SUE Waste Project 3 - Appropriate scales and technologies for bioprocessing of organic urban wastes including energy production from anaerobic digestion

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Related website	http://www.suewaste.soton.ac.uk/	

• Centralised green waste composting

Issues

At the start of this project, the UK had some successful examples of large-scale green waste composting schemes, but virtually no infrastructure for dealing with organic kitchen wastes (excluding paper and cardboard packaging) arising in the home or from catering establishments. This type of waste can account for as much as 20% of the domestic wastestream. The quantity generated via other sources is not accurately known because of the manner in which it is currently dealt with. Even if this material is source-segregated in the future, bioprocessing it presents problems since the

EU Animal By-products Regulations do not permit land disposal of catering wastes including domestic kitchen waste unless it has undergone both biological and heat treatment. Considering the outbreak of foot and mouth in the summer of 2001 and the continuing consequences of BSE, these regulations are both sensible and necessary, and are in line with the precautionary principle.

Technical options

Options for treatment and disposal of kitchen and catering wastes are thus limited, with further restrictions due to the physical nature of the waste. Kitchen waste is typically only 15-20% total solids, and even if collected 'dry' it soon compacts to form almost a slurry: this makes it unattractive for composting, which requires a more stable matrix to allow the passage of air. The requirement of the EU Animal By-products Regulations for reduction of particle size to < 9 mm compounds the problem, as the material becomes even more slurry-like. Collection of mixed green and kitchen wastes is clearly not a sensible option as the entire wastestream then requires processing to the high level demanded by the Regulations. Aerobic composting of green wastes from gardens, parks and cemeteries has been successful, but questions remain concerning economics of scale, and the relative environmental impacts of transporting bulky, wet materials long distances to centralised composting plants with a high degree of process control, versus uncontrolled home composting with its potential for methane release and health impacts.

• Typical kitchen wastes

Research activities

The project included theoretical and experimental work. The theoretical component involved assessment of appropriate scales and technologies for urban bioprocessing plant, based on the methodologies developed for a similar SUE Waste project led by Imperial College on thermal processing of urban waste. This was complemented by research looking specifically at 'best value' and BPEO for green wastes in the Hampshire area. The work took a holistic look at the options for green waste management, including economic and environmental criteria such as energy costs and equivalent CO2 emissions from transport of green wastes and compost products, mechanical pre-treatments, process control, leachate treatment and other factors involved in centralised, community or home composting schemes. The experimental part of the work looked at anaerobic digestion as a technique for management of source-separated kitchen and catering wastes, and at the economic and environmental costs and benefits of composting options including home composting.

• Greenfinch research digester

Deliverables

a) Data and methodologies for rational selection of bioprocessing plant and management options for urban organic wastes (Imperial College leading, with input from Soton).
b) Characterisation of organic waste residues from a multifunctional catering service, and development of management strategies to meet the requirements of the Biowastes Directive (Soton).
c) Loading limits for different configurations of AD plant treating kitchen and mixed catering wastes (Soton).
d) Energy balance for a typical kitchen waste digester (Soton).
e) Data on the microbiological safety of digestion products, the effectiveness of proposed measures in the EU Animal By-products regulations, and their impact on energy balance (Soton).
f) An estimate of the environmental impact of home composting compared with centralised treatment of urban organic wastes (Soton).
g) Energy flow data on bioprocessing of catering and domestic green waste for modelling of the sustainability of these practices (Soton leading, input from IC).

• Progrow from Hampshire green waste

Collaborators:

Imperial College
Greenfinch Ltd
Onyx Environmental Group PLC