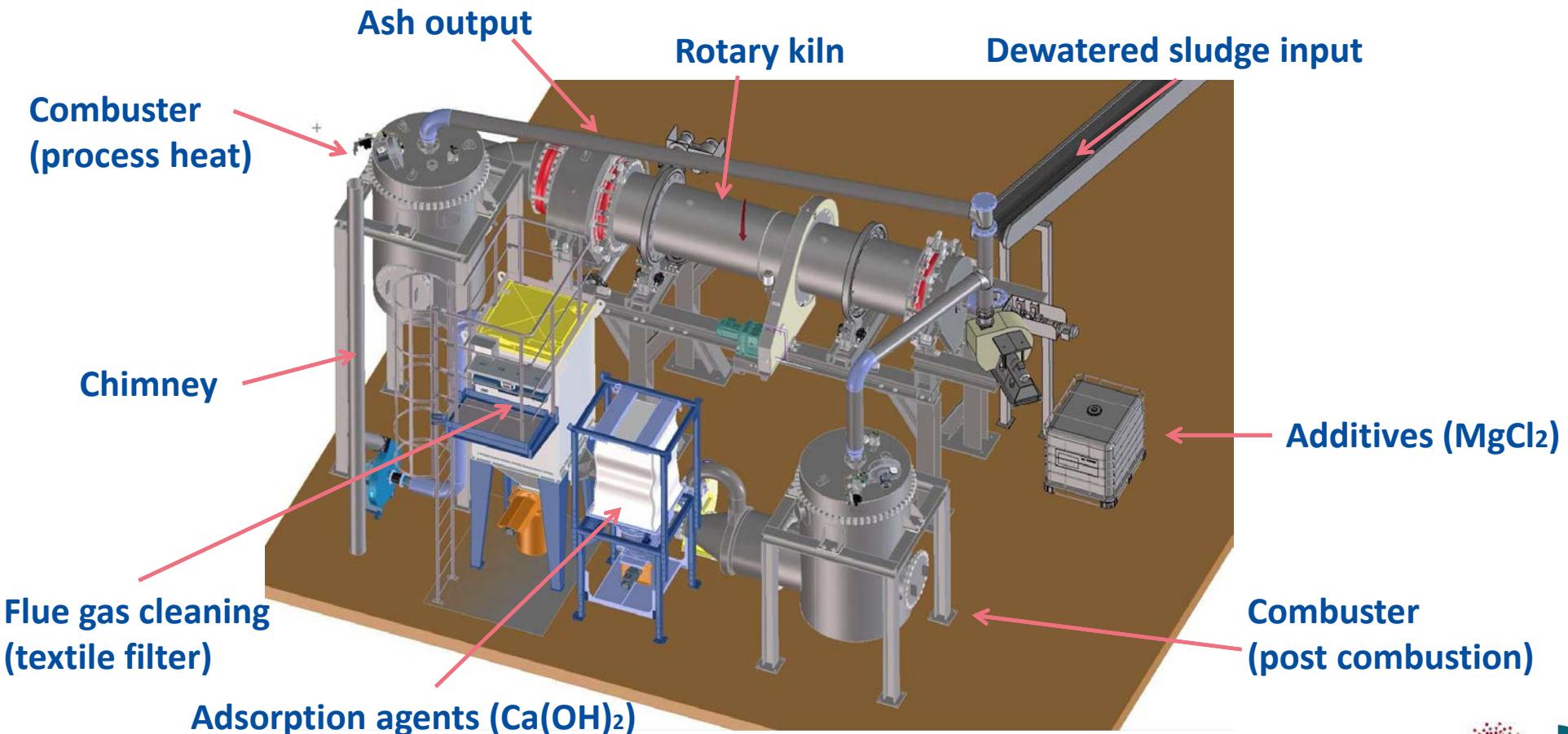
- 1. The EuPhoRe technology**
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EuPhoRe-Process – Experiences and deployment's Potential

1. The EuPhoRe technology



2. The EuPhoRe pilot plant in Dinslaken



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2. The EuPhoRe pilot plant in Dinslaken

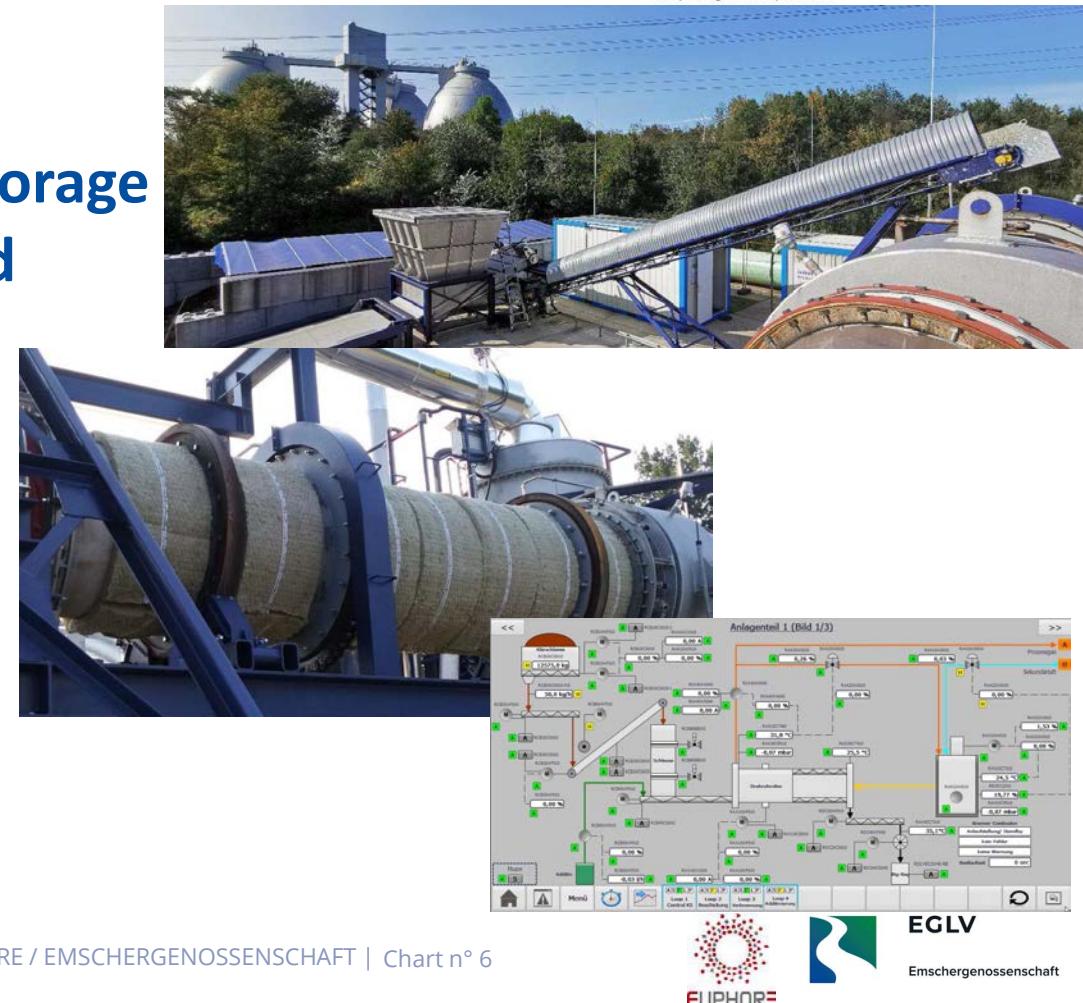
Ready for startup in May 2019



3. Optimisations at the pilot plant (examples)

- **Discharge system of the sludge storage**
- **Conveyor belt: gradient and speed**
- **Insulation of the rotary kiln**
- **Changing the burners**
- **Dosing system of the adsorbent material**
- **Adjustment of programming**
- ...

All pictures: L. Pamuk / Emschergenossenschaft

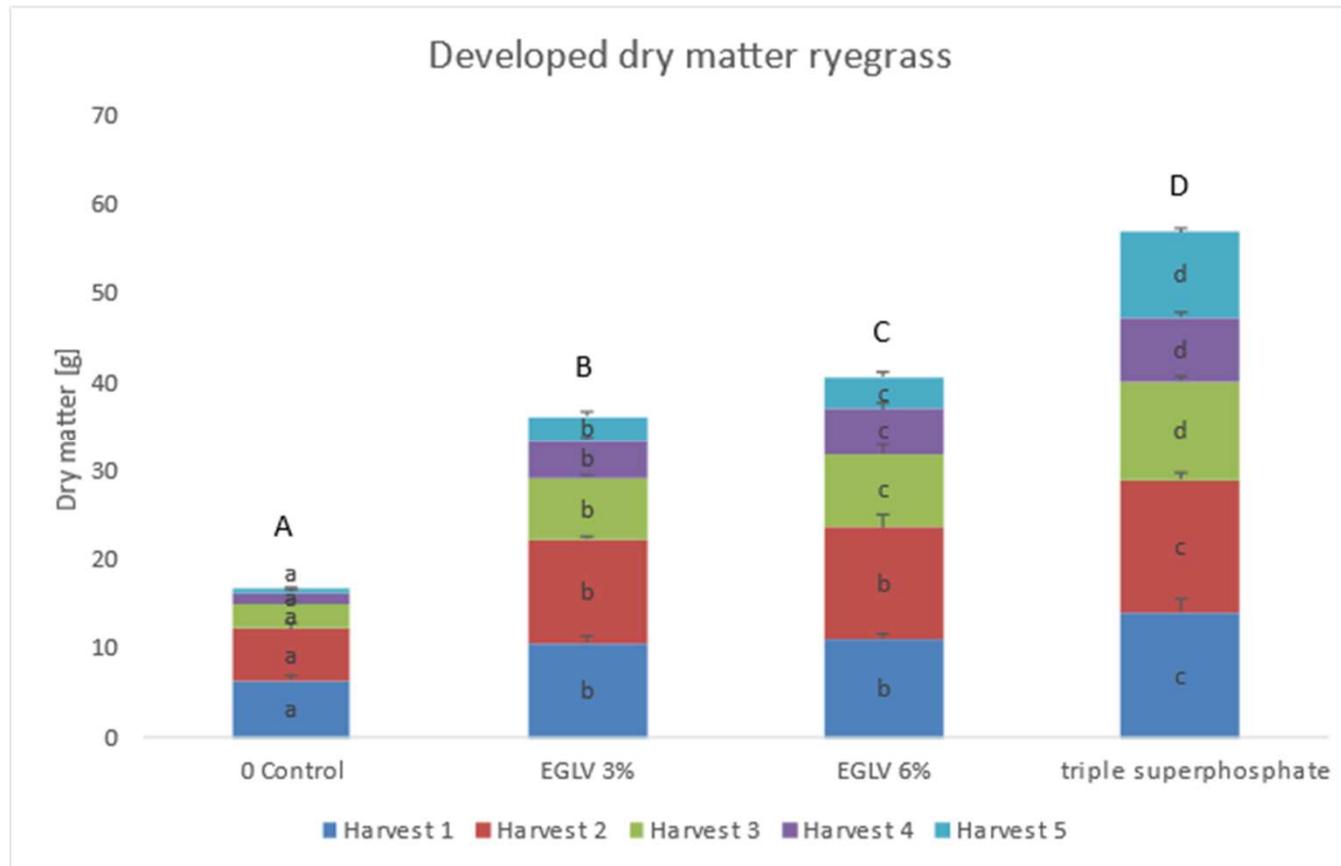


4. Results: Heavy metals in the sewage sludge ash (SSA)

Heavy metals [ppm]	SSA 3 % (March 2021)	SSA 6 % (April 2021)	Limit (German Fertiliser Ordinance DüMV)
As	10	9,3	40
Pb	34	15	150
Cd	<0,4	<0,4	1,5
Cu	940	780	900
Ni	89	65	80
Zn	2100	1400	4000
Hg	<0,05	<0,05	1
Tl	<0,4	<0,4	1



4. Results: Pot trials



Harvest 5:
O-Control (above)
EGLV-ash 6% (below)



Source: HGoTech GmbH

4. Results: Grinding and granulation



Source: Lösche GmbH



Source: Eirich GmbH



5. Examples industrial scale: Oftringen and Mannheim



Oftringen:

- Thermo-chemical treatment for 30.000 t dewatered sewage sludge per year
- Dry Matter = 22-32%
- Commissioning 1992
- EuPhoRe-Process 2016

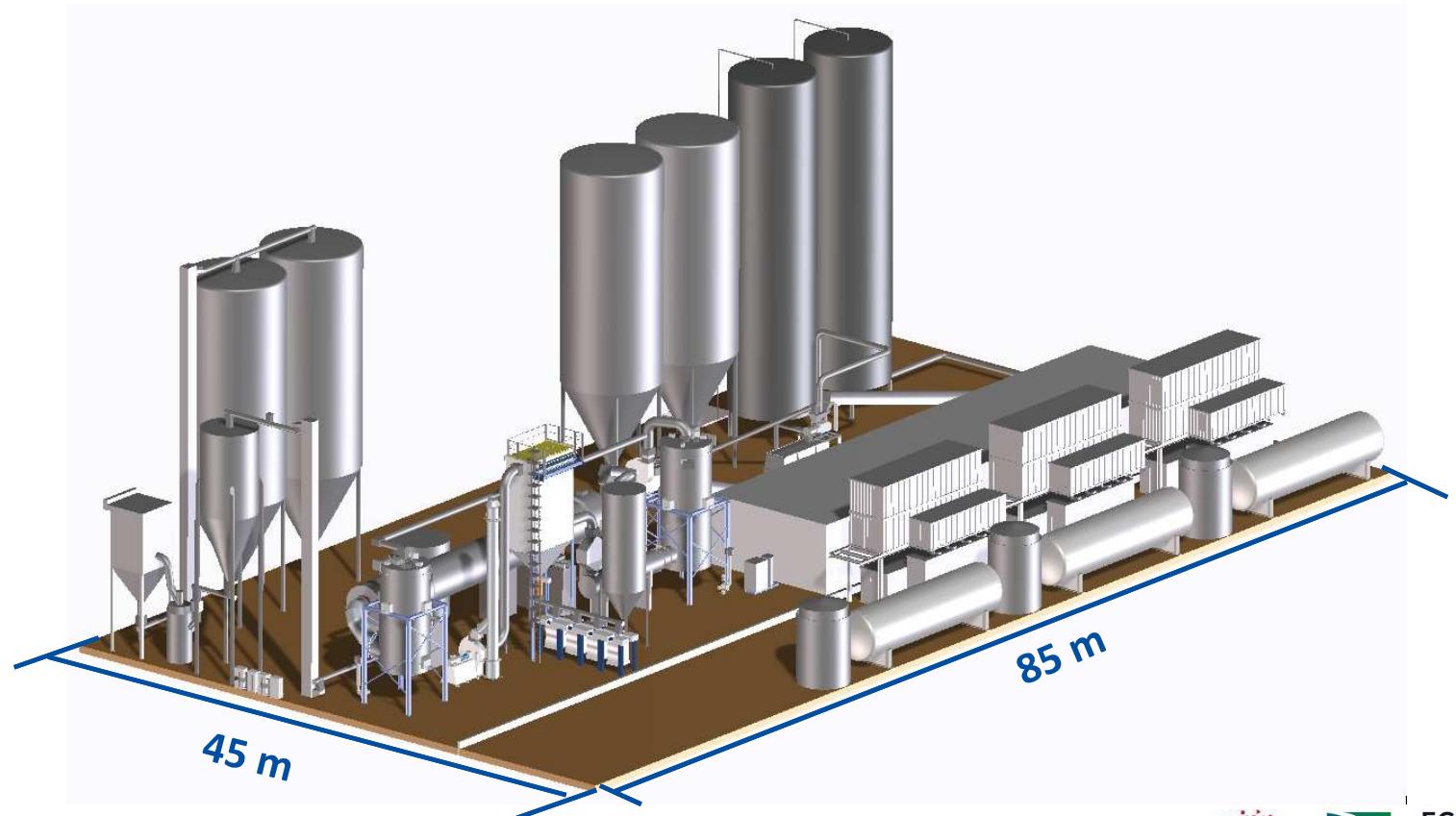


Mannheim:

- Thermo-chemical treatment for 135.000 t dewatered sewage sludge per year
- Dry Matter = 23-29%
- Expected commissioning 2022

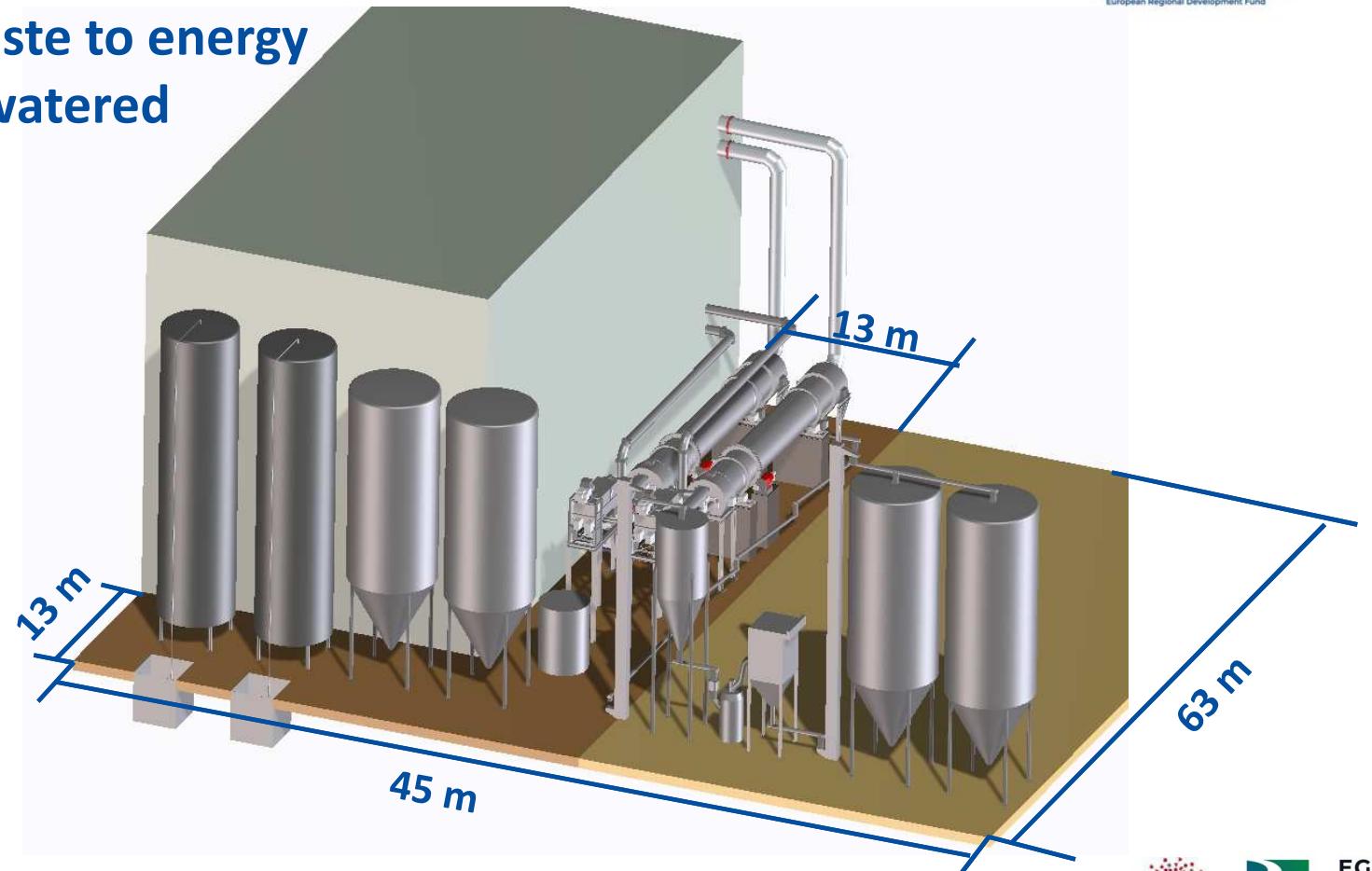
6. Outlook and potentials

Autarkic plant for 85.500 t dewatered sludge per year



6. Outlook and potentials

Combination with waste to energy
plant for 85.500 t dewatered
sludge per year



7. Stand-alone or combination with waste incineration?

Comparison	Advantage	Disadvantage
Autarkic Plant	<ul style="list-style-type: none"> + Freely planning options on the free space + Shorter and simpler conveying routes possible + Better logistics + Sufficient space required for future system expansions + Better control options with regard to temperature and O₂ content 	<ul style="list-style-type: none"> - Complete reinstallation of the flue and process gas line including cleaning - no synergy effects can be used - possibly more complex and expensive approval planning - Significantly higher investment costs, since more equipment is required - Significantly higher operating costs and more additional staff are required

7. Stand-alone or combination with waste incineration?

Comparison	Advantage	Disadvantage
Combination waste to energy (wte)	<ul style="list-style-type: none"> + Very simple system structure + Low investment and operating cost + Cost savings through shared use of the existing infrastructure and staff + Simplified approval planning + Entry of nitrogen and sulphate compounds reduces urea for flue gas cleaning and maintenance costs due to corrosion 	<ul style="list-style-type: none"> - Complex planning of the system integration - Impairment of the operation of the waste incineration lines due to the renovation work - slight reduction in the plant capacity for waste incineration, if the CO₂-neutral energy is not used

8. Economic aspects¹

Scale-up study for 85.500 t/a dewatered sludge

Concepts	Autarkic Plant	Combination wte
Initial investment	25,0 – 30,0 Mio. €	approx. -30 %
Opex	2,8 - 3,8 Mio. €/a	approx. -30 to -50 %
Finance costs	1,0 – 1,5 Mio. €/a	approx. -30 %
Treatment costs	50 - 53 €/t dewatered sludge	27 - 29 €/t dewatered sludge

SS: sewage sludge

wte: waste to energy

¹ Indicative pricing as per September 2021 and subject to volatility in raw material market pricings and changing financing costs

Thank you for your attention!



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