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The power of integration: upfront optimisation of compost sites through AD

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Introduction

Comparison composting versus AD

Overview AD technologies

Product quality from AD

Worked example:

- process flow**
- mass and energy balance**
- design**
- costs**

Summary



Reasons for integration of AD in existing composting facilities

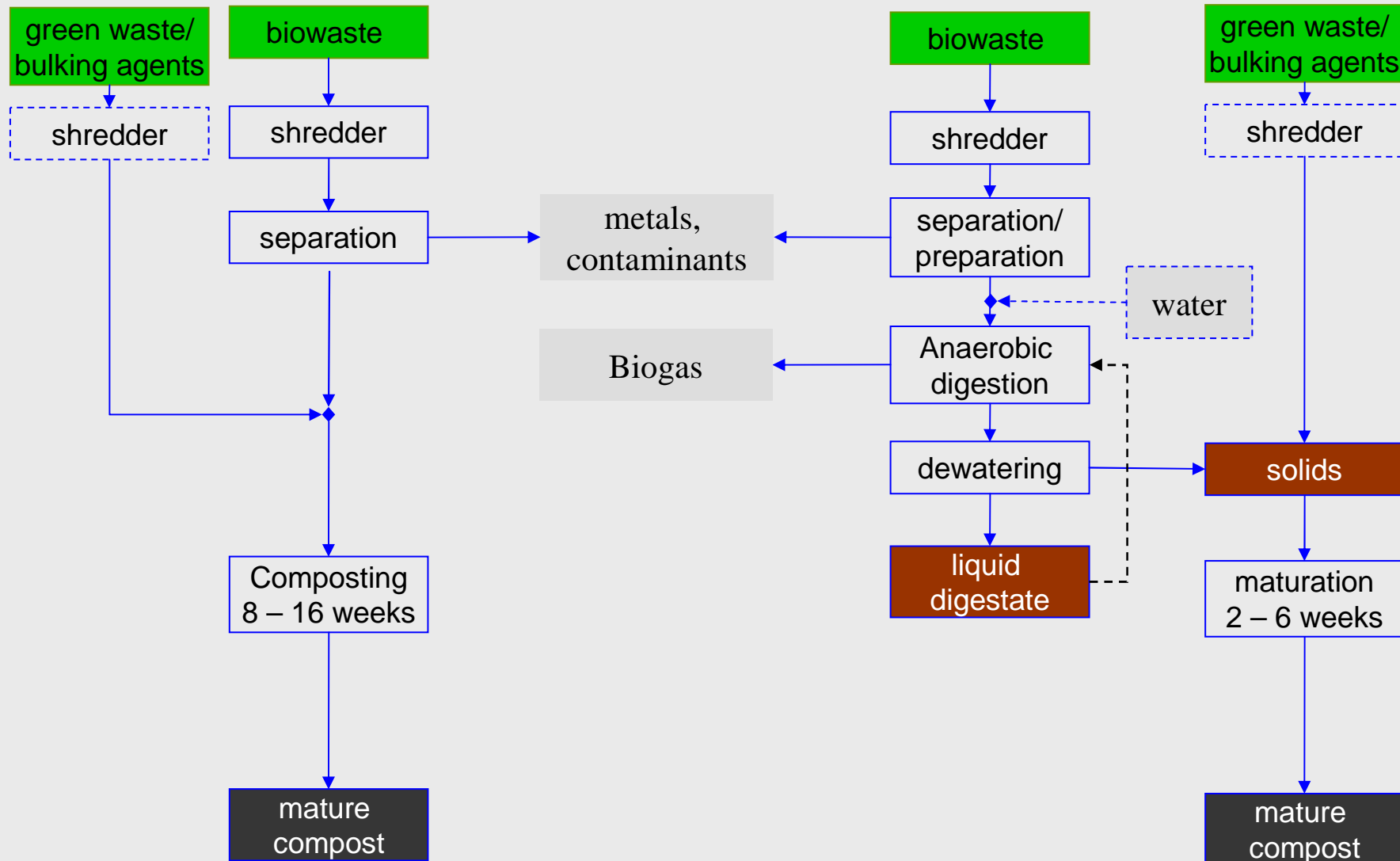
- 1. Energy production**
- 2. Increase of capacity of plant**
- 3. Product quality**
- 4. Costs savings**

“Biowaste”: Source Separated Kitchen and Garden Waste

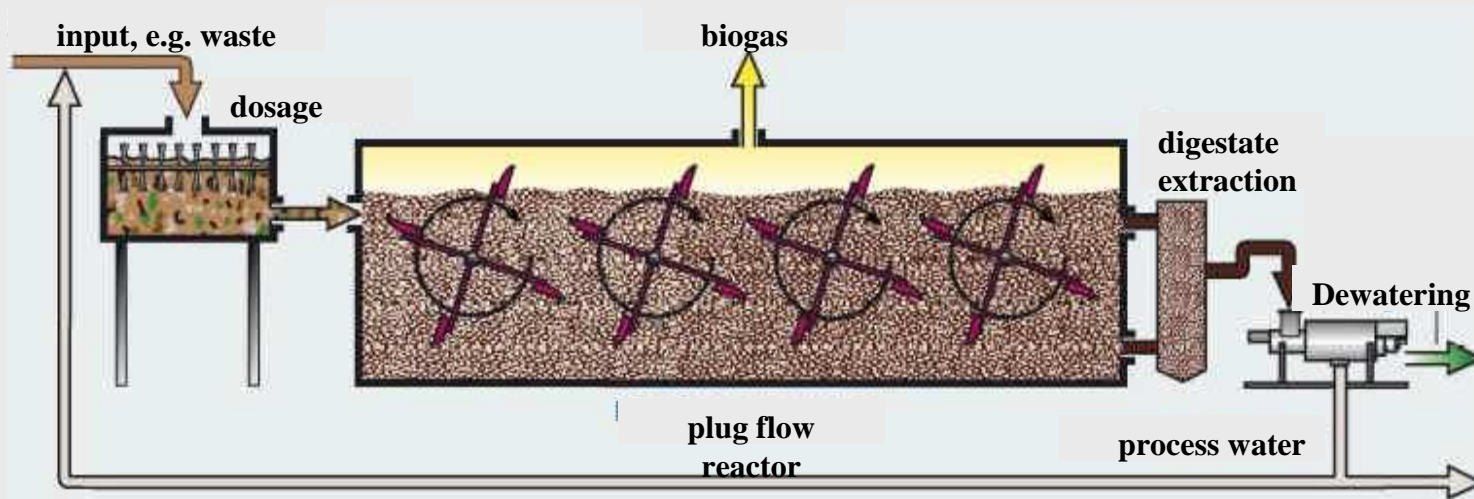




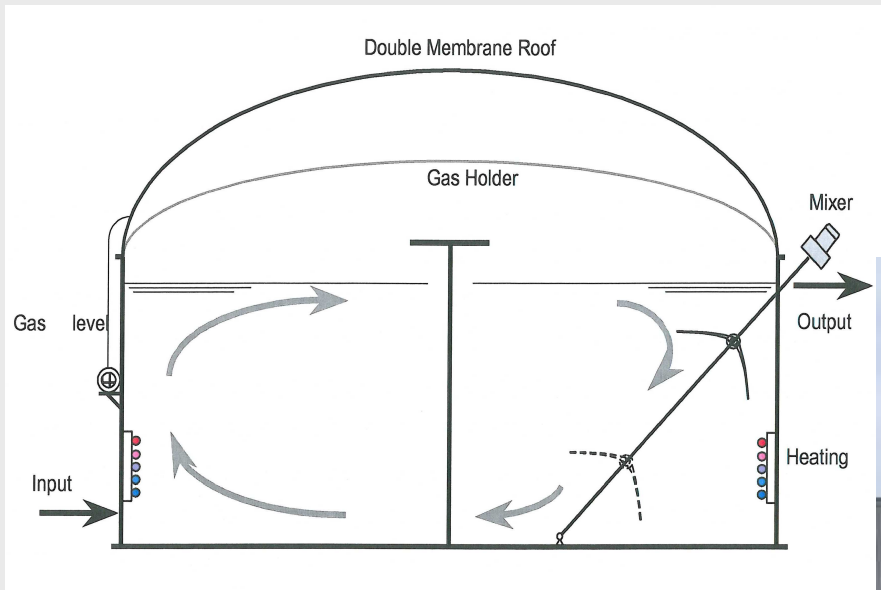
Composting versus AD



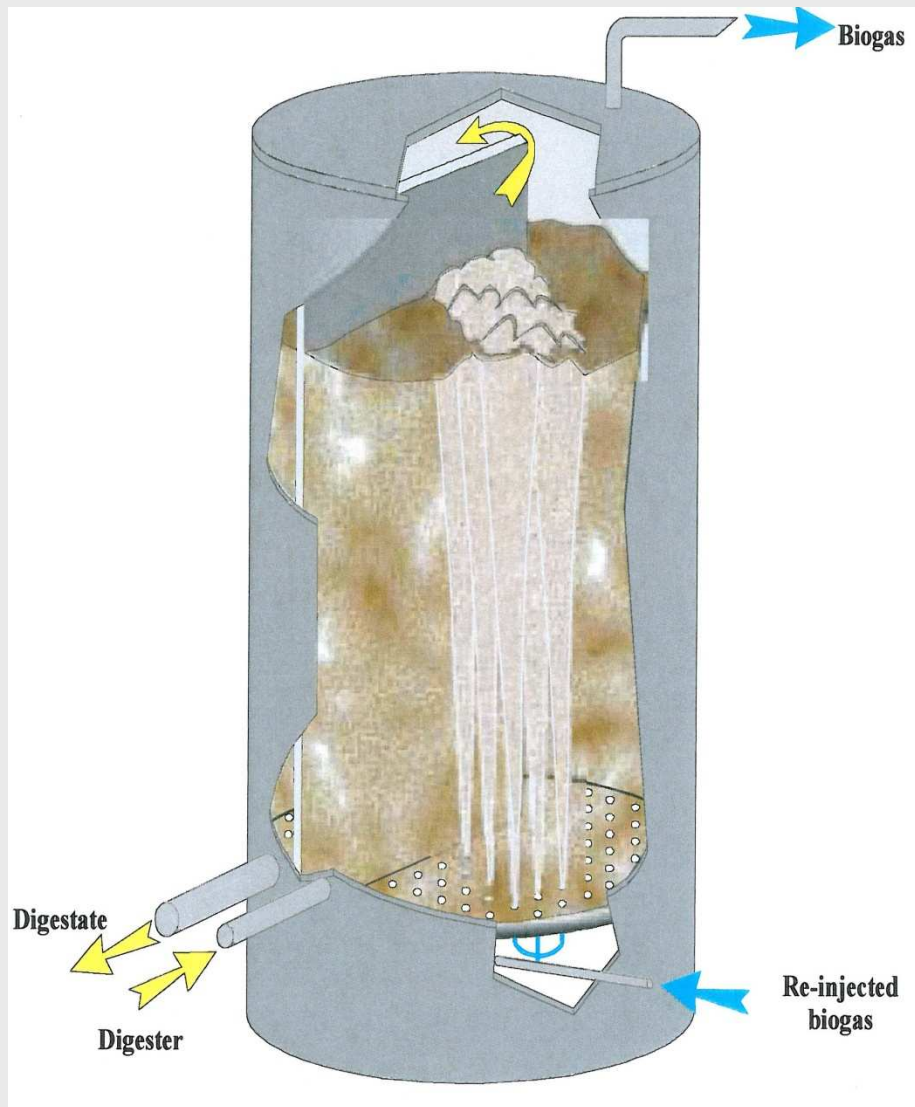
Dry Digestion, continuous process, horizontal digestors



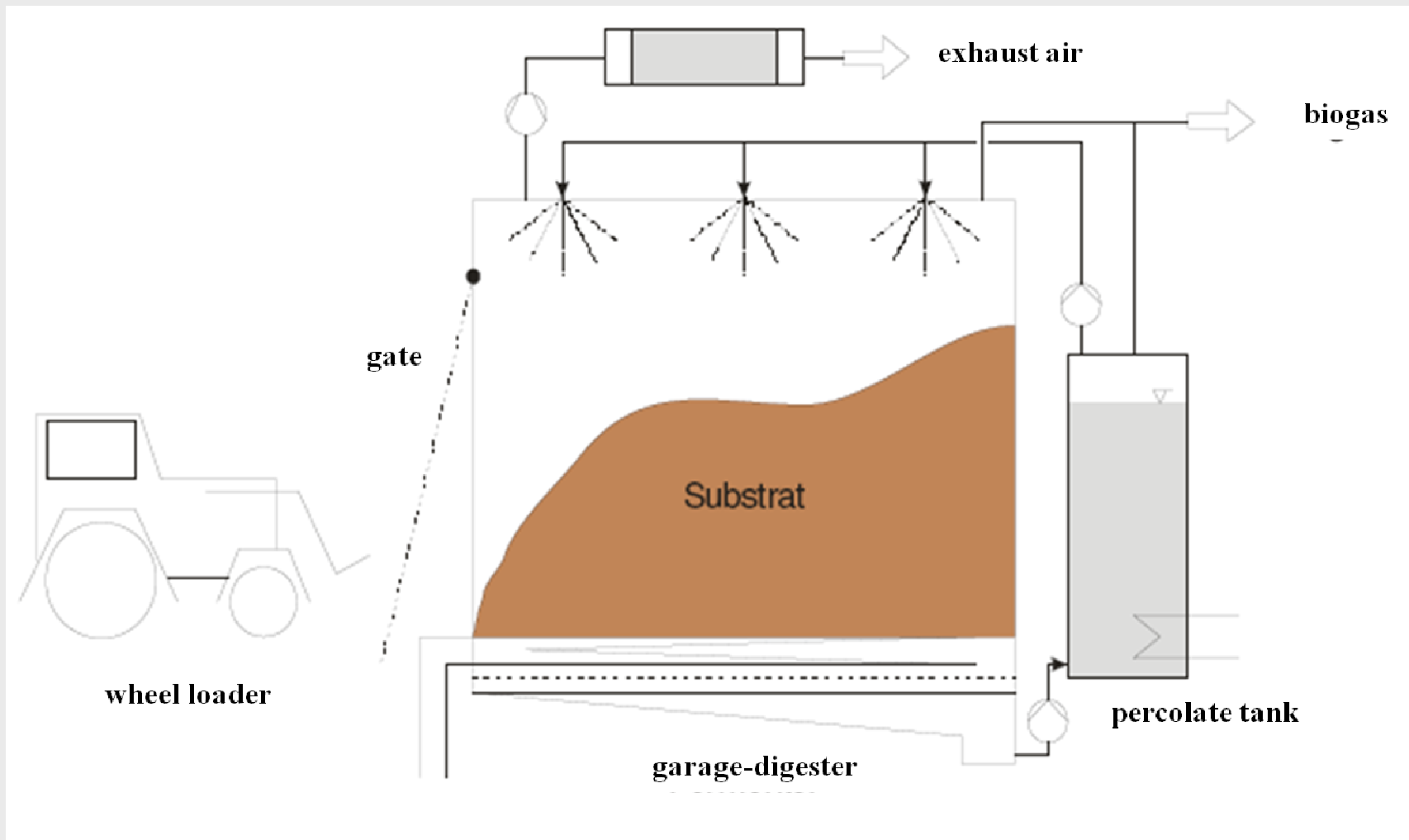
Wet digestion, continuous process



Dry Digestion - continuous process, vertical systems



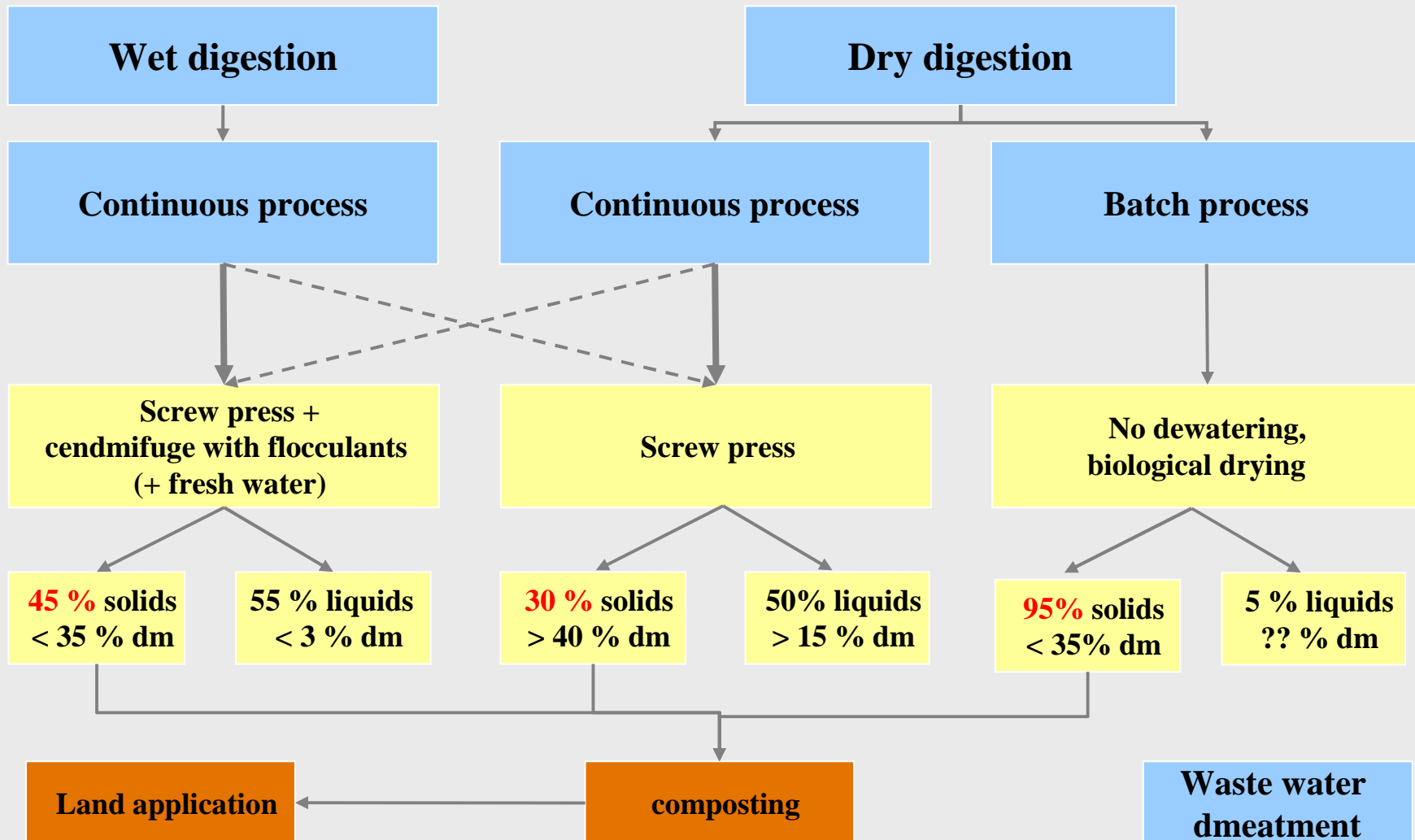
Dry Digestion, batch process



Dry Digestion, batch process



Digestate treatment





Water balance

	wet digestion	dry digestion continuous	dry digestion batch system
	Per 1000 kg biowaste (40 % dm, 65 % VS)		
Fresh water demand (flocculants)	300 l	-	-
Liquid digestate	500 l 3 % dm	350 l 16 % dm	50 l
Solid digestate	750 kg 34 % dm	470 kg 42 % dm	800 kg 33 % dm
Water evaporation in digestate composting to achieve 60 % dm in compost	330 l	170 l	380 l

Nutrient concentration of liquid digestate and solid digestate compost

	Dry matter content	Nitrogen (N)	Phosphor (P ₂ O ₅)	Potassium (K ₂ O)
	%	g/kg TM		
Liquid digestate (screw press)	16	19,4	10,0	30,7
Solid digestate compost	58	14,2	8,9	10,6

Comparison of biowaste compost with digestate and digestate compost

source: BGK 2008

	Solid digestate	Digestate composted	Biowaste compost	Green waste compost
	n = 43	n = 72	n = 1811	n = 909
Dry matter content (% FM)	32,6	58,8	63,3	59,4
Maturity „Rottegrad“	II - III	bis V	bis V	bis V
Plant growth test_{25%}	-	105 %	105 %	110 %
Plant growth test_{50%}	-	98 %	93 %	106 %
Salt content(g_{KCl}/l_{FS})	4,1	4,6 (dry AD) 2,3 (wet AD)	5,9	2,7

Salt content of AD compost

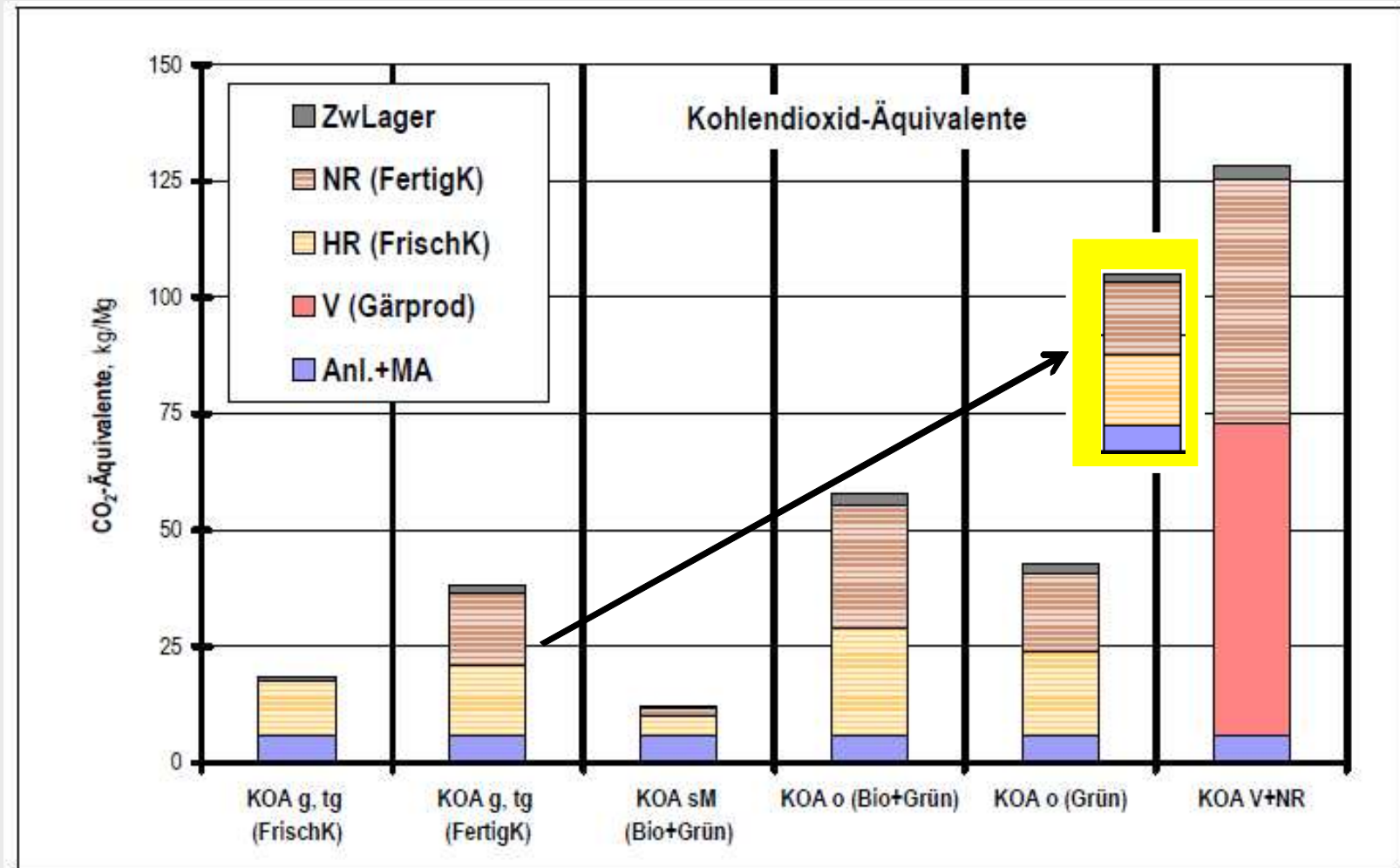
		Dry digestion	Wet digestion
		n = 39	n = 24
Salt content	g/l_{FS}	4,3	2,4



Characterisation of liquids as fertilizer of continuous and batch AD processes

- 1. Nutrients and organic matter concentration increases with dry matter content**
- 2. Enriched with K_2O**
- 3. Nitrogen,**
 - high ammonia concentration (directly available to plant growth)**
 - little organically bound nitrogen**
- 4. Heavy metals similar to biowaste (in relation to the dry matter)**
- 5. Value of nutrients approx. 10 €/m³ for liquids with high dry matter content (15 – 18 %)**
- 6. Risk of high nitrogen losses when spread to land without special techniques (deep injection)**
- 7. Limitations for land application (Winter, pastry land, fodder growing land)**
 - storage necessary**
- 8. Sanitisation required**

CO₂-equivalents from composting and AD processes





conclusion

- 1. Compost from digestate is suitable for agricultural use independent of the type of AD process**
- 2. For the production of substrates AD process with dewatering are favourable with wet AD being best (salt elimination)**
- 3. To achieve desired dry matter content of digestate (approx. 60 %) dry digestion is advantageous**
- 4. No problem to achieve mature compost and good plant tolerance**
- 5. Digestate compost shows higher quality for substrate production than composting alone due to reduced salt and soluble nutrients content**
- 6. Whether the implementation of AD achieves an improvement of the plant economy depends on the revenues for the energy and the local conditions**



Thank you for your attention

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