

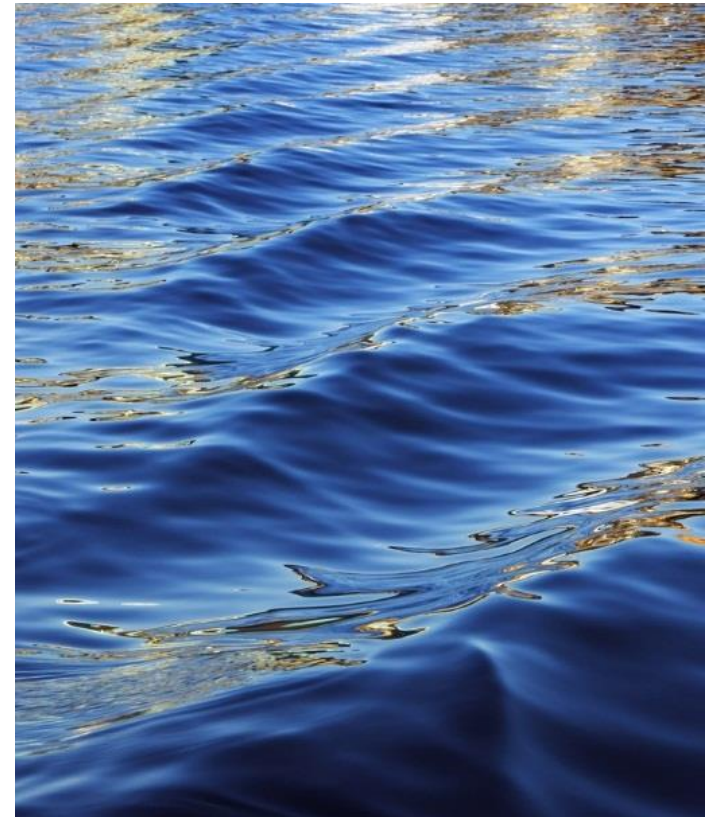
ΒΙΟΕΝΕΡΓΕΙΑΚΗ ΚΡΗΤΗΣ ΑΕ

BIOENERGY CRETE SA

*Πρότυπος Σταθμός Βιοαερίου
Δυναμικότητας 1MW*

Biogas Station 1MW

June 2023

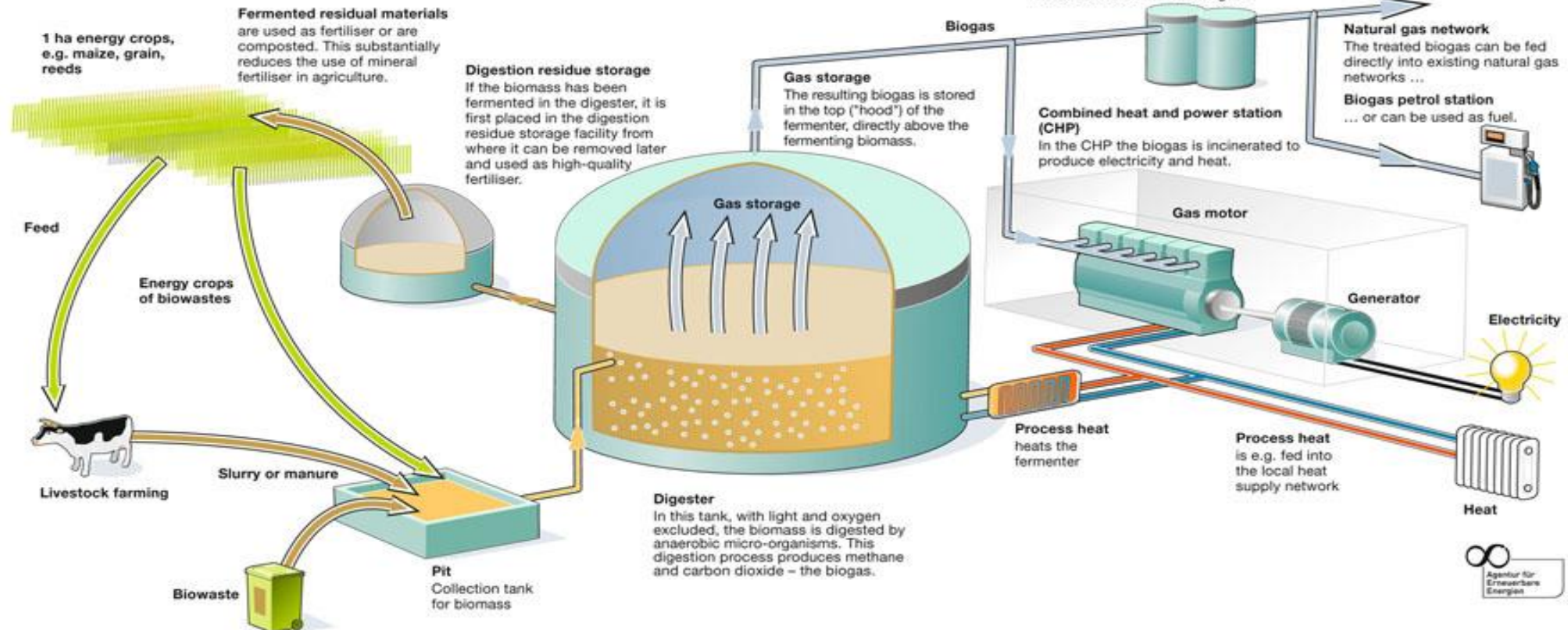




Integrated management plan

Biogas system

Slurry and solid biomass are suitable for biogas production. A cow weighing 500 kg can be used to achieve e.g. a gas yield of maximum 1.5 cubic metre per day. In energy terms, this equates to around one litre heating oil. Regrowable raw materials supply between 6 000 cubic metre (meadow grass) and 12 000 cubic metre (silo maize/fodder beet) biogas per hectare arable land annually.



Πηγή: www.unendlich-viel-energie.de

Raw Materials

**Poultry and pig
manure**

Whey

**Expired food
from super
markets**

Oils and Fats

**Oil-mills organic
residue**

**Slaughterhouse
waste**

**Organic Waste
(leftovers) from
restaurants and
hotels**

**Butcher shop
waste**

Fish leftovers

Indicative Raw Materials

Fish & Meat industrial by-products



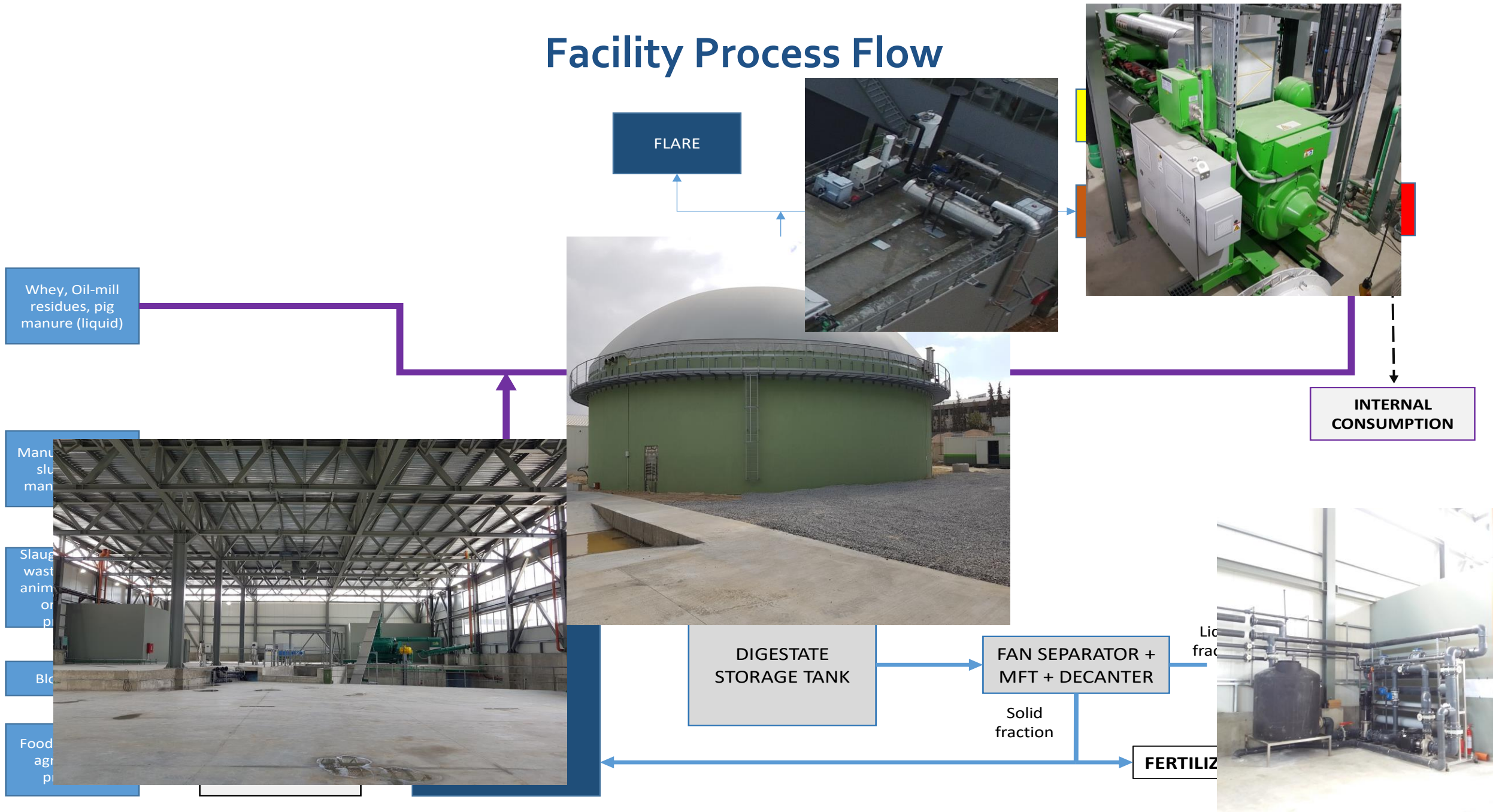
Indicative Raw Materials from hotels & restaurants leftovers



Easy & safe management of organic hotel leftovers in biogas station

- Use of existing refrigerators for organic waste storage – no extra expenses
- Use of closed licenced refrigerator trucks for the organic waste collection, in comparison to open and smelly municipal garbage trucks
- containers for organic waste storage are washed and disinfected at each collection
- a HACCP system is applied

Facility Process Flow



Products

- *Electricity*



- *Heating (self consumption and local district heating)*



- *Organic Fertilizers (excellent compost)*



- *Pure Water*



Challenges - Innovations

**Reception &
management of
incoming raw
materials**

**Odor control
system - biofilter**

**WWTP (MBR –
MBBR – UF – RO)
liquid digestate
management &
fertilizer
production**

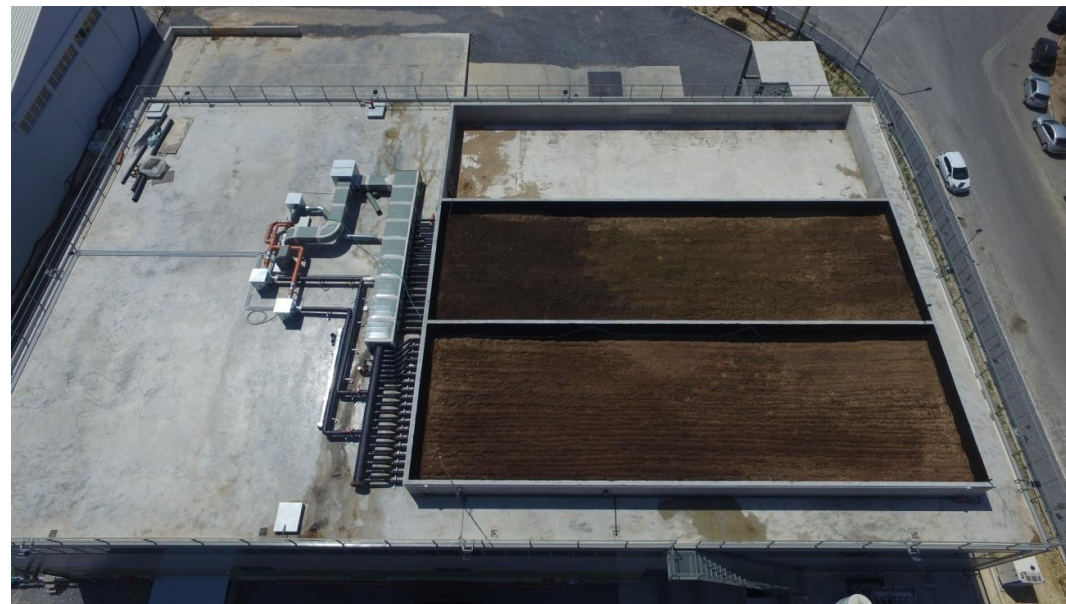
Challenges - Innovations

**Reception &
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Challenges - Innovations

**Odor control
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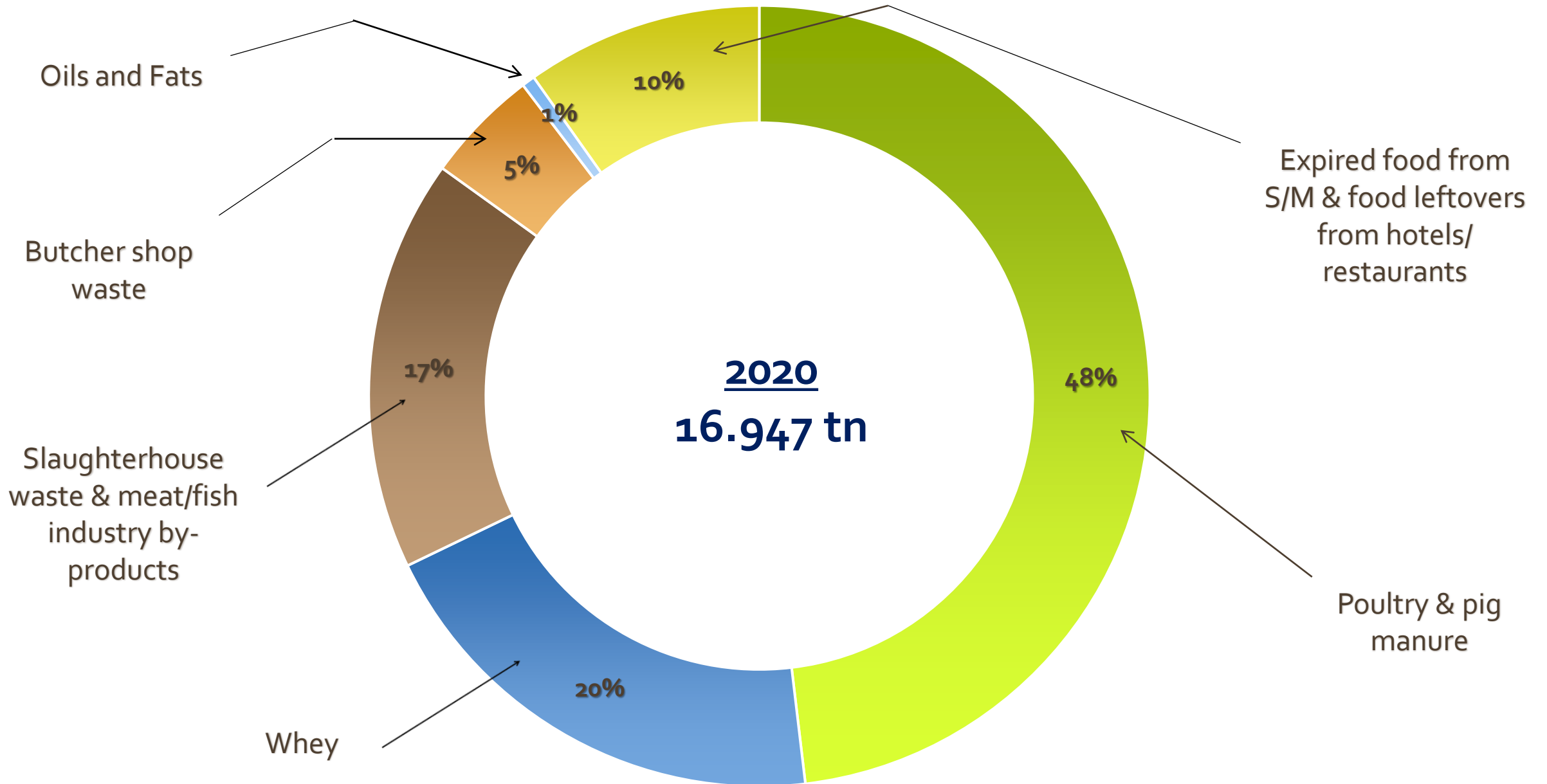


Challenges - Innovations

WWTP (MBR –
MBBR – UF – RO)
liquid digestate
management &
fertilizer production



Raw Materials – type & quantity



Companies Served – Circular Economy



80 companies & biowaste producers

>100 organic compost clients



Total CO2 emission Savings



65.529.863 km



252.238



9.273,44 tn

YEAR	SAVINGS		
	CO2 (tn/y)	TREES	CARS (km)
2017	1.033,32	28.106	7.301.876
2018	1.817,19	49.428	12.840.983
2019	2.213,09	60.196	15.638.578
2020	2.597,31	70.647	18.353.597

Organic Liquid Soil Conditioner



ΕΝΔΕΙΚΤΙΚΗ ΦΥΣΙΚΟΧΗΜΙΚΗ ΣΥΣΤΑΣΗ	
Ολικό Άζωτο	1,1 % w/w
Ολικός οργανικός άνθρακας	2,6 % w/w
Ασβέστιο	0,6 % w/w
Φώσφορος	0,10 % w/w
Κάλιο	0,17 % w/w
Ψευδάργυρος	510 mg/Kg
Μαγνήσιο	230 mg/Kg
pH	8,0 - 8,9

Organic Compost



ΕΝΔΕΙΚΤΙΚΗ ΦΥΣΙΚΟΧΗΜΙΚΗ ΣΥΣΤΑΣΗ	
Ολικό Άζωτο	1,6 % w/w
pH	8,5
Ολικός οργανικός άνθρακας	7,0 - 13,7 % w/w
Ασβέστιο	0,64 - 1,75 % w/w
Φώσφορος	0,26 - 0,34 % w/w
Κάλιο	0,14 - 0,19 % w/w
Ψευδάργυρος	360 - 900 mg/Kg
Μαγνήσιο	680 - 1000 mg/Kg

Biogas to Biomethane



“Production procedure” Video





Vehicle Weighing



Awards and Distinctions



award

2023 - One prestigious international award for the innovative Biogas Plant in Crete -
AD and Biogas Industry Awards, Birmingham, UK



Best biogas plant below 1 Mwe-equivalent



International Publications in press for TECHNICAL BIOENERGY CRETE Project.



Bioenergy International, Digital Biogas Special 1, 2020



On Crete, the largest Greek island, biogas was produced by two existing landfills, as well as from the sewage treatment plants in Chania and the capital Heraklion. As of May 2017, biogas is also produced in a new anaerobic digestion (AD) and cogeneration plant. Bioenergy International paid a visit.

— **THIS BIOGAS PROJECT** Techniki Bioenergeiaki Kritis 2, was designed by the SYCHEM S.A. It is an expansion of the existing cogeneration plant located in the Industrial Area of Heraklion. The primary purpose of this biogas application is the production of electrical energy, which is sold to the public power corporation, explained Giannis Petrakakis, Plant Manager for the biogas facility plant.

Petrakakis explained that the first plant started at the end of 2016 with an installed power capacity of 500 kW.

— Already during 2018, we could increase the power capacity to 1 MW. Our plant receives more than 14 000 tonnes per year of slaughterhouse waste, food waste, expired food products from supermarkets, food processing industry waste including cheese whey, pig manure, chicken manure, oils and fats from the entire island of Crete, giving a viable solution to the management of such organic waste, Petrakakis added.

In the beginning, the plant was using GE's Jenbacher JMS 312 GS-B, L v. D25 cogeneration unit fueled with biogas which is produced by the AD plant.

— The second GE's Jenbacher unit, model JMS 312 GS-B, L v. D25, was installed to extend the electrical power capacity. The thermal energy produced from the CHP unit is used for heating the digester, said Petrakakis.

SYCHEM Group plant
The biogas plant was constructed by SYCHEM Group, that according Petrakakis, applied



Giannis Petrakakis, Plant Manager of Sychem Biogas says that his company is able to provide integrated solutions for the management of organic waste and the production of biogas by designing plants incorporating novel technologies such as odour control bioreactors, fully automated feeding system and advanced biological treatment of the liquid digestate.

"cutting-edge technology" at the most critical points of the production process such as the collection and management of the incoming organic waste, the deodorisation system, heat recovery and the innovative wastewater system for the digested effluent treatment.

The EUR 6 million green investment by the European Financing Tool «JESSICA» was used to protect the environment and create new jobs at the plant.

— This biogas power plant manages all types of organic waste ranging from slaughterhouse residuals to manure, and its great advantage of being odourless recognises it, Petrakakis said.

Deodorization system
— Our innovative digestive treatment system, ZERO land application, our odour control system and our waste reception and processing line, all of which were also engineered and constructed by SYCHEM group, Petrakakis underlines.

The Biogas Plant features a unique deodorisation system that enables plant's integration into the urban environment and a highly specialised wastewater treatment system for the effluents avoiding any contamination of the environment. — We have built a fully sealed underpressurised plant building to prevent odour escape into the environment. Also, we installed innovative biofilters for odour neutralisation, Petrakakis stated.

Only a few characteristic waste odours were noticeable but these came from the trucks leaving the facility. Those should not though bother anybody because the plant is middle of a vast area of compactly built factory halls.

The automated process in the facility and management secures the separation of the organic fraction from the packaging material

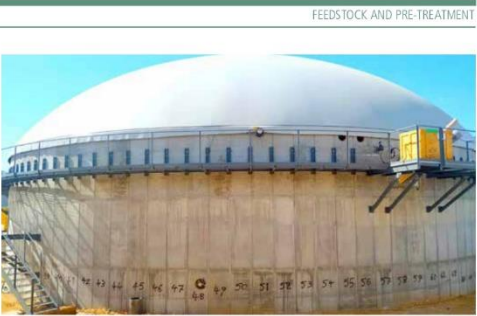
— Our new anaerobic digester with a capacity of 4 500 m³ is almost ready for production. The investment regarding the mechanical equipment is just over EUR 4 million, while the total including land purchase and civil works is estimated at EUR 6 million, said Giannis Petrakakis.

Greek energy and water major
Apart from energy, Sychem Group is the biggest Greek manufacturer regarding water desalination plants with significant share in private sector engineering and industrial construction projects such as oil refineries, power plants, hotels. The Group is also the biggest manufacturer of open loop geoechange energy projects in Greece with a focus on the sea water energy exploitation and the most prominent private producer of water in Greece.

The company, with headquarter in Athens, is also an international provider of cathodic protection equipment and anodes and industrial facilities and keeps offices in Crete, Cyprus and China.

A few years ago the Sychem Group relocated and expanded its Hydrominon subsidiary to the new modern desalination facility within the industrial area of Heraklion.

Hydrominon S.A is the largest private water producer in Greece, owning the largest desalination unit for potable water production and is



The new biogas fermentor/digester at Sychem's plant in Heraklion. The digester will be operational soon and which will further increase the plant's total capacity (photo courtesy Sychem Group).



The Heraklion Biogas Plant features here in this part of the facility a special deodorization system that enables plant's integration into the urban environment and a highly specialized wastewater treatment system for the effluents avoiding any contamination of the environment.



Chania, the tourist hot spot of Crete. The DEDISA waste-processing centre of this seasonally crowded city serves a population of 155 000 inhabitants, which represents around 25 percent of the island's total population. Furthermore, the Chania prefecture also provides another 88 000 beds for tourists, and most of the region's municipalities fall within the DEDISA plant's catchment area.

currently the only desalination plant in Crete.

The installed capacity is 5,000 cubics per day and owns a modern production and quality control equipment.

Along with the future desalination units development in the Almiros river of Malevizi, the

plant will contribute significantly to the final resolution of the drought issue in Heraklion and to the assurance of high-quality potable water.

Text and photos: Markku Björkman
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