TIETJEN
DAS ORIGINAL

Waste EXPO AUSTRALIA

Better use of Resources – Conditioning FOGO and COGO

Thomas Runde
CEO
October 27th, 2022

Agenda

I. Company Tietjen

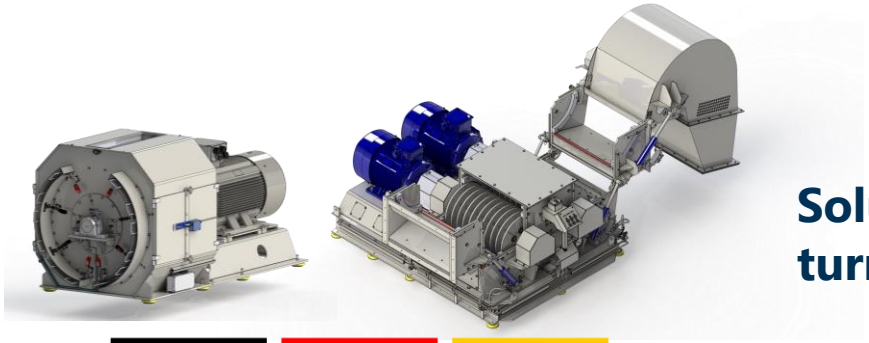
II. FOGO and COGO – a valuable Resource

III. Treatment Solution

1. Critical Issues and how to tackle them
2. DRM System Technology

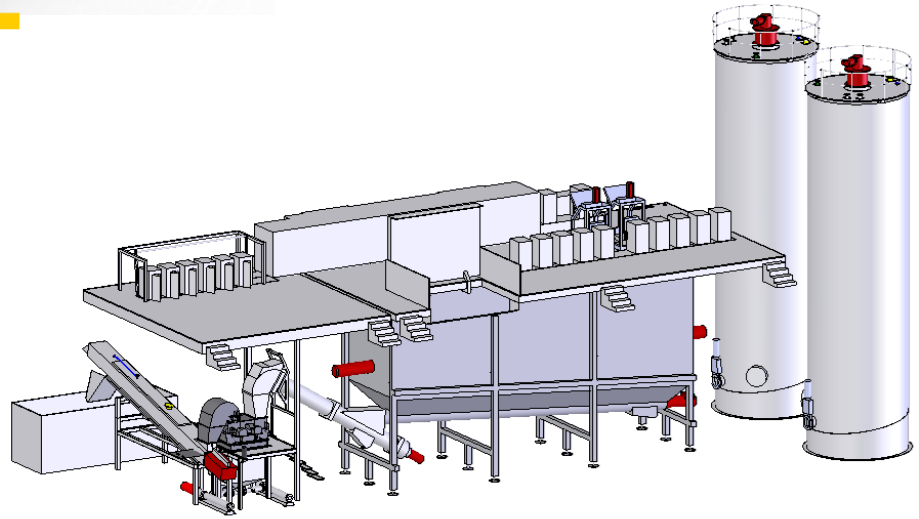
Company Info Tietjen

Manufacturer of high class industrial grinding and separation systems

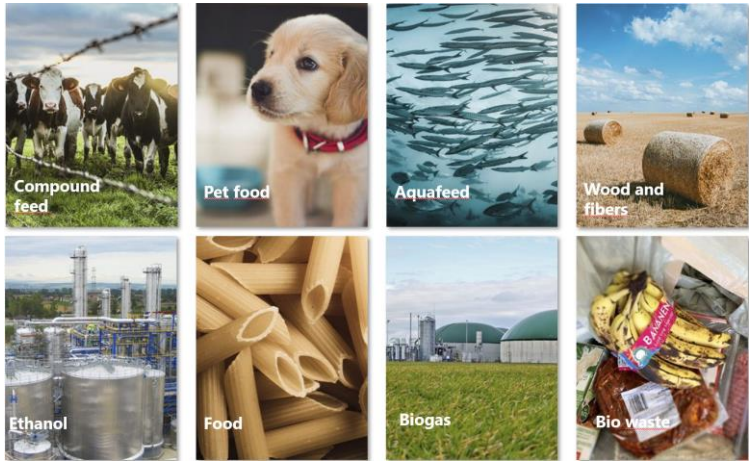


MADE IN GERMANY

Solution provider for turnkey projects



Successfull in different industries



Check our website:
https://www.tietjen-original.com/en/

Challenge and Potential

FOGO: Mixed organic waste

Organic

Inorganic

CO_2 Neutral

Natural gas
Heat
Electricity

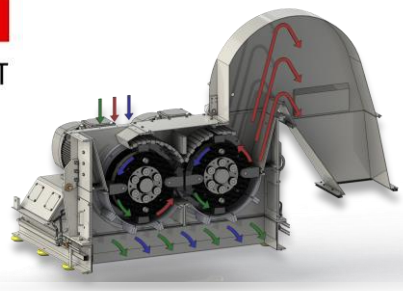
Liquid digestate
Compost

Economical thermal use

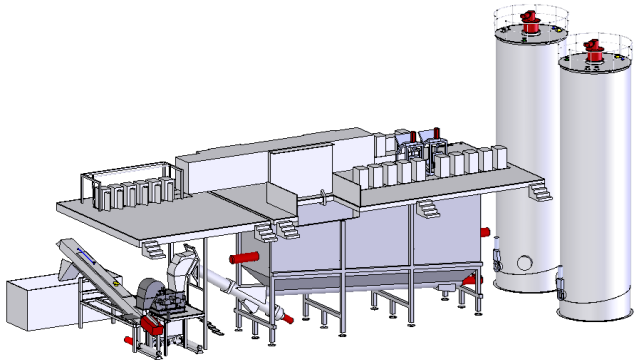
Experience in biowaste treatment

2005 First Inquiry for a Separation Mill by **Remondis (ReFood)**

2007 Development of the **DRM** (**D**ouble **R**otor **M**ill) **Separation Mill**

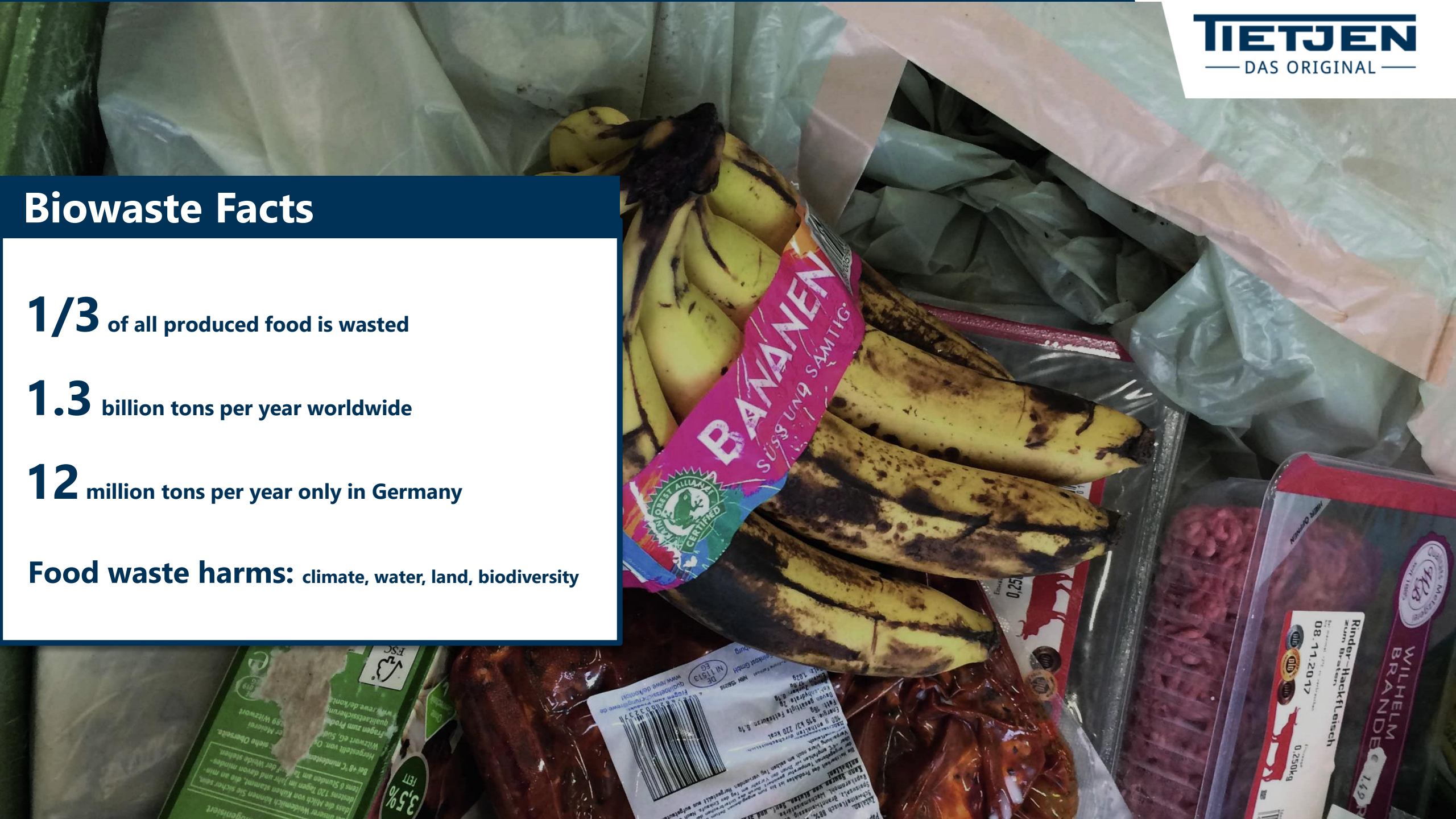


since 2008 **Implementation of a successful concept**
Several sites, customers, designs and scopes
Expansion of scope over the years



2020 **Full biowaste treatment plant** ARA Bern, Switzerland

2022 IFAT 2022 introduction: **New Screw Press PRS**
(for dewatering of separated packaging)



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Biowaste Facts

1/3 of all produced food is wasted

1.3 billion tons per year worldwide

12 million tons per year only in Germany

Food waste harms: climate, water, land, biodiversity

Use FOGO - Benefits

"Organics are the biggest stream but uneconomic to recycle compared to underpriced landfill" (MRA, David Cocks)

?

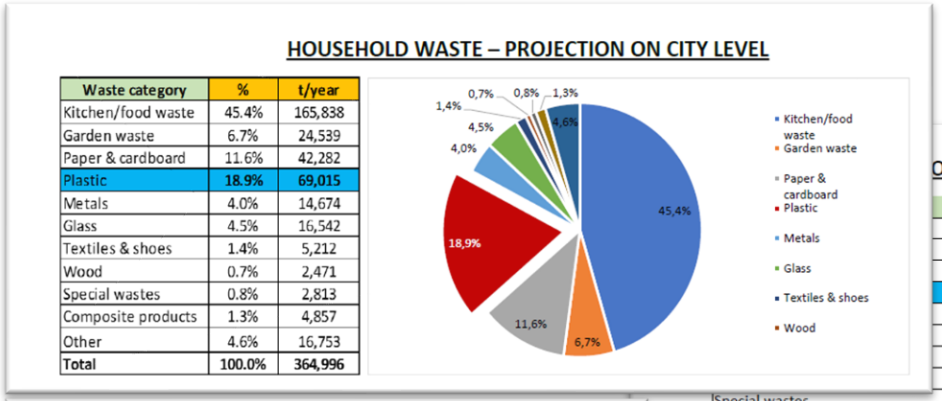
"Halve the amount of organic waste sent to landfill *(27 Mt in 2019)* ***by 2030"***
(National Target AUS)

!

Case Study: FOGO Separation from MSW and Treatment – Vinca, Belgrade

Belgrade Waste Data Analysis

National Waste Report AUS 2020: Food 36% + Garden Organics 13% in MSW



HOUSEHOLD WASTE – PROJECTION ON CITY LEVEL

Waste category	%	t/year
Kitchen/food waste	45.4%	165,838
Garden waste	6.7%	24,539
Paper & cardboard	11.6%	42,282
Plastic	18.9%	69,015
Metals	4.0%	14,674
Glass	4.5%	16,542
Textiles & shoes	1.4%	5,212
Wood	0.7%	2,471
Special wastes	0.8%	2,813
Composite products	1.3%	4,857
Other	4.6%	16,753
Total	100.0%	364,996

OMMERCIAL) WASTE

	%	t/year
	40.2%	21,609
	0.0%	0
	18.5%	9,926
	11.4%	6,095
	2.3%	1,244
	27.6%	14,824
	0.0%	0
	0.0%	0
Special wastes	0.0%	0
Composite products	0.0%	0
Other	0.0%	0
Total	100.0%	53,699

MORPHOLOGY OF MUNICIPAL WASTE

data are from the GIZ project – October 2021.

HOUSEHOLD WASTE

1.7 mn Inhabitants

Household Waste: 364.996 t/a

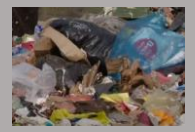
Commercial Waste: 252.715 t/a

with 40-60% Biowaste Potential

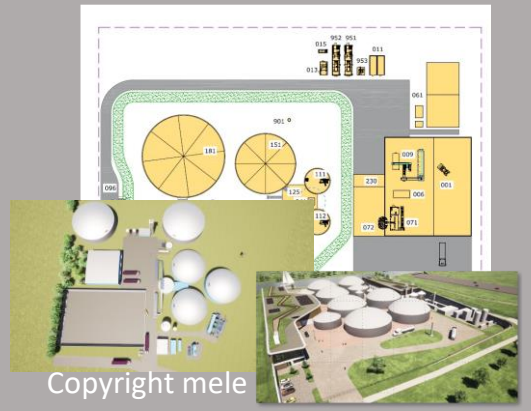
“Volume Split" at City Transfer Stations

Transfer Station

40%



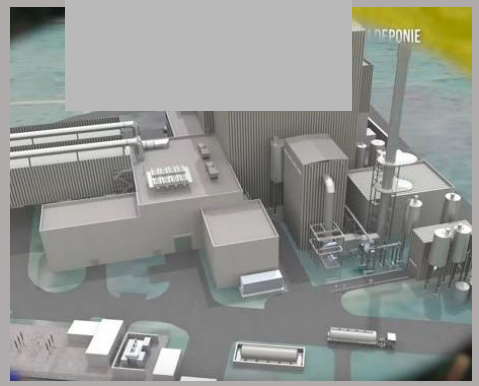
60%



Biowaste Treatment & Biogas Plant

10%

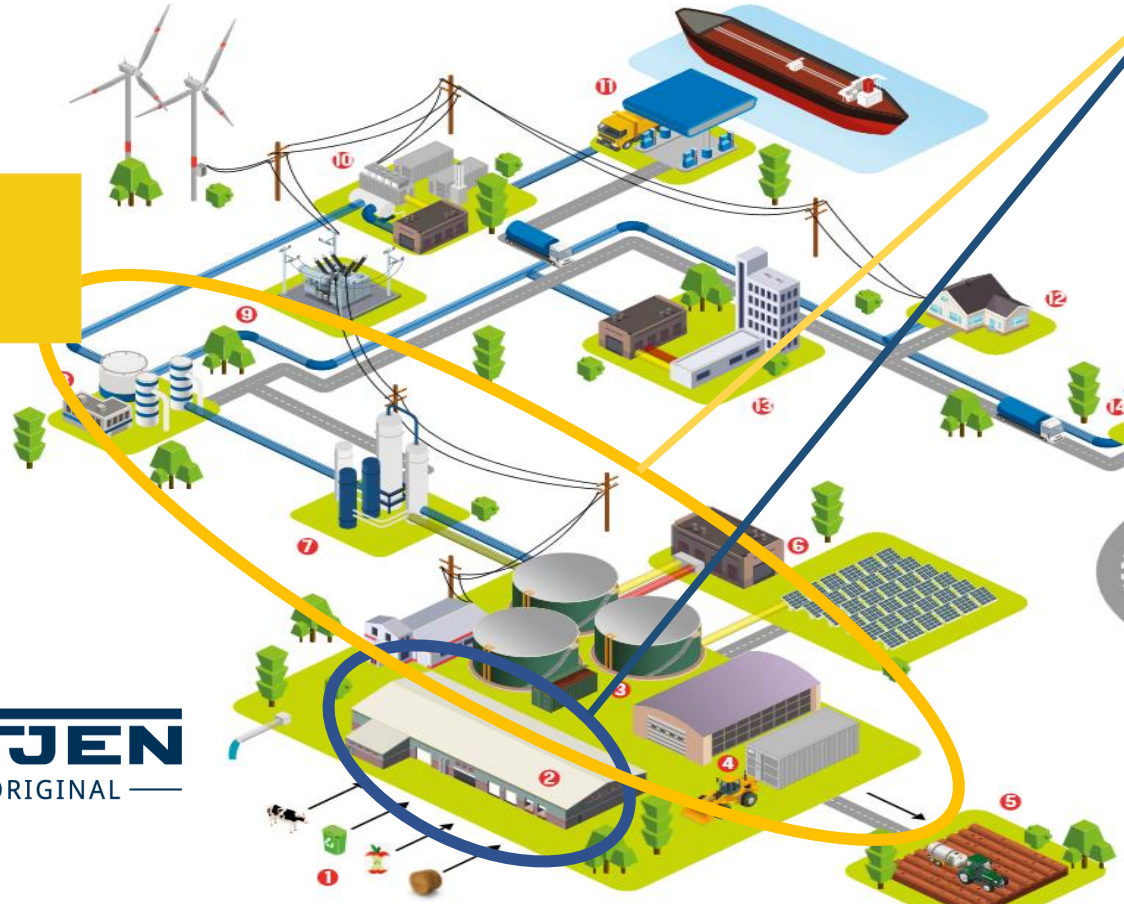
Plastic / RDF



Incineration Plant

Integrated Proposal: BioW-t-E + Green Public Transportation

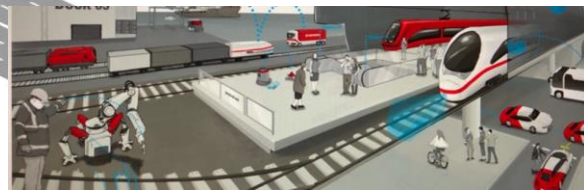
Project development based on PPP approach



1 Feedstock *(Livestock Manure, Industry Residues, Bio Waste, Renewable Crops)*
2 Storage Area
3 Digestion Line
4 Digestate Upgrading
5 Concentrate
6 CHP for Power & Heat Production
7 Biogas Upgrading Unit
8 Feed-in Station Gas Network
9 Substation
10 Biomethane – Liquefaction Plant
11 Bio-LNG (Gas Station for Trucks, Ships and Cars)
12 Bio-CNG (Gas Station for Trucks, Cars, Busses)
13 Private Consumption of Biomethane
14 Commercial Use of Biomethane

Biomethane
Electricity
Heat
Raw Biogas

Green Public Transportation
Green Mobility City Concept



DRM Technology

Critical issues for conditioning FOGO

- **Purity** of the biomass product
- **Organic yield** from FOGO
- **Avaliability** and **Throughput**
- Ease of **Maintenance**
- **Investment** and **Cost** (CAPEX/OPEX)

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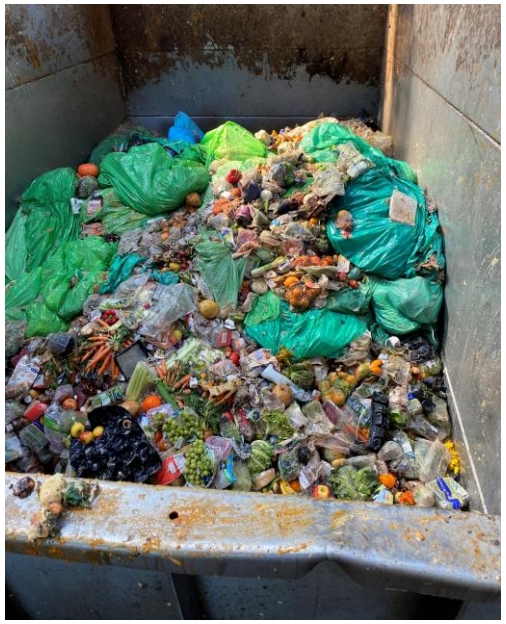
What we are talking about

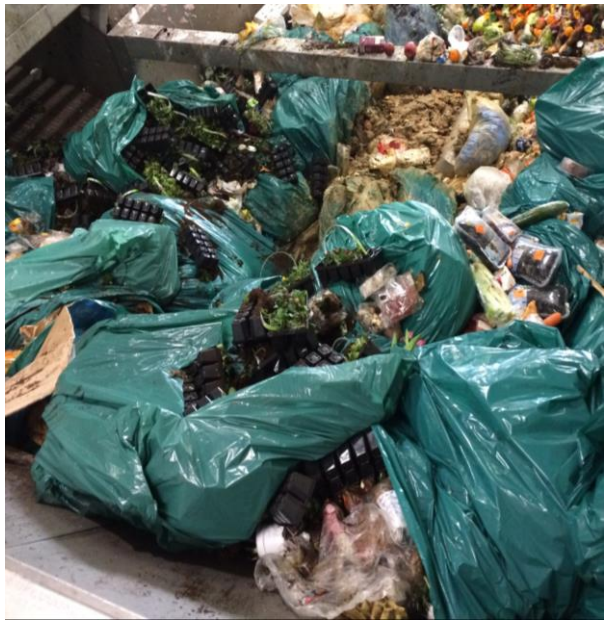
Waste Composition Analysis

Waste Composition

					First Sample			Second Sample			Third Sample		
Waste Dimensions	**Type**	**Description**	**Average 3 Sample**		**Weight (kg)**	**Percent**	**Total**	**Weight (kg)**	**Percent**	**Total**	**Weight (kg)**	**Percent**	**Total**
above 200 mm	Organic	Long or big vegetables, kitchen and restaurant waste, supermarket waste, commercial waste											
	Inorganic	packed household waste											
		Wooden board/box, straw											
		plastic											
		paper board											
		Other											
150 - 200 mm	Organic												
	Inorganic	Household waste in small package											
		Plastic bands											
		Other											
80 - 150 mm	Organic												
	Inorganic	Plastics											
		Foam											
		Other											
below 80 mm	Organic												
	Inorganic	small strings, plastic											
		Other											
		Total											

Waste Categories





Best-case — Good-case — Worst-case

Best-case	Good-case	Low organic content	High inorganic content (e.g.soil)
Mainly organic	Good organic content	Mainly in bigger bags	Mainly in bigger bags
Liquids included	Homogenieus	Mixture of plastic and foils	Lots of brittle plastic (flower pots)
Mixture of plastic and foils	Mixture of plastic and foils	Low liquid content	Very low liquid content

Purity-Legal Situation

Relevant

New Limit 2

0.5% total plastics >2 mm

Limit 1

~~>2 mm~~ **New >1 mm !**

0.1% plastically deformable plastics

0.4% of other foreign substances, in particular glass, metals and plastically non-deformable plastics.

Organic

Natural gas
Heat
Electricity

Liquid digestate
Compost

Amendment of the BioAbfV in Germany 2022

Purity after DRM process

Separated impurities

Purity after DRM

Realistic „purity range“

97 – 99,9%

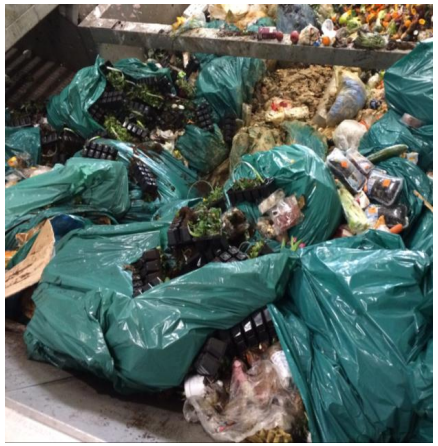
(in weight % dry matter)

„Worst Case“ material:

2nd purification step

99,5 – 99,9 %

(in weight % dry matter)



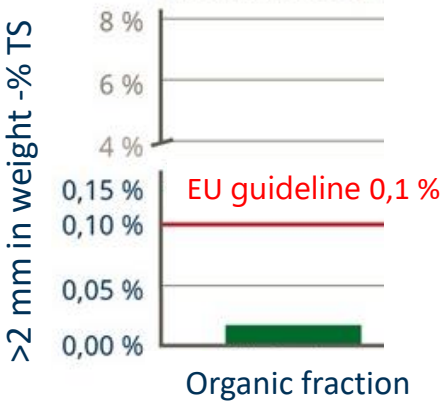
Purity after DRM

Test

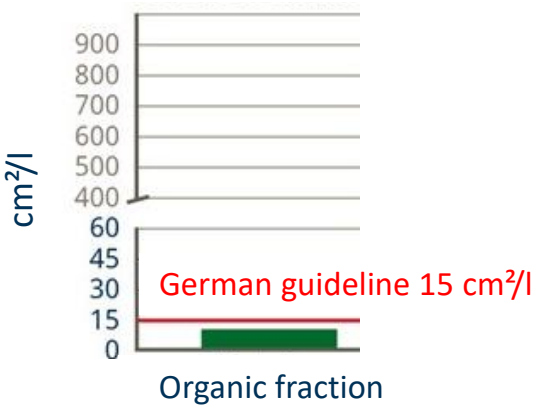
Result

Analysis by Witzenhausen-Institute

Plastic packaging, foreign matter



Total Surface



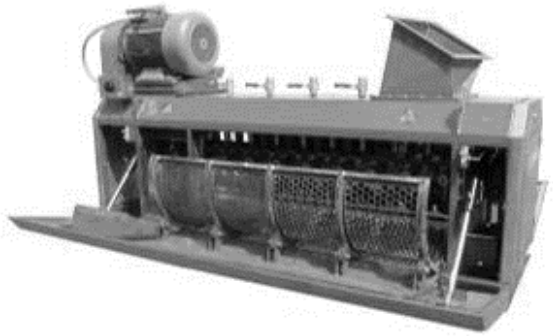
German legal requirements achieved

Critical issues for conditioning FOGO

- **Purity** of the biomass product
- **Organic yield from FOGO**
- **Avaliability** and **Throughput**
- Ease of **Maintenance**
- **Investment** and **Cost** (Capex/ Opex)

Maximizing Organic Yield - DRM

Loss of organic!



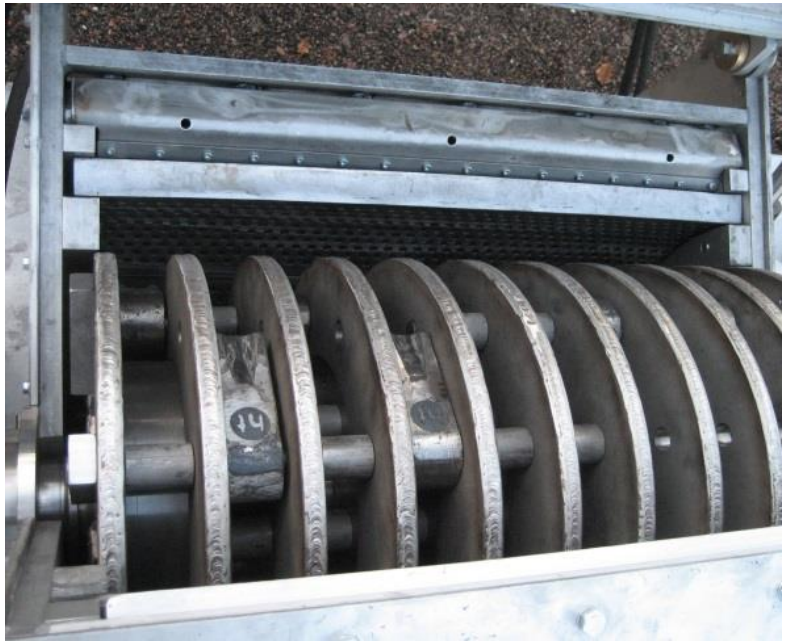
Profit!

Critical issues for conditioning FOGO

- **Purity** of the biomass product
- **Organic yield** from FOGO
- **Avaliability** and **Throughput**
- Ease of **Maintenance**
- **Investment and Cost** (CAPEX/OPEX)

Reliability/Throughput

- **Throughput** — **15 - 25 t/h**
- Can be **upgraded**, with 2x75kW motors — **future proof**
- **Robust** stainless-steel construction — **long lasting**
- **In case of** contaminant causing blockage — **short stop, no damage**



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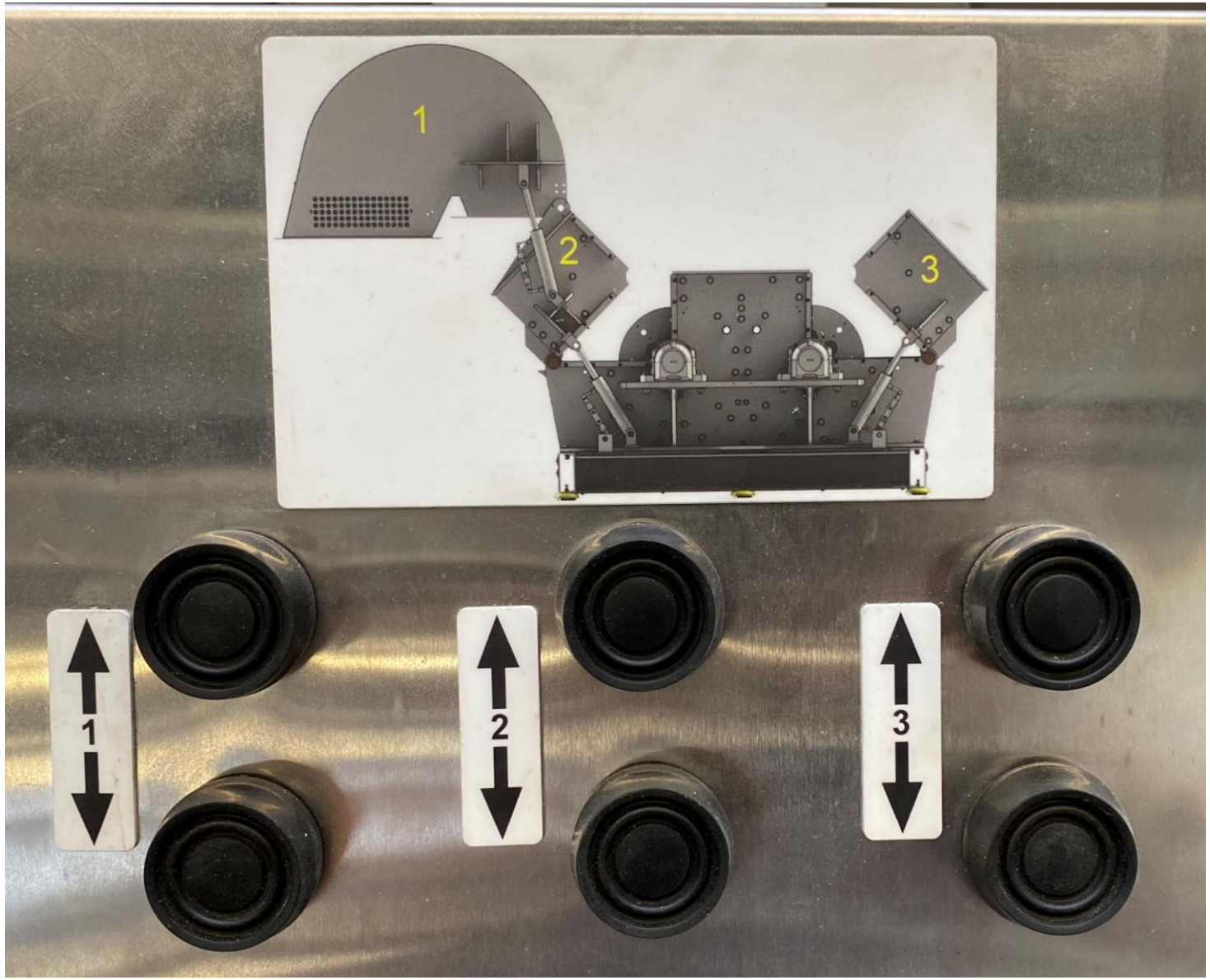
DRM Technology: Ease of maintenance



DRM Technology: Ease of maintenance

Ease of maintenance - Summary

- Maintenance very easy → **No experts necessary**
- Access very fast – opening & closing without tools → **3 Minutes**
- Long lifetime of wearparts
  - Beaters = 10.000 – 16.000 t approx. → **only 1-2 times a year ***
  - Screens = 20.000 – 25.000 t approx. → **only 1 time per year***

  *= 80 t/d → 250 days of production, depending on waste
- Few man days for maintenance → **short downtime**

Critical issues for conditioning FOGO

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- **Organic yield** from FOGO
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- Ease of **Maintenance**
- **Investment** and **Cost** (CAPEX/OPEX)

OPEX: Energy, wear- and spare-parts (7 Years)

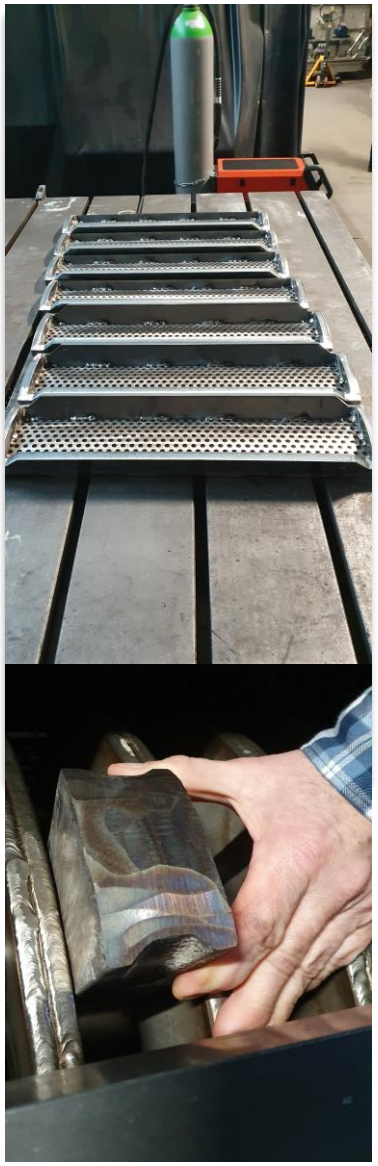
- **Energy:** Total: 6 – 8 kWh/t = **1,5- 2 €/t** (25 cent/kWh)

  DRM: 3 -5 kWh/t, Conveyor: 1-2 kWh/t, Pumps: 0,4 – 0,7 kWh/t

- **Wear:** 78 cent/t **mainly beater and screens**
- **Spare:** 12 cent/t **including rotor exchange**

- **Yearly costs** Wear- and Spare- parts approx.:

  12.000 t x (0,78 + 0,12 €/t) = **10.800 €**



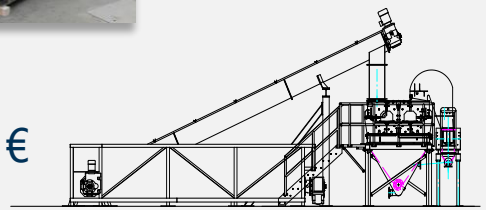
CAPEX Overview

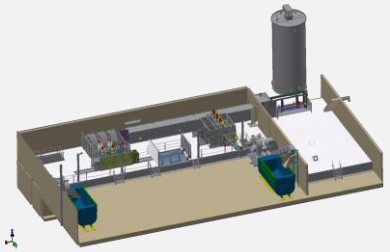
Capital-Expenditure

Depending on the concept

Approx. 250.000 €

Approx. 850.000 €





> 2 Mio.€

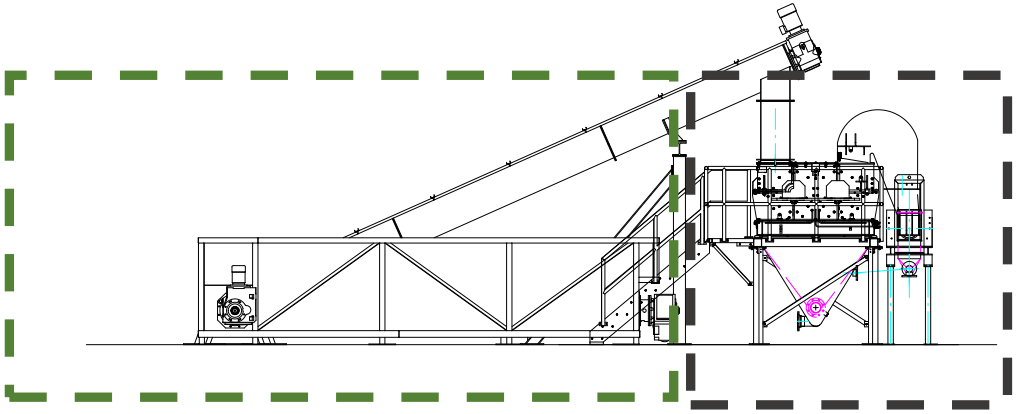
Summary

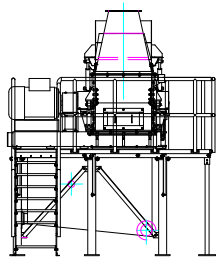
- **Purity** of the biomass after treatment — 98,0 – 99,9 %
- **Organic yield** after the treatment — max./ no loss
- **Reliability/ Throughput** of the treatment system — 15-25 t/h, tolerant
- Ease of **maintenance** — no experts, 2 times/a
- **Cost** for the treatment (CAPEX/OPEX)

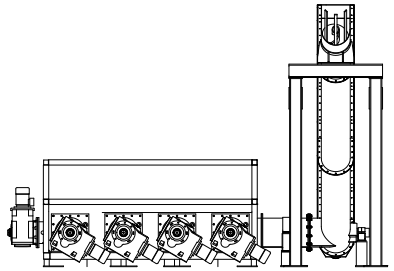
OPEX (Wear- and Spareparts)	approx. 0,9 €/t
CAPEX (for Solution)	approx. 850.000€

Refrences

Simple plant layout I “Food Recycling”

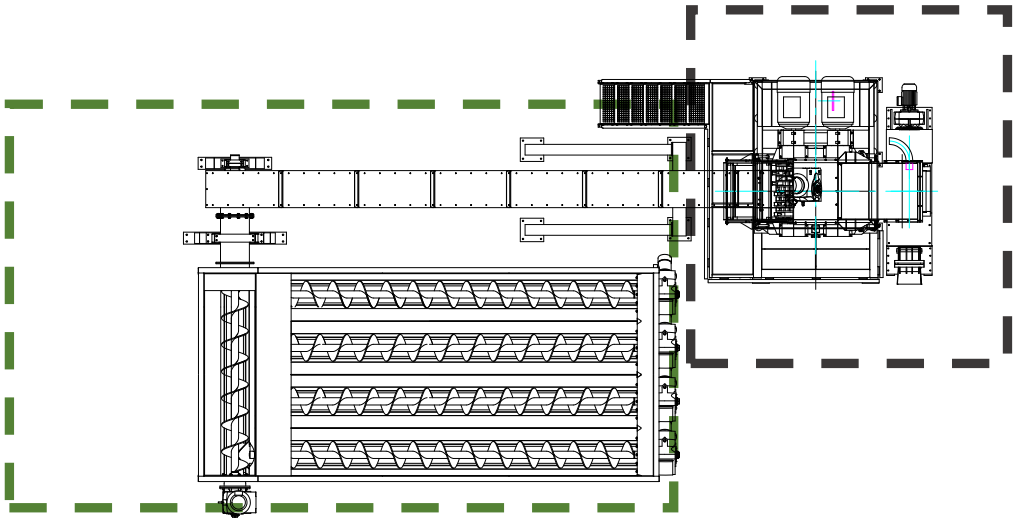






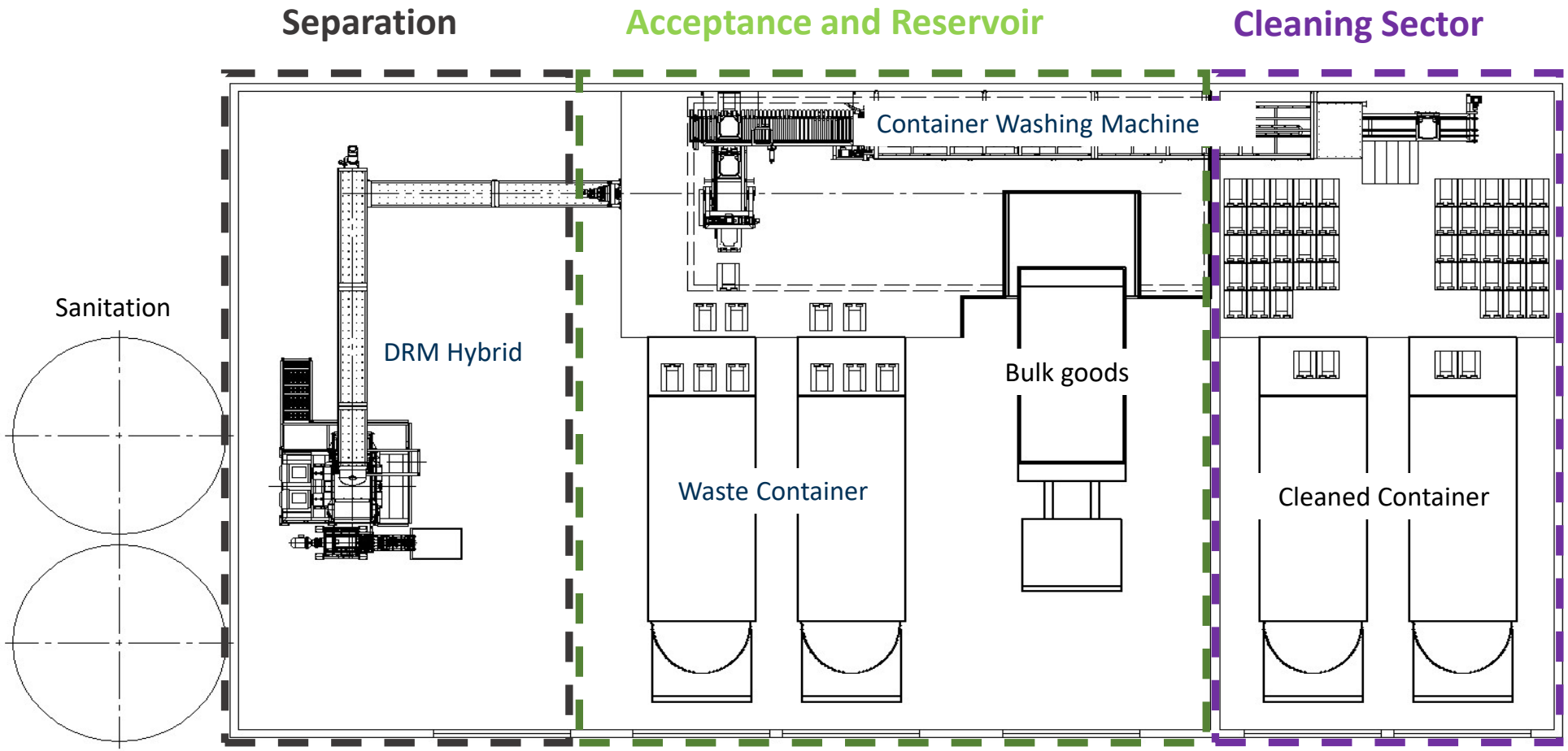
Acceptance and Reservoir

Separation



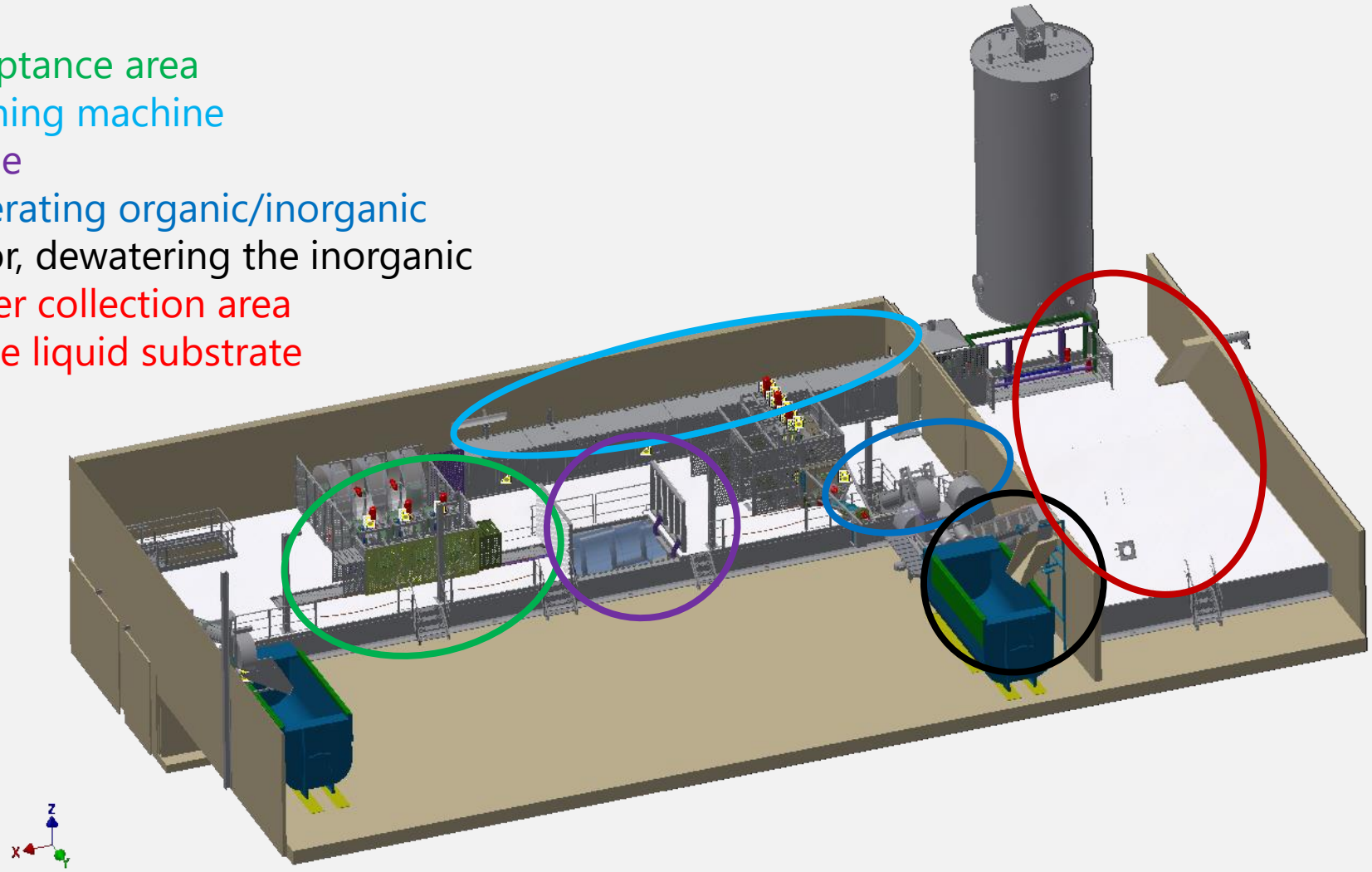
Example Layout I “Food Recycling”

Plant layout “Food Recycling”



Example Layout “Food Recycling”

1. Container acceptance area
2. Container washing machine
3. Bulk acceptance
4. DRM 800, seperating organic/inorganic
5. Screw separator, dewatering the inorganic
6. Empty container collection area and storage of the liquid substrate



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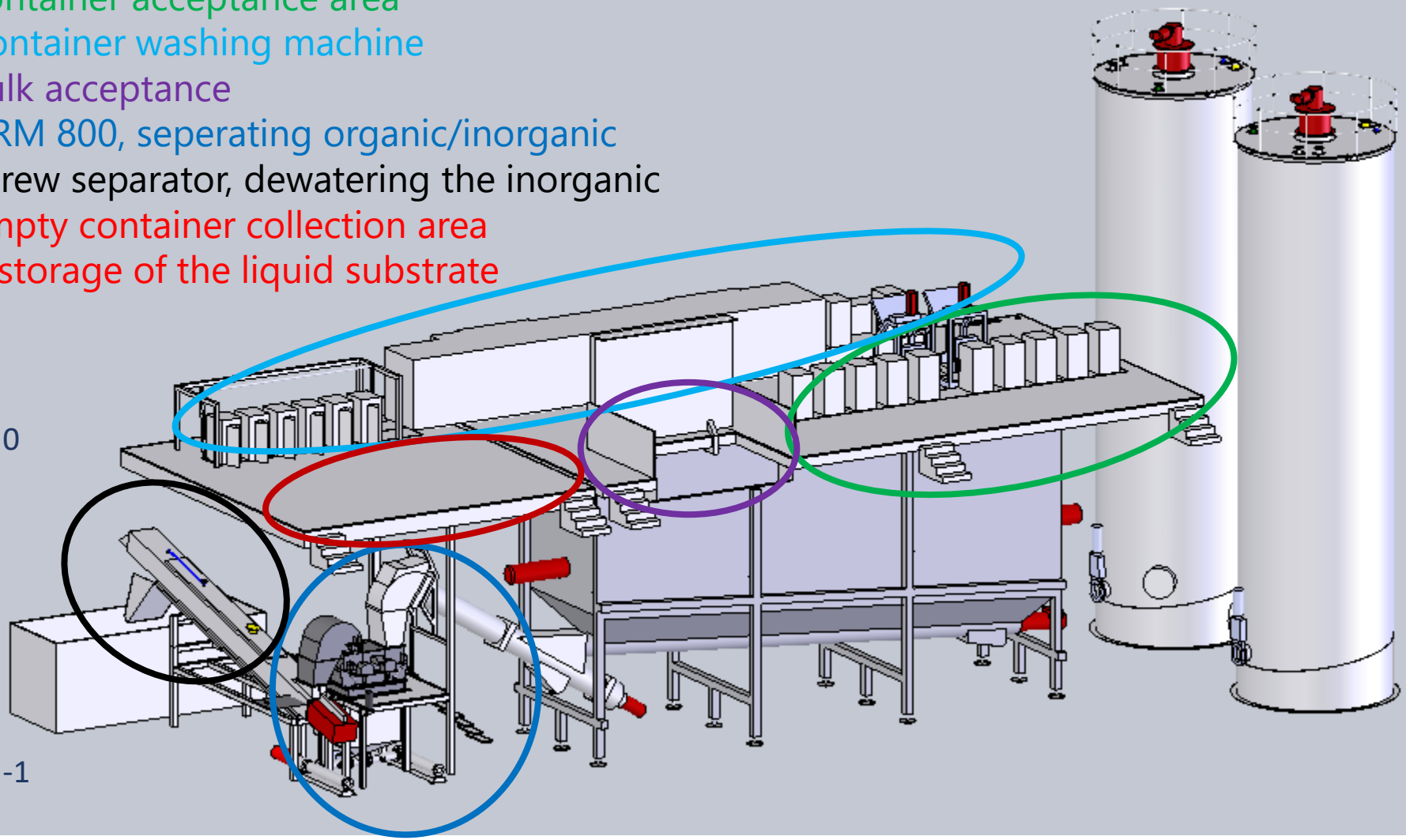

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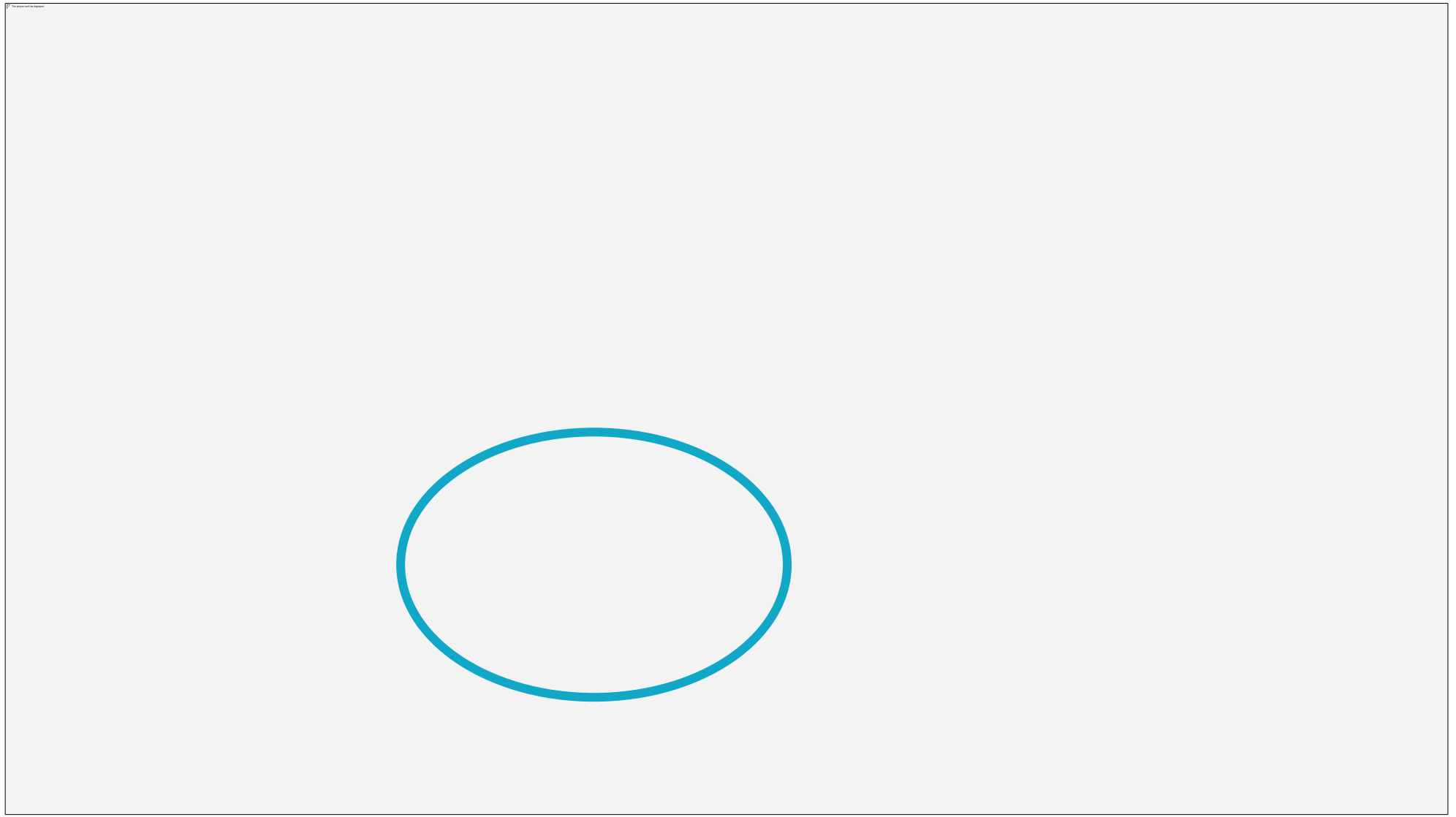

Example Layout “Food Recycling”

Customer Reference

ARA Bern AG – Bern Switzerland April 2020

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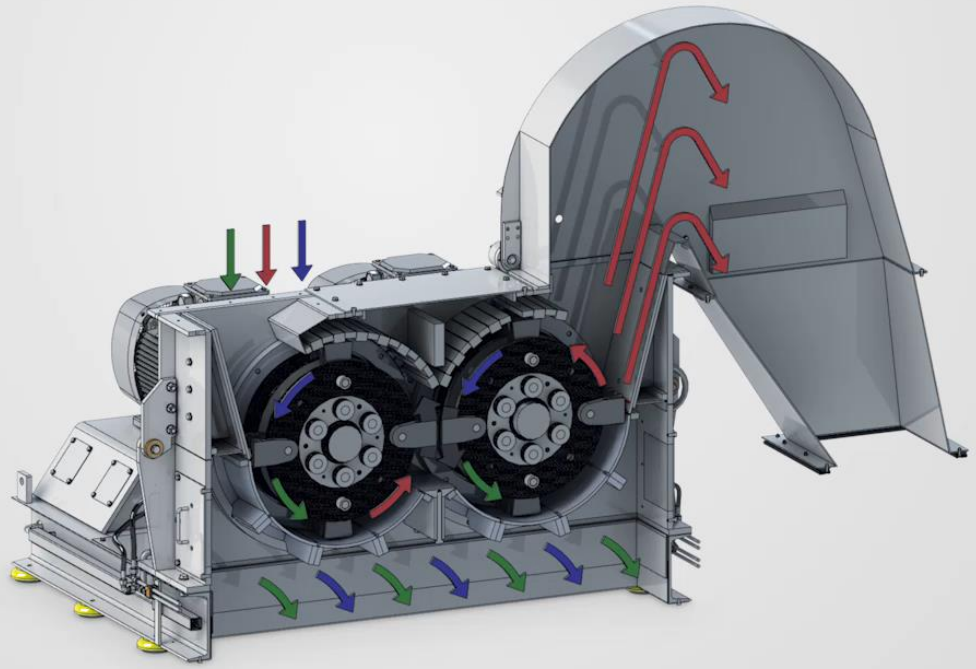
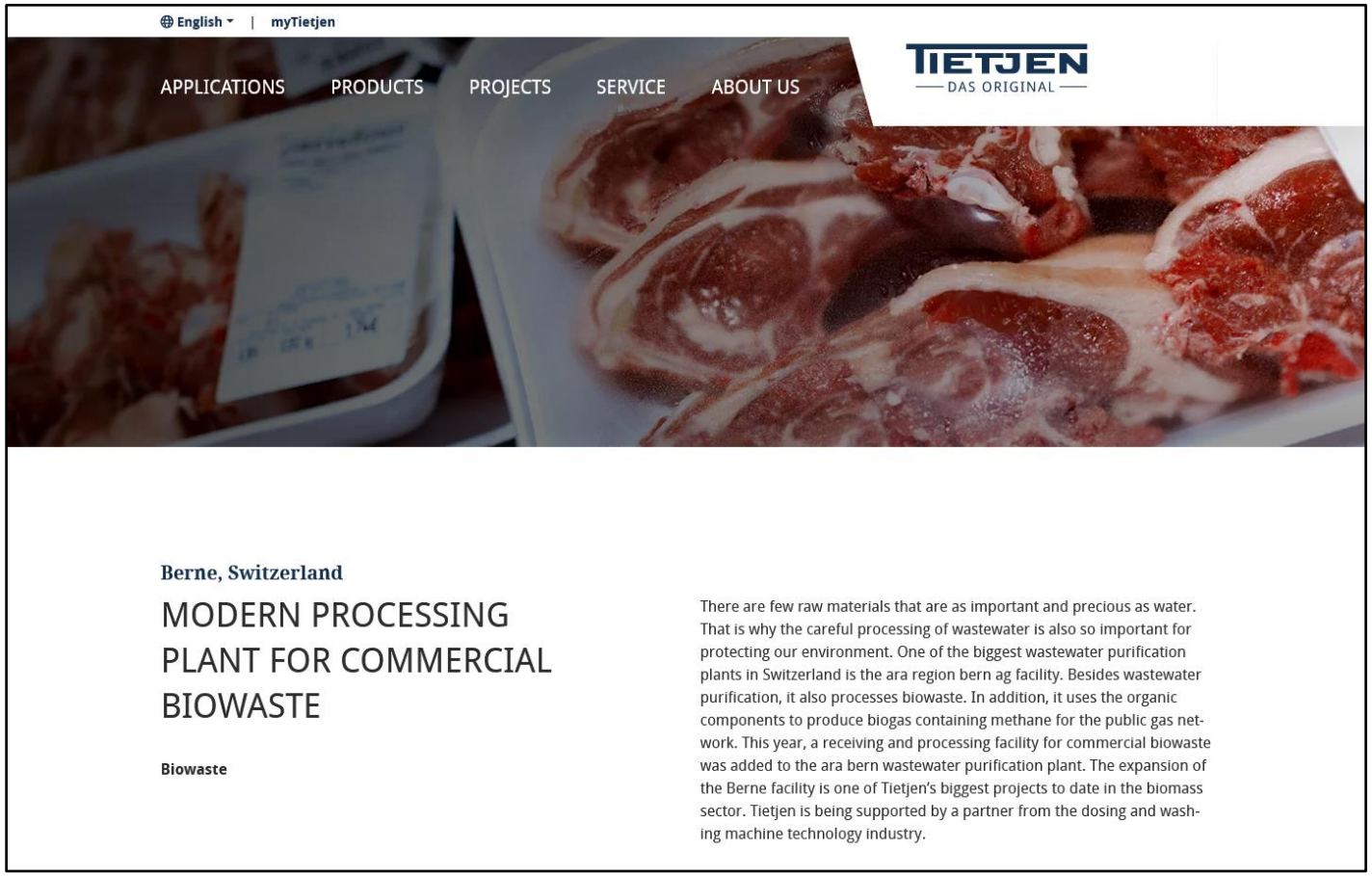


For more information

Meet us @WasteExpo:
Booth D123



Check our website:
https://www.tietjen-original.com/en/applications/biowaste/

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