

BIOENERGY

"Whenever and wherever bioenergy is discussed"

Digital Biogas Special 1- 2020

INTERNATI♥NAL



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BIOENERGY - THE UNSUNG ENERGY TRANSITION HERO

Half of all energy being consumed in 2018 came from renewable energy, and according to the International Energy Agency (IEA) this share is expected to rise to 50% by 2050.

Renewable energy is the fastest growing energy source in the world, with a projected CAGR of 10.5% between 2018 and 2025.

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COVER PHOTO



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 (photo Markku Björkman).

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ANAEROBIC DIGESTION IS BOOMING, GREEN GAS IS GOING GLOBAL

As governments around the world recognise the scale of the climate crisis and acknowledge the need for action to counter and mitigate the effects of rising temperatures, anaerobic digestion (AD) is one bioenergy technology that has enormous untapped potential and is seeing remarkable growth.

A recent report by the World Biogas Association (WBA) illustrates the contribution that the AD can make to meeting the Paris Agreement commitments, and its potential to become a key player in the development of a sustainable circular economy. A key finding of the WBA report, 'Global Potential of Biogas' is that anaerobic digestion (AD) technology, which produces biogas from the treatment of wastes, can help reduce global greenhouse gas (GHG) emissions by 3 290 to 4 360 million tonnes CO₂ eq or approximately 10-13 percent of the world's current GHG emissions.

Furthermore, the report finds that only 2 percent of the feedstocks available are treated through AD. These include food waste, sewage waste, farm waste and crops, which can all be used to make biogas in every country. Indeed, an estimated 80 percent of all global wastewater discharged is currently not being recycled through an AD process suggesting that there is still a huge potential for governments, city- and urban administrations to address wastewater treatment and curb methane emissions while improving air- and water quality, nutrient recovery and produce biogas as an energy source, displacing fossil fuels. The use of untreated wastewater from cities to irrigate crops downstream is 50 percent more widespread than previously thought, 65 percent of all irrigated areas within 40 km downstream of urban centers – amounting to about 35.9 million hectares (about the size of Germany) – are affected by wastewater flows to a large degree. Of the total area of 35.9 million hectares, 29.3 million hectares are in countries with very limited wastewater treatment, exposing 885 million urban consumers as well as farmers and food vendors to serious health risks according to the study 'A global, spatially-explicit assessment of irrigated croplands influenced by urban wastewater flows'.

Another recent report, 'Global Food Waste Management: An Implementation Guide for Cities', also by the WBA in partnership with the C40 Cities Climate Leadership Group Food, Water and Waste Programme puts particular emphasis on the importance of separately collecting and treating inedible food waste. A "how to do" guide for cities, the report highlights the role of biogas technologies, which through AD recycle inedible food waste into renewable heat and power, clean transport fuel, and nutrient-rich biofertiliser. AD technologies, which are mature, ready-to-implement, and cost-effective, allow maximum recovery of resources for both green energy generation and soil restoration.

Most cities around the world currently do not collect food waste separately, leaving it to be disposed of in landfills or, at best, in waste-to-energy facilities. As a result, food waste is not treated and loses its potential to resolve a series of environmental issues faced by all cities. A timely guide given that the 'Global Gas Report 2018', jointly published by Snam, International Gas Union (IGU) and The Boston Consulting Group (BSG estimates that more than 90 percent of global gas' consumption growth to 2040 will come from cities.

On biomethane (aka green gas or renewable natural gas – RNG), the joint report suggests that it is still at "an early stage of development", although biogas plants have seen strong growth in Europe, driven by favourable policy environments in certain countries. Renewable gas used in existing gas infrastructure could play an important role in reducing Europe's greenhouse gas (GHG) emissions to net-zero by mid-century, according to a study conducted Ecofys and commissioned by the Gas for Climate initiative. Such a reduction is needed to comply with the Paris Agreement to keep global warming well below 2°C and could save Europe EUR 138 billion annually the study suggests.

Initiated mid-2017, the Gas for Climate group consists of seven leading European gas transmission companies; Enagás, Fluxys Belgium, Gasunie, GRTgaz, Open Grid Europe, Snam and TIGF and two renewable gas industry associations, the European Biogas Association (EBA) and Consorzio Italiano Biogas (CIB).

The study, 'Gas for Climate: How gas can help to achieve the Paris Agreement target in an affordable way' shows that it is possible to scale up renewable gas production between now and 2050 to more than 120 billion m³ (bcm) >>





Crete has many breathtaking mountains like these to the west of Chania. It is this kind of scenery that is loved by hundreds of thousands of tourists who, unfortunately, also leave lots of waste on the island. However, it is efficiently taken care of by three recycling and biogas facilities.

Biogas expansion on Crete

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. D225, 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

"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 Hydrominoan subsidiary to the new modern desalination facility within the industrial area of Heraklion.

Hydrominoan 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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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 biofilters, fully automated feeding system and advanced biological treatment of the liquid digestate.