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Design, construction and performance evaluation of a greenhouse temperature regulated, agitated portable biogas digester

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Biogas technology has a high potential to meet the domestic, medium and large-scale facility energy needs of South Africa. Many digester designs, which include the different models of the fixed dome, balloon and floating drum digesters, have been installed in the country for more than sixty years. The effects of low temperatures during cold seasons and nights, temperature fluctuations, the high cost of electrical heating, infeasibility of digester installation in rocky and mountainous terrains, inefficient agitation and difficult maintenance experienced in the use of most of the installed digester designs are common challenges associated with the biogas technology. In this research, a 100 litre, semi-continuously fed and agitated portable digester whose operation temperature is automatically maintained at an optimum of 35 ± 0.5℃ and a pH of 6.8-7.2 within a thermodynamically sized greenhouse by means of a temperature sensitive thermal piston for venting control through a suitably sized window was designed and tested. The digester has an anchor impeller for intermittent mixing of the substrate slurry. The cowdung used had a total solids(TS), volatile solids (VS), chemical oxygen (COD and ammonia nitrogen content of 151 mg/L, 33.6 mg/L, 2235 mg/L and 698 mg/L respectively. Analysis of the biogas produced showed a specific biogas yield of 0.582 m³/kgVS_{added} and a methane content of 64% using cow dung as substrate. The benefits of high methane production and digester design suitability in any setting i.e. rural, urban, rocky or smooth areas offered by this design will lead to a faster dissemination of the biogas technology. The design is also in intimate alignment with the South African Integrated Resource Plan (IRP) national strategy of 2010.

Apply to be
 considered for a student
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Yes

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

MSc

Main supervisor (name and email)
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Would you like to <br> submit a short paper <br> for the Conference
 Proceedings (Yes / No)?

Yes

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