

The key components, such as the inspectable heated bottom and one of the strongest mixing shafts on the anaerobic digestion market, are covered by a patent. The Thöni blade stirrer stands out for the optimal management of complex mixing and continuous and constant digestion tasks of non-homogeneous substrates. The sizing of the blades and the shaft of the mixer guarantees a high mixing efficiency as well as durability. The special shaft configuration and the design of the blades prevent 100% the possibility of settling, transporting the aggregates towards the digester exit and at the same time preventing the formation of floating layers. This allows a high reliability of operation with no maintenance even in the presence of high quantities of impurities inside the waste.

Strengths of the chosen technology are:

- Gasometer directly incorporated in the fermenter
- Digestore with steel bottom (can be inspected from the outside through a lateral tunnel)
- Heating of the fermenter by means of an external heat exchanger
- High power mixer
- System of dehydration of fermentation residues
- High yield thanks to the incomparable stirring technique
- Insensitivity to the high waste impurity content.
- Economy in terms of self-consumption thanks to the very low number of revolutions of the paddle mixer
- Floating effect of the mixer shaft (total absence of supports inside the digester)
- Mixing in the digester possible even at partial load
- High operating safety
- Possibility of modular application, making the system expandable over time
- Economics linked to the high flexibility with respect to the composition of treated waste
- Low maintenance and operation costs.

THE COMPANY

OWAC Engineering Company is located in Palermo, Via Resuttana 360, Sicily, Italy; the company has been operating in the "waste to energy" for many years and has a long time experience in the field of management consultings for the development and diversification of industrial assets. In particular the company develops its activities in the designing and building of waste treatment plants and environmental remediation.

The more relevant characteristic of OWAC's activities is the development of an idea, the designing of the system and the management of the construction works all culminating with the start-up of the initiative. Therefore OWAC is the catalyst for all the phases which bring to the final start-up of industrial plants.

The working team is very flexible, qualified and adaptable, able to develop all the required activities with care, high precision and "tailor made" solutions. Company references and activities, both in progress and already made, are available on our website.



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PLANT FOR THE PRODUCTION
OF BIOMETHANE



DRY ANAEROBIC DIGESTION

Anaerobic digestion is a biological process by which, in the absence of oxygen, the organic substance is transformed into biogas, a mixture consisting of methane and carbon dioxide, in variable percentages depending on the type of organic substance digested and the conditions of process.

For the anaerobic digestion processes, different technologies have been developed, based on the dry matter content of the reactor-fed substrate:

- wet digestion, when the substrate has a dry substance content of less than 10%;
- dry digestion, for substrates with a dry matter content of more than 20%;
- semi-dry digestion, with substrates showing intermediate values of dry substance.

The anaerobic digestion processes can also be distinguished on the basis of the reactor feed, which can be continuous or discontinuous, and on the basis that the substrate inside the reactor is mixed or pushed along the longitudinal axis. The anaerobic digestion can, finally, be carried out both in mesophilic conditions (about 35 °C) and thermophilous (about 55 °C). The technology in the plant is Martin dry anaerobic digesters with Thöni system, and based on the piston flow principle. This type of digester is particularly suitable for organic waste with a high concentration of impurities.



THE PLANT

- Site area: 3.1 ha
- Treatments: mechanical pre-treatment of incoming waste, anaerobic digestion and aerobic stabilization of the digestate;
- Anaerobic digestion: n. 2 dry digesters of 2,250 m³ for each part;
- Aerobic stabilization of the digestate: n. 4 biocells with forced and controlled ventilation (7 x 24 m for each part);
- Final maturation on stalls (not aerated piles);
- Average process period: 90 days;
- Air treatment: 80,000 Nm³ / h (wet scrubber and biofilter).

PRE-TREATMENT

The vehicles entering the plant are subjected to weighing for the administrative verification of the quantities of material entering and leaving. Once the weighing operations have been completed, the vehicles discharge the waste into areas dedicated to the type of waste (organic waste, pruning shoots, other biomasses), while any non-compliant materials, accidentally present in the loads assigned and not processed by the plant, are confined to an area dedicated to the purpose and able to ensure the necessary environmental protection requirements (covered and confined area, waterproof flooring, etc.). The waste is then moved by means of wheels bucket and bridge crane. The green fraction (used as a structuring material to improve the quality of the substrate to be treated), consisting essentially of wood-cellulose matrices, mowing, pruning, is crushed to be sent to the process.



The organic waste is withdrawn from the reserve area and treated with shredder and subsequently sifted in order to make the waste suitable for subsequent treatments (undersize materials). The oversize materials, instead, is loaded inside containers and sent for disposal. The undercover is then moved by a bridge crane and subjected to a mixing operation, with the previously pretreated green fraction. This phase aims to create a material able to ensure compliance with the process parameters (humidity, density, C / N ratio, porosity, etc.) considered as priorities for subsequent biological treatments. The mixed and homogenized organic matrices is then sent to the anaerobic digestion section by means of a conveyor belt.

BIOLOGICAL TREATMENTS

The anaerobic digestion section consists of two digesters located outside the shed, inside these units the degradation of the organic substance occurs (anaerobic digestion conducted in conditions of thermophilia, ie with a temperature of about 50-55 ° C) and there is the production of biogas. The biogas produced is sent to the up-grading unit for the cleaning process (removal of acid gases and carbon dioxide) in order to increase its calorific value and to exploit it as gaseous fuel (completely similar to natural gas). A production of biomethane of about 4,000,000 m³ / year is planned.



The digestate produced by the anaerobic treatment is instead withdrawn from the reactors by means of screw extraction and dehydrated by means of screw presses, obtaining a separation of the solid phase (with reduction in volume and dry substance content of about 40%) from the liquid one , recirculated for the process needs (the surpluses, finally, will be treated within a reverse osmosis system that returns the water with characteristics that can be released in the environment without any danger of contamination, in compliance with the legal limits planned for surface discharge). The solid digestate is then mixed with structuring material inside a hopper and placed in heaps inside aerobic biocells for accelerated stabilization, with insufflation of air from below and automatic control of process parameters. After this phase, the compost produced is subjected to final maturation in heaps inside the shed, in order to allow completion of the composting process (90 days). Following maturation, the compost is finally subjected to a refining process for the separation of any plastic materials still present and to recover also the structuring material (oversize) to be reused at the top of the processes. The compost produced (undersize), about 11,000 t / year, is therefore stored in a shed waiting for sale / recovery.



UPGRADING OF BIOGAS IN BIOMETHANE

The upgrading process makes it possible to obtain, starting from the biogas produced during the anaerobic digestion of the organic waste mats of urban waste (organic waste), a biomethane with qualities similar to those of methane of fossil origin. The chosen technology is based on the process of physical absorption of carbon dioxide and hydrogen sulphide in water, which exploits the different solubility of the various components present in the gaseous stream to be treated. Process water is recirculated, which minimizes consumption and the environmental impact of the plant. The system, modular and built on a single foundation base, consists of:

- a prefabricated container where the electric cabin for the control system is located, the pump room for water distribution and recirculation and the process room, for compressors, dryers and gas analysis instrumentation
- an absorption column;
- a flash column;
- a release column;
- a refrigeration unit;
- condensate separators and heat exchangers.

The biomethane resulting from the upgarding process is constantly analyzed to monitor carbon dioxide, oxygen, hydrogen sulfide and moisture content. The entire plant is also controlled by "programmable logic (PLC)" and the management takes place both on site and remotely.

