- THE LIFE PROGRAMME -

OVER 20 YEARS IMPROVING WASTE-TO-ENERGY MANAGEMENT IN THE EU

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The LIFE programme was established in 1992 and is the EU's funding instrument for the environment and climate action. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with added-value.

With regards to waste management, LIFE has continuously co-funded innovative projects that upgrade waste recycling technologies and processes in a wide range of industrial sectors all over Europe. Out of more than 4300 initiatives supported by LIFE to date, 667 have been exclusively focused on waste, with more than €433 million allocated. In fact, waste management is the theme most widely tackled by the programme.

In particular, LIFE has focused on demonstrating innovative technologies for recycling specific materials from waste streams, such as hazardous, agricultural or municipal waste. Many projects co-funded by the programme have linked waste management to other environmental topics, such as climate change or waste-to-energy. LIFE has also actively contributed to waste prevention by raising public awareness, promoting the exchange of knowledge and developing information tools for better waste management.

Below you can find some best examples of LIFE projects on specific waste-to-energy themes:

Main Text

Sludge's wealth

1. Main aim

The Sludge's Wealth project successfully demonstrated a cost-effective and efficient pilot treatment system for relatively small volumes of biological sludge for offshore oil rigs and similar units that converts biological sludge with 75% humidity into combustible pellets.

1.1. Technology

A portable and small sized 12m-long pilot plant was constructed, based on a hybrid microwave and hot air heating technology (the designed elements include a system to level and convey the sludge into the process, a drying tunnel, the position and number of microwave generators and the electromagnetic field distribution), in order to enhance the "sludge" and obtaining agglomerates with high calorific value (maximum water content of 18%), leading to an increased use of biological sludge in combustion plants.

1.2. Results

The project team built and assessed a fully operational prototype, which achieved an annual conversion of 650 tonnes of organic sludge with 75% humidity into sludge with 14-18% humidity through a highly efficient drying system, enabling the generation of 280 tonnes of pellets with high heating power that are easily transportable. The prototype also ensured the elimination of unpleasant odours and the longer life of the system's components due to the lack of abrasion in the process.

Prograss

2. Main aim

The Prograss project aimed to provide integrated approach for conserving semi-natural grasslands whilst generating energy sustainably for the first time.

2.1. Technology - Methodology

A state-of-the-art technique was used, called the "Integrated Generation of Solid Fuel and Biogas from Biomass" (IFBB), which aims to divide the grassland silage – characterised by a high proportion of lignocellulose and minerals that makes it difficult to use in conventional systems like biogas production or hay combustion - into a solid part for combustion and a liquid fraction for biogas production.

The project team carried out an inter-disciplinary study, testing the IFBB system at eighteen experimental sites in Germany, Wales and Estonia, which covered a representative sample of the vegetation types found in Natura 2000 grassland habitats, in order to examine and analyse the productivity and quality of the grassland biomass and the dynamics of the biodiversity under different cutting regimes.

2.2. Results

The IFBB procedure showed that 45% of the energy stored in the grassland biomass can be transformed into available heat. However, in an independent IFBB electricity plant, about 15 % of the gross energy yield is used to cover internal heat demands, especially for drying. In comparison, an IFBB-system with a biogas plant produces excess heat and hence the value of heat provision can be raised to about 53 % of the gross energy yield.

The broad operational approach ensured the replicability of the system and successfully promoted biomass and biogas productions from protected grassland sites as well as the protection of Natura 2000 reserves and the livelihoods of small farmers in marginal areas.

Inter-Waste

3. *Main aim*

The Inter-Waste project constructed and demonstrated an integrated energy-autonomous prototype unit based on anaerobic processes with a Membrane Bioreactor system (MBR-AD), for the treatment of various organic waste fractions such as wastewater, sludge and other biodegradable organic waste (BOW) while delivering added-value marketable products in the form of biogas, organic fertiliser and clean water effluent that can be safely used in agriculture.

3.1. Technology - Methodology

The prototype consisted of a Membrane bioreactor (MBR) unit that treated municipal wastewater and produced sludge as well as an Anaerobic Digestion unit which further treated the MBR's sludge along with other Biodegradable Organic Waste (BOW) streams. The MBR unit was tested for a sufficient time period and a significant number of trials - each trial lasting around 20 days – so as to record unit's performance under different conditions. The MBR system enabled to treat 3-4 m3/d of wastewater, while the anaerobic digestion unit received approximately 3 to 5 tonnes of feed waste per trial. Through several trials, the project team analysed and characterised the middle and end products (digestate, liquid digestate and solid digestate), optimised the unit's operations and developed guidelines and specifications for the construction of the prototype.

3.2. Results

The process of the MBR-AD unit was based on a 'zero' waste symbiotic approach that used waste of one process as feedstock material for the other. In this way all organic waste streams (including sludge) were effectively managed using a stand alone treatment system. The unit produced 12.1 m3/d of good quality biogas - 59% methane - and after filtering and drying, the dried solid digestate (AD unit) acquired good quality characteristics for land applications such as organic fertilizer. The MBR unit treating wastewater and liquid digestate produced high irrigation water that conforms to the stringiest Cypriot water reuse limits.

Importantly, the project team also successfully highlighted the replicability potential of the project by assessing and proving the system's application in two hypothetical scenarios, a village and a luxury hotel.

Acumen

4. *Main aim*

The Acumen project used a combination of innovative technologies and techniques to find a financially viable and technically feasible method for capturing and using methane produced by non-operational (closed) landfill sites.

4.1. Technology - Methodology

The project initially developed user-friendly modelling tools which provided advice to site owners and municipal operators responsible for managing the gas at closed landfills. The tools developed were able to calculate how much landfill gas is likely to be generated by any given site as well as the cost and benefits of different management options.

Additionally, a range of utilisation technologies and mitigation techniques – small scale spark-ignition engines, micro-scale “Stirling” engines, and active bio-oxidation - were installed and tested at five UK closed sites which typically produce smaller amounts of landfill gas and methane than operational landfills.

4.2. Results

The project showed, through cost-benefit analysis, that small-scale spark-ignition engines could generate up to 150 kW of electricity from approximately 140 m3/h of landfill gas with 40% methane concentration. Moreover, a pair of micro-scale “Stirling” engines generated 18 kW of electricity from 25 m3/h of landfill gas with 32% methane concentration. Both type of engines helped to avoid 10 000 tonnes of carbon dioxide emissions a year (small-scale spark-ignition engines) and 1 000 tonnes of carbon dioxide a year (pair of micro-scale “Stirling” engines) respectively.. Finally, the in-situ bio-oxidation of methane using a biofilter resulted in 90% methane removal rates at the site surface, successfully demonstrating the potential of these techniques to be used during the very last phases of a closed landfill’s life.

All in all, different approaches were tested which allowed to successfully establish best practices for utilising methane and demonstrating the economic viability and transferability of the various approaches.

References

All the information provided in this abstract has been extracted from the LIFE Programme project database: http://ec.europa.eu/environment/life/project/Projects/index.cfm