Onsite fecal sludge treatment with the Anaerobic Digestion Pasteurization Latrine

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The overall objective of the Anaerobic Digestion Pasteurization Latrine (ADPL) is to provide self-contained and energy neutral on-site sanitation using anaerobic digestion of fecal sludge to generate biogas, and then use the biogas to pasteurize the treated effluent at 65-75 °C. Three ADPL systems were installed in 2013 on residential plots with 15-35 residents in a peri-urban area outside of Eldoret, Kenya, one system was installed in 2014 in Cebu Island in the Philippines and one system was installed on the campus of IIT Madras, in Chennai, India in 2015.

In Eldoret, each system was comprised of three toilets built above a floating dome digester and heating system, using gravity-induced flows. Adoption at two sites was successful, and residents reported that the system has little to no odor or flies, and they were interested in the possibility of excess biogas and effluent reuse. Systems were monitored daily for biogas production and temperatures in the pasteurization system. The ADPL serving 35 residents produced on average 330 L_{biogas} d^{-1}, and the temperature in the heating tank was greater than 65 ℃ on 87% of sampling days. The digester outlet at the two sites with successful adoption was periodically analyzed for chemical oxygen demand (COD), biochemical oxygen demand (BOD), total ammonia nitrogen (TAN), and pH, finding an average effluent concentration of 4,500-5,600 mg COD L^{-1} (87-89% reduction in COD from average human waste diluted with 1 L flush water); 2,000-3,900 mg BOD L^{-1}; 2,400-4,800 mg NH_3-N; and 7.1-7.3 pH units.

Results from this field study show that anaerobic digestion of minimally diluted fecal sludge can provide enough energy to pasteurize the effluent, and that the ADPL can be a suitable option for onsite fecal sludge treatment. Up to date results for all five ADPLs, and including novel microcontroller-enabled remote monitoring systems that allow remote monitoring in real time will be presented and discussed at the conference.

Figure 1. Concept and flowsheet of ADPL (left) and built system in Kenya (right).