IEA BIOENERGY TASK 37: Energy from Biogas Workshop

Small Scale AD technology for livestock farming in Australia

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Overview of biogas developments in Australia

- Biogas capture more common in municipal waste treatment and landfill industry
  - Most sites employ cogeneration (electrical power and heat) units

Substrate/Plant type	Estimated Number of plants	Number of plants from 2015 survey	Estimated Production (GWh/year) *
Sewage sludge	49	19	221
Biowaste	4	2	15
Agriculture	20	9	27
Industrial	33	11	39
Landfill	49**	-	1140**
Total	**155**	**41**	**1442**

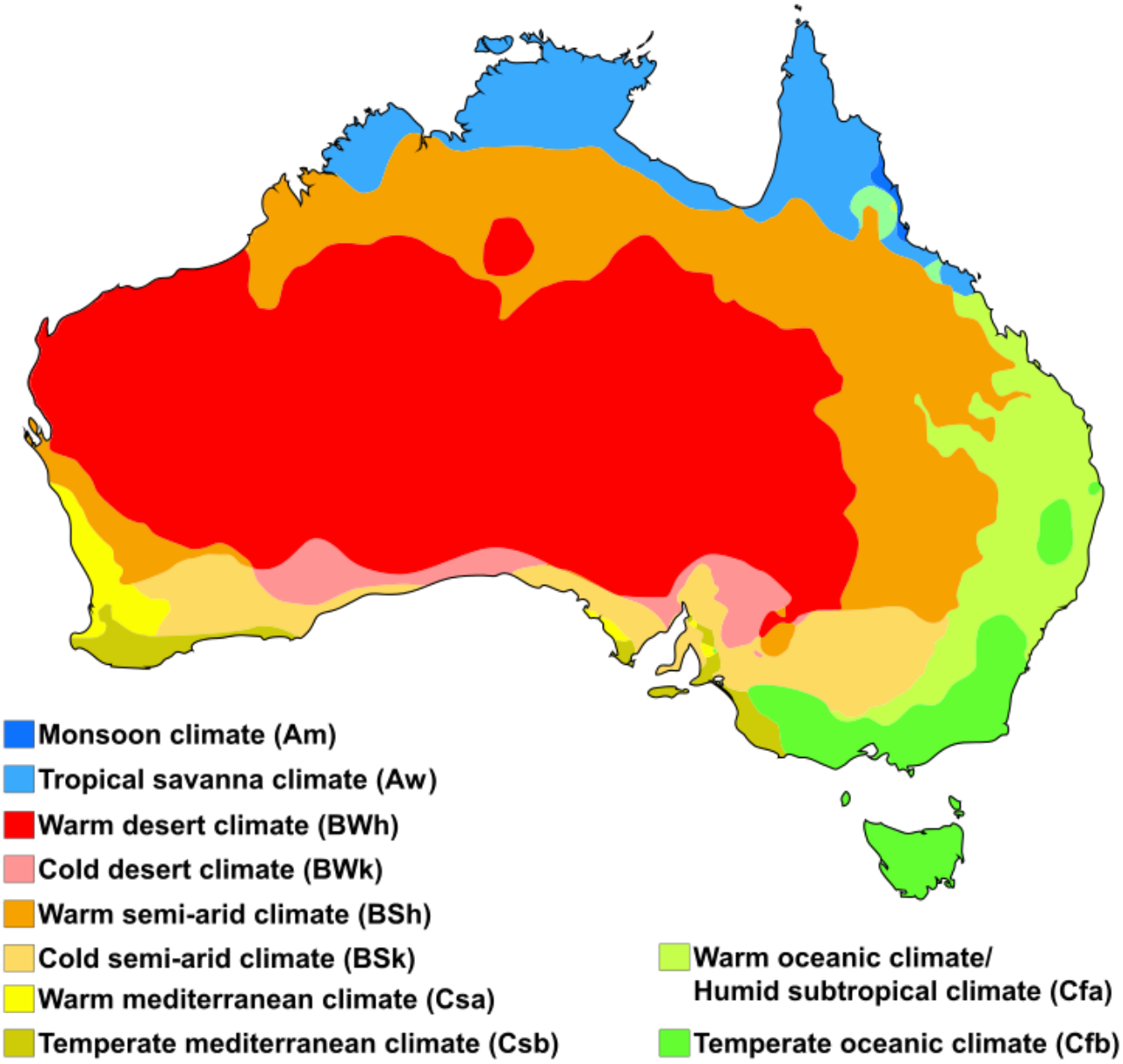
*Calculated from the estimated electricity production and an assumed efficiency of 35% with 70% methane content in biogas.

**From 2006 Sustainable Power Plant Register, Australian Business Council for Sustainable Energy.

Location of biogas facilities in Australia

Source https://batchgeo.com/map/2fb1cc9f27a39cb7b37562b95c32bcf4
(does not contain up to date data)

Australia map of Köppen climate classification



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https://en.wikipedia.org/wiki/Climate_of_Australia#/media/File:Australia_map_of_K%C3%B6ppen_climate_classification.svg

AD in the livestock industry and technology

- Intensive livestock industries in Australia have been slow to adopt biogas technology

  - Relatively inexpensive alternative energy sources
  - Relatively high cost and lack of proven technology suitable for Australian production systems
  - Absence of Government incentives, in comparison to other countries

Current biogas drivers

- Rapidly increasing energy costs
- Odour emission and urban encroachment onto traditional rural areas
- Potential for improved regulatory compliance
- Potential for higher value liquid and solid by-products (organic fertiliser)
- Move to larger, more intensive production units
- Reduced carbon footprint
  - Reduced economic liability under a possible carbon emissions reduction scheme
  - Possible renewable energy credits
  - Reduced consumption of fossil fuels

Covered Anaerobic Lagoon (CALs) Technology

- Covered anaerobic lagoons are the preferred technology to treat livestock waste and waste water from food processing plants
  - Climatic conditions and land availability

- Benefits
  - Opportunity to control odours
  - Capture of greenhouse gases
  - Use of biogas to generate heat and power

CAL: Rendering plant, Beaudesert, Queensland

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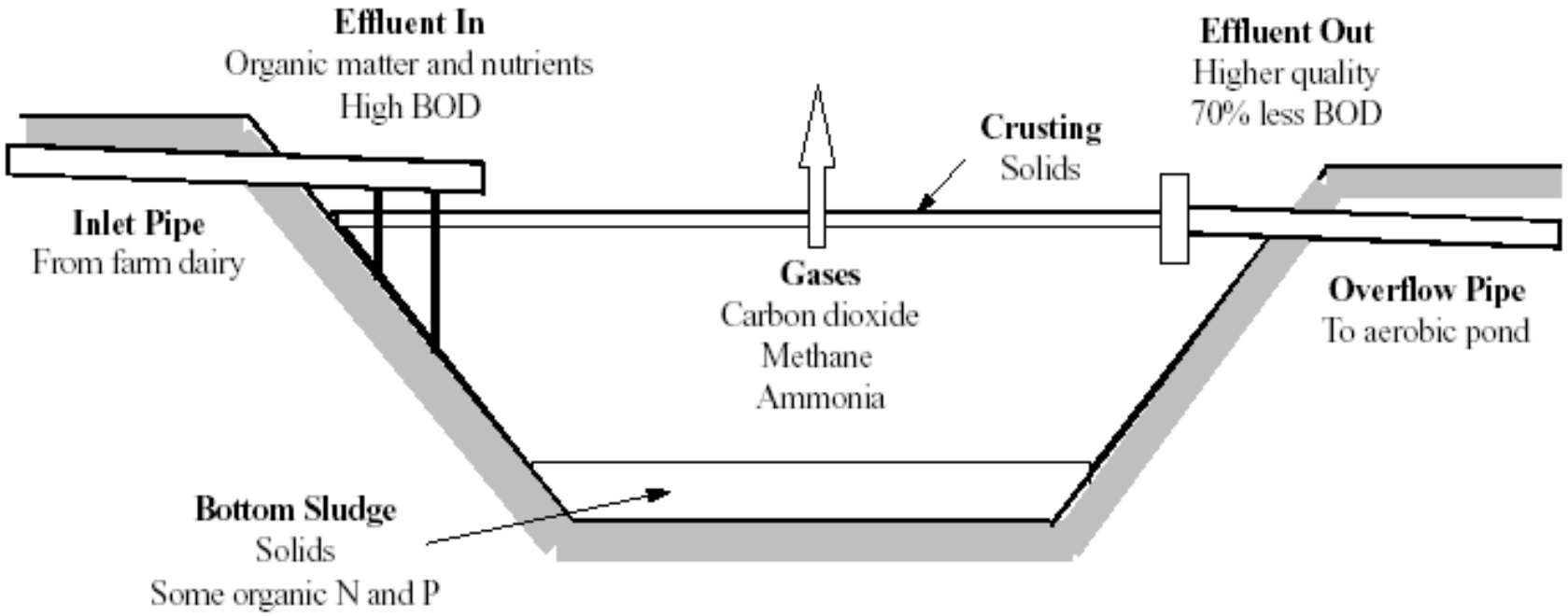
CAL Technology

- Simple to build and operate
- Significant reduction in BOD
- Require greater volume (∴ area/footprint)



http://ponce.sdsu.edu/ramadan/stabilizationponds03.gif

Overview of adoption in intensive livestock and meat processing industries

- Pork industry
- Dairy Industry
- Poultry Industry
  - Meat chicken (broiler)
  - Eggs
- Beef cattle feedlots
- Red meat processing industry

Case Studies

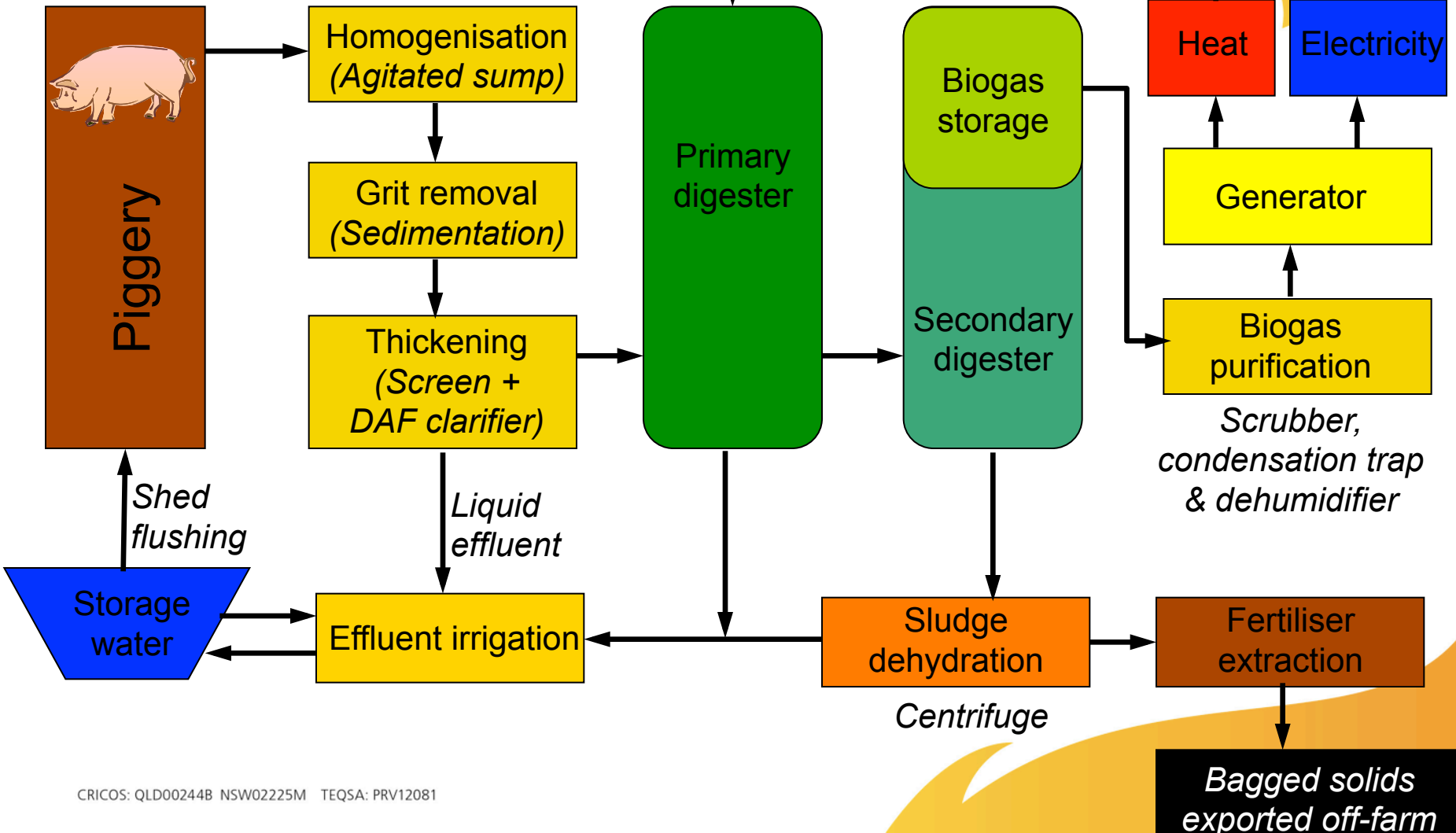
- Pork industry

1. Berrybank Piggery, Ballarat, Victoria

2. Bears Lagoon piggery, Bendigo, Victoria

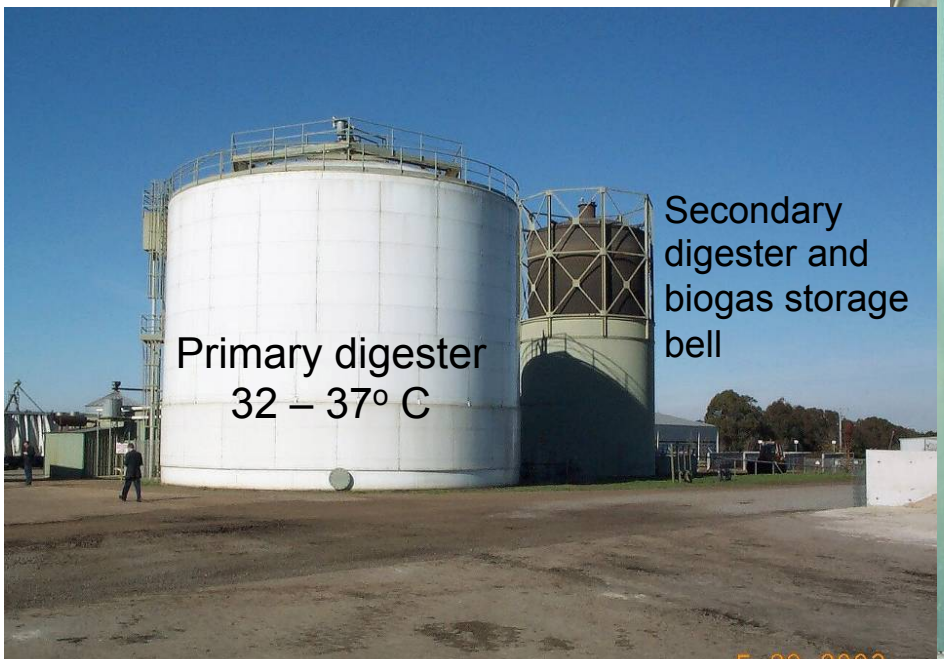
Case Study 1: Berrybank Piggery, Ballarat, Victoria

Berrybank piggery waste management system
Schematic drawing

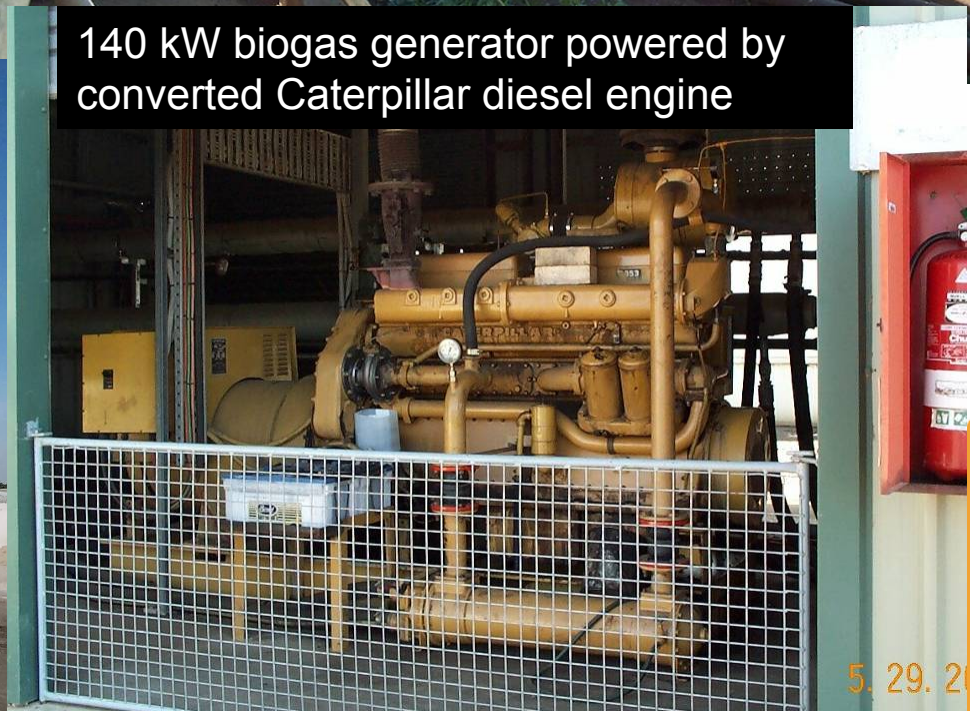


Raw piggery effluent is collected and agitated in a sump and transferred to this homogenisation pit

Grit removal system



140 kW biogas generator powered by converted Caterpillar diesel engine



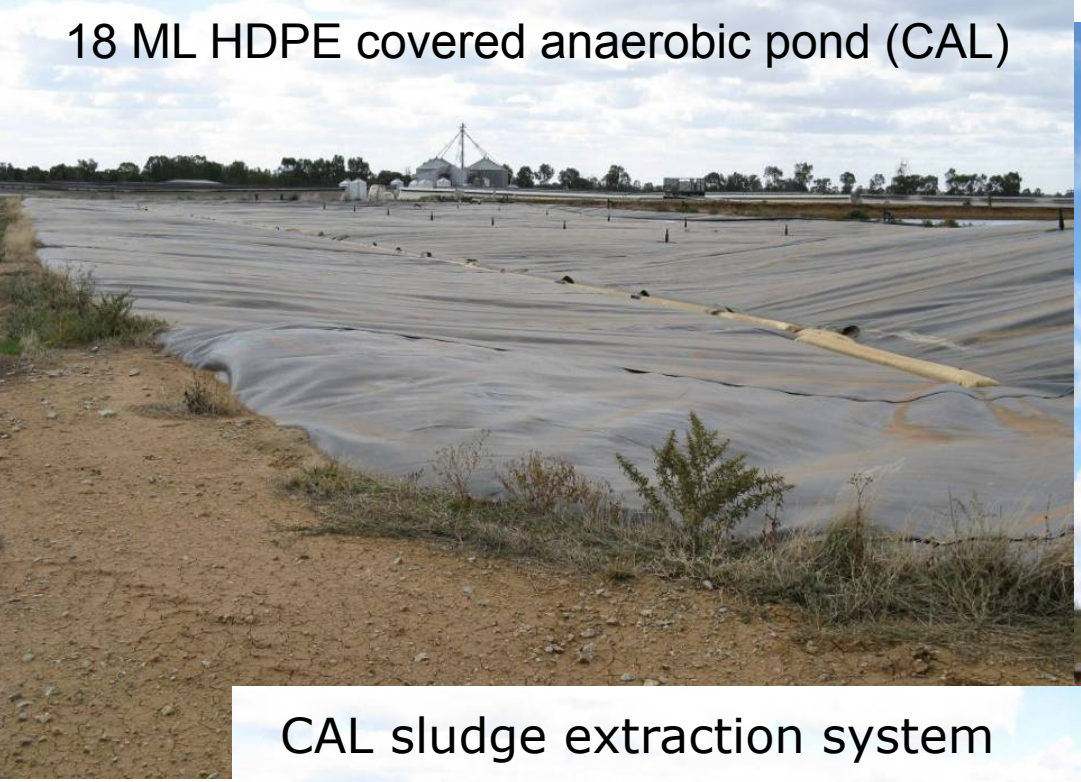
Robot stacker on fully automated bio-solids bagging plant producing approx 1 million x 30 L bags per year of compost, potting mix and manures

Loading truck with bagged bio-solids (compost, potting mix and manure) for commercial market

Irrigating excess liquid effluent onto pasture using a travelling boom irrigator

Case Study 2: Bear's Lagoon Piggery

18 ML HDPE covered anaerobic pond (CAL)



Biogas flare

CAL sludge extraction system

CAL Performance

- CAL removed 64% VS and 71% COD from screened shed effluent.
- Mean daily biogas production: 3350 m^3/day, screened.
  Range: 2550 (Winter) – 4030 (Summer) m^3/day.
- Biogas yields increased following removal of screens.
- Mean methane concentration 63.2%.
- Mean biogas energy value: 71,600 MJ/day.
- Power generation potential: 5000 kW.hr/day.
- CAL sludge accumulation rate: 0.00094 m^3/kg TS added.
- Currently considering options for beneficial use of biogas.

Thank you

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