

# CAMPOSAMPIERO (PD)

## BIOTREATMENT CENTRE

www.etraspa.it



aggiornamento 2018

### Main Characteristics

The Biotreatment centre in Camposampiero is made up of three zones:

- An urban water purification plant
- An anaerobic digester, able to treat various substrates: some organic urban waste (FORSU), the sludge from the purification plant and other compatible waste such as de-oiling fats and waste from the food production industry;
- A cogeneration plant that uses the biogas from the digester to produce electric and thermal energy.

The local urban waste from the nearby households, the leachate from the FORSU pre-treatment and from the dehydration of

the digested waste are all taken to the sewage works.

The digester is fuelled by FORSU as well as by the excess sludge and the de-oiling fats that come from the sewage works, and finally from other compatible organic waste by using a certain amount of process water (water from the sludge dehydration and water from the sewage works.) The cogeneration plant supplies electric and thermal energy, which is used by the whole Biotreatment Centre, including for the air-conditioning of the offices and the neighbouring analysis labs.

**70.000 AE**

Inhabitants capacity for purification of equivalent inhabitants

**4-5.000 tonnes / yr**

Production of stabilised compostable sludge

**13.800**

Tonnes of treated FORSU per year

**80 - 100 tonnes / wk**

Production of compostable digested waste

**3.300**

Cubic meters digester's capacity

**4.500 MW / yr**

Production of electric energy used by the plant

Accredited by Accredia



Organisation with Certified Quality Management System  
UNI EN ISO 9001:2008  
CERTIFICATE No. 624

### Trigeneration

Thermal energy produced by cogeneration, heats the anaerobic digester and the offices in the winter, while in summer it is used to keep cool.

1

### FORSU\* incoming (\*Organic solid urban waste)

Authorised for the treatment of 53,500 tonnes of waste per year, the plant receives 16,000 tonnes from FORSU. After pre-treatment including deferrization and initial grinding, the waste is "defibrated" into a pulper using process water. Once that has been done, the heavy part is removed (shells, bones...) and a subsequent sifting is carried out for other foreign objects, mainly plastic. The pulp is then taken to a hydrolysis tank where the organic material will undergo an initial decomposition, before being "dosed" by the digestion plant.

### Sewage Works

2

The quantity of purified wastewater is the equivalent for 35,000 inhabitants, but soon it will be increased to 70,000. The sewage works receives the wastewater from the nearby municipalities (Camposampiero, Loreggia, Piombino Dese, Resana, S. Giustina in Colle, Villa del Conte, Trebaseghe), as well as the liquid remnant from the dehydration process of the exhausted sludge from the anaerobic digester. After the pre-treatment including sieving and the removal of grease and grit, the slurry is channelled into the denitrification and oxidation tanks (in three parallel rows) and then on to the final sedimentation stage. The purified wastewater is then filtered and disinfected before it is returned to the waters of the Muson dei Sassi stream.

3

### Anaerobic digestion

Anaerobic digestion takes place in a cylindrical tank with a capacity of 3,300 cubic metres of which the top 300 are taken up by the biogas produced. This process is fuelled by 3 substrates: hydrolyzed pulp obtained from the FORSU sludge from the purification system (thickened), pre-treated waste or other suitable material from the agri-food associate. Methanogenic bacteria, in anaerobiosis and at a temperature of 55°C, use these substrates during a cycle of 19 days in order to produce biogas made up of 60% methane, 35% CO<sub>2</sub> and 5% other gases. The substrates are mixed using some of the biogas produced which is blown back in and an electric pump. The temperature of the digester is kept constant thanks to the thermal energy produced by the cogenerators; the residual organic sludge is dehydrated and the liquid residue is sent to the sewage works, while the solid residue is sent to be used in agriculture.

### Energy Production

4

The energy generated by the biogas and produced in the digester is valorised by the cogeneration plant. This biogas, stored in a hemispherical gasometer with 2 concentric membranes with a capacity of 2,600 cubic metres, is purified and then used for biogas-compatible engines. At full working capacity approximately 2,000,000 cubic metres of biogas is produced, from which 4,470,000 kWh of electric energy is produced, as well as the thermal energy which is needed for the digester and all the air conditioning for the offices and labs. Some of the energy (around 640,000 kWh) is fed back into the national grid.

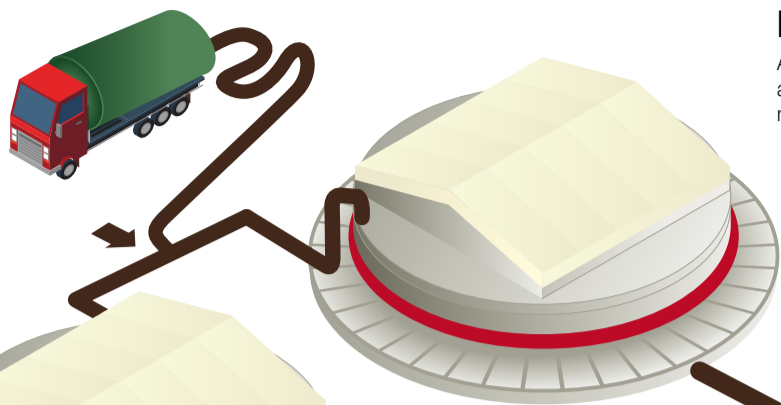
# DIAGRAM OF HOW THE PLANT WORKS

## LIQUID WASTE

## TREATMENT OF ORGANIC WASTE (FORSU)

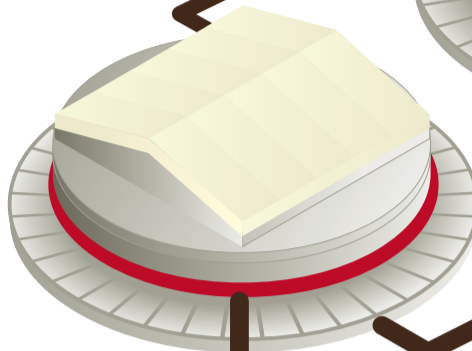
### Incoming

Waste is brought by the road tankers.



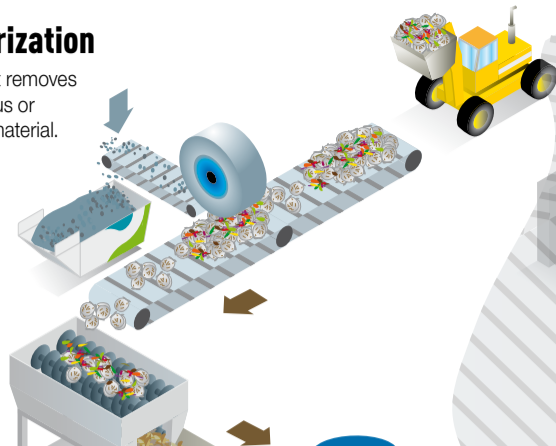
### Wastewater tanks

The liquid waste is temporarily accumulated in special tanks before being added to the digester.



### Deferrization

A magnet removes any ferrous or metallic material.



### Grinding

The material undergoes a grinding by a special mill to reduce the volume.

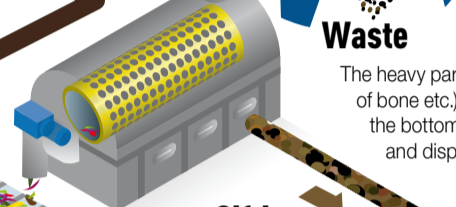


### PULPER

Inside a tank with the mixer called a "hydropulper", a pulp is obtained by homogenizing the material with the recycled liquid from the plant.

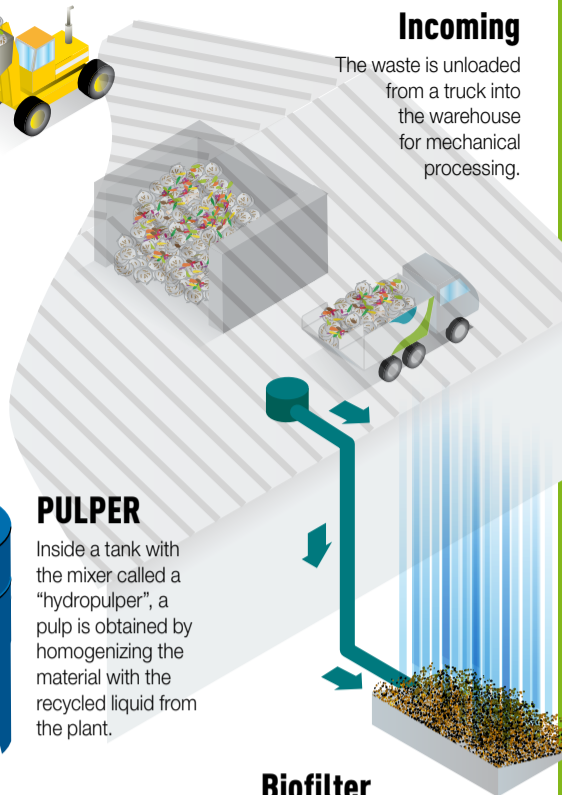
### Waste

The heavy part (shells, pieces of bone etc.) are removed from the bottom of the hydropulper and disposed of.



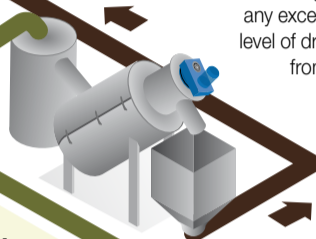
### Biofilter

Air is taken from the warehouse and deodorised thanks to specialised micro-organisms that are present in a filtering layer made up of woodchip.



### Thickening in the drum

The sludge is thickened (eliminating any excess water) and brought to a level of dry substance concentration from 0.6% to about 5%.

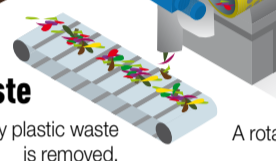


### Waste

Mainly plastic waste is removed.

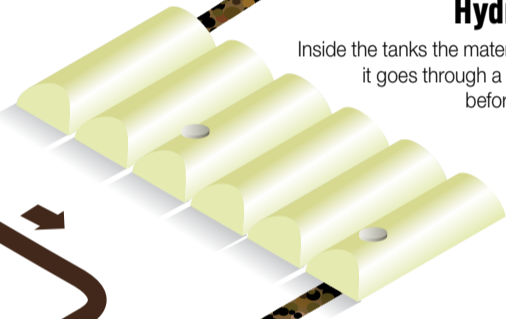
### Sifting

A rotating cylinder separates out any foreign objects.



### Hydrolysis tanks

Inside the tanks the material is hydrolysed and it goes through a ketogenesis process before it is biomethanised in the digester.



## ANAEROBIC DIGESTION



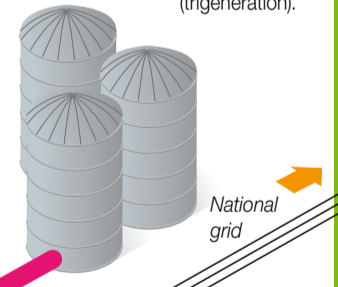
### Digester

The anaerobic digestion process is carried out in a reactor where the pulp, the sludge and the waste liquid is homogenized. This anaerobic process (in the absence of oxygen) occurs in heated conditions at around 55°C, a temperature which is maintained thanks to the thermal energy generated by the cooling of the fumes during the combustion of biogas. The main end products are biogas and organic sludge.

## ENERGY PRODUCTION

### Warm water tanks

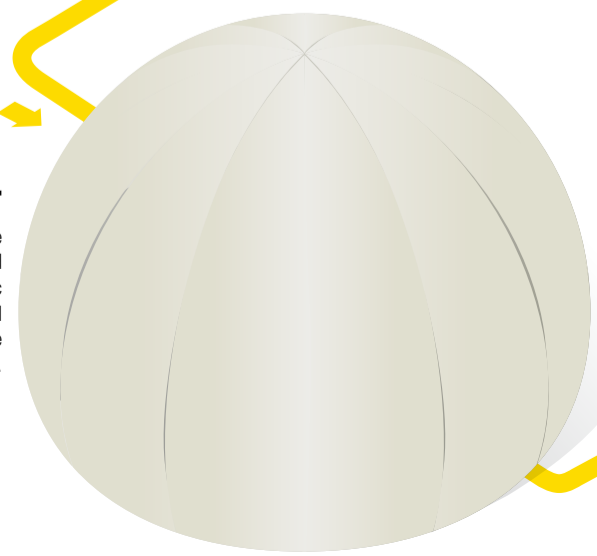
The thermal energy is accumulated in warm water (50-55°C) and used both to keep the temperature constant for the digestion process and for the air conditioning of the plant's offices in the summer and in the winter (trigeneration).



## GASOMETER

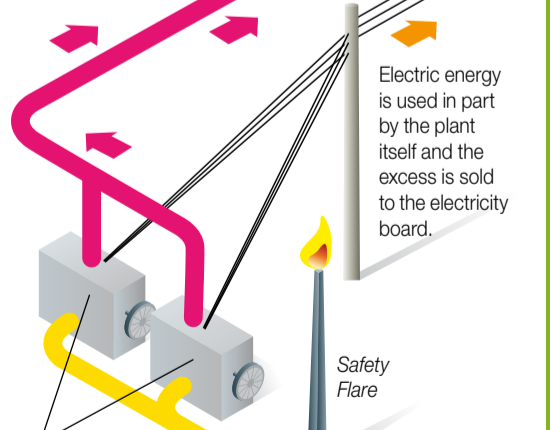
### Gasometer

The biogas produced inside the digestion plant is collected in a tank with 2 concentric membranes in a spherical shape with a storage volume of around 2,600 m<sup>3</sup>.



### Cogenerators

The biogas is sent to cogenerators (combustion engines) to produce thermal and electric energy.

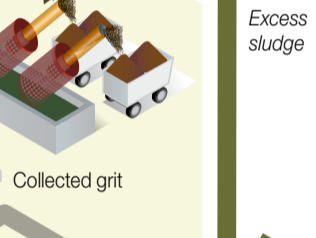


Biogas

## SEWAGE WORKS

### Initial degritting

Excess sludge



Collected grit

### Sieving

### Reduction of Nitrogen and Phosphorus

### Bio-oxidation of wastewater

### Sedimentation tanks

The sludge that is formed during the purification process is separated from the purified effluents through sedimentation.

### Filtration

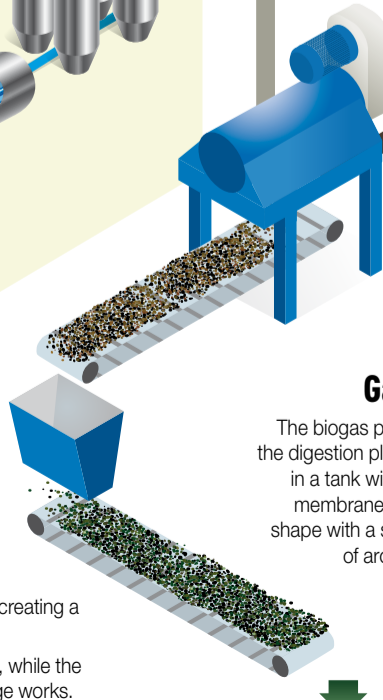
### Disinfection

With UV rays and/or reagent dosing.

### Discharge of purified water

### Centrifuge

The organic sludge is dehydrated creating a solid and liquid part. The solid part is sent to be reused, while the liquid part is returned to the sewage works.



Solid part sent to agriculture