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Recycling and reuse of human excreta for energy generation: A review

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Almost a billion people in developing world have no access to toilet and practice open defecation. But that waste should not go waste. Rather than tainting the environment and transmitting diseases, it could actually be harnessed to heat or power for millions of homes. The review paper will discuss about utilization of human excreta to produce biogas/energy as an alternative renewable energy. Utilization of human waste is considered beneficial in terms of the process because it does not require additional starter (microorganism's seeds) and a supply of microorganisms occur continuously during the feeding of raw materials. Product gas resulting from typical dry human feces have LHV and energy values of 17.2 MJ/kg and 24 MJ/kg, respectively, at optimum equivalence ratio of 0.31 values that are comparable to wood biomass. Non-sewered Sanitation Systems (NSS) are emerging as one of the solutions to poor sanitation because of the limitations of the conventional flush toilets. The new sanitary systems are expected to safely treat fecal waste and operate without any external connections to sewer, water supply or energy source. The Nano Membrane Toilets (NMT) is unique domestic-scale sanitary solution to treat human waste on site. The Reinvent The Toilet Challenge (RTTC) is one of the pioneering schemes initiated in 2011 under the Water, Sanitation and Hygiene (WASH) program of the Bill and Melinda Gates Foundation to increase access to safe, sustainable and affordable sanitation. In the present communication merits, demerits, advantages, limitations of various engineered technologies employed will be critically reviewed on the basis of their innovations, user friendliness, cost effectiveness, maintenance, etc. Also, health aspects of biogas generated, design and R&D aspects of biogas plant fed by human excreta with or without supplementary feed stocks, treatment of slurry and its use, strategy for promotion and integration with other programs will be thoroughly discussed.

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