

Anaerobic Digestion at Loughborough University

Dr Tanja Radu

Prof Andrew Wheatley

Dr Richard Blanchard

Bioenergy for Sustainable Rural Living (BURD) 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.

Methodology:

- Appropriate feeding stock identification- the main crops in UK and India are identified
- Maize is the most commonly grown crop in the world and our results are shown
- Examining the effect of particle size on gas production: 6 mm vs. 2 mm- finding the most appropriate milling method
- Pre-treatment options- soaking feedstock in digestate, heating
- Retention time
- Enzymes
- Varying substrate
- Mixing methodology (horizontal, vertical)

Experimental

- 4 x 9l reaction vessels- sewage sludge and maize feedstock
- 22 days retention time
- Continuously stirred reactors (vertical stirring)
- 37°C hot room
- Substrate pre-treatment: soaked overnight in sewage at 37°C in shaker
- Digestate tested daily for TS/VS content
- gas production continuously monitored; gas quality monitored daily

Results/Conclusions

- Results 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 figures show the impact of changes in organic load the inflections in the green reactor are reductions from 4 to 2 kgVS/m³/day.

Loughborough is one of the largest Civil Engineering Departments in the UK with over 100 staff and 1000 students. It specialises in applied research and has worked for over 250 companies. Its current research portfolio includes 77 projects totalling over £20.3M. The 3000m² laboratory includes specialist hydraulic and analytical equipment for microbiology, soils and water to ISO standards. There is Zone 2 microbiology containment and temperature controlled laboratories for mesophilic and thermophilic digestion trials. There is also a pilot plant room for scale up studies.

School of Civil and Building Engineering
School of Electronic, Electrical and Systems Engineering

