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A Contribution to the Optimisation of Biogas Digesters with the Design of Experiments Method

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Abstract: The big challenge of modern life is the search for technologies that will allow for more efficient and cost-effective waste treatment. One technology that can successfully treat the organic fraction of wastes is anaerobic digestion. It is a biochemical process in which bacteria digest biomass in an oxygen-free environment, resulting in the production of "biogas". Thus, we turn a waste problem to a profit centre. This makes it attractive for many developing countries and constitutes an ideal sustainable growth option. Among factors that affect the production of biogas which are the temperature, the Volatile Solids (VS), and the Hydraulic retention time (HRT). A mathematical model allows us to determine the biogas produced as a function of these three parameters. Using the design of experiments method, we found that the effects of the parameters that influence the methane production are, in a decreasing order: the volatile solids, the temperature followed by the retention time. The interaction of these parameters is also analysed. This allows us to optimize the design of anaerobic digester.

Key words: Waste, Anaerobic, Biogas, Digesters, Optimisation.