



Optimising Inputs and Outputs from Anaerobic Digestion Processes

Project Staff	Principal investigator: Prof. CJ Banks Associate investigator: Dr Y Zhang
Start year	2007
Finish year	2010
Funding body	Defra

Objectives

The aim of the work was to better understand the factors influencing the stabilisation of the organic fraction of municipal solid waste (MSW) in the anaerobic digestion process. In particular the research addressed whether stabilisation, as judged by volumetric gas production, solids destruction and bio-stability of the residues, could be improved by co-digestion with other organic wastes from industry, commerce and agriculture. By understanding the basic factors that control the rates of anaerobic degradation, such as nutrient ratios, fibre composition, and build-up of recalcitrant materials, it is hoped to establish standard operating conditions providing a higher degree of quality assurance for the gaseous, fibre and liquor products recovered. A further environmental goal is to assess the impact on the 'value' of the final residues by the inclusion of organics derived from post-collection segregation.

Work programme

The project involved the following key activities

1. Characterisation of two municipal waste streams used in a baseline study: one from source segregated material and one after post collection segregation.
2. Identification and selection of potential co-substrate feedstocks from the commercial, industrial and agricultural sectors.
3. Characterisation of identified co-substrates for digestion.
4. Determination of biochemical methane potential from the two MSW substrates both in isolation and combination with co-substrates from commercial, industrial and agricultural sources.
5. Laboratory-scale trials using both types of MSW and co-substrates to determine process loading rates and reactor conditions for optimisation of biogas production.
6. Digestion trials at a technical scale to validate laboratory data and establish standard operating conditions.
7. Assessment of the characteristics of digestates (including separation of the solid and liquid fractions) from different mixtures of substrate for their potential value as agricultural products.
8. Measurement of the biostability of the solids separated fraction of digestates from different mixtures of substrates in relation to landfill acceptance criteria. .



Collaborators:
Greenfinch Ltd

Publications:

Zhang, Y. and Banks, C.J. (2012) Co-digestion of the mechanically recovered organic fraction of municipal solid waste with slaughterhouse wastes. *Biochemical Engineering Journal*, 68, (15), 129-137.

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Zhang, Yue, Banks, Charles J. and Heaven, Sonia (2012) Anaerobic digestion of two biodegradable municipal waste streams. *Journal of Environmental Management*, 104, 166-174.

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Zhang, Yue, Banks, Charles J. and Heaven, Sonia (2012) Co-digestion of source segregated domestic food waste to improve process stability. *Bioresource Technology*, 114, 168-178.

(doi:10.1016/j.biortech.2012.03.040).