EFFECT OF TEMPERATURE ON ANAEROB PROCESSES

Pantea Emilia*, Romocea Tamara*, Ghergheleş Carmen*

University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail:,panteaemilia@yahoo.com

Abstract

Food wastewater can be treated through anaerobic digestion, as has a biodegradable organic load, alkalinity sufficient, adequate levels of phosphorus, nitrogen and micronutrients for bacterial growth. In most anaerobic reactors operating in a single phase was observed an imbalance between the two types of microorganisms acidogene and metanogene and some favorable conditions for bacteria may be inhibiting acidogene for the metanogene. This paper proposes tracking efficiency anaerobic treatment in two step, separating the two phases defining anaerobes: acidogeneza and metanogeneza.

Keywords: wastewater, anaerob, thermophilic, biogas

INTRODUCTION

Methane fermentation of organic solid and liquid waste is an anaerobic process that occurs through the gradual mineralization of organic matter due to biochemical oxidation-reduction processes and lead to the formation, on the one hand, carbon dioxide by oxidation, and secondly methane by reduction. In this fermentation, the gas mixture formed is known as fermentation gas methane, swamp gas or biogas (Bjornsson, L. et. al., 2000; Roš, M.and G. D. Zupančič, 2003).

Of chemical, biogas is a mixture of methane gas that is the weight, the remainder being carbon dioxide and very small proportions, carbon monoxide, nitrogen, hydrogen sulfide, water vapor etc (Kim, M. Y. Ahn, and R. E. Speece, 2002). In the process of anaerobic digestion of organic residues macromolecular substances, polysaccharides (cellulose, hemicellulose, etc.), proteins and lipids under the action of extracellular enzymes (cellulase, hemicelulaze, proteases etc.) are broken down into simple sugar substance (glucose or other sugar products, amino acids. volatile fatty acids, water and other organic products micromoleculari, after which, by bacteria, forming continuous decomposition of reduced organic acids (formic acid and acetic acid), carbon dioxide, hydrogen and water.

Some authors argue that during anaerobic systems around 3% of organic matter is converted into cell mass, the remaining 97% is processed by catabolism to CH_4 and CO_2 (Wiegant, W. M. et. al., 1985)

Processes underlying the anaerobic fermentation are classified into three broad categories:

► hydrolysis
► acid formation and acetogenesis
► metanogenesis

Microorganisms producing biogas from organic waste are the result of three types of microorganisms:

► non-methanogenic microorganisms, but microorganisms liquefied and acidogenic
► non- methanogenic but acetogenic
► methanogenic microorganisms

Temperature is considered one of the decisive factors for the proper functioning of the anaerobic process, it depends on both metabolism and reproduction of bacteria metanogene capacity and duration of fermentation, the quantity and quality of product gas. In such anaerobic processes occurring in the temperature range 0-97°C.

Depending on the temperature achieved in the anaerobic treatment ponds were found three distinct areas:

• the low temperature (below 15°C), where bacteria grows and does criofile
• the low temperature (15 - 43°C), in which the bacteria mesophilic
• the high temperatures (44 - 60°C), in which the thermophilic bacteria

Thermophilic systems is an elegant solution for treating wastewater with high organic loadings and high temperatures. If we could treat the effluent hot thermophilic conditions, this could represent an efficient alternative in terms of both cost and energy consumption.

Wastewaters at higher temperatures, increases the amount of gas produced, reduces the process increases by 5-10% the amount of decomposed organic matter, while cutting and pathogenic bacteria.

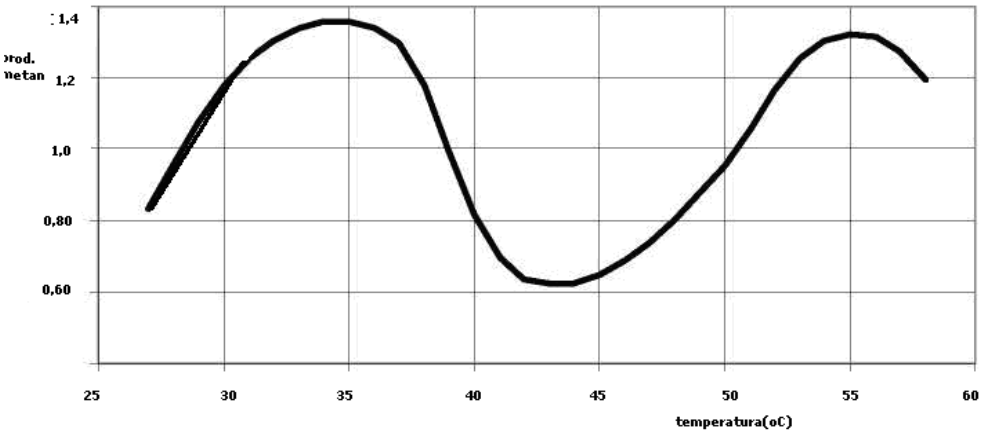

Fig.1.Specific biogas production depending on the temperature(Stronach, S. M. et.al., 1986)

MATERIAL AND METHODS

For effective biological treatment of industrial effluent a high biological treatment capacity is required.

The experiment takes place in three stages. In the first stage reactor temperature is maintained at 35 °C (mezofil field), and feeding is done with waste water coming from a brewery for a period of 5 days, the transit rate of 1.5 to 2.5 l / day. Reactor temperature is increased to 55 °C (thermophilic area) to begin the second phase of the experiment. The supply is made for all waste water for 5 days and a transit rate of 1.5 to 2.5 l / day. In the last stage reactor temperature is 25 °C (criofil area) and power was realized with the same waste water for a period of 5 days in a transit rate of 1.5 - 2.5 l / day.

RESULTS AND DISCUSSION

The experimental results were pooled in the following table:

Table 1.

Effects of temperature on anaerobic digestion

Temperature	pH	Alkalinity	Production of Biogas
25°C	7,6	3,047.00	0,06
35°C	7,56	3,052.47	0,065
55°C	7,80	2,899.89	0.08

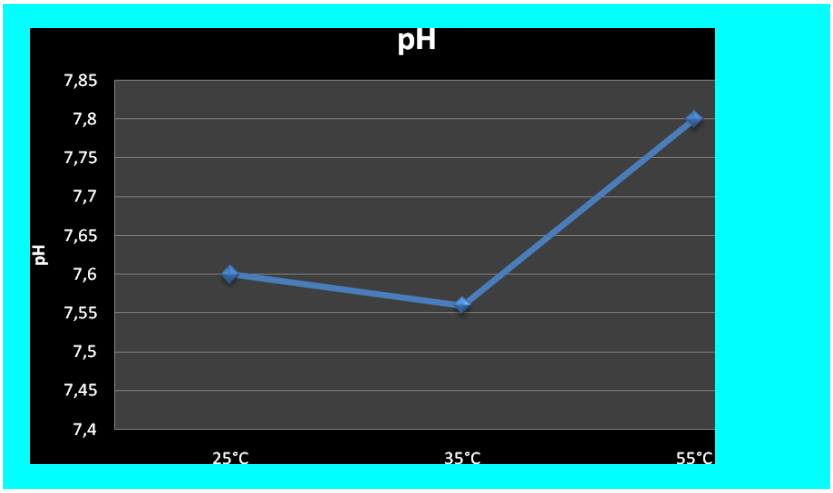

Fig.2. pH evolution versus temperature

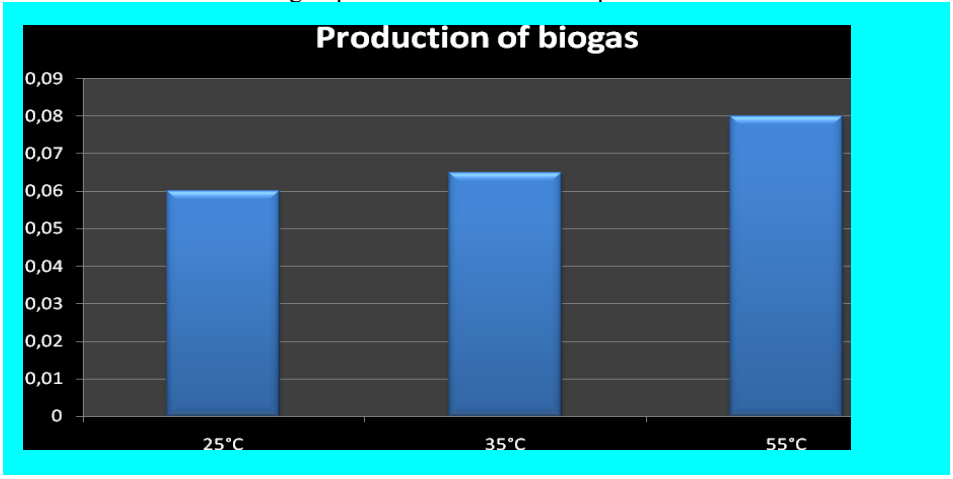

Fig. 3. The amount of biogas produced depending on the temperature

Studying the evolution of pH in the case of wastewater with the same characteristics observed in thermophilic that it has the highest value. The production of methane produced at a temperature of 55°C under the effect of thermophilic bacteria is

about the same as that performed by bacteria developed in mezofil at temperatures of 25°C and 35°C, but after a longer period of time.

CONCLUSION

Following the experimental research carried out showed that temperature variation has a significant impact on biological and physical factors of anaerobic conversion process, so that with increasing temperature and increases the amount of methane in biogas produced and obtain an effluent with greatly improved quality, in order to discharge the legal limits are respected envoy imposed by NTPA 001/2002. Thermophilic fermentation and mezofilă ensure the greatest methane in the biogas produced and the highest rate of CCO_{Cr} removed;

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