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Evaluation of the Technical Feasibility and Economic Viability of Solar Heated underground fixed dome household size digesters suitable for Vhembe district of South Africa.

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Biogas technology (anaerobic digester) is finding increased relevance especially in rural communities not connected to the electricity grid. Most of these systems are meant to operate unheated regardless of seasonal climatic changes. However, the operation of anaerobic digestion is heavily dependent of the temperature of the digester slurry. So during colder seasons the systems underperform and hence the need to heat them up to maintain the temperature to optimal operational point values. In this regard the main challenge is that, the achievement of the optimal temperature comes with an extra cost and this has to be incorporated in the optimization process of the whole system starting from the designing stage. This paper gives a thorough review of the different heating mechanism designs suitable for underground fixed dome digester systems in typical temperate climate characteristic of the study area of Vhembe District of South Africa. Solar data for the district is used in the design and sizing of the heating system. A model created is used to determine the most cost effective design of the heating mechanism. The results of the study are expected to improve the operation of the typical household biogas digester systems in temperate climates.

key words: optimal operation, heating mechanism, temperate climate

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YES

Level for award (Hons, MSc, PhD, N/A)?

MSc

Main supervisor (name and email) and his / her institution

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