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Exergy Analysis of Biogas Digester and Effect of Iron Oxide Nanoparticle in Bio Digestion

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Abstract

Wasted food product is the second largest category of municipal solid waste sent to landfills along with other organic waste generated. Such biodegradable waste can be processed scientifically to produce energy. By utilizing these wastes in an anaerobic digester one can produce biogas containing methane gas (upto 60%) and the dry solid can be used as organic fertilizer. Performance analysis of anaerobic digester is well reported in the literature. It is the best means to deal with organic waste in rural as well as urban areas.

Bio digestion involves slow chemical reactions. It is well reported in literature that high retention time makes this system less attractive. Additional iron content in the digestion process increase the production rate. Since pure iron may corrode the system additional iron oxides powders are used. Generally nanoparticles catalyzes better than its bulk analogs. Bio degradable iron oxide nano particles produced by co-precipitation method will be added to the digester to enhance the rate of production.

Exergy analysis of biogas digester is of recent interest. Exergy is the maximum useful work that can be obtained from a system at a given state in a given environment; in other words, the useful work that we can extract from a system. The main aim of this work is to evaluate the system on its exergy aspects. The losses obtained during the process will be analyzed and design modification will be incorporated to make the system more effective and implementable in both large and small units.

Keywords: Bio Digestion; Iron Oxide Nanoparticles; Exergy Analysis