

AGAMA Prefab Digester - Basic Information Brochure - June 2009

Extend all your existing sustainable living activities; integrate all your current waste management activities composting, recycling, wastewater and water saving -into a 'one-stop shop' - and produce renewable energy on-site.

Achieve this with the AGAMA Prefab Digester, a living "machine" that has a range of beneficial bacteria as its "engine". These bacteria consume the biodegradable materials - biowastes -they are fed. The results are magic - free fuel and fantastic fertiliser!

The AGAMA Prefab Digester provides an integrated solid and liquid waste processing facility. Think of it as a sealed septic tank, to which various biowastes are added. It will vastly improve your management of useful resources - previously called wastes! - and provide valuable nutrients, energy and pre-treated water.

The free fuel comes in the form of biogas, a natural gas consisting primarily of methane, which is stored in the top of the AGAMA Prefab Digester and piped directly to the gas cooker. While the gas cannot be connected up directly to LPG appliances, it is used on a purpose-built biogas appliance. Biogas can also be 'cleaned' and used in a similar fashion to liquefied petroleum gas (LPG) for cooking, with the felt experience being identical.

It can also be used for electricity generation, usually in larger applications.

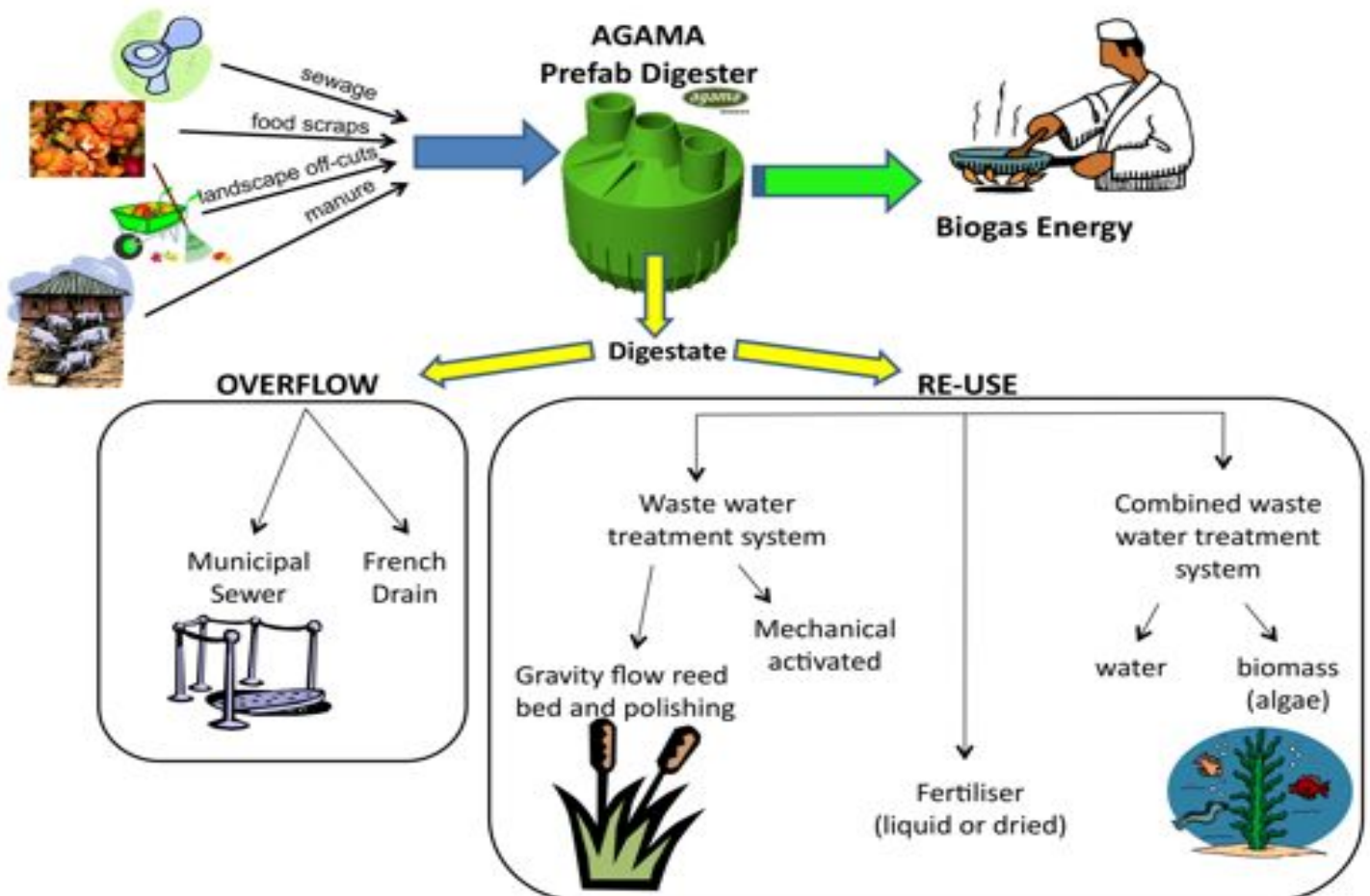
What are the benefits?

- Convenient, integrated waste management
- Renewable source of fuel
- Avoided waste to landfill
- Free fertiliser *
- Water re-use *
- Reduced carbon footprint

The AGAMA Prefab Digester specifications

The AGAMA Prefab Digester is 6m³ (6000 litres) total capacity. It is 2.2m in diameter and 2.5m high (including inlet, outlet and gas pipe risers). It can produce a maximum of 2m³ of biogas every day, which is equivalent to 4 hours burning time, 0.8kg LPG, or 3.5 kWh continuous electrical output. The biogas is captured and stored within the tank.

In order to produce the maximum possible biogas, the AGAMA Prefab Digester should be fed with 40kg of mixed organic raw material per day. The AGAMA Prefab Digester can take a maximum of 1000 litres of water per day.



Other things to note ...



No detergents, bleaches, acids etc should go into the system. Biodegradable compounds should be used at all times to avoid killing the good, gas-producing bacteria.

Non-biodegradable materials such as sand, plastic bags etc will block the system.

Provided no inorganic, difficult to digest or fibrous material enters the AGAMA Prefab Digester, sludge accumulation is very slow. The AGAMA Prefab Digester is designed to be pumped out about once every 10 years or so.

The digestive bacteria get lethargic in cooler weather resulting in up to 1/3 less gas in the winter months.

Feeding the AGAMA Prefab Digester

The more biodegradable material the AGAMA Prefab Digester is fed, the more biogas energy it will produce. Like all living beings its digestive process is sensitive to wide variations in diet, and so the daily feeding regime should remain as consistent as possible.

A rule of thumb is that any organic biodegradable material (except woody material) can be fed to the AGAMA Prefab Digester. Different feedstocks have different gas producing potentials, resulting in varying daily outputs. A kilogram of food waste yields 2 - 3 times the amount of biogas a kilogram of cow manure will!

A list of suggested raw material feedstock types:

- Kitchen Scraps
- Manure
- Landscape off-cuts (grass cuttings and other non-lignin materials)
- Sewage

Feeding a digester with biowaste



Further applications *



The AGAMA Prefab Digester overflow (digestate) can either be overflowed or used, as follows:

Overflow: into a sewer or French drain. This is the cheapest and simplest application, but with no fertiliser benefits

Re-use: nutrients in the digestate can be used to grow valuable biomass, which can be used as additional digester feedstock. This also cleans the digestate to permissible quality standards.

Options include:

- ○ Fertiliser drying beds or liquid fertilizer
- ○ Waste water treatment system (aerobic components) followed by water redistribution
- ○ Combined bio-energy water treatment system where a useful biomass is grown from the nutrients in the water as part of the wastewater treatment system

Any post AGAMA Prefab Digester options will be subject to the owner's preference and may be influenced by environmental parameters. AGAMA Biogas or other specialists can design these systems separately.



BIOGASPRO

Biogas Digester



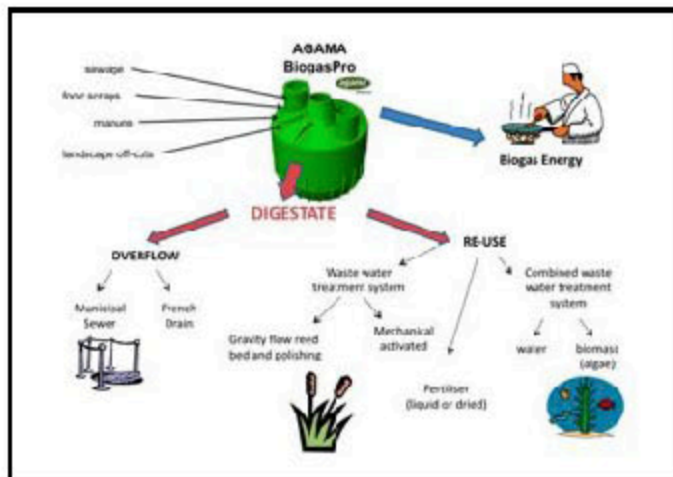
The **BIOGASPRO** is a prefabricated biogas digester designed specifically to meet the waste management needs of households. It has been developed using AGAMA Biogas expertise in the design and implementation of biogas systems, combined with ten years of experience and appreciation of the needs of customers and limitations of other systems. It can be used in the rural context as an on-site thermal energy generator; in the urban context as a sanitation and energy generation technology; and for all contexts, an integrated waste management system. The product is applicable for all households, and rural clinics, schools and community centres. The **BIOGASPRO** combined performance, features and competitive price provides the best small biogas digester value on the market.

It is highly reliable, with all quality assurance taking place in a controlled factory environment and having no moving parts prone to failure. It differs from all other small digesters, being fully prefabricated and incorporating unique design features that allow for co-digestion of multiple feedstocks.

KEY FEATURES & BENEFITS

Improved operation

Feedstocks – The multi-feedstock capability ensures optimal gas production. Feedstocks include sewage, food waste, animal manures and grass (silaged)



Large Volume – Provides extended retention time for optimal biodegradable waste (biowaste) treatment and maximum biogas production

Multiple Connections – Provides flexibility for connecting different waste flows

Large Inlet – Ensures larger sizes of biowastes may be directly added to the digester

Large Outlet – Minimises the opportunity for blocking of outlet connection package plant arrangement for sewage treatment

Greater Energy Supply

High efficiency – A high efficiency due to its patented design ensures maximum biogas production under all temperature conditions

Extremely High Reliability

Quality – Manufacture takes place in a factory environment, using only the best quality Linear Low Density Polyethylene (LLDPE)

Installation – Installation is performed using certified plumbers and gas practitioners in accordance with SANS 1200 and SANS 087

Other Features

Flexibility – Installed it can be a stand-alone energy system or as part of a large package plant arrangement for sewage treatment

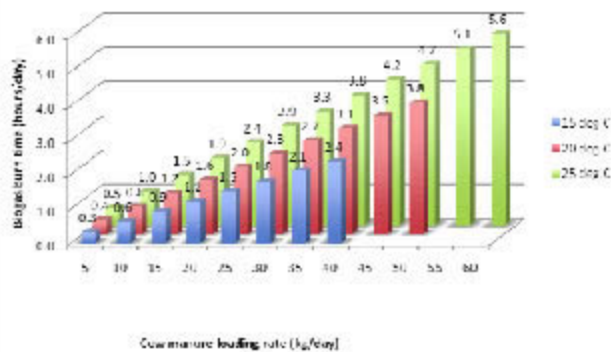
Convenience – Installation planning ensures that the optimal product location leads to the highest convenience for the customer when it comes to disposing of food wastes

Utilisation – the gas holding capacity allows for 60% of the nominal daily biogas production (1.9 m³ of biogas per day) to be contained – ideal for a regular daily cooking routine. For greater biowaste loading – with subsequent increased gas production – alternative biogas use options such as heating can be considered

Maintenance – great care in design of the top section and the gas outlet area allows for easy, regular maintenance

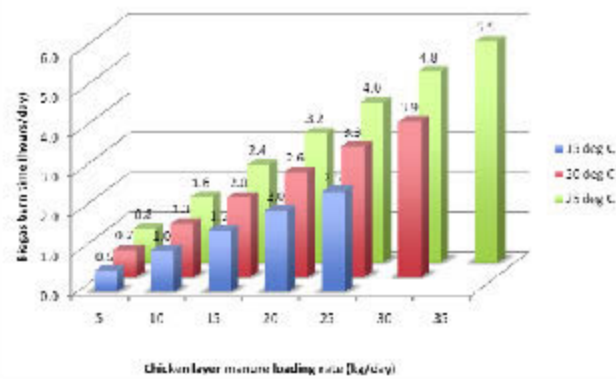
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Biogas output for cow manure



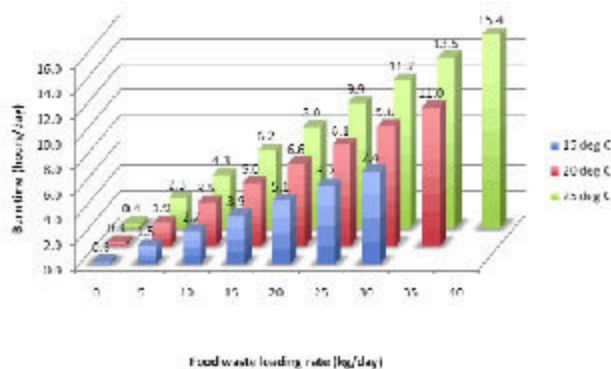
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Biogas output for chicken (layer) manure



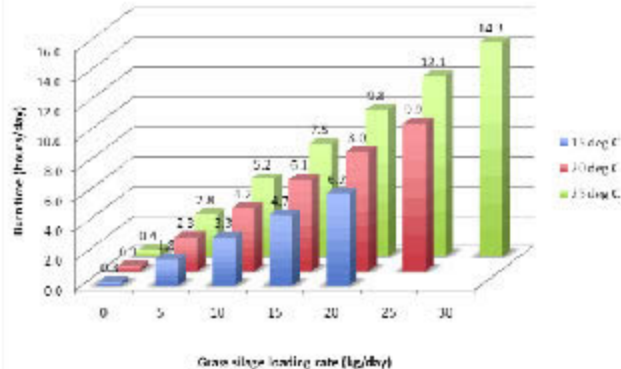
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Biogas output for food waste



4

Biogas output for grass silage



Note: in graphs (3) & (4) the biogas inputs assume only 50 l of sewage water per day, equivalent to 0.125 kg solids in that volume per day. The gas production shown with no added solids reflects the gas from the solids in the sewage.

TECHNICAL SPECIFICATIONS

Energy specifications

- Biogas production is proportional to the amount of feedstock. The graphs above indicate the biogas production rates for different loading rates at different temperatures
- Biogas contains approximately 60% methane (CH_4), 39% carbon dioxide (CO_2) and 1% hydrogen sulphide (H_2S)
- Each cubic metre of biogas has the heating value of approximately 0.45 kg LP Gas

Mechanical specifications:

- Volume: 6,000 litres
- Dimensions: 2,200 mm diameter x 2,500 mm high (including access risers)
- Weight: 300 kg
- Ass chambers: 450 mm diameter
- Thickness: 8 – 12 mm
- Gas storage: 1.13 m³ maximum
- Maximum gas pressure: 8.5 kPa

Loading specifications

- Feeding rates are feedstock and temperature dependent. A maximum of 1,000 litres of water can be added daily.
- Note the different limits on mass of feedstocks between winter and summer conditions as depicted in the graphs above

DAILY LOADING LIMITS (kg/day)

Temp (deg C)	15	20	25
Cow Manure	40	50	60
Chicken Manure	25	30	35
Biowaste	30	35	40
Grass Silage	20	25	30

- The optimal ratio of fresh feedstock to water is 1:1

Environmental specifications

- Operating temperature: +10 °C to + 70 °C
- COD reduction: 50 – 98% (feedstock dependent)

WARRANTY: The **BIOGASPRO** has a 3-year warranty. The complete installation when undertaken by AGAMA Biogas (Pty) Ltd or an accredited agent is guaranteed for 1 year.

