TRIF PS - Particle size requirements for effective bioprocessing of biodegradable municipal waste

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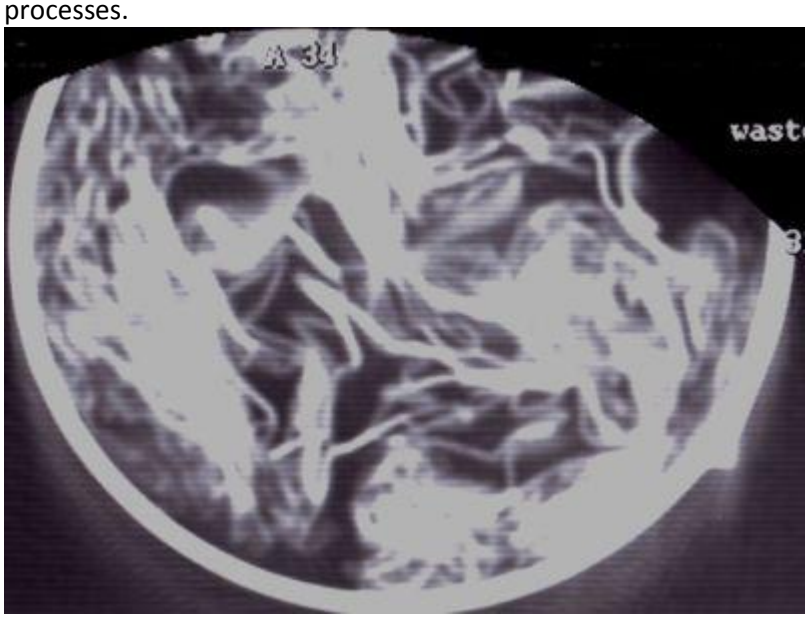
• 40-litre reactors for kinetic studies at different particle sizes

Project description

One of the fundamental factors affecting the efficiency of bioprocessing by either the aerobic or anaerobic route is particle size. This is because it influences many of the processes taking place: for example degradation rate, structural strength and stability, movement of liquids and gases, de-waterability, provision of macro and micro environments, and pathogen destruction. The effects can be positive or negative, and action to improve one property may adversely impact on another. This often results in a compromise in selection of pre-treatment methods, substrate types, and even the kind of process that can be applied. The research thus looks at particle size effects as a generic theme of fundamental importance to the treatment and diversion of biodegradable waste.

Experimental programme

The first phase of the work considers the pre-treatment processes currently in use for mixed and source-segregated wastes, and other technologies that could be applied. These will be classified in terms of performance for different material types. Experimental work will then be undertaken to assess degradation rates for feedstock materials in different particle size ranges, using laboratory and pilot-scale aerobic and anaerobic reactors. Rates of degradation will be assessed using kinetic data from in-situ monitoring and analytical testing, and practical interventions to optimise performance will be identified. Novel methods involving freezing and CAT scanning will be used to examine waste structure and its implications for gas and liquid flow. The results will directly benefit both the practical design of pre-processing plant and advanced modelling of waste degradation processes.



• CAT scan of waste materials

Collaborators:

University of Leeds
Greenfinch Ltd
ORA Ltd

Publications:

Zhang, Y. and Banks, Charles J. (2013) Impact of different particle size distributions on anaerobic digestion of the organic fraction of municipal solid waste. Waste Management, 33, (2), 297-307. (doi:10.1016/j.wasman.2012.09.024).