Biogas potential in Australia:

Environmental and techno-economic considerations

Bernadette K. McCabe

National Centre for Engineering in Agriculture, University of Southern Queensland, Toowoomba, Australia

Email: Bernadette.McCabe@usq.edu.au

Introduction

Anaerobic digestion (AD) of waste to produce biogas is only in its infancy in Australia, however, there is significant potential for biogas production. Recent reports indicate that Australia produces approximately 25 million tonnes of organic waste per year from livestock industries alone. This in turn accounts for a large portion of national greenhouse gas emissions and as such unused organic residues and waste represent a significant under-exploited resource.

Current biogas status

The majority of Australia's AD industry are associated with municipal waste water treatment plants (WWTP) with most sites employing cogeneration (CHP) units (Figure 1). Numbers for industry and agricultural AD facilities are difficult to obtain, however, an estimate has been provided in Table 1[1]. Renewable energy provided 14.8% of Australian electricity generation during 2013. Bioenergy totalled 6.9% of this, with biogas contributing to about 2% of the share of total renewable electricity capacity[2]. However, electricity generation from AD installations has shown most growth over the past five years. Goals of 2,413 and 55,815 GWh for bioelectricity were set for 2020 and 2050 respectively, to which on-farm AD and AD using biowaste and industrial organics are key contributors[3].

Table 1: Number and type of AD for bioenergy generation in Australia (2013)

Anaerobic Digestion Feedstock Category			
WWTP Sewage sludge	Biowaste (residential and commercial)	Agricultural (on-farm AD)	Industrial
46	4	15	13

Figure 1: Australian AD installations [4]

Figure 2: Example of a covered anaerobic lagoon treating abattoir wastewater

Drivers for biogas

Recently there has been considerable interest in biogas technology in the intensive livestock and red meat processing industries driven by a range of factors. These include:

- rapidly increasing energy and fertiliser costs
- odour emission and urban encroachment onto traditional rural areas
- the potential for improved regulatory compliance
- and various points related to the reduction of carbon footprint

Covered anaerobic lagoons, sometimes called ponds, are the preferred type of technology for Australian agricultural industries. They are a relatively low cost option which perform well under the warmer conditions and are supported by the available land space. Figure 2 illustrates an example of a recently commissioned high rate anaerobic lagoon (COHRAL) which treats abattoir wastewater and utilises the biogas on site.

Environmental and techno-economic considerations

The slow uptake of biogas of AD facilities has been due to the difficult financial environment, policy uncertainty and grid connectivity. One of the reasons behind the small number of plants currently operating in Australia lies in the underlying cost and performance of the technology. The main issues can be summarised as:

1. Predicting biogas: There is no reliable data to support biogas for some industries (for example the beef feedlot industry).
2. Construction risks.
3. Regulatory requirements: Different states impose different levels of regulation.
4. Certainty of revenue or costs savings generated by using or selling energy output or fertiliser.
5. Financial performance: currently no direct government support.

References

[1] Based on information provided by grant agencies and the Clean Energy Regulator (courtesy Joel Edwards, RMIT)

[2] Clean Energy Council, "Clean Energy Australia" , Canberra 2013.

[3] Clean Energy Council, "Australian Bioenergy Roadmap", Canberra, 2008.

[4] Source: https://batchgeo.com/map/2fb1cc9f27a39cb7b37562b95c32bcf4 (courtesy Joel Edwards, RMIT)