

ANAEROBIC DIGESTION

A PRACTICAL GUIDE

AT A GLANCE

Best suited to:

Intensive livestock and food processing businesses

Main benefit:

Can help cover on-site power needs and manage waste

Main barriers:

Upfront costs and labour-intensive operation

Good first step:

Confirm the availability of long-term, reliable feedstock

Image: Blantyre Farms





OVERVIEW

Anaerobic digestion is a biological process where microorganisms break down organic materials (such as manure, food waste, or crop residues) in the absence of oxygen. As the nutrients are digested by bacteria, biogas is produced (mainly methane and carbon dioxide). The gas can be captured and used:

- Directly, by burning it for heating or in fuel boilers.
- To create electricity, by fuelling a reciprocating engine or gas turbine to operate equipment like chillers or dairy vacuum pumps, or to export to the grid.
- To produce biomethane which can be used as a replacement for fossil gas once the gas has been cleaned.

The remaining material (digestate) can be used as a nutrient-rich fertiliser.



SUITABLE BUSINESS TYPES

The most suitable business types produce a lot of organic waste or residue, such as manures or straws. Such business types include:

- Intensive livestock farms such as piggeries and feedlots.
- Food processing plants such as abattoirs.
- Horticulture with consistent crop residues (may need to be mixed with poultry or other similar waste).
- Wastewater management.
- Farms that collect liquid, slurry or semi-solid manure at a single point of collection every day or every second day.
- Businesses that can co-digest manure with feedstocks from nearby operations (e.g. fats, oils and grease, food waste, cheese or wine waste), which can increase biogas production – pre-processing equipment and holding tanks may be required.



BENEFITS

There are a number of potential benefits associated with anaerobic digestion, including:

- Systems can be designed to produce and store energy (electricity, heat, or biomethane) 24 hours a day.
- Environmental benefits including reducing carbon emissions through methane capture. Methane reduction incentives may be available.
- Manages waste and reduces odours.
- Produces digestate that can replace synthetic fertilisers.
- Potential to generate additional income by exporting excess energy to the grid or receiving payments under carbon credit systems.
- Improves nutrient management and bio-security.



CHALLENGES

Some of the challenges to consider include:

- High upfront capital costs mean a project's economic viability depends on scale and energy prices.
- Operation can be labour intensive.
- Each system is bespoke, designed according to the feedstock available.
- Systems require significant and consistent feedstock supply for the economic life of the project.
- Requires a good water supply (although this can be wash down or wastewater, as long as there isn't too much dilution).
- Operational complexity and maintenance needs – larger systems may need dedicated operational staff.
- There may be a long timeline for regulatory approvals, and there are compliance requirements to meet. Approvals are different for each state and can take years.

- Transport/logistics to bring sufficient feedstock can add cost.
- Compliance, such as with gas storage and environmental reporting, can be time consuming.



TECHNICAL CONSIDERATIONS

Infrastructure needed

A number of elements are needed for each system:

- Anaerobic digester tank – either an in-ground covered system or an above-ground sealed reactor.
- Feedstock collection and handling systems (e.g. manure scraping, pumps).
- Biogas storage system.
- Gas utilisation equipment (gas cleaning system and generator, boiler, or upgrading system).
- Digestate storage and handling facilities.

Grid connectivity

- While anaerobic digestion systems can operate off-grid, grid connection allows you to sell excess electricity (subject to local network rules). If grid export constraints exist, methane gas must sometimes be burnt off.
- Biogas can be used directly for heating without a grid connection.



IMPLEMENTATION CONSIDERATIONS

Land or space requirements

- Moderate space required depending on system size. Lagoons or covered ponds require more land; compact tank systems require less.
- Buffer zones may be needed for odour management.

Suppliers or service providers

- Most systems require specialist design and installation, which may not be available in some regions.



DECISION FACTORS

When this option may make sense

- Your business produces high levels of concentrated waste and has the space to establish an anaerobic digester.
- Your business incurs high waste disposal costs with waste suitable for anaerobic digestion.

When it may not be suitable

- You have limited capital or access to financing.
- You have low energy demand on-site.
- There is a lack of technical expertise or support available in your area.
- You run a small-scale or extensive grazing farm with dispersed manure.

Key decision criteria

Some factors to consider when deciding whether anaerobic digestion is right for you:

- The long-term availability and consistency of feedstock (i.e. waste volume).
- Whether co-digestion with external waste could help maintain a regular supply. This may involve additional costs for collecting the extra feedstock.
- Whether your electricity and heat needs align with the energy the produced gas can efficiently provide.
- Your proximity to grid, your grid capacity, and your access to energy markets for excess production.
- Costs for setting up anaerobic digestion facilities can be high, as the specification and design depend on volume and quantity of feedstock and the output.



CASE STUDY.

BLANTYRE FARMS

Blantyre Farms, near Young in New South Wales, is a mixed farming and livestock business combining broadacre cropping, beef, wool, and lamb production with an indoor piggery. The farm produces around 40,000 pigs each year and employs 40 staff.

Blantyre Farms uses piggery effluent to generate renewable electricity through an accredited biogas system. Effluent flows into a covered pond, where biogas is captured and refined into methane to run generators that provide electricity for the site. Excess renewable electricity is sold back into the national grid.

The system reduces methane emissions, with more than 100,000 carbon credits awarded since the project began. After biogas is harvested, solid effluent is spread on paddocks as fertiliser, reducing synthetic fertiliser use and helping grow grain that is fed back to the pigs.

For more information see: blantyrefarms.com.au



www.re-alliance.org.au/electrification