BIOGAS – A SUSTAINABLE ENERGY SOLUTION FROM AGRO-INDUSTRIAL WASTES

Natalia VLADEI*, ORCID: 0000-0003-1094-6812,
Ecaterina COVACI, ORCID: 0000-0002-8108-4810

Technical University of Moldova, 168, bd. Stefan cel Mare, Chisinau, Republic of Moldova

*Corresponding author: Natalia Vladei, natalia.furtuna@adm.utm.md

In the current global circumstances, a sustainable approach needs to be adopted to ensure successful food production and supply chain. The majority of agro waste are untreated and are disposed-off by burning. Consequently, as part of the global responsibility of safeguarding the earth and in consistence with the Kyoto protocol agreed by the United Nations, governments around the world have developed bio-based energy policies.

Nowadays, due to the increase in population, it is necessary to find a sustainable solution for the enhanced demand of energy in the world. The fossil fuels are limited and nonrenewable resources; the use of biomass for energy production seems to be a solution to provide energy and reduce the dioxide carbon emissions. The food-processing industry generates large quantities of residues, which may represent sustainable and rich sources of bioactive compounds. Agro-industrial residues provide an enormous potential to generate sustainable products and bioenergy.

This paper investigates the topic of finding a solution to protect and remedy the ecological problems caused by the food industry, namely the potential of biogas.

Biogas originates from bacteria in the process of bio-degradation of organic material under anaerobic conditions. The natural generation of biogas is an important part of the biogeochemical carbon cycle. Methanogens are the last link in a chain of micro-organisms which degrade organic material and return the decomposition products to the environment. In this process biogas is generated, a source of renewable energy.

The composition of biogas varies depending upon the origin of the anaerobic digestion process. Landfill gas typically has methane concentrations around 50%. Advanced waste treatment technologies can produce biogas with 55-75% CH_4. Like those of any pure gas, the characteristic properties of biogas are pressure and temperature-dependent.

The calorific value of biogas is about 6 kWh/m^3 - this corresponds to about half a liter of diesel oil. The net calorific value depends on the efficiency of the burners or appliances. Methane is the valuable component under the aspect of using biogas as a fuel.

Biogas is produced through an anaerobic digestion by anaerobic bacteria with four steps identified as: hydrolysis, acidification, production of acetate and production of methane using a microorganism consortium. The final product is a gas mixture composed mainly of methane and carbon dioxide and traces of hydrogen sulfide, ammonia, hydrogen, and carbon monoxide.

Anaerobic digestion has demonstrated to be a flexible technology with a variety of reactor designs adapted to many situations, transforming liquid and solid residual organic matter to valuable intermediates such as carboxylates, which can be recovered, and finally to biogas, which can be used for the production of heat and electricity or upgraded to biomethane.

Current policies favor biogas production as an energy source, for biomethane or electricity. The anaerobic digestion is a key technology to prepare the transition to a new energy and a bio-based circular economy paradigm.

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