

CONTACTS

ORGANISATION	CONTACT POINT
Daithi O'Murchu Marine Research Station	Coordinator: Julie Maguire
The European Biomass Industry Association	Valeria Magnolfi
Validex	Patrick Vajda
Maisonneuve	Severine Le Roux
ADS Sustainable Development Consulting SL	Aleksander Ivancic
ETA Energia Trasporti Agricoltura	Stefano Capaccioli
Cand-Landi	Claude-Alain Roulet
Irish Seaspray Ltd	Sean Galvin
Fastnet Mussels Ltd	John Murphy
Murphys Irish Seafood	David O'Neill
University of Applied Sciences Western Switzerland	Jean-Bernard Michel
Institut de Recerca i Tecnologia Agroalimentaries	Belen Fernandez
University of Manchester	Krishna C. Persaud
CSEM SA	Silvia Angeloni
University of South Wales	Sandra Esteves
Association Nationale des Industries Alimentaires	Laura Marley
Union of Dairy, Beef, Food Industrialists and Producers of Turkey	Ozge Güler
Helvacizade Food Compnay	Zeliha Ustun
International Federation of Green Regions Associations	Maurice Jutz
Digesto Sàrl	François-Régis Mahrer



ORGANIC WASTE MANAGEMENT BY A SMALL-SCALE INNOVATIVE AUTOMATED SYSTEM OF ANAEROBIC DIGESTION

WWW.PROJECT-ORION.EU

Email: info@project-orion.eu

This project is supported by the European Commission under the Research for SME Associations theme of the 7th Framework Programme for Research and Technical Development

OVERVIEW

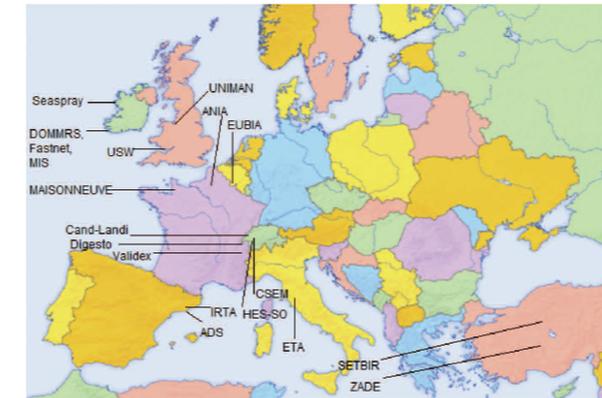
Millions of tonnes of organic waste are produced by agro-food industries every year. Figures based on EUROSTAT data from 2006 (the most recent figures at time of printing) estimates approximately 89Mt of food waste is produced annually and includes manufacturing and household sectors. At present there are anaerobic digestion (AD) systems in place for large enterprises producing 5,000 – 50,000 tonnes of organic waste per year. For small-to medium-enterprises (SMEs) that may only produce 100 – 3,000 tonnes annually, the only solution for organic waste treatment is incineration or landfill. These treatments are both costly and harmful to the environment. The development of an innovative aerobic digestion system for smaller quantities means that SMEs will be able to manage their own organic waste.

An AD integrated system consists of a waste conditioning system, a thermo-regulated digestion tank, a gas holder to store the biogas and a gas-burning engine/generator set if electricity is to be produced. The organic waste is broken down in the tank and 40-90% of the waste is converted into biogas. Apart from biogas the process also produces a digestate which may be separated into liquid and solid components. The liquid element can be used as a fertilizer and the solid component may be used as a soil conditioner or further processed to produce higher value organic compost. ORION focused on several agro-food industries including biomass, agro-food (fisheries, vegetable oil producers, dairy and beef) and markets.

OBJECTIVES

1. Developing AD machines at the SME scale that will combine effectiveness for a wide range of organic wastes and reduced capital and operating costs;
2. Developing advanced control tools and sensors to reach an optimum reliability;
3. Increasing know-how on the impact of nanostructured surfaces on bacterial growth and increase waste throughput in the digester;
4. Developing a training strategy in order to address a vast community of SMEs and offer them a personalised service;
5. To contribute to the implementation of EU policies on waste management and renewable energies production.

PROJECT PARTNERS



CURRENT CHALLENGES

- Millions of tonnes of agro-food waste produced annually in the European Union. For example, up to one third of all raw material entering a fish processing plant will end up as organic waste.
- Space requirements and unhygienic conditions of storage and handling. In the case of landfills, issues include nauseous odours and microorganism proliferation which both contribute to poor public image. There is also the negative impact of incineration on the global environment quality which includes generation of greenhouse gases and uncontrolled emission of dioxins.
- High costs of collection, transport and treatment (landfill, incineration, composting and biomethanisation in centralised facilities). Costs of waste disposal across Europe vary from €50 - €200/tonne, thus an SME producing 500 tonnes of waste per year may be paying up to €100,000 on disposal.



Storage and handling



Collection, transport and gate fees

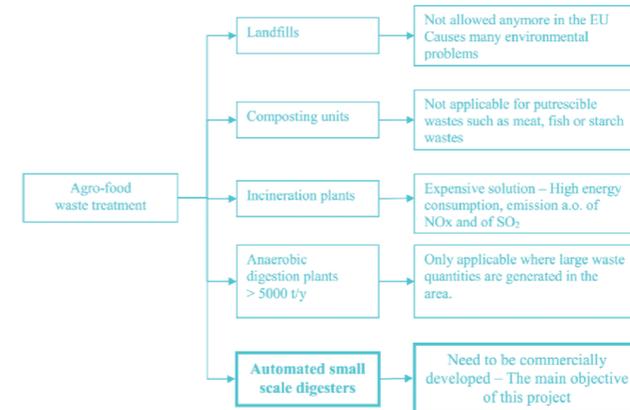


Laboratory analysis

Some of the factors contributing to the high cost of organic waste disposal.

DIFFERENT ROUTES FOR AGRO-FOOD WASTE TREATMENT

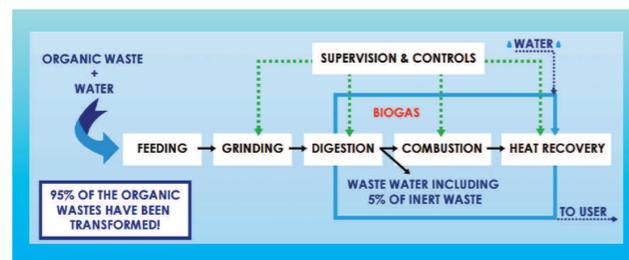
There are several different options for the management of organic waste (see figure 2). EUROSTAT has found a decrease of 49% in the amount of municipal waste disposed of by landfill between 1995 and 2013. However, in the same period incineration rates have increased by 92%. The incineration of organic waste is expensive, has high energy consumption and emits significant quantities of direct greenhouse gases including carbon dioxide and nitrous oxide.



The different routes for agro-food waste treatment, past, present and future.

THE ORION SOLUTION

- Local treatment and valorisation on-site in a compact and isolated unit;
- Reduction of working hours and financial savings for the end-user;
- The development of a digester with a volume of 3 - 30 m³;
- Organic load: 80 -1000 kg/day of humid waste;
- Daily energy production of 1.5 –7.5 Nm³ biogas/m³;
- Production of biogas containing 50-65 % methane;
- On-site direct use of biomethane or combined production of heat/power (hot water/electricity).



An overview of the components of the ORION solution.

TASKS

WORKING PACKAGE NUMBER	TITLE
1	Technological evaluation of SME needs to manage their organic waste
2	Digestion module development/test
3	Combustion module development/test
4	Supervision and control module development/test
5	Active surfaces for bacterial control
6	Integration
7	Validation tests
8	Validation and pre-normalisation activities, economic and environmental risk assessment
9	Dissemination, training and exploitation
10	Project management



Team Orion in Barcelona!

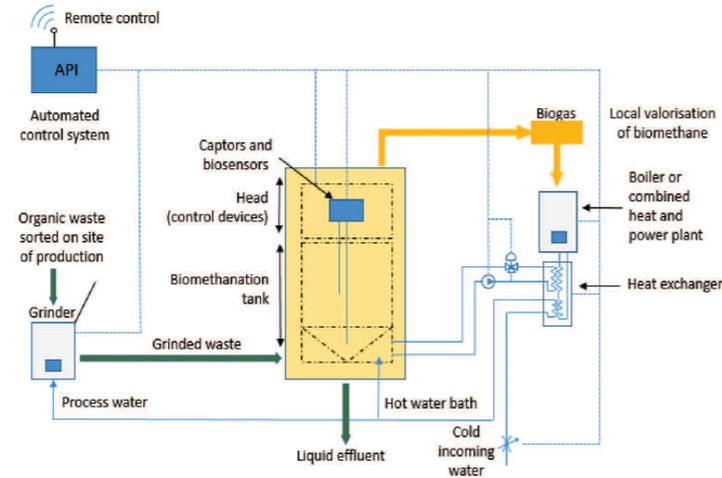
THE DIGESTER

AUTOMATISATION

- Optimised & automated operating cycles
- Operational autonomy
- Biomethane valorisation

REMOTE MONITORING

- Remote access & control
- Video surveillance
- Alarms
- Preventive maintenance
- Database



MEASURES & PROACTIVE CONTROL

- Captors and miniaturised smart biosensors
- Integrated analyses
- Process modeling
- Fuzzy logic

DIGESTER COMPONENTS



The combustion system and boiler with the simulated biogas bottles and support fuel



Digestion station containing the digestion module

THE SIEVING GRID

- Filters the overflow of the methanation tank;
- Retains particles of insoluble matter.

THE JABOT

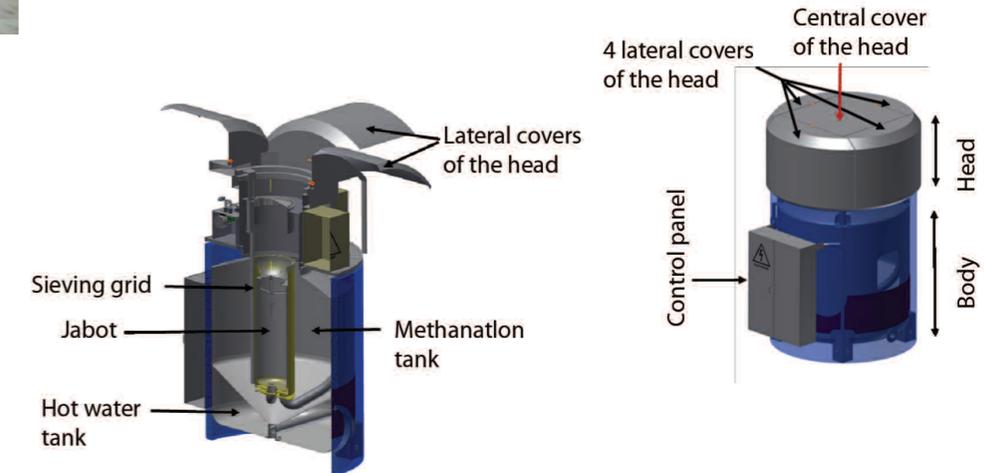
- Is a substrate distribution unit;
- Feeds the methanation tank regularly;
- Initiates the first steps of the digestion process.

THE METHANATION TANK

- Is where the methanogenic digestion occurs, leading to biogas production.

THE HOT WATER TANK

- Heats the digester



CASE STUDY: FASTNET MUSSELS LTD

FASTNET MUSSELS



The company was established in 1984 and initially concentrated on growing and selling fresh mussels for export and by 1989 production had reached 150 tonnes. In 1990 the company built a depuration and holding facility which enabled Fastnet to process their harvested mussels and consequently increase margins and profitability. In 1996, having patented a process for the production of individual quick frozen (IQF) mussels, work commenced on a new state of the art 4,000m² facility which was approved by the Department of the Marine (EU Directive 91/492) and is HACCP and BRC approved. Currently the company farms 250 tonnes and processes 1400 tonnes of mussels (annual turnover €3.5 million) and employs 33 people. However, they have the capacity to farm 500 tonnes and process 2,000 tonnes. Since then through successful R&D the company has diversified into the production of value added products; pasteurised mussels in sauces (white wine, garlic butter), cooked crab claws, lobster tails, oysters and periwinkles. They have also worked on a number of nationally and EU funded research projects including an investigation of turbot and scallop farming and biofouling research. Due to their versatility they have the necessary attributes for transferring and receiving knowledge. Fastnet Mussels produces 500 tonnes of mussel waste per year costing €37,500 disposal. The company is located on a remote peninsula where other fish processing plants are also located. The AD system could potentially process the waste from all the companies located in the area.



BENEFITS TO USERS

- Reduced cost for waste treatment;
- Local recovery and recycling of energy from organic wastes;
- Enclosed process – low emissions;
- Removes risks related to hygiene in food waste logistics;
- Technology complies with European and National legislation;
- 70-80% diversion of waste from landfill and incineration;
- Reduction in greenhouse gases in comparison to uncontrolled landfill;
- Growing market for renewable energy;
- Large potential of compost market;
- Full integration into the local waste handling logistics (e.g. kitchen wastes);
- Potentially a mobile machine.

