Decentralized, small scale anaerobic digestion: UK-Thailand technology exchange

Tanja Radu

Research Associate
School of Civil and Building, Loughborough University, Loughborough, UK
T.Radu@lboro.ac.uk
07733297080

Abstract

This paper describes joint research between Loughborough University, and the Asian Institute of Technology (AIT), Bangkok to implement small, community scale anaerobic digestion (AD). The project is funded by the British Council, Newton Fund to exchange AD technology for processing food waste. Underpinning research will be generated from the need to adapt to the changes in composition of food waste in the two countries. National grids in Thailand will be expensive to implement and hybrid community scale services are needed. This is Thai Government strategy to achieve decentralized generation and responsibilities for energy supply. AD has been recognised in this policy as also providing the usual additional benefits of waste reduction and decrease in greenhouse gas emissions.

A key project output will be remote monitoring of decentralized community digesters connected into an expert network. A monitoring system is being developed from a small and inexpensive commercially available monitoring platform. These were originally introduced for control of fugitive methane and CO_2 emissions at closed landfill sites. The platform has been developed by addition of mass, pressure, temperature, O_2, H_2S, and NH_3 sensors. The project has created a small network consisting of three units, a demonstrator at each UK and Thai University and a comparative large scale UK digester. The data is sent to a joint online portal to be easily accessed independently by researchers from participating institutions. A set of alarms will be established to send warning if the measured values exceed the assigned threshold levels. A learning expert system will integrate the data received and reduce the skills required from the local operators.

Research will also report on the comparative merits of the dry and wet digestion alternatives for smaller food waste digesters. Another key output is to achieve simple digital characterisation of the complex feedstocks as it affects digester stability using thermal properties. Calibration of the model will be via standard characterisation of food waste at the laboratories to also determine differences in typical feedstock composition in the two countries. The expert system will enable variations in loading rate to determine optimal resilient operation and gas yield with minimal supervision. Experiments will include the benefits of elevated temperature and other pre-treatment processes based on reducing the particle size using ball, hammer mills or macerators. Two fully operational remotely monitored, networked community scale digesters will be compared.