Providing energy for rural Indian communities- Anaerobic Digestion at Loughborough University

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Rural Hybrid Energy Enterprise Systems (RHEES) is a research partnership between 6 UK and 7 Indian Universities. The aim of this project is to develop best practise at a smaller community scale which makes use of hybrid and combinations of biofuels. The idea is to improve rural energy availability, equity of cost and to generate an economic stimulus from the desire to provide greater energy security and reduced environmental impact.

The Loughborough University part of the project is on how to apply village scale anaerobic digestion. This will be achieved by:

- Development of small-medium scale systems
- Combining solar/ thermal heat integration for pre-treatment of feedstock and pasteurisation of digestate
- Designing prefabricated systems
- Development of remote monitoring of digesters
- Working with partners and stakeholders throughout.

What is **anaerobic digestion (AD)**?
Breakdown of biodegradable material by bacteria without oxygen
Products of AD: biogas (~60% methane, ~40% carbon dioxide) and solid residue-fertilizer

Why is AD beneficial for Indian communities?

- Remote un-electrified rural areas
- The digestate can be used as a fertilizer
- Biogas burners more efficient than burning wood or dung
- Reduced health risk with less smoke pollution from biogas
- Potential for biomass resources (domestic waste, animal and agro-residues)
- Opportunity for energy crop plantation in unused lands
- Small scale reactors would provide cooking/heating energy and bring immediate improvement of quality of life for rural communities

AD at Loughborough University:

Methodology:

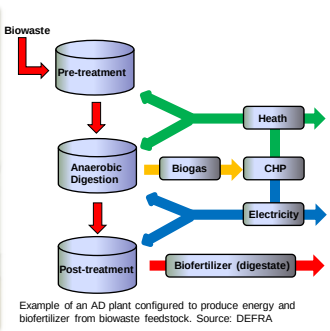
- Appropriate feeding stock identification- the main crops in UK and India are identified
- Pre-treatment options-milling, soaking feedstock in digestate, heating
- Retention time
- Varying substrate- sewage sludge, maize, food waste

Experimental:

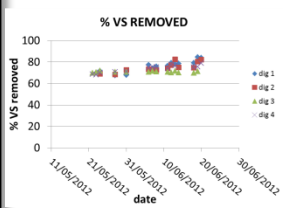
- 4 x 9l reaction continuously stirred
- 22 days retention time
- 37^{o}C warm room
- Digestate tested daily for TS/VS content
- Gas production continuously monitored; gas quality monitored daily

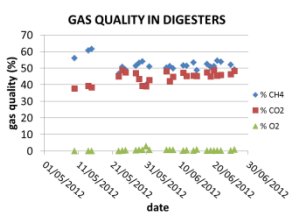
Results/Conclusions

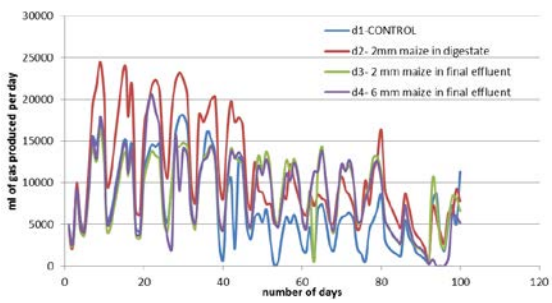
- Results from maize-sludge co-digestion shown are from the commissioning period demonstrating the consistency possible between duplicates. Average %VS removal and gas quality are shown from four reactors.
- Gas production is a function of the organic loading rate (OLR)
- Good quality of biogas achieved: >60% methane



Example of an AD plant configured to produce energy and biofertilizer from biowaste feedstock. Source: DEFRA







Science at work!

School of Civil and Building Engineering
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ACKNOWLEDGEMENT: This research is funded by Engineering and Physical Sciences Research Council (EPSRC) grant EP/J000361.
Maize for experimental work is donated by Severn Trent AD plant in Nottingham