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# ULTRASONIC APPLICATION FOR BIOLOGICAL ACTIVATED SLUDGE TREATMENT

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## *Introduction*

Ultrasonic field has many applications especially because of cavitation effect which generates free radicals, very reactive and able to oxidize organic or inorganic pollutants. This paper shows the application of entire capacity of ultrasonic field, including solid matter solubilization because of mechanical effect, in order to improve the biogas production from medium or large wastewater treatment plants (WWTP).
Ultrasonic pretreatment of biological sludge before the anaerobic treatment phase, which generates biogas, leads to a higher quality of the sludge and as consequence, higher amount of biogas. The combination of ultrasonic and alkaline digestion has proved to be more efficient comparing to each one single application. This ultrasonic pretreatment can be adapted to present wastewater treatment plants or to be include it in the new designed WWTP.

## *Materials and methods*

The main goal of this paper work was to shows that ultrasonic and alkaline digestion can be a real method in order to increase the quality of biological sludge and the amount of biogas.
Pretreatment phase of biological sludge had the following main parameters:

- alkaline digestion with NaOH, 10 min. mechanical stirring
- ultrasonication, 20 kHz, 10 min., US energy 9000 kJ

The Figure 1 show the both phases of ultrasonic pretreatment and anaerobic digestion phase.
Anaerobic digestion phase was performed at 37.5 $^0$C.
In order to compare the performance of biogas generation by anaerobic digestion two paralel tests were performed:

- bioreactor 1: anaerobic digestion, no ultrasonic pretreatment;
- bioreactor 2: ultrasonic and alkaline pretreatment before anaerobic digestion.

The main parameters of process efficiency were: organic load and fat acids levels during the all experimental period of time (30 days), dry substances content, total nitrogen and phosphorous concentrations, volume of biogas and methane content.

***Results and conclusions***

The positive influence of ultrasonic and alkaline digestion to biogas generation in the second phase of anaerobic digestion has two aspects:

- from the beginning of anaerobic digestion phase the ultrasonic pretreated sludge from bioreactor 2 has a higher content of organic load (56%) and fat acids (~80%) than bioreactor 1 (no pretreatment);
- fter 30 days, the biogas volume generated in bioreactor 2 was two times higher than bioreactor 1 and the content of methane was 70% comparing with 65% (bioreactor 1); Figure 2 presents time evolution of biogas amount.

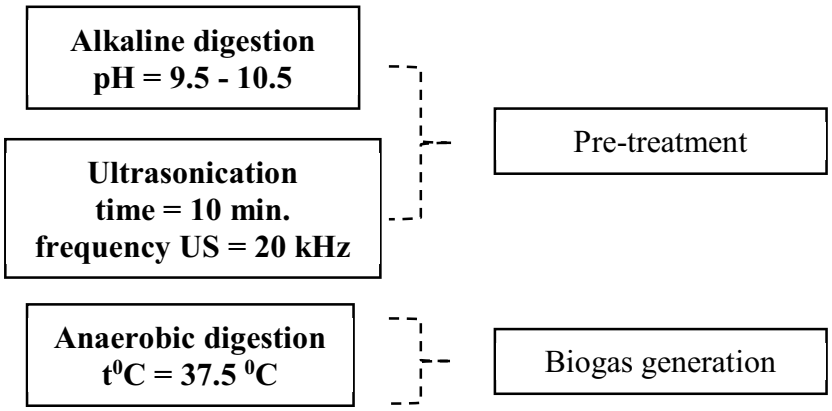


**Figure 1.** Biogas scheme generation

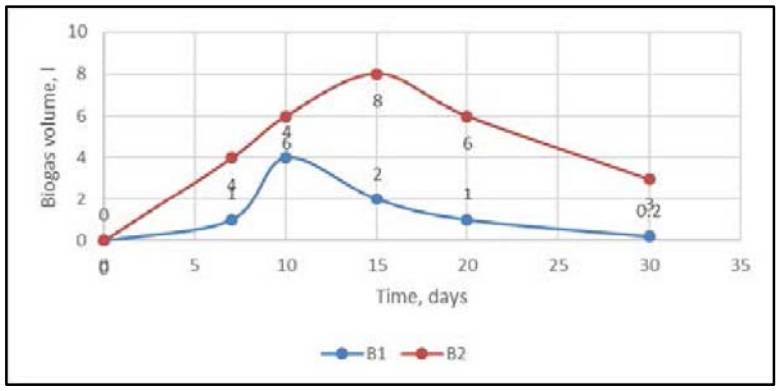


**Figure 2.** Biogas generation - comparing volumes bioreactors 1 and 2

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