

Regenerative Energy from Industrial and Municipal Organic Waste

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Krieg & Fischer Ingenieure GmbH

Krieg & Fischer Ingenieure GmbH

Engineering Office, specialized in Design and Engineering of Biogas Plants

Foundation: 1999

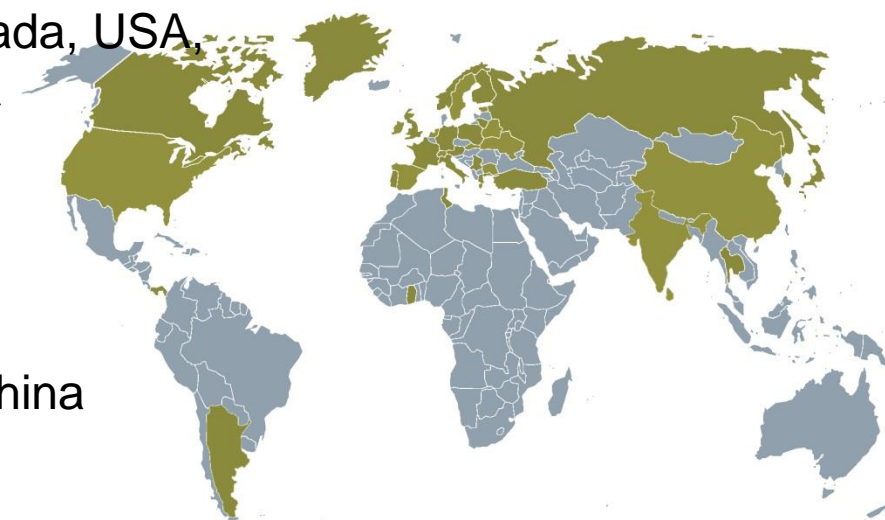
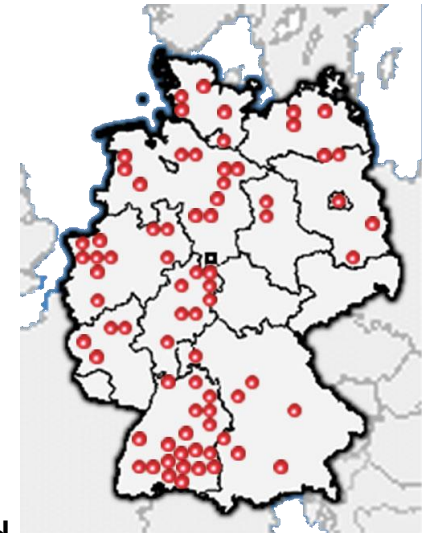
Team: 25

Experience: > 25 Years

References: ca. 150 Biogas Plants

in: Germany, Japan, Netherlands, Austria, Switzerland, Lithuania, Italy, Slovakia, Canada, USA, Spain, France, Ireland, Russia and India

Partner in: Japan, Korea, USA, Canada, Bulgaria, France, Hungary, Turkey, Poland, Italy, Spain, Ireland, Serbia, Greece and China



Service offerings of Krieg & Fischer in the field of Biogas

- Studies
- Concept Development
- Calculations
- Permits & Approvals
- Engineering
- Tendering and Commissioning
- Supervision of Construction
- Start-up
- Optimization/Retrofits
- Supervision and Consulting

References - Examples



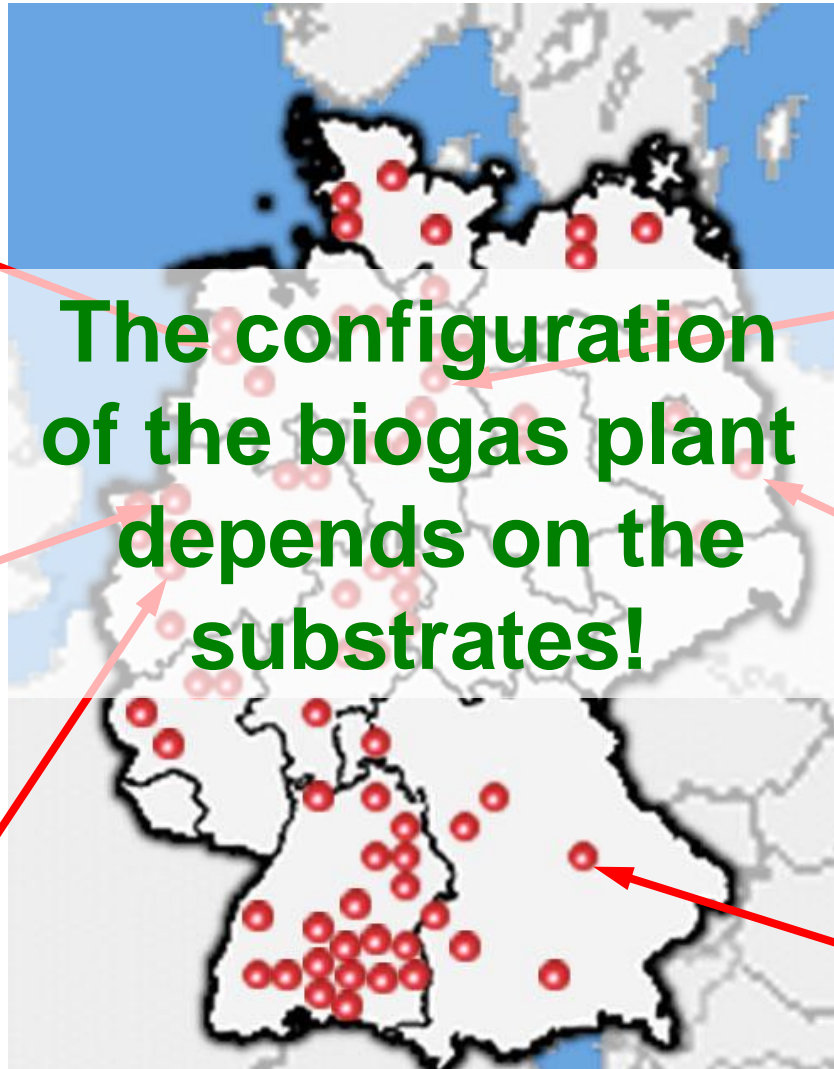
Central Biogas Plant



Energy Crop Biogas Plant



Kitchen Waste Digestion



The configuration of the biogas plant depends on the substrates!



Potato Residue Digestion



Energy Crops with Cattle Manure



Biowaste Digestion

Introduction

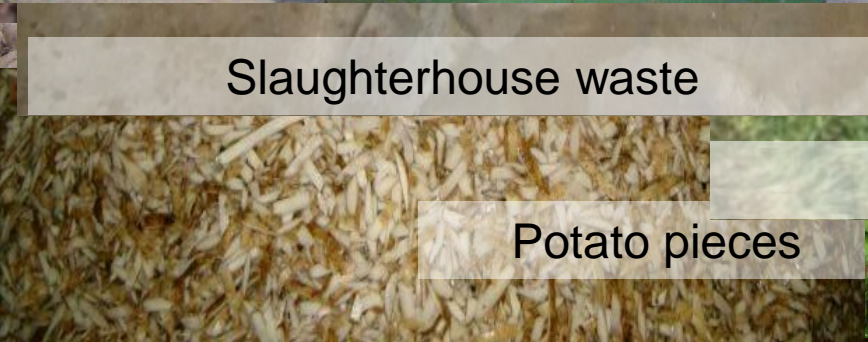
“Regenerative Energy from Industrial and Municipal Organic Waste”

This presentation is not about the most wonderful system for regenerative energy but about the way to get there. And one of the key challenges is a proper pre-treatment.



Municipal organic waste

Old bread



Slaughterhouse waste

Potato pieces



Waste french fries

Collection of municipal organic waste – source separated



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Biogas production from municipal organic waste in Germany 2011

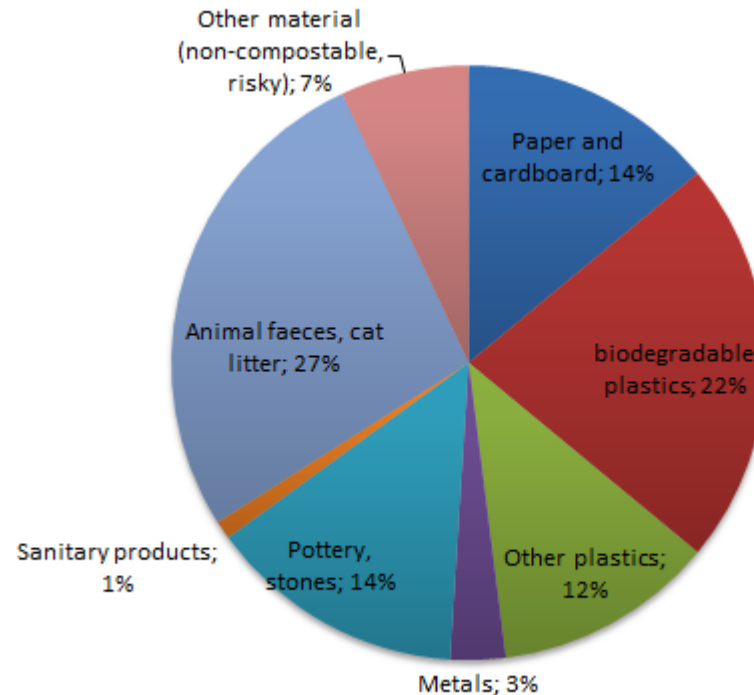


Fermentation container	Plug flow digester	Wet digestion
14	22	44
17%	28%	55%

Source: Biogas-Atlas 2011/12; Anlagenhandbuch der Vergärung biogener Abfälle in Deutschland; Witzenhausen-Institut für Abfall, Umwelt und Energie GmbH; 2011; Bioabfallvergärungsanlagen in Deutschland 2011

Contaminants of source separated municipal organic waste (“bio waste”)

Contaminants	Proportion (by weight)
Paper and cardboard	14%
biodegradable plastics	22%
Other plastics	12%
Metals	3%
Pottery, stones	14%
Sanitary products	1%
Animal faeces, cat litter	27%
Other material (non-compostable, risky)	7%
Total	100%



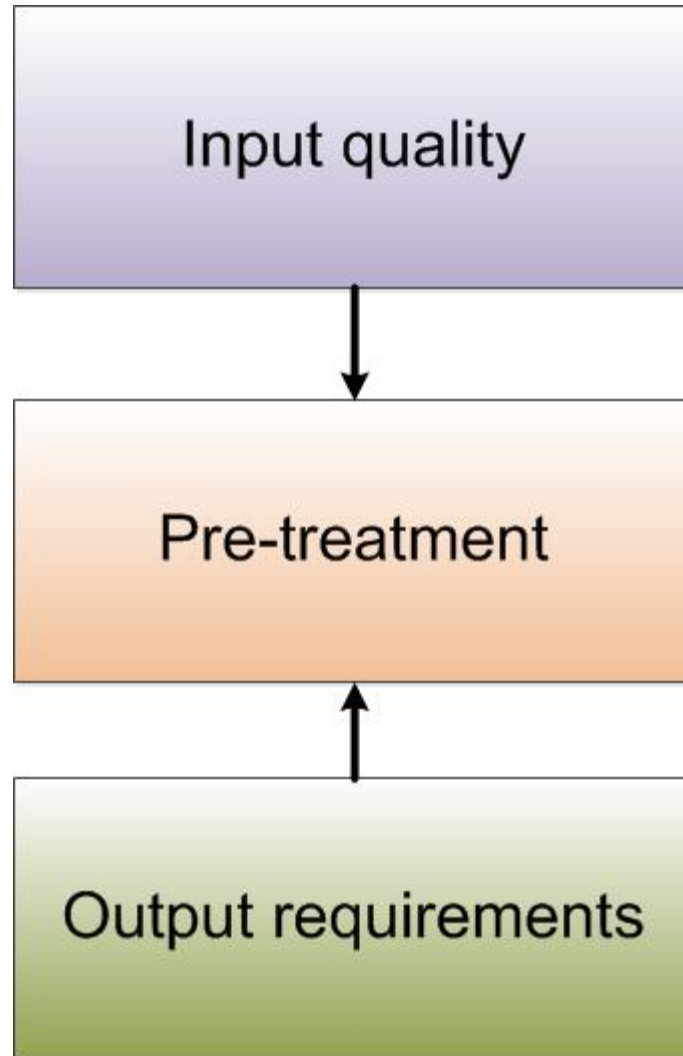
* According to analyses the waste contains approx. 2% of contaminants

Source: Biojätteen Laatututkimus, 2010; Finland

Key question:

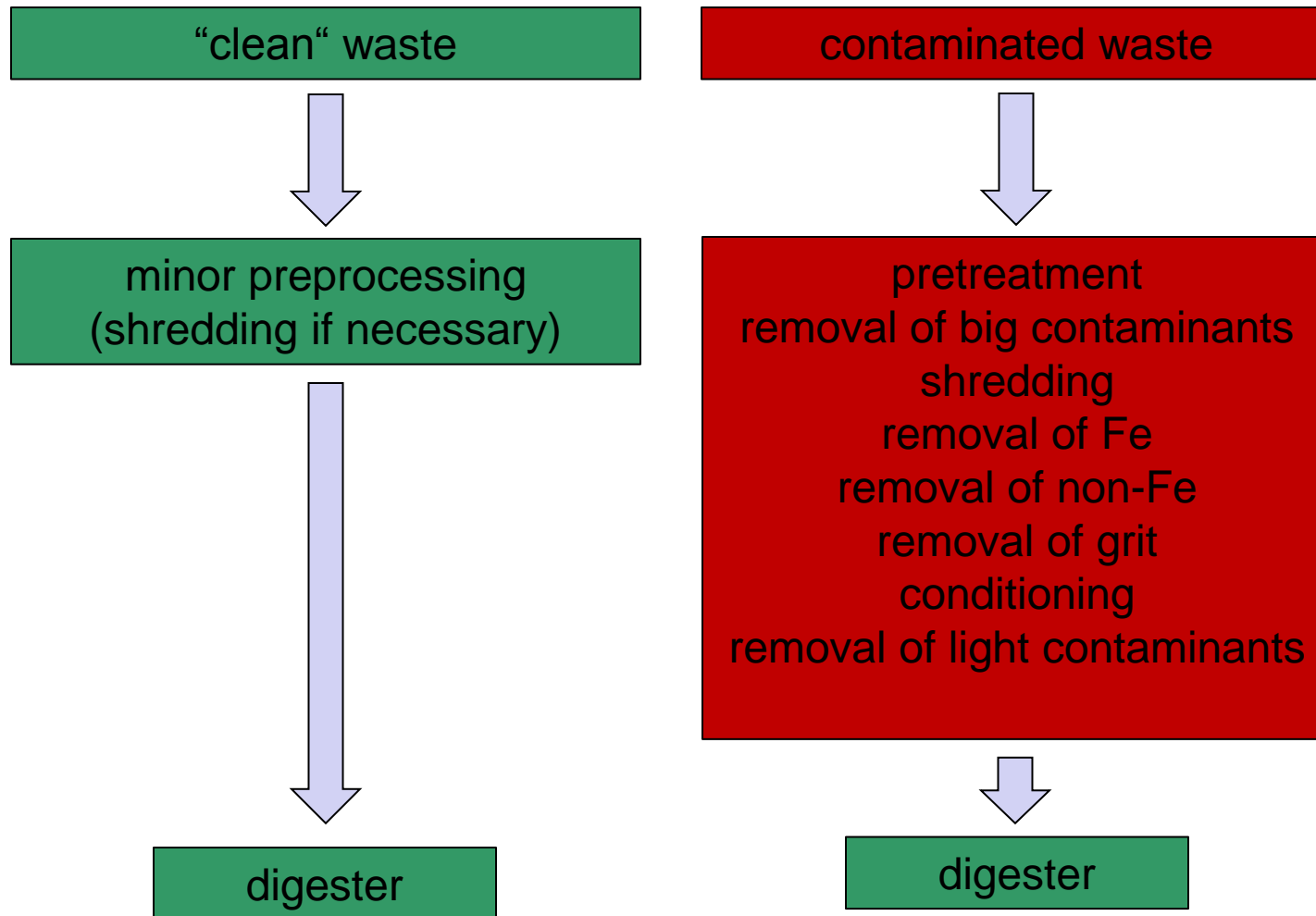
How does the pre-treatment looks like?

Pre-treatment

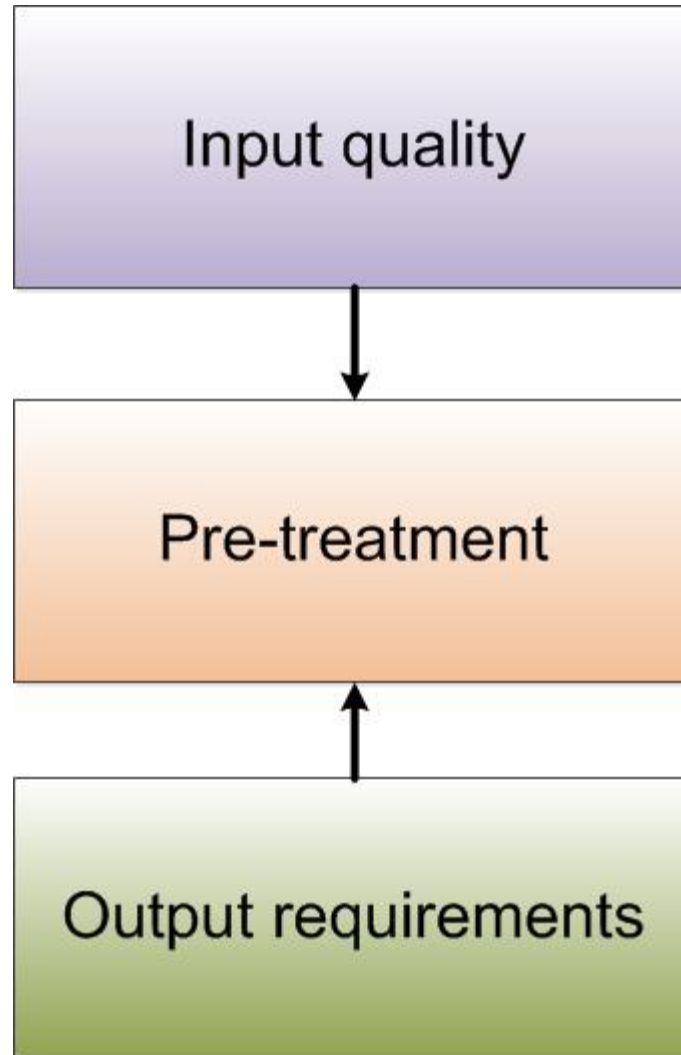


What is the aim ???

Pretreatment



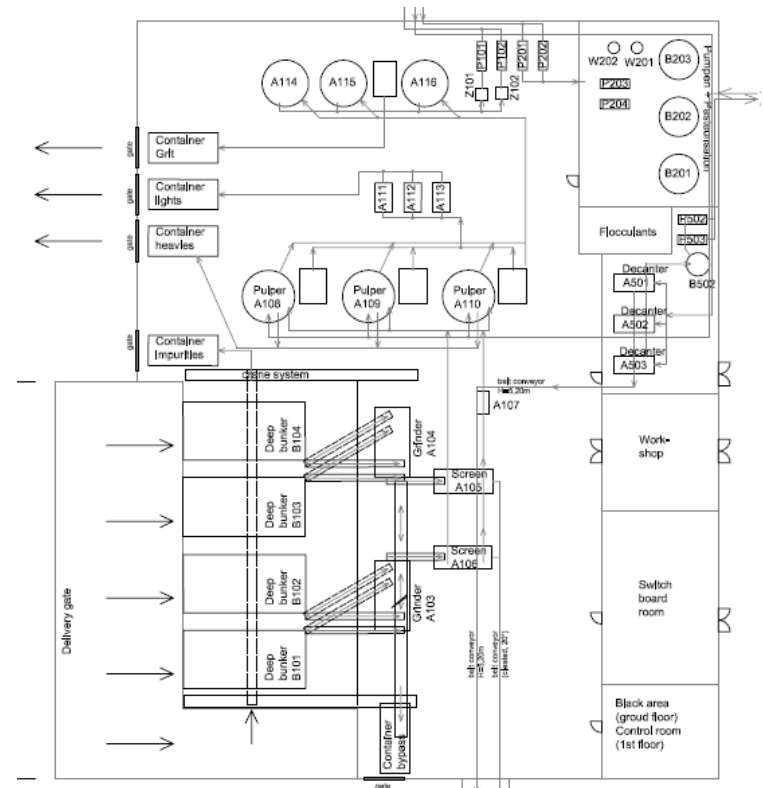
Pre-treatment



Selection Process technology

Depends on:

- Kind of Substrate
 - Dry matter content
 - Amount of contaminants
 - Content volatile solids
 - Particle size
 - Seasonal variation
- Location
- Logistic
- Use of digestate



Noyon Delivery liquid waste



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Noyon Delivery solid waste



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Pre-treatment



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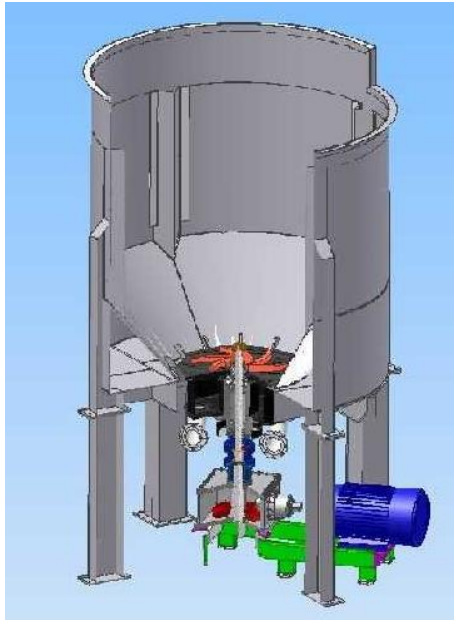


Trommelsiebmaschine SM 518 A

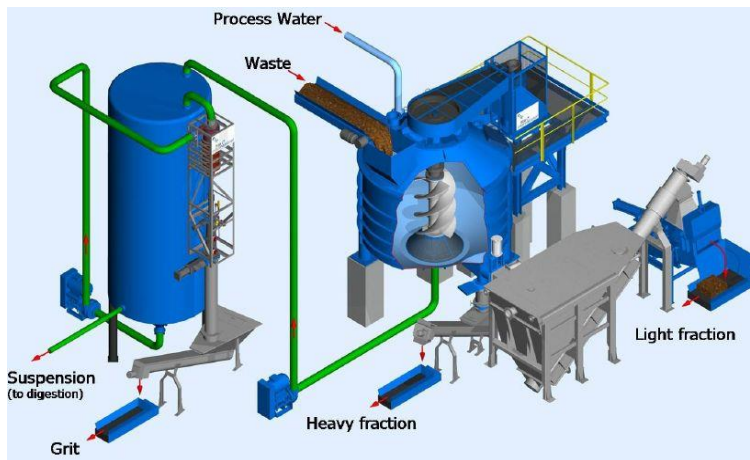
Walzenzerkleinerer DW 2060 - E „Büffel“

Doppstadt-Zerkleinerer AK 230 E

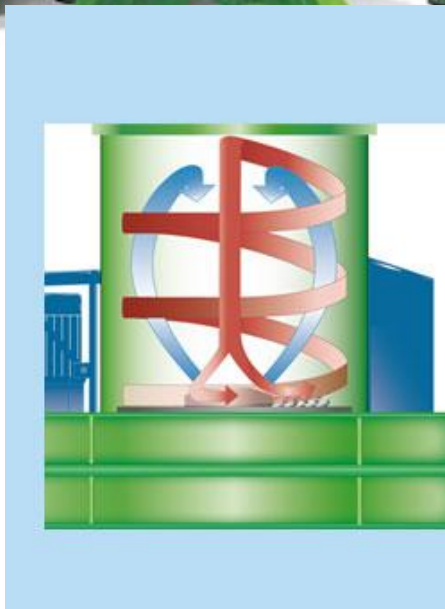
Pre-treatment



pulper



Pre-treatment



Cross flow shredder

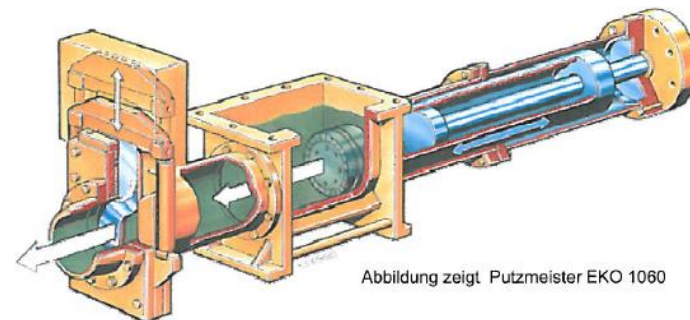
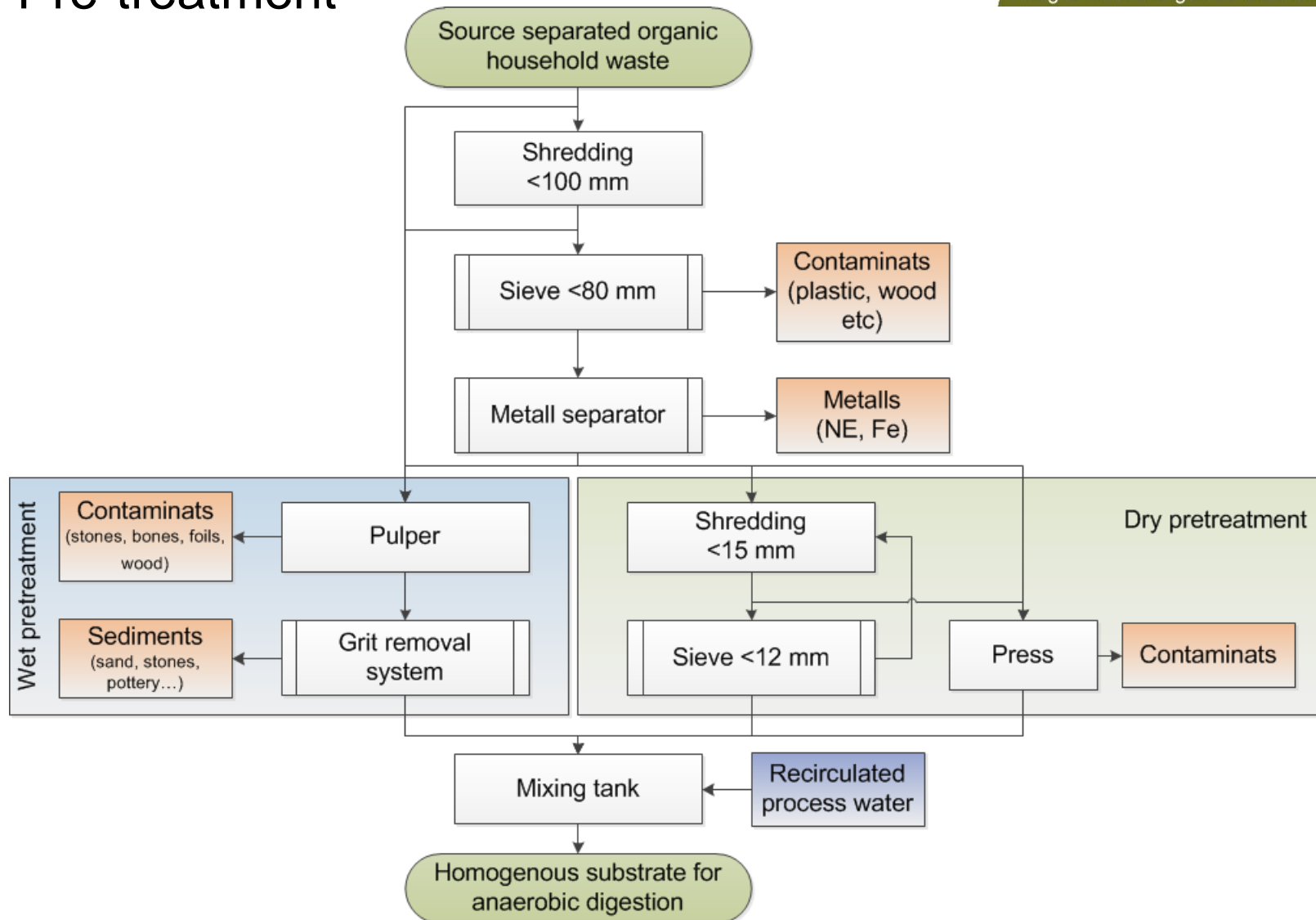


Abbildung zeigt: Putzmeister EKO 1060

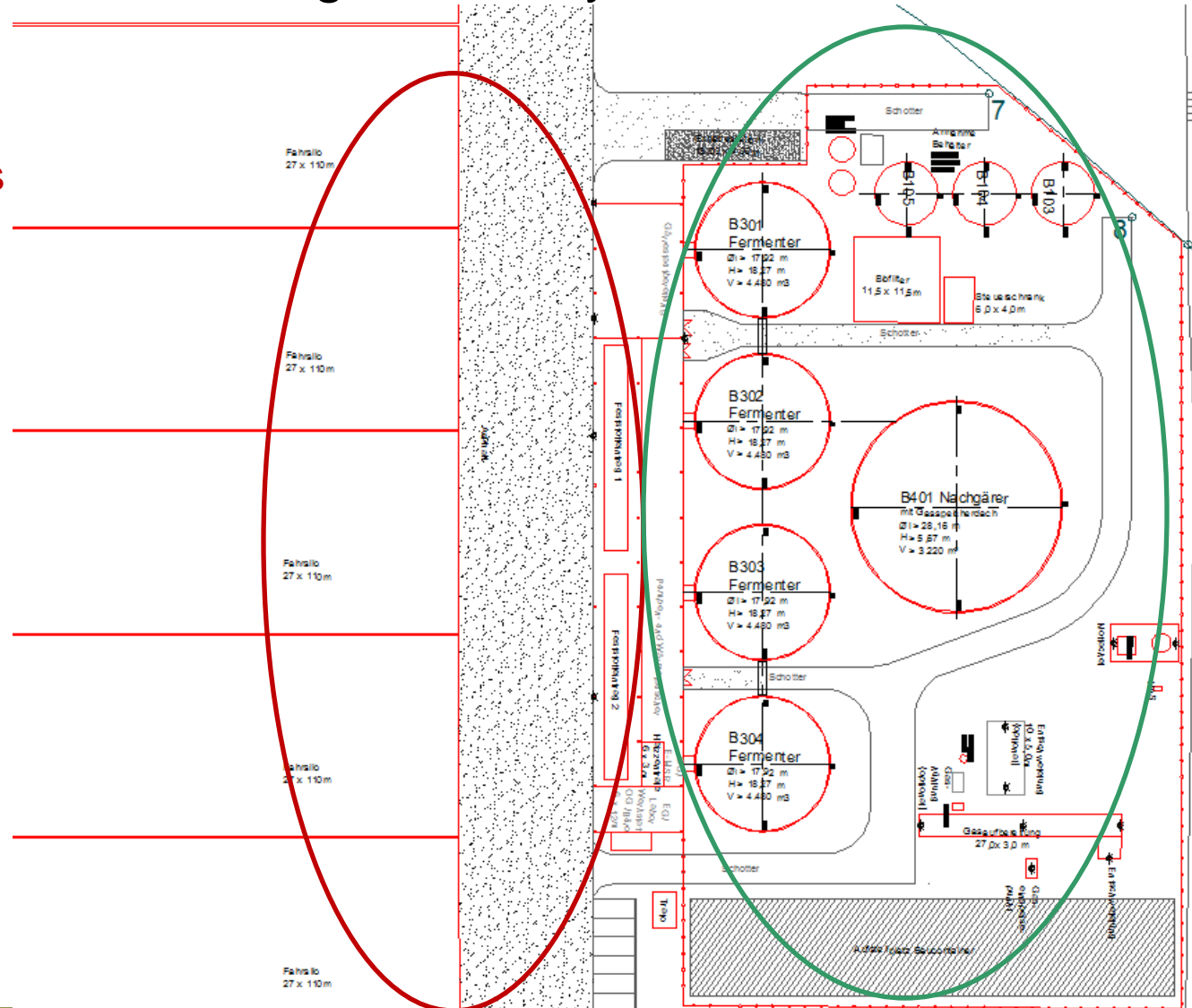
Pre-treatment



Example 1: waste from sugar industry

Pretreatment:
 Different silage plates
 → solid input device
 (red framed area)

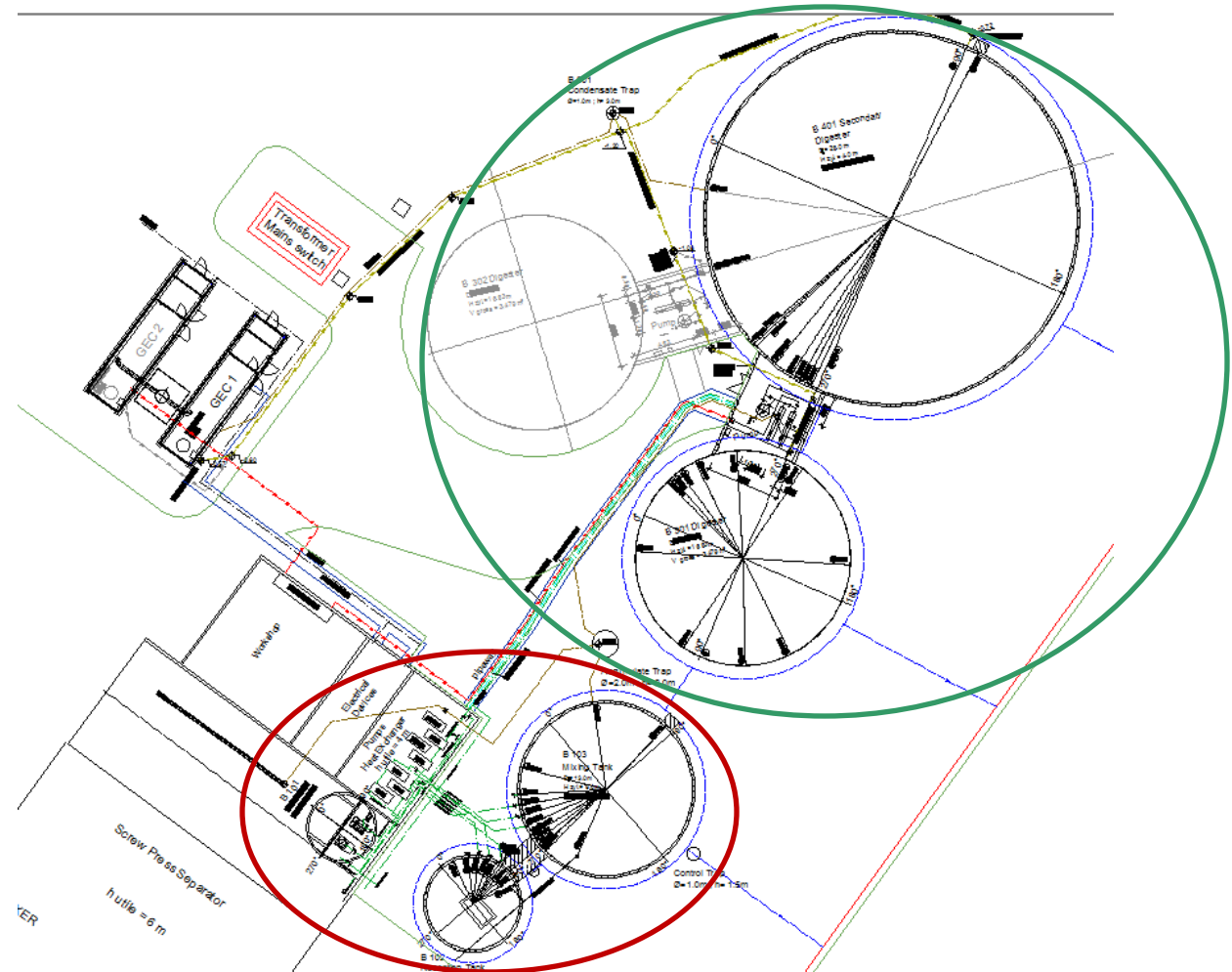
Digestion:
 → 4 Digester →
 secondary digester
 (green framed area)



Example 2: “clean” organic waste from industry

Pretreatment:
 Different tanks for delivery → shredding
 → mixing tank
 (red framed area)

Digestion:
 → Digester →
 secondary digester
 (green framed area)



Sludge from food industry, kitchen and market waste

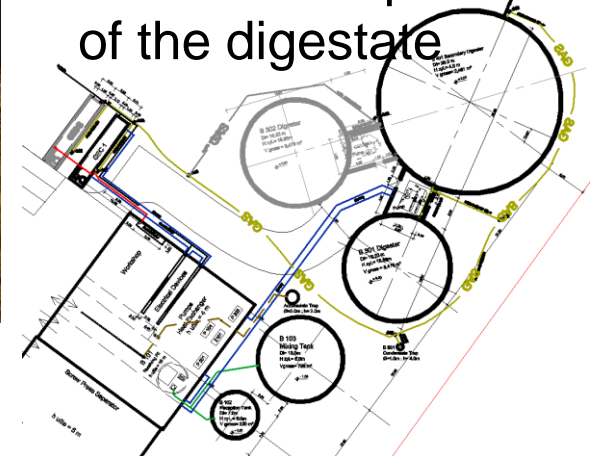
France, Noyon



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- Built: 2007
- Substrate: 40,000 t/year fluid and solid organic waste and sludge
- Digester: steel tank 3,479 m³
- Gas engine: 716 kWe
- Solid-fluid separation of the digestate



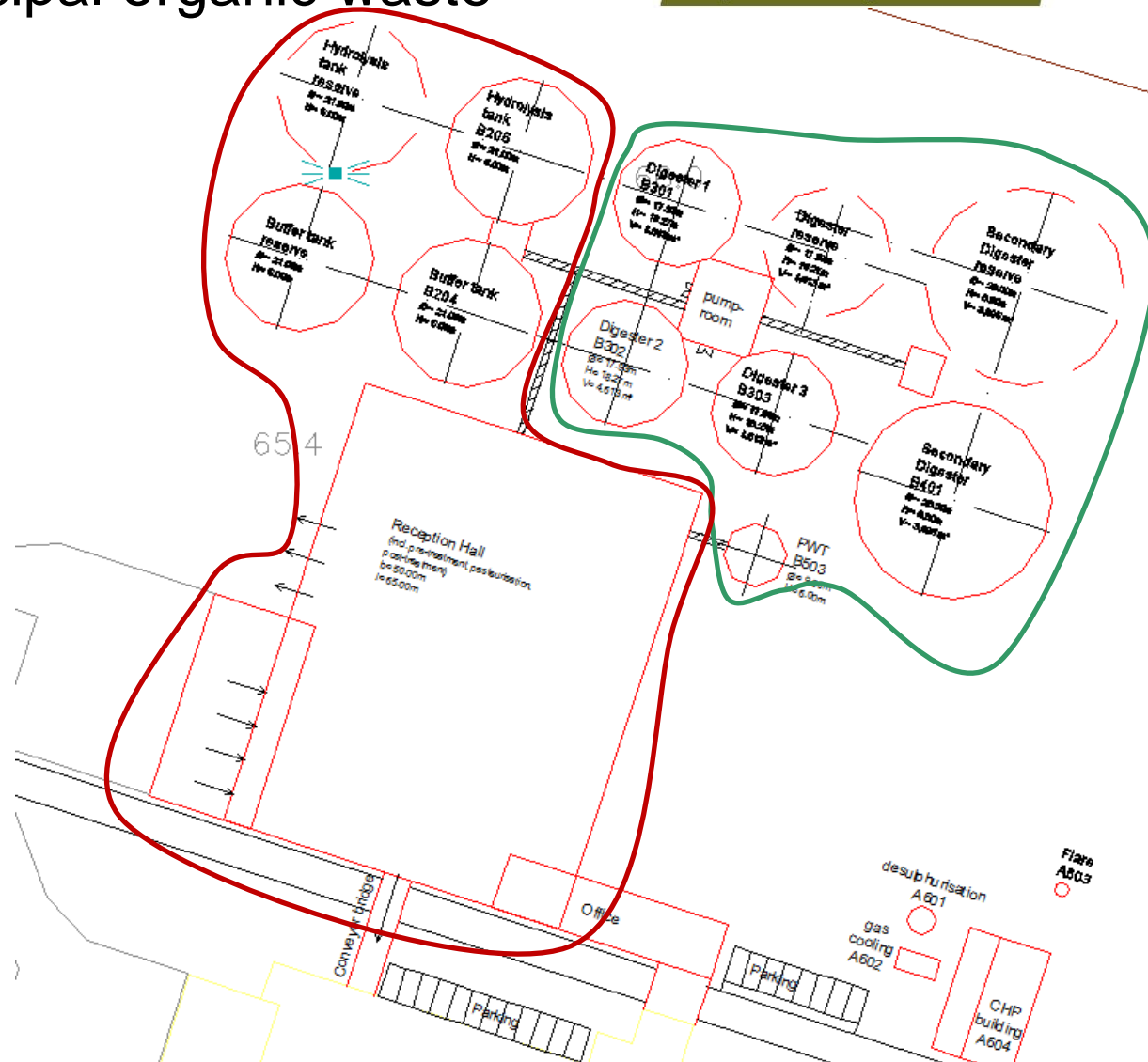
Example 3: municipal organic waste

Pretreatment:

Different tanks for delivery
 → screw mill/bag opener
 → interim bunker →
 pulper → grit removal
 system → buffer tank →
 mixing tank → hydrolysis
 (red framed area)

Digestion:

→ Digester → secondary
 digester
 (green framed area)



Type of digestion

Type of digestion

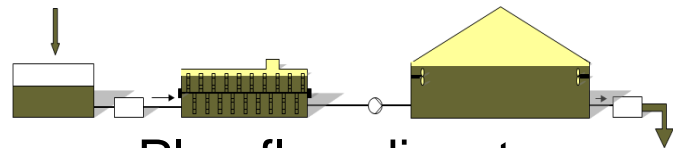
Constant type

Batch type

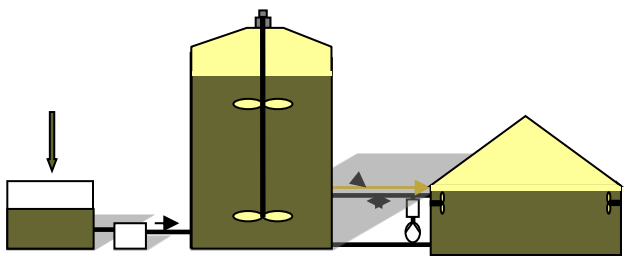
Wet digestion
TS <15% (in digester)

Dry digestion
TS 20-30% (in digester)

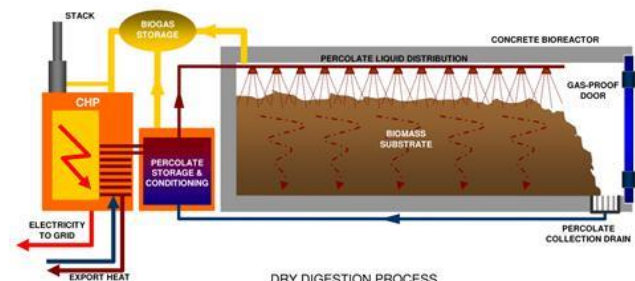
Dry digestion
TS 30-40% (in digester)



Plug flow digester



Wet digestion



Garage digester

Type of digestion

Type of digestion

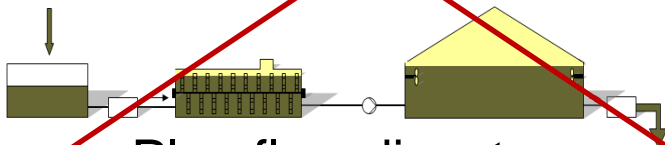
Constant type

Batch type

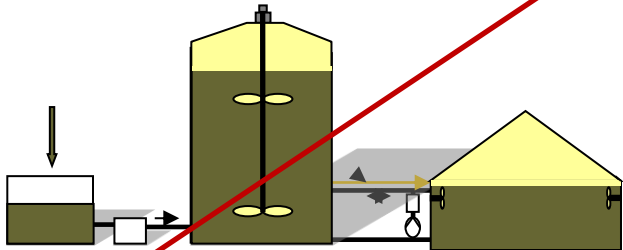
Wet digestion
TS <15% (in digester)

Dry digestion
TS 20-30% (in digester)

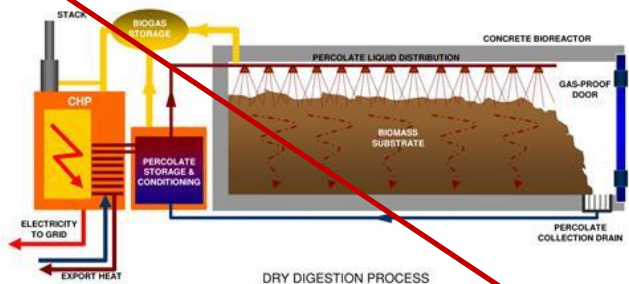
Dry digestion
TS 30-40% (in digester)



Plug flow digester



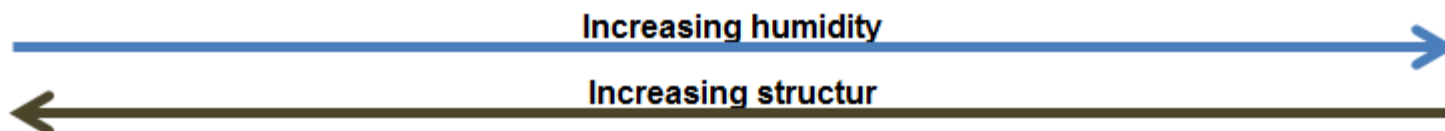
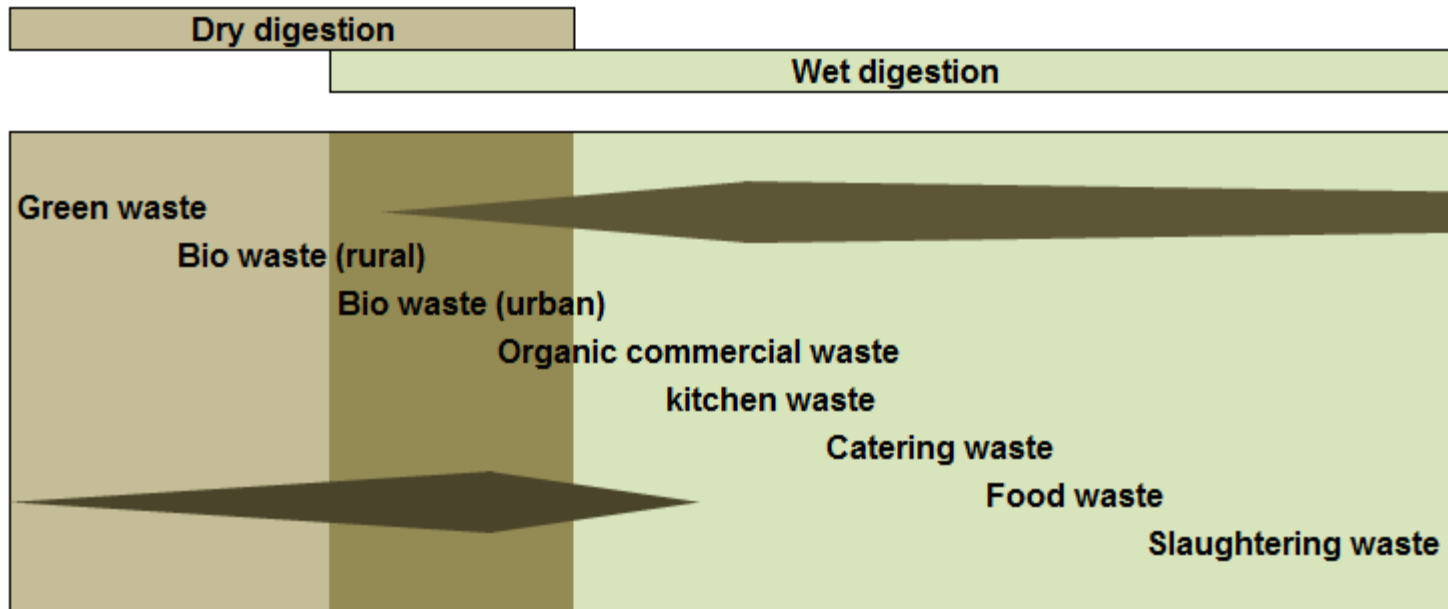
Wet digestion



Garage digester

Main criteria wet/dry digestion

Suitability organic waste for dry digestion or wet digestion:



Conclusions:

- Clear definition of the input substrate is inevitable for every proper selection of pre-treatment components
- Clear definition of the output quality needs to be done prior to selection of pre-treatment aggregates
- The chosen pre-treatment equipment influences the digester volume and system
- Nothing is simple

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