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Biological treatment technologies and practices *composting – biogas – MBT*

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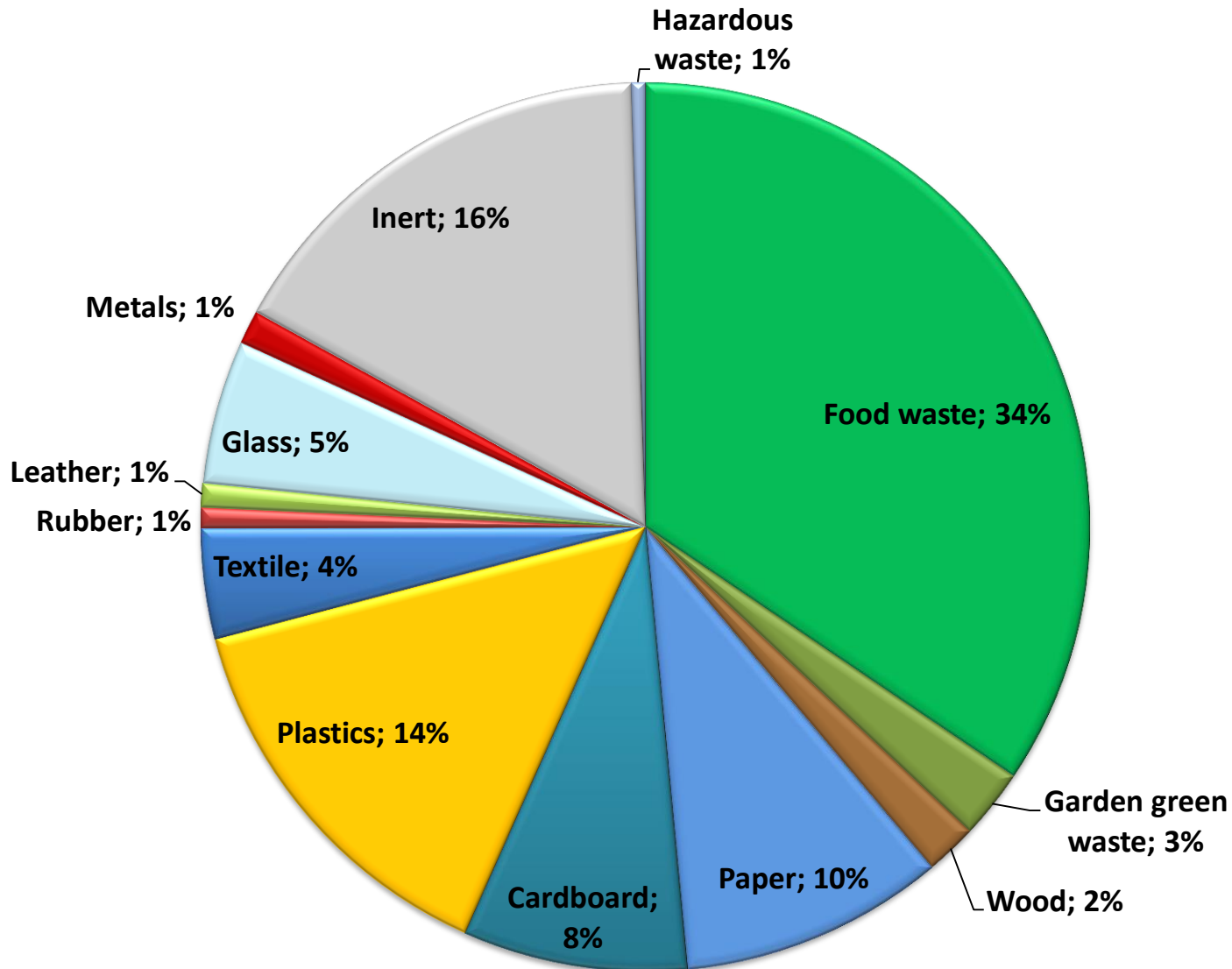
What do we want to achieve ?



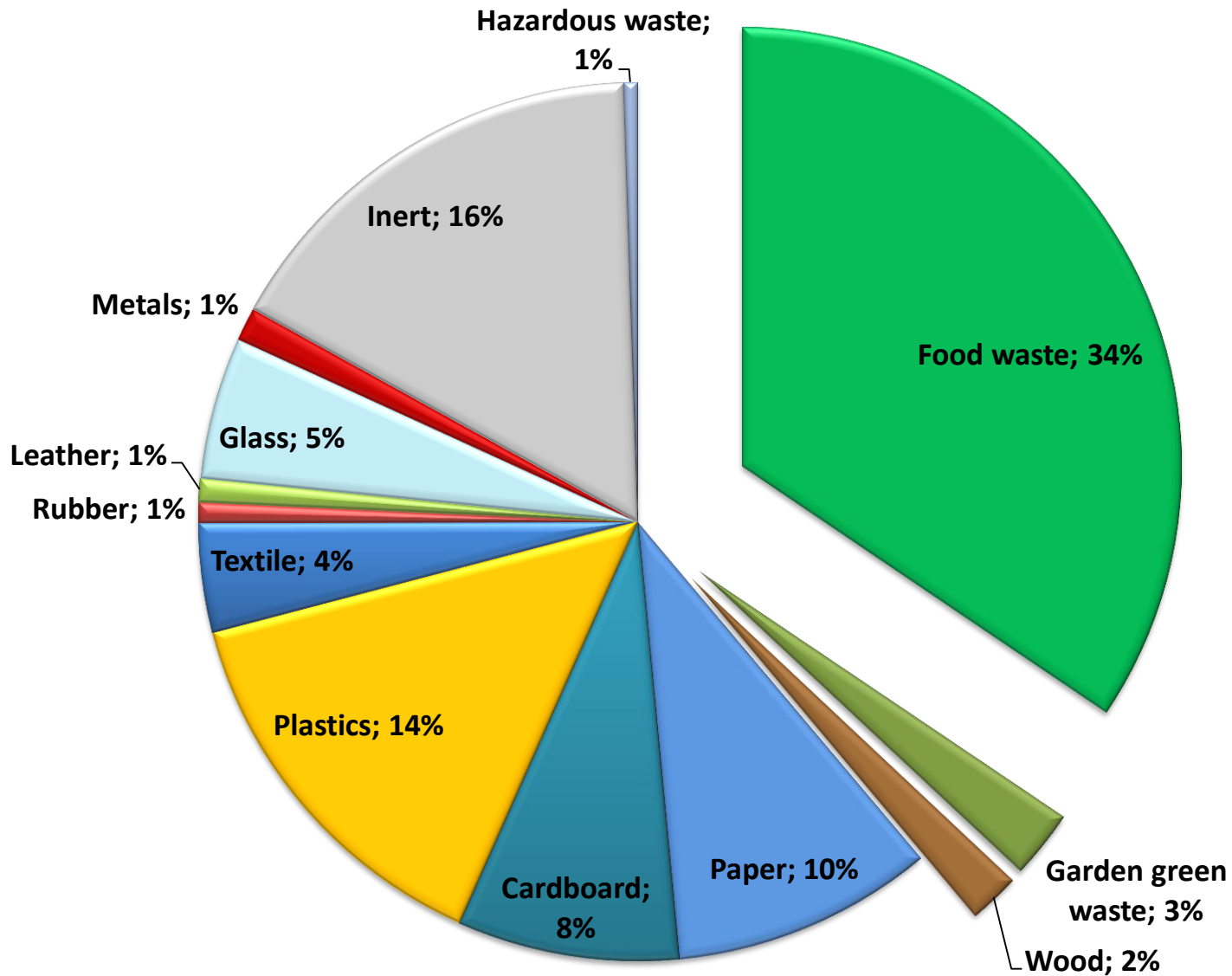
Mixed household waste



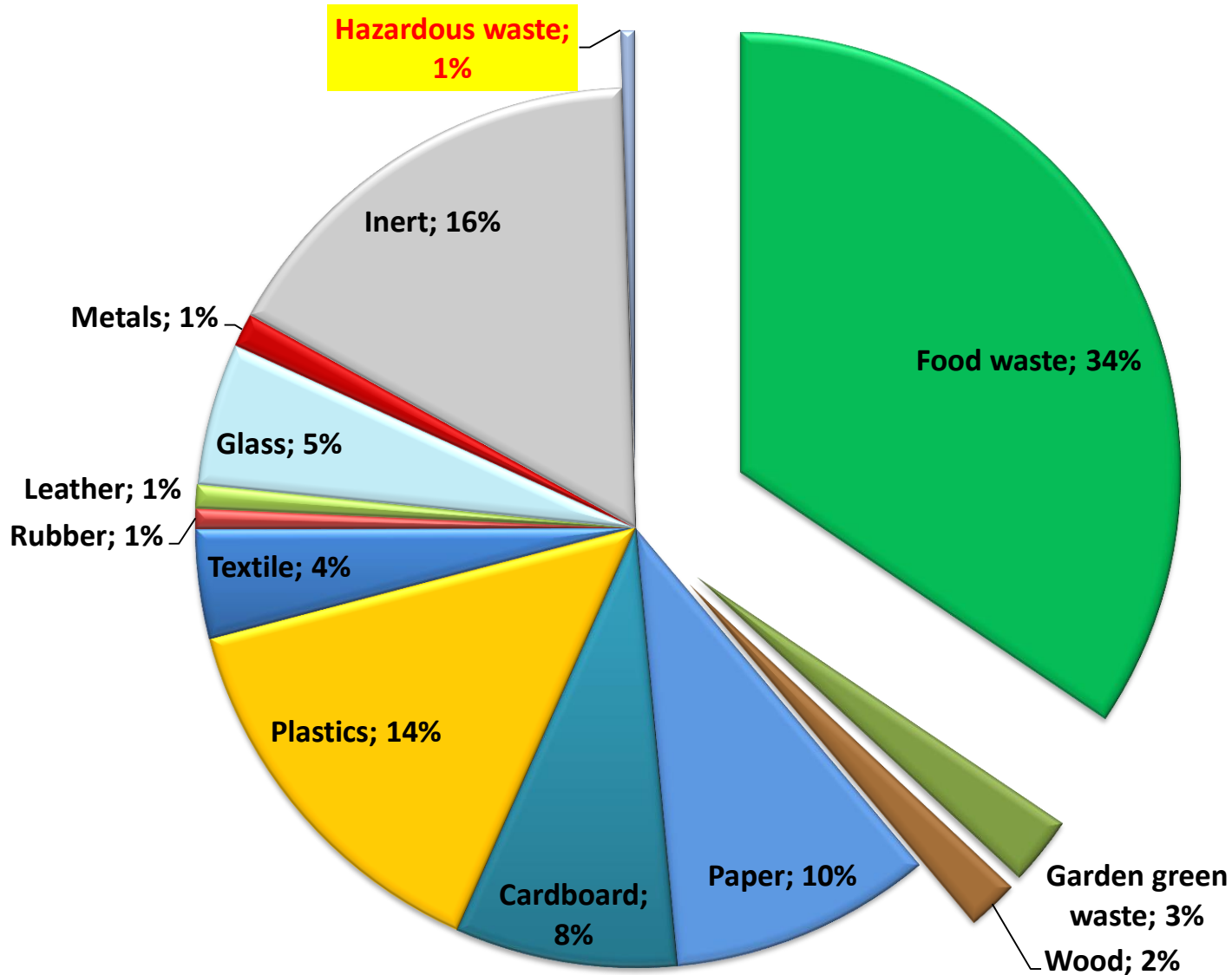
Composition of waste – Example Sofia Municipality



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Composition of waste – Example Sofia Municipality



Feedstocks for biowaste-treatment: bio-bin



Feedstocks for biowaste-treatment: food waste

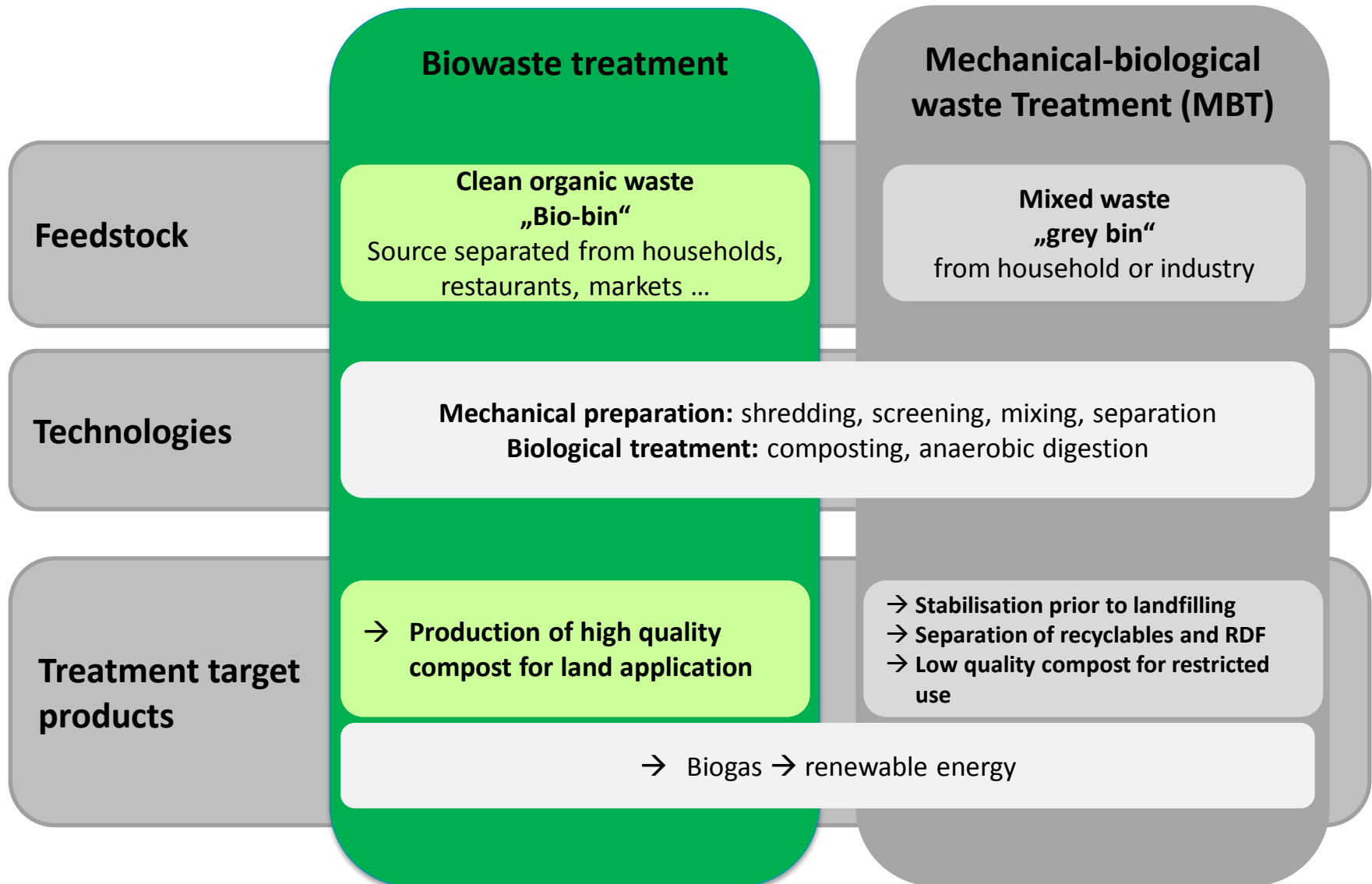


Foto: J. Biala

“Biowaste”: Source Separated Kitchen and Garden Waste



Strategies for biological waste treatment



Mechanical preparation: Screening



Metal separation – magnet, eddy current separation



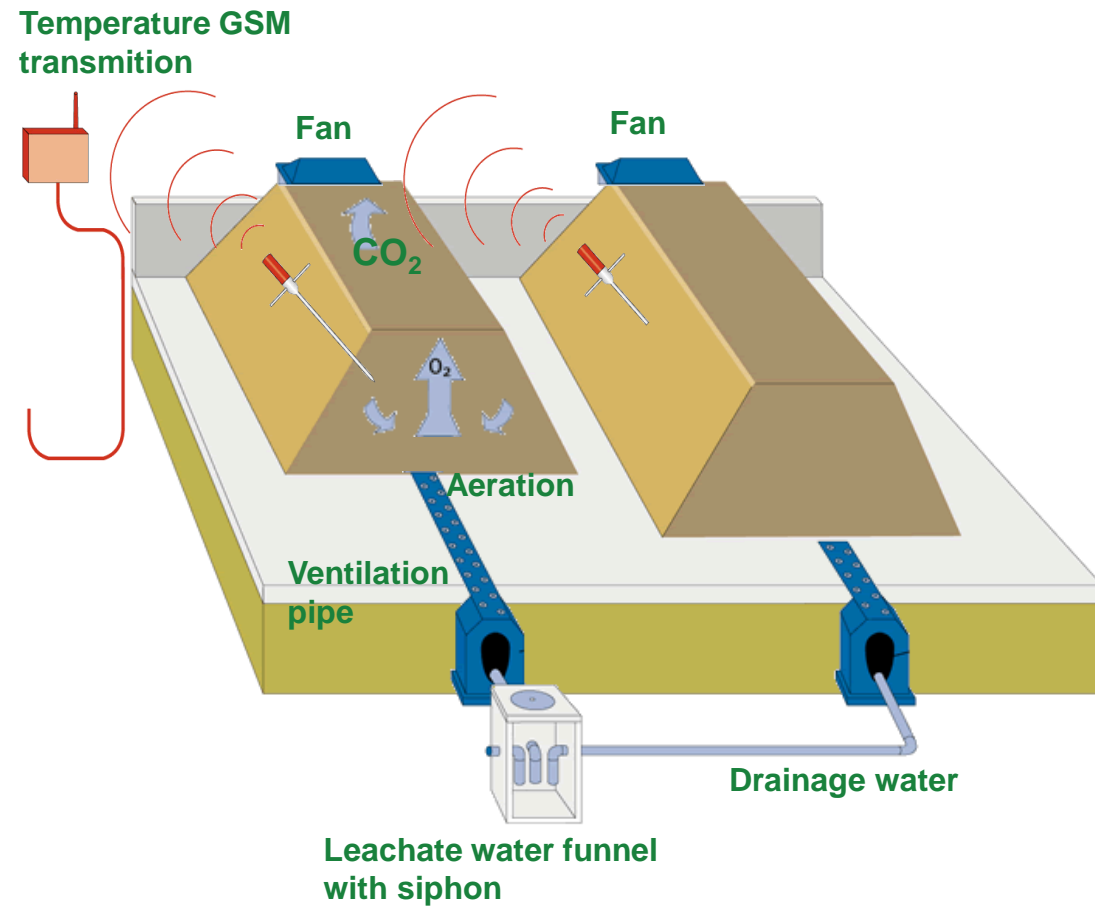
Composting

Organic matter + oxygen → CO₂ + water + compost + heat

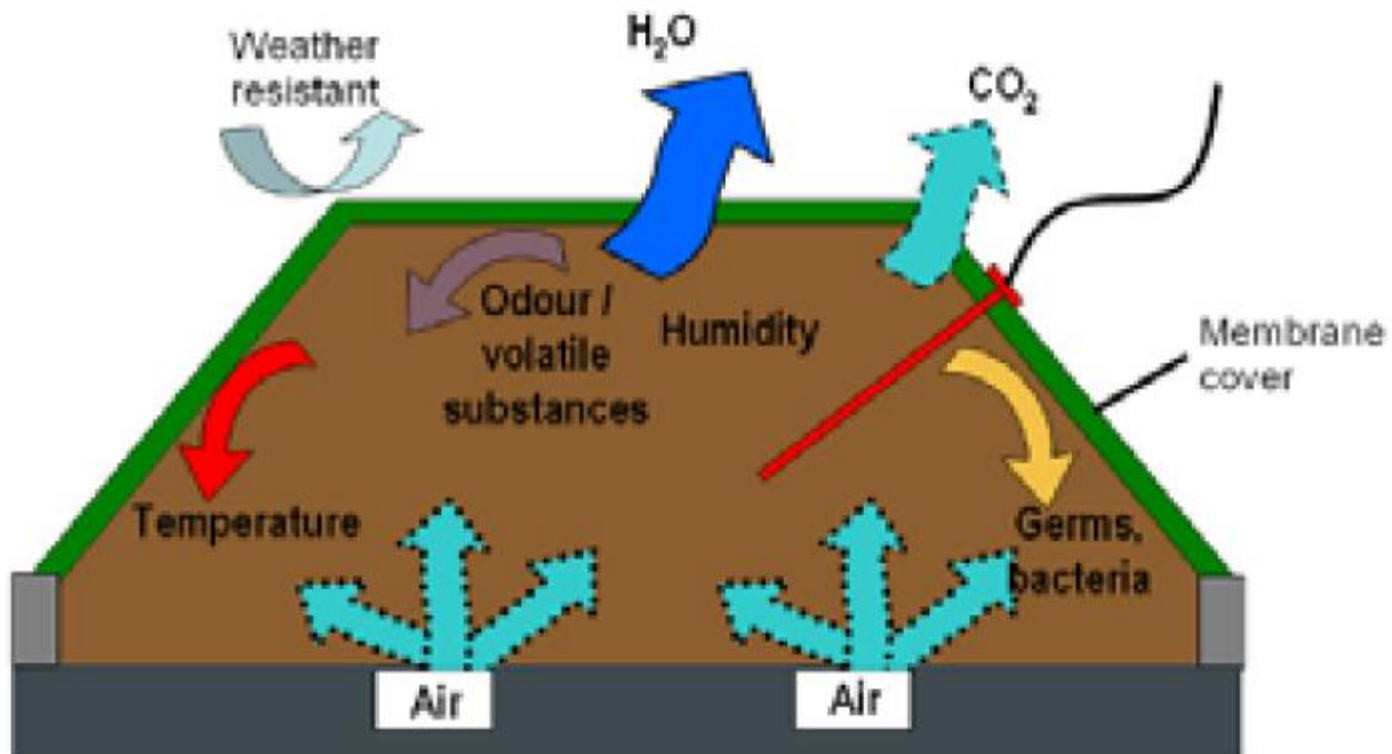
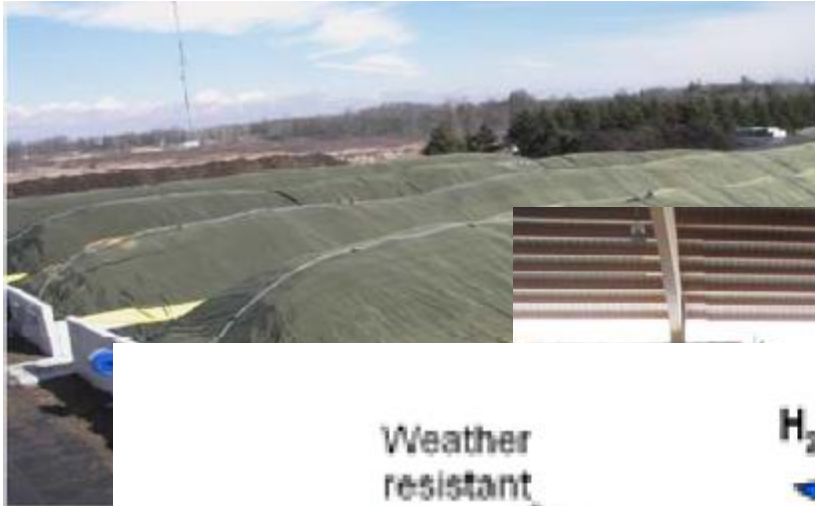


Can be applied for small quantities – decentralized solutions

Forced aeration in windrow composting



Windrow composting with membrane cover



Windrow composting with roof and housed



Tunnel composting



Table windrow composting with automatic turning



Composting

Organic matter + **oxygen** → CO₂ + water + **compost** + heat

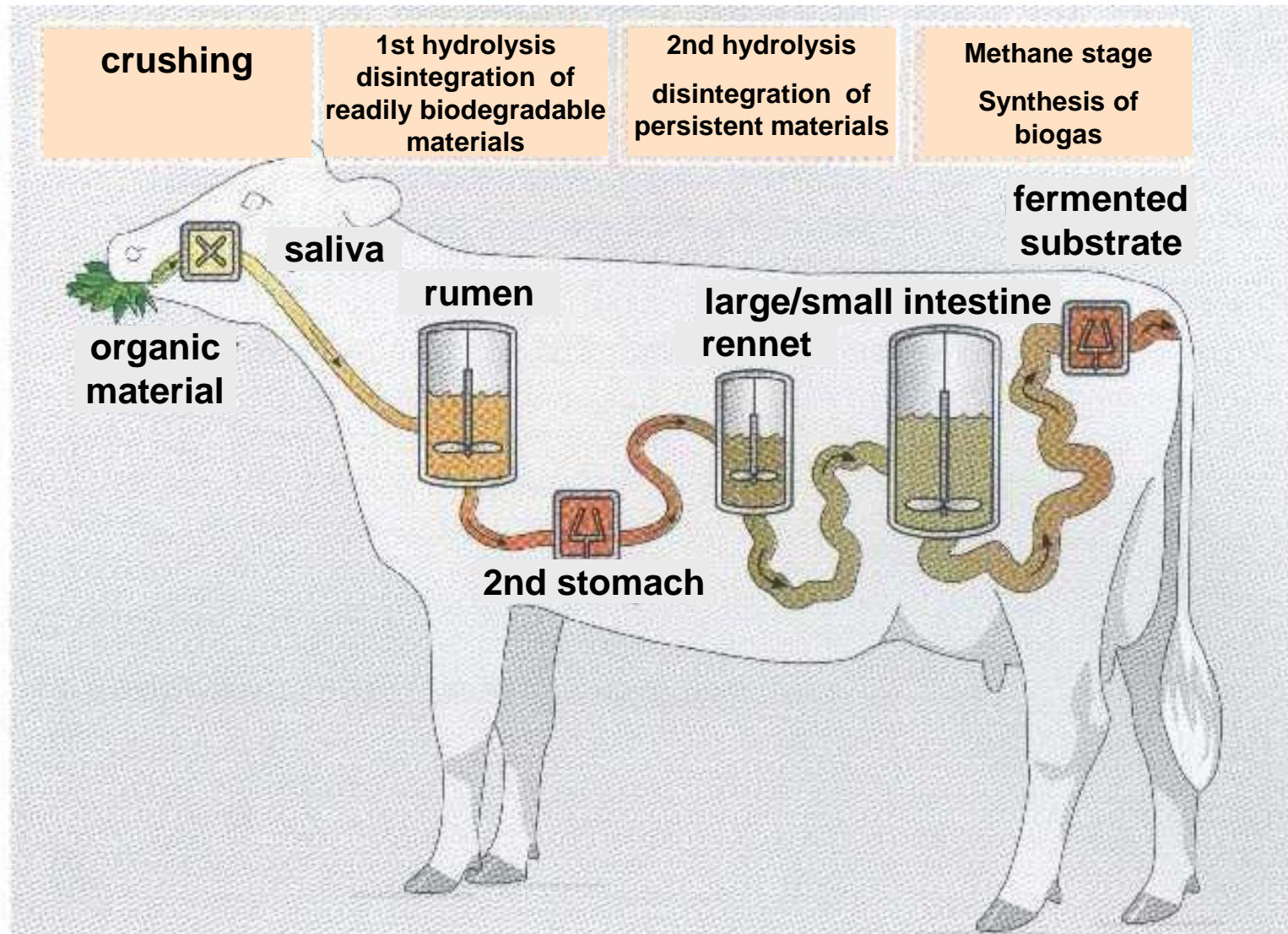
Anaerobic digestion

Organic matter + no oxygen → **Biogas** + digestate

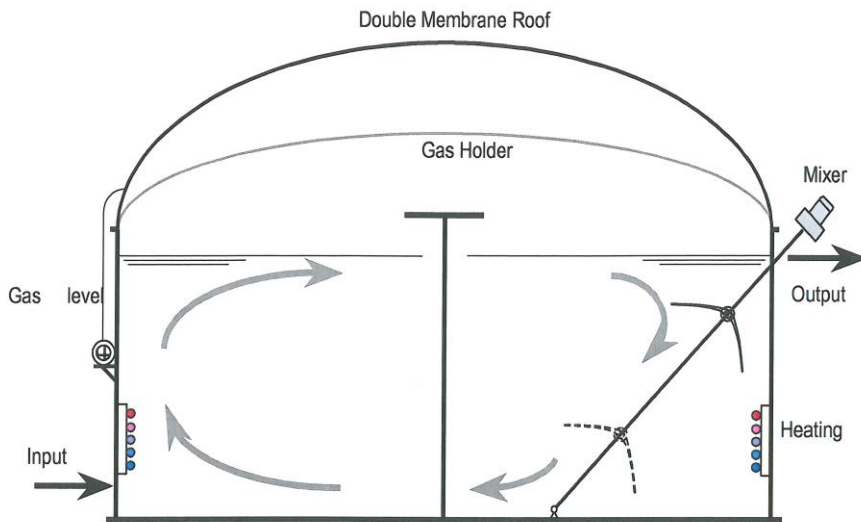
Biogas + oxygen → CO₂ + water + energy (electricity + heat)

digestate + oxygen → CO₂ + water + **compost**

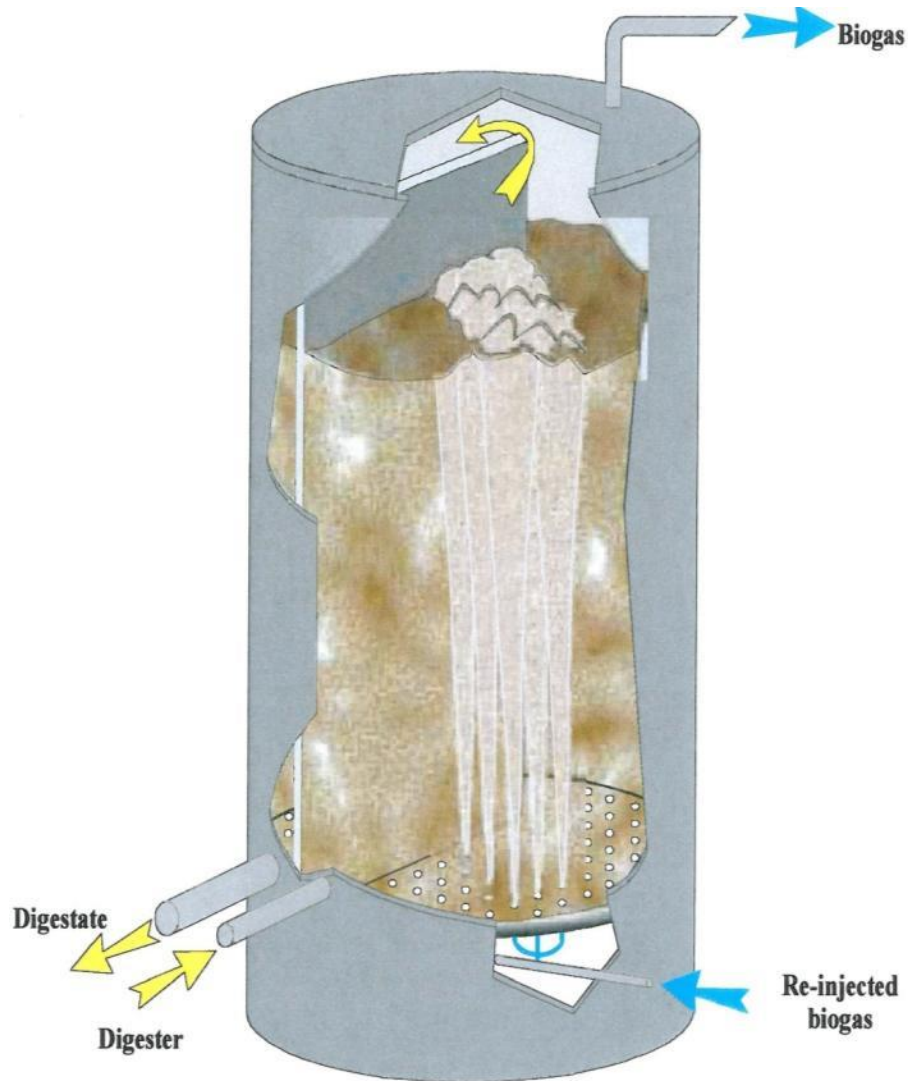
Anaerobic digestion process



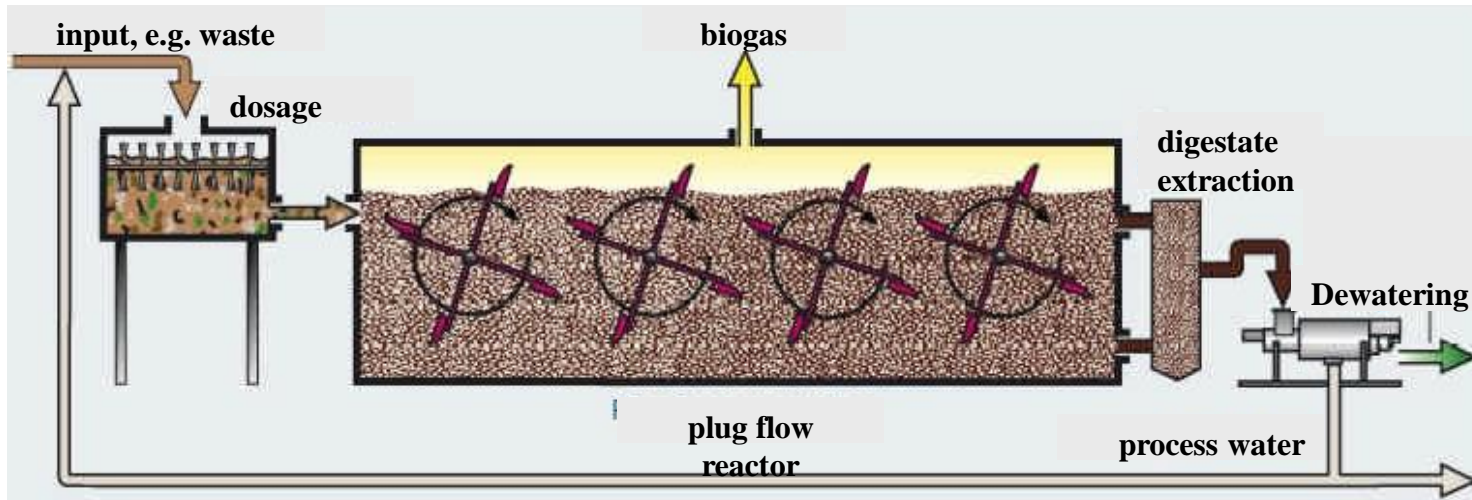
Wet digestion, continuous process



Dry Digestion - continous process, vertical systems



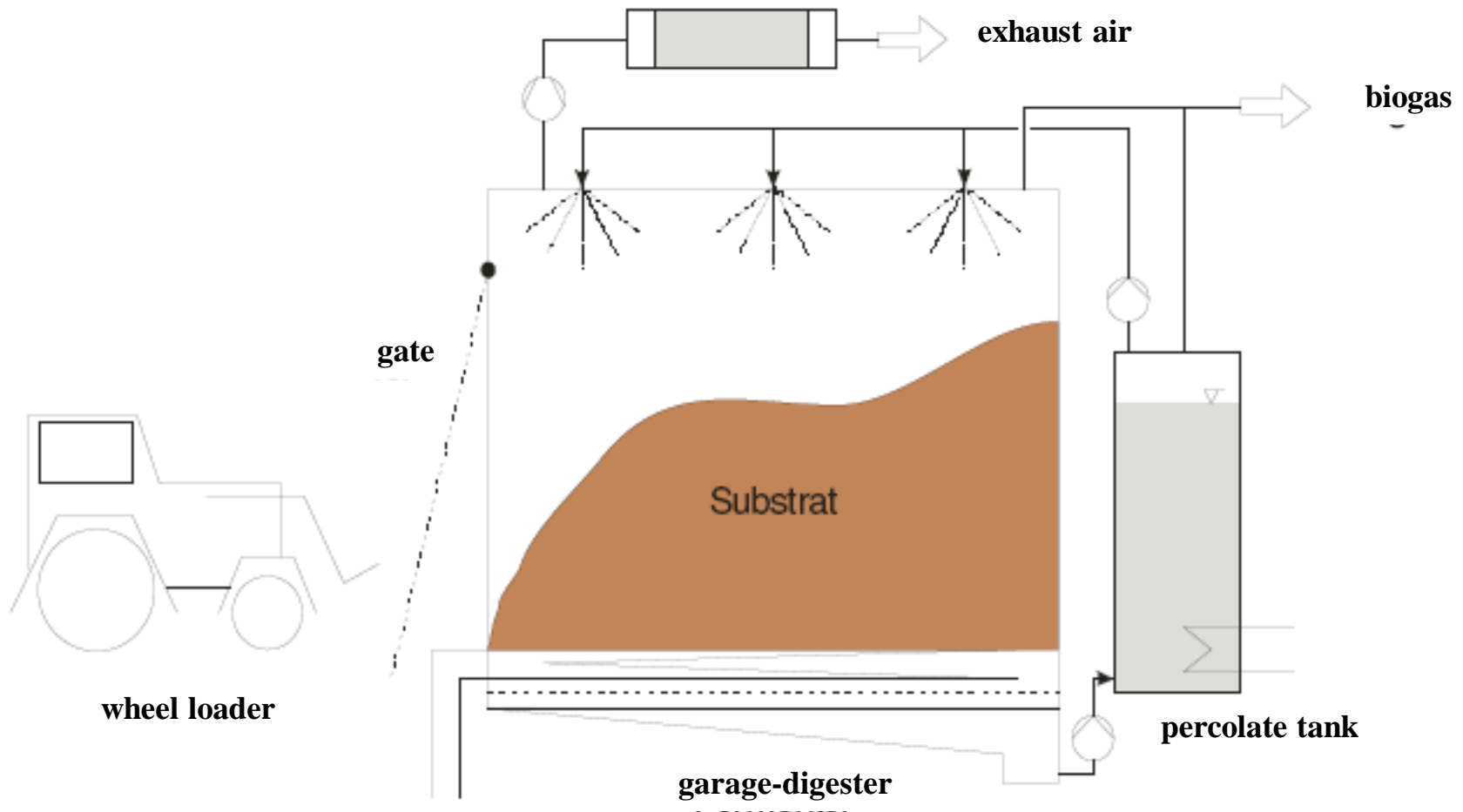
Dry Digestion, continous process, horizontal digestors



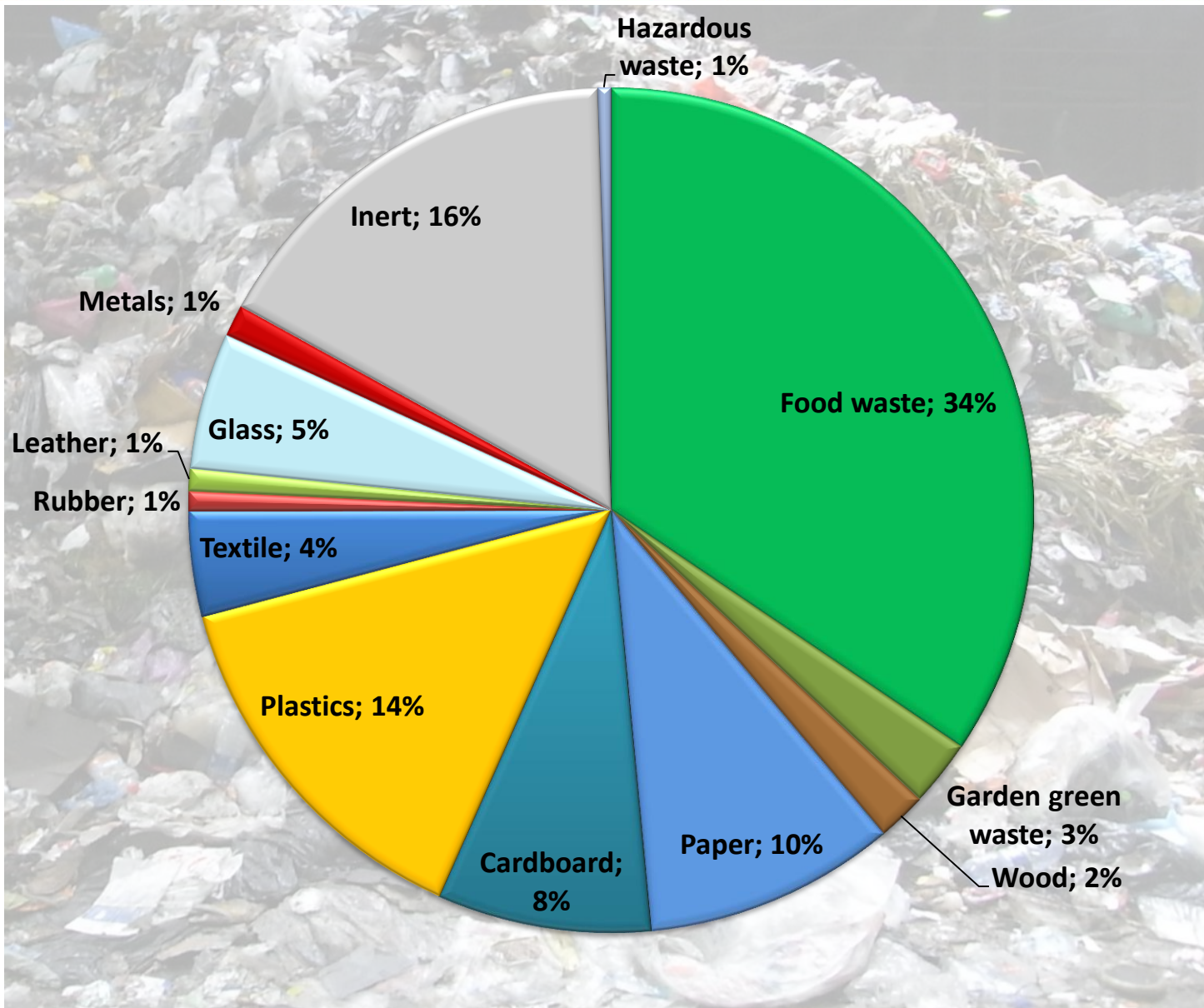
Dry Digestion, batch process

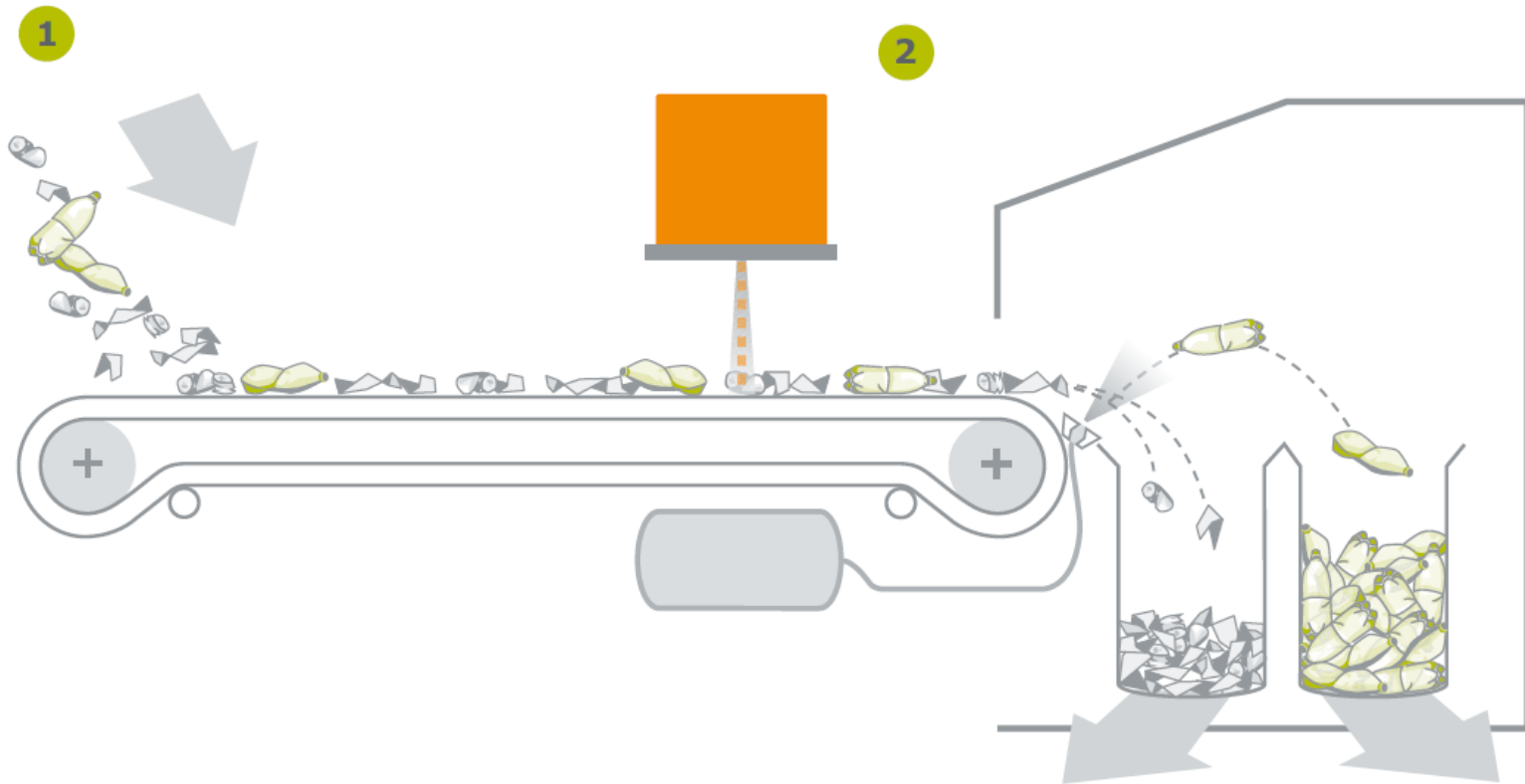


Dry Digestion, batch process



MBT- mechanical biological Treatment of mixed household waste





- 1 Feeding of unsorted material
- 2 Spectrometer scanner
- 3 Separation chamber

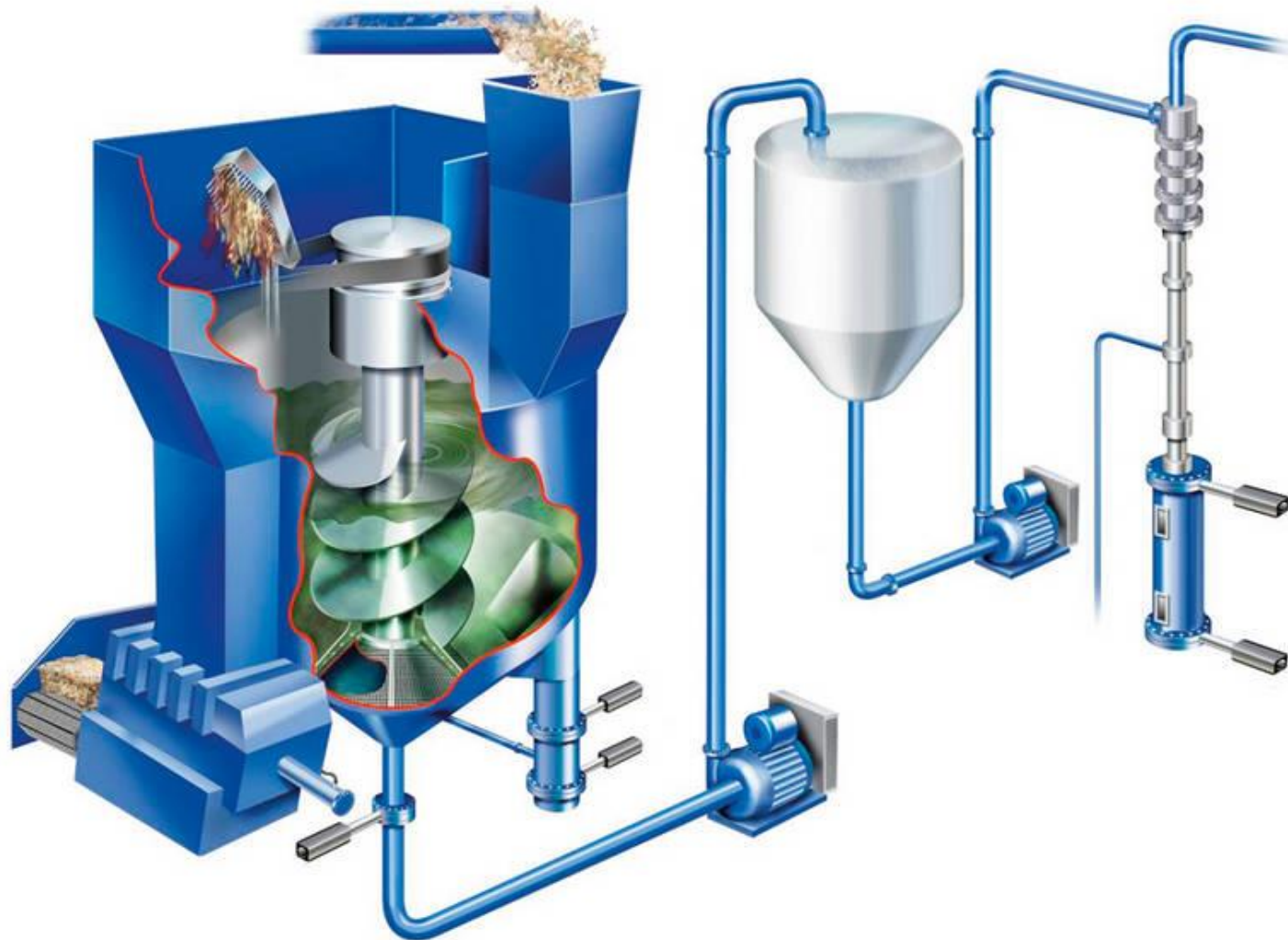
Reccyclables



RDF - Refuse derived fuel



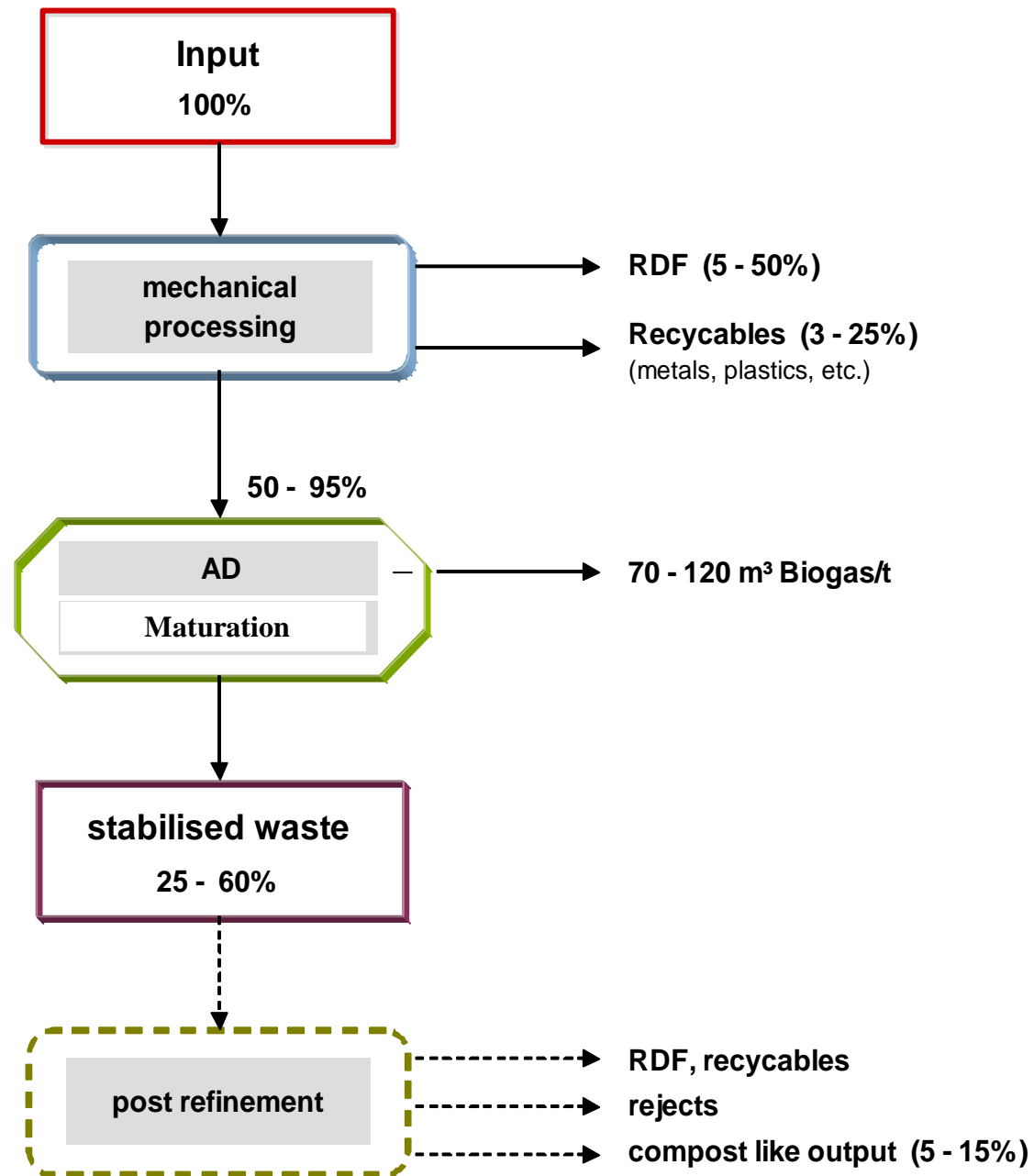
Waste preparation with pulper and grit-removal



Contraries (separated in wet separation)



MBT – generic process flow and mass balance



Required Treatment time for MBT



Properties of compost from a MBT in the UK

Unit	Batch 2 Green waste fully processed	Batch 3 Mixed Household waste 3 weeks processed	Batch 4 Mixed Household waste 12 weeks processed	Batch 8 Mixed Household waste 12 weeks processed < 10 mm	Batch 8 < 10-40 mm	Batch 8 > 40 mm	PAS 100 Potentially Toxic Elements Upper Limits
Dry Matter (DM) [%]	60.7	83.8	81.6	69.5	71.4	76.6	
Total Nitrogen [% of DM]	1.02	1.95	1.71	1.75	0.82	0.29	
Total Phosphorus [% of DM]	0.136	0.268	0.55				
Total Potassium [% of DM]	0.429	0.674	0.25				
Total Carbon [% of DM]	15.4	24.1	20.1	18.7	8.32	23.7	
C : N Ratio	15:1	12:1	11.7:1	11:1	10:1	82:1	
Total Zinc [mg/kg DM]	162	387	435	503	232	122	400
Total Copper [mg/kg DM]	26.2	132	155	159	56.3	40	200
Total Lead [mg/kg DM]	84.2	686	606	433	109	46	200
Total Nickel [mg/kg DM]	5.0	16.5	27.5	29.8	14.4	5.7	50
Total Chromium [mg/kg DM]	7.8	18.1	31.7	30.0	14.4	5.05	100
Total Mercury [mg/kg DM]	0.16	0.13	0.45	0.70	1.97	0.60	1
Total Cadmium [mg/kg DM]	0.29	1.15	3.49	1.68	0.53	0.29	1.5
PH	7.61	7.26	8.3	7.5			
Conductivity [Mmhos]	0.78	1.35					

Required Treatment time for MBT

	Respiration acitivity < 5 mg/g DM (German/Austrian limits)	Respiration acitivity < 10 mg/g DM (EC limit)
Composting	8 – 16 weeks	5 – 8 weeks
AD + composting	2-3 weeks AD 4 – 10 weeks composting	2-3 weeks AD 2 – 5 weeks composting

Landfilling of MBT residues



- **Biological waste treatment is proven and accepted across Europe**
- **Source separated organic waste is increasingly seen as a resource to produce**
 - * high quality compost and fertilizer (liquid digestate)**
 - * renewable energy from biogas**
- **Biological waste treatment provides high flexibility**
 - can be designed for a wide range of capacities – from small to big**
 - can be developed gradually, in terms of capacity and treatment targets**
 - is flexible in terms of feedstock (change from MBT to treatment of clean organic waste)**
- **MBT is an efficient option for the treatment of mixed waste to meet the requirements of the EU landfill directive**

Thank you for your attention

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