

Total waste management system at Berrybank Farm Piggery, Charles I.F.E. Pty Ltd

SUMMARY

Charles Integrated Farming Enterprises Pty Ltd (Charles I.F.E. Pty Ltd) is saving \$435 000 per year from a \$2 million investment in a Total Waste Management System for its Berrybank Farm. The System involves generating electricity from biogas, conserving and recycling water, and collecting waste for sale as fertiliser. Despite the large investment, most of which went into the electricity generation equipment, the technologies and methods used are simple and straightforward. Many of the measures simply involve good housekeeping, such as putting timers on pumps to ensure water is not wasted if taps are left on.

HIGHLIGHTS

The capital cost of the Berrybank Farm project was approximately \$2 million and the economic payback investment will take about six years, but the immediate environmental benefits as a result of cleaner production are enormous.

BACKGROUND

Charles I.F.E. is finding that the old farming philosophy of wasting nothing makes good business sense. The waste from one part of a farm is the input to another. Along the way, the company has eliminated environmental problems such as odours and groundwater contamination. At the same time, it has dramatically reduced consumption of water, one of Australia's most precious resources.

Pigs do not utilise all of the feed they consume—more than half of the feed used is returned as waste.

Charles I.F.E., the company that runs Berrybank Farm at Windemere in Victoria, considered this a poor return on investment as well as a poor use of resources and decided to seek ways to improve the efficiency of the operation. The company also wanted to relieve the pollution problems associated with the odorous waste from the piggery, and to find ways of reducing its consumption of 400 000 litres of bore water per day.

THE CHALLENGE

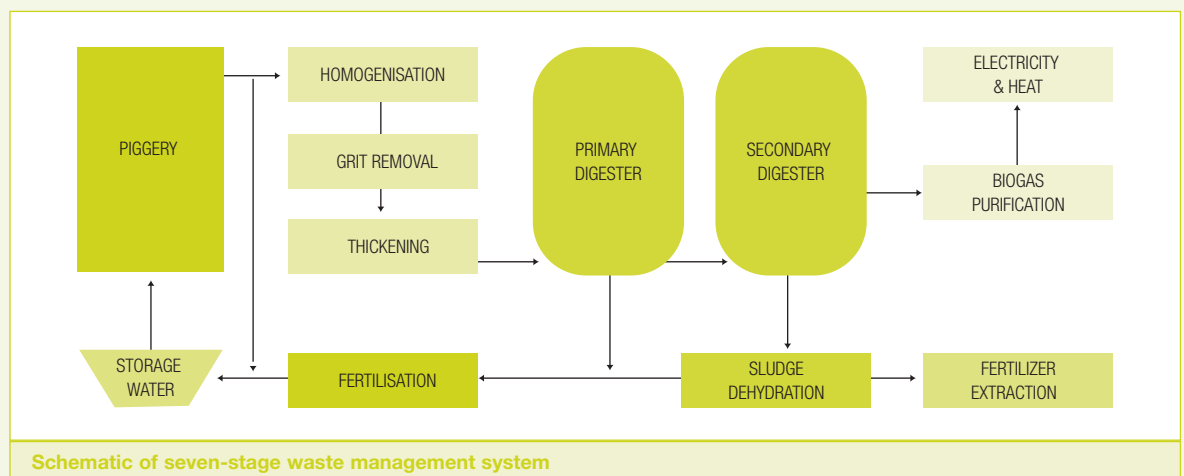
Berrybank Farm is home to 15 000 pigs with an estimated live weight of 800 tonnes. It produces a daily average of 275 000 litres of sewage effluent with an organic solids content of approximately 2%. This is roughly the same as the sewage output of a town with a population of about 50 000 people.

THE SOLUTION

Berrybank Farm has developed a sophisticated waste management system to recover all the waste from the pigs and to treat it so that the various by-products can be used on the farm (as flush water, gas for electricity, and fertiliser) or sold at a profit.

The waste management system is a seven-stage process—shown schematically below—including automatic and continuous waste collection, grit removal, slurry thickening, primary digestion, secondary digestion, biogas purification and a cogeneration thermic plant. The process was implemented in November 1989. Electricity production commenced in 1991.

The farm modified the existing drainage around and under the piggery to recover the waste products, and installed automatic flushing valves and linked them to the main pumping station. The valves are solenoid-activated and enable remote-controlled flushing at various times of the day, working in a somewhat similar way to an automatic watering system in a domestic garden.



Schematic of seven-stage waste management system

Meat and bone meal fed to the pigs contains granules of bone and this passes through the pig and into the effluent. The grit from these granules resides in the slurry and is removed by simple sedimentation. This is important, as the grit can damage the internal pump mechanisms.

The slurry is then pumped to the thickening plant, where the finer suspended solids are separated from the water. The clarified water is recycled, either as flush water in the piggery, put into storage, or applied directly to the land as fertiliser.

The thickening plant separation process is a combination of an existing screen and a newly developed flotation system. Flotation allows the separation of water from the smaller suspended particles; this is not always possible using other processes.

The primary and secondary digesters are where the anaerobic digestion takes place. Anaerobic digestion is a biological process very similar to the production of naturally occurring swamp gas, where bacteria break down rotting vegetation to produce gas. A digester simply provides the ideal conditions for the process to proceed at a faster, more controlled rate, by excluding air, thoroughly mixing the contents and maintaining optimum temperatures. A photo of the primary digester is shown below.



Primary digester

The biogas is then purged of potentially damaging sulfur by scrubbers, traps and a dehumidifier before being pumped to the co-generation thermic plant, where it is converted into thermic heat and electricity. The plant currently produces 180 kW/h of electricity for 16 hours per day (enough to power over 400 households) and has the potential to considerably boost this output.

Heat is used for the primary digester, while electricity not used on the farm is sold to large power producers. The farm's feed mill consumes 60% of the electricity generated during the day.

The solid and colloidal parts of the digested slurry are separated from the water by centrifuge. This reduces the bulk of the slurry by up to 90%. The end result is composted humus—a valuable fertiliser for the farm and the domestic potting mix market. The separated water also has enough residual nutrients to replace the use of chemical fertiliser when applied to cropping land. The farm can use this fertiliser (both liquid and solid) on 80% of their cropping land.

THE BENEFITS

Each day the farm now recovers:

- approximately 7 tonnes of waste solids at 35% dry matter, used as fertiliser;
- 100 000 litres of recyclable water;
- 100 000 litres of mineralised water, used as fertiliser; and
- 1700 cubic metres of biogas, able to run a cogeneration electricity program with a daily output of 2900 kW of electricity.

The capital cost of the Berrybank Farm project was approximately \$2 million. Berrybank Farm estimates that the economic payback on its investment will take about six years (this was achieved), but considers the immediate environmental benefits to be enormous. As a result of cleaner production, Berrybank Farm has also achieved:

- 70% reduction in water usage;
- improved stock conditions;
- improved working conditions for staff; and
- elimination of odour.

Annual estimated savings as a result of cleaner production are shown in the table.

	Saving
Electricity	\$125 000
Water	\$50 000
Fertiliser	\$250 000
Total annual savings	\$425 000
Payback period	6 years

Incentives

The cleaner production incentives for Berrybank Farm were both financial and environmental. Berrybank wanted to change its image in the community—from an environmental problem to a welcome industry that offered a good working environment.

THE FUTURE

In terms of the success of the cleaner production initiatives over time, Charles IFE continues to reap the rewards. Environmental considerations are integral to the management of Berrybank Farm. The philosophy is that humanity should live with the environment.

In 2001, Charles IFE supplied liquid and solid organic fertiliser from the piggery to two garden product companies who use the organic fertilisers in their potting mixes and soil conditioners. The final product is sold to numerous sporting fields, bowls greens, golf clubs and racecourses. Notably, organic fertilisers have been found to have advantageous properties over chemical fertilisers in that grass roots penetrate deeper and turf recovers faster. As a consequence, the benefits of the cleaner production initiatives at Berrybank Farm flow-on through the replacement of chemical fertilisers and reduced maintenance at sporting venues. A new case study was documented in 2001 for the production of biological soil conditioner at Nutrathem Australia, one of the companies receiving organic fertiliser from Berrybank Farm.

PROJECT DETAILS

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Implementation: 1989
Further initiatives: 1991
Case study initially prepared: 1998
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Australian Centre for Cleaner Production