

Conversion of pig effluent into energy and fertilizer



Background

For many years the owners of Charles I. F. E. had problems with disposal of the waste from their 1200-head pig farm. The piggery produces a daily average of 210 000 litres of slurry with an organic solids content of 1.7 per cent. This is comparable to the sewage output of a town with a population of 30 000–40 000 people.

Liquid manure, composed of a suspension of faecal and urinary waste including spilled feed, hair and bedding, was size segregated by screening. The retained solids were spread over the farm land and the liquids were held in a large reservoir for summer irrigation.

The company received many complaints about this disposal method which was far from odour-free and which wasted a potentially valuable resource.

Cleaner Production

To resolve the problem, the company decided to introduce the process of anaerobic digestion in which organic waste, in this case pig effluent, is broken down by bacteria in the absence of oxygen and at an optimum temperature of 35 °C. The bacteria produce biogas and their dead bodies provide an excellent odourless organic soil conditioner that has resulted in dramatic improvements to the farm's cropping programme. Charles I. F. E. was assisted financially by an interest-free loan from the Victorian Government's Cleaner Production Grant Scheme.

Enabling technology

The new technology involved:

- ❖ an automatic flushing system to clean the effluent from the pig sheds;
- ❖ a grit removal machine;
- ❖ a high-rate dissolved air flotation unit to concentrate the solids and produce biogas;
- ❖ a cogeneration plant to produce electricity and hot water; and
- ❖ the development of an organic soil conditioner called Perma Fert.

The technology base was of Italian origin but Charles I.F.E. developed some significant and unique modifications to the system during construction and commissioning stages, especially in the digestion phase which is two stage but also continuous, enabling it to cope with all wastes, including excess non-digested feed.



Advantages

No longer does the farm have to dispose of 210 000 litres per day of noxious high strength pig waste. The farm sells 'grit', which it separates from the effluent, to a local worm farmer. The farm now uses 70 per cent less water because it recycles water that is separated by the high rate dissolved air flotation unit. The plant produces 1700 m³ of biogas per day which is converted to:

- ❖ 3840 kWh of electricity per day;
- ❖ 28 800 megajoules per day of energy in the form of hot water.

The plant produces approximately four tonnes of humus solids per day which it uses to increase crop yields or to produce a fertilizer called Perma Fert. The plant produces 100 000 litres/day of nutrient rich liquor for irrigation or fertilization. The Environment Protection Authority buffered zoning, requiring the owners of the farm not to spread effluent in certain areas, has been removed. There are far fewer flies and rodents around the farm. The neighbours are much happier as the odour has almost totally disappeared.

Economic benefits

	\$Aus/year
Savings and electricity	100 000
Improvements to cropping, sales of Perma Fert	300 000
Running costs	2500
Net savings	397 500
Capital investment	1 800 000
Payback period	5 years



Country

Australia (Victoria)

Industry

Agriculture

Company

Charles I.F.E. is a family company involved in the agricultural industry. The major enterprise run by Charles is a 1200-head intensive piggery.

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