

Renewable Energy Focus

Modeling energy requirements for a biogas-supported decentralized Water treatment systems for communities in chambishi (Zambia) and diepsloot (South Africa) townships

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Abstract

An analytical model to determine energy requirements for a Biogas-supported Decentralized Water Treatment Systems was carried out based on energy consumption in Zambia and energy produced during water reclamation from wastewater in South Africa. For Zambia, the power consumption of the pumps for water abstraction, suction, distribution and treatment was the basis for determining energy required per hour. This energy was provided by biogas which was produced from a mixed feedstock of equal proportions made up of food leftovers, sewage sludge and fecal matter. This energy and amount of feedstock were used to design the biodigester. The model determined that a 1400m³ biodigester with biogas output of 8.6ML/day could yield 57kW electricity. These results compare proportionally very closely with those of the Safi Sana plant which has a 2500 m³ biodigester and produces 100kW electricity. For South Africa, energy requirements were modeled using experimental data obtained from water reclamation of wastewater and using sludge residue to produce biogas for electricity. This experimental model determined that 618ML/day of wastewater could be processed to yield power generation of 4.2MWh, an upscale from the current 97ML of wastewater per day that generates 1.1MWh.