

VALORIZATION OF ENERGETIC POTENTIAL FOR AGRO-INDUSTRIAL RESIDUES THROUGH BIODEGRADATION PROCESSES AND CATALYTIC COMBUSTION OF OBTAINED BIOGAS

Goal of the project

Determination of the best recipes with the help of mathematical apparatus (mathematical modeling) in accordance with the experience accumulated so far, for obtaining biogas with the best characteristics in terms of quality and quantity; testing at laboratory level (volumes between 1 and 6 liters) for substrates identified as being the most suitable for anaerobic fermentation process; for the existing pilot installation there will be made modifications for process optimization through increasing the control degree for process parameters and improvement of material homogeneity during the residence time inside the reactors. The obtained experimental values will be compared with the ones obtained from modeling processes and corresponding conclusions will be traced; biogas capitalization in catalytic firing processes.

Short description of the project

The proposed project highlights the way different biodegradable materials can be capitalized with emphasis on agricultural, municipal and industrial residues, using anaerobic fermentation processes with biogas production. The project structures in an interdisciplinary manner lifecycle of degradable resources mentioned above, from the point of origin to the exploitation of obtained biogas using catalytic combustion. It will be used a two-pronged approach to capitalize biodegradable materials: theoretical, using mathematical models for determining the characteristics of the anaerobic fermentation process and experimental, through laboratory determinations to characterize the substrates and obtained biogas using combustion tests in order to identify the most suitable catalysts in this regard. The purpose of the project involves a novel contribution in a direction which is currently under development at national level by providing relevant information impacting the quality of life by increasing regional and local autonomy in the context of valorization the renewable energy resources. The degree of novelty for the project also involves developing an experimental pilot for testing liquid substrates in anaerobic fermentation processes, which can have further industrial applications.

Project implemented by

Politehnica University Timisoara,
Mechanical Engineering Faculty,
Department of Mechanical Machines Equipment and Transportation

Implementation period

01.10.2015 – 30.09.2017

Main activities:

- Establishing the substrates which will be further used in experimental determinations;
- Mathematical modeling;
- Experimental tests on existing installations;
- Catalytic elements synthesis for further use in biogas combustion processes;
- Tests over the optimization possibilities for biogas combustion using catalytic elements;
- Comparison of experimental and modeling determinations.

Results

- 2 papers published in ISI journals (Web of Knowledge);
- 2 papers published in BDI indexed journals;
- participation to at least 2 national/international conferences;
- publishing of a book or a book chapter with the obtained results.

Applicability and transferability of the results

The project underlines the need to develop new methods of valorization for the non-usable biodegradable part through interdisciplinary approach which has as a main purpose determining the exploitation possibilities for the residual materials which originate from agriculture or municipal /industrial environment through chemical conversion processes with impact on biogas production.

Through developing and application of models for determining the best residual material sorts which are to be used in anaerobic fermentation processes and their application at pilot scale, it can be open a new research direction relative to the used models for semi - industrial or industrial scale for solving, at least partially, the energetic demand from renewable sources.

This aspect can help in regards to increased degree of energetic independence at local and regional levels with impact on life quality for the involved population of the respective areas from two points of view: reduced price for gas through input of renewable energy and increased work opportunities in case of developing respective installations in this purpose.

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Research Centre

MMUT / ICER

Research team

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