

Piggery waste a valuable resource



Piggery waste is a major and rapidly growing problem in China and other countries. Effective ways to manage this waste are needed urgently. Not only does piggery waste contain valuable nitrogen and phosphorus, but treatment with the right biodigester can also produce energy in the form of biogas. CRC CARE is working with partners in China to turn a large pollution problem into revenue from recovered nutrients and biogas energy.

A 700-million pig problem

China has 1.8 million pig farms and over 700 million pigs, supplying two-thirds of the nation's meat consumption. The waste from this industry is estimated at 1.4 million tonnes of pig excreta and 7 million tonnes of urine per year. At present 90% of this waste is discharged untreated, polluting nearby environments with large amounts of nitrogen, phosphorous and other compounds and contaminants. As well as damaging ecosystems, this waste poses a threat to human health.

The nutrient in waste generated annually by 1000 pigs is equivalent to 50 tons of fertiliser, which translates to potentially millions of tons across the whole of China. Furthermore, the digester technology best suited to dealing with this waste produces biogas, which can be used by local communities for cooking and heating.

However, despite the high potential value of the pig waste, cost-effective treatment technology is yet to be refined and deployed.

In collaboration with Huazhong University of Science and Technology, Wuhan Province, and Hong Kong-based HLM Pty Ltd, CRC CARE is working on new, appropriate technology to treat pig waste locally.

The main scientific and technical challenges faced by CRC CARE are the high nitrogen (N) and phosphorus (P) loads in pig waste compared with domestic sewage, the small scale of current biogas reactors, the slow rate of digestion, the limiting influence of low temperature, and the presence of heavy-metal contaminants that limit the use of residues as fertiliser.

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Unique design

CRC CARE and its research partners have developed a two-step anaerobic reactor (or biodigester) for pig waste – known as pooCARE™ – and established optimal settings for load and digestion time. The biodigester's innovative horizontal, underground design allows it to operate more efficiently and at larger scales than traditional vertical biodigesters, and also to operate through the cool winter months.

By using a particular combination of anaerobic treatments, pooCARE is able to produce clean biogas energy. This has been demonstrated in the field and the technology is being scaled up to treat larger volumes of wastes from a number of piggery farms.

A fertile harvest

The experimental biodigester can:

- remediate 200 tonnes of piggery waste daily (73,000 tonnes annually)
- produce 380 m³ biogas daily (138,700 m³ annually)
- produce 5600 tonnes of fertiliser annually.

Supplied as heating fuel for the piggery or cooking fuel for nearby residents, the biogas will generate annual income of 270,000 Yuan (\$A48,000)¹ at current energy prices.

Assuming a price of 600 Yuan (\$A91) per tonne of fertiliser, the potential income from selling the fertiliser from the initial experimental plant will be 3,360,000 Yuan (AUD \$600,000) per year.

Looking to expand

As these and other results accumulate, CRC CARE will be in an increasingly strong position to design and offer unique technology and solutions in the sustainable treatment of animal waste. Whether the CRC derives an income stream from intellectual property (with equipment made in China), or whether it branches out to supply new research services in the field, the market in China, India and the rest of Asia is already very large and needs clean solutions now. Excellent potential exists for the CRC to include Australian business partners in packaging and delivering new technology and services in this field across Australia and the Asian region.

To enquire about pooCARE, contact CRC CARE Waste program coordinator Jayant Keskar at jayant.keskar@crccare.com.

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The pooCARE biodigester on site in China



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¹ Currency conversions as of August 2013