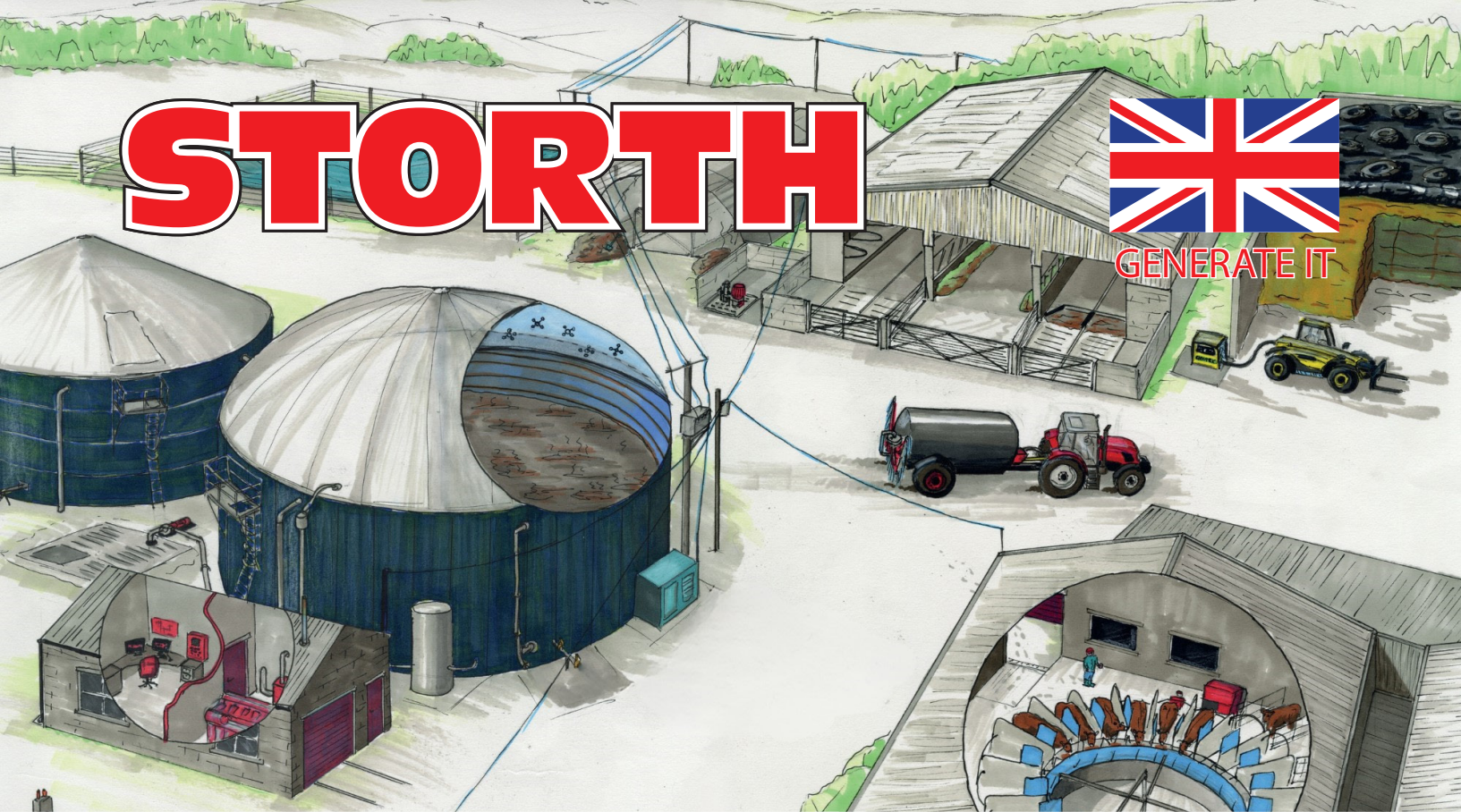


STORTH



GENERATE IT



Storth have used their experience of Slurry Management and market research to develop a range of waste management equipment. Aimed at the modern day farmer, contractor, water, industrial and anaerobic digestion sectors our objective is to provide complete waste management solutions.

Anaerobic Digestion

Specialist Manufacturers of
Slurry Handling Equipment



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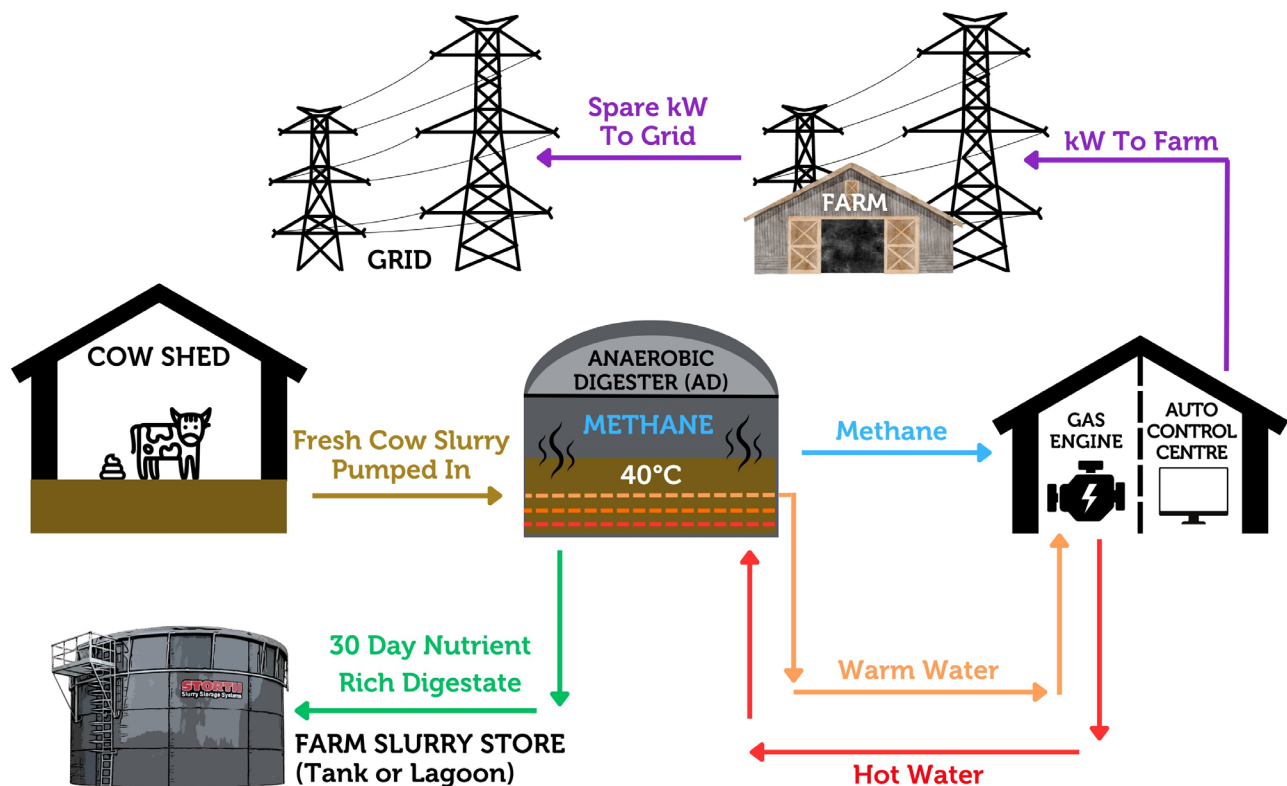
Manufactured in the UK

www.storthmachinery.co.uk

The Future of Cow Slurry Anaerobic Digestion (AD)

Discover the power of Storth's latest innovation slurry-only Anaerobic Digestion. Unleash sustainable energy solutions for agriculture with our pioneering technology, reshaping the landscape of renewable energy.

Storth Turn Key AD Solution



AD Plant Overview

- Digester requires 30 day slurry storage
- Slurry heat maintained at 40°
- Methane captured to run biogas engine
- Electricity produced used with 3 phase generator
- Electricity used on farm to offset use of grid
- Excess electricity exported

Electric from Slurry

1 Cow = 0.053m³ per day of slurry

Slurry Wizard (53lt/day, 0.053m³, 11.65 gal)

1 Cow = 0.15 kW of Instantaneous Power

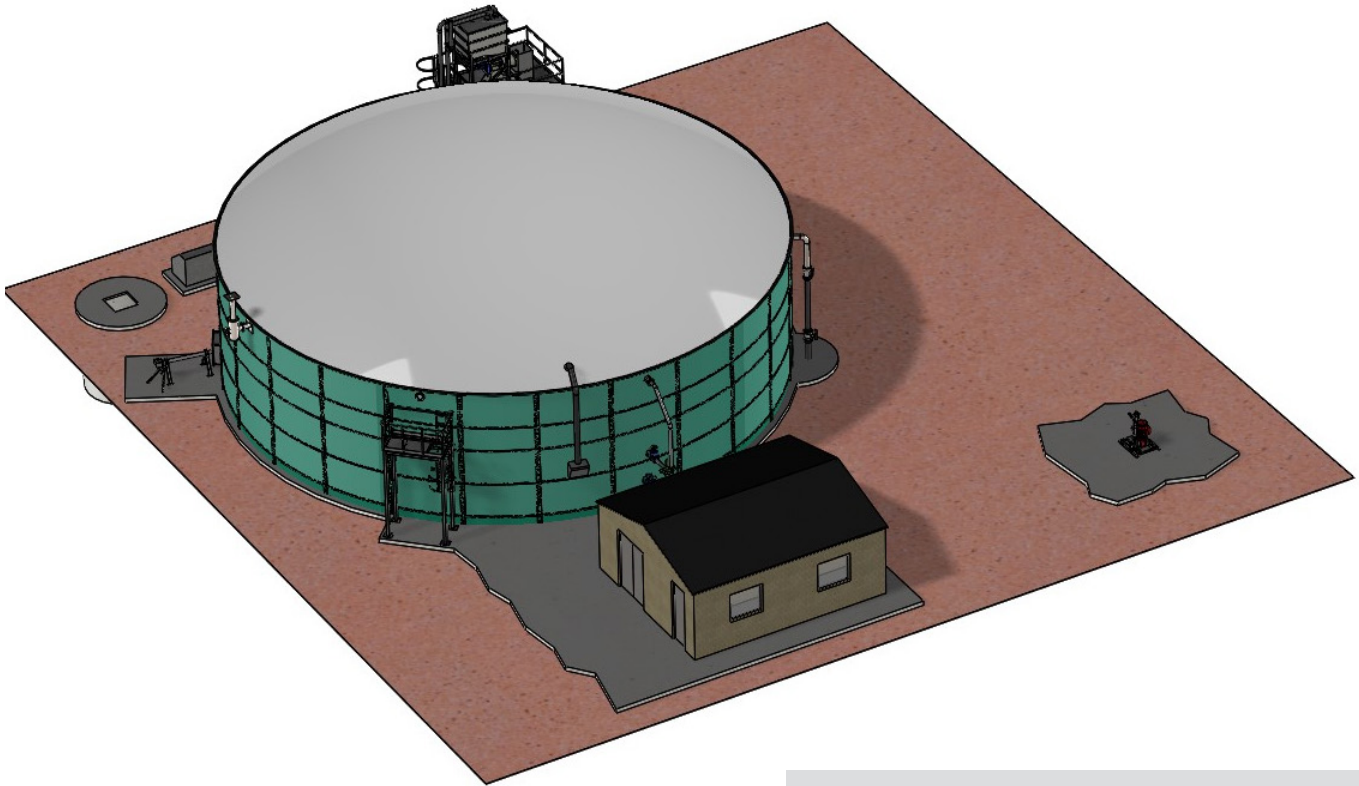
= 3.6 kWh per day of electricity (0.15kW x 24hrs)

Slurry from a single cow can produce 1314 kilowatt hours/year of electricity (Storth Ltd UK Research)











1 Cow = £1.00p per day potential saving

3.6 kWh x £0.28

kWh per day produced x £ electric cost



Storth's 10 Steps to AD

-  Calculate a Farms Maximum Potential
-  Grid Connection Application (LOA)
-  Slurry Sampling & Electric Monitoring
-  Plant Sizing & Quotation
-  Planning Application & Permission
-  License Applications, T24 Waste Exemption
-  Order with Storth
-  Storth Turn-Key Site Construction
-  AD Plant Commissioning
-  Electric Generation - "Slurry to Switch"

AD Benefits

1. Produce an on-farm source of recycled nutrients, reducing the reliance on artificial fertilisers.
2. Produce a rich, valuable organic fibre
3. Produce renewable energy in the form of biogas
4. Kill most of the pathogens found in organic waste
5. Reduce odour
6. Allow more efficient management of grassland
7. Make livestock waste easier to store, handle and spread
8. Kill most weed seeds
9. Encourage beneficial earthworms and clovers
10. Reduce water pollution
11. Reduce greenhouse gas emissions

Source: Letcher, J, *Farm Digesters*, 2016)

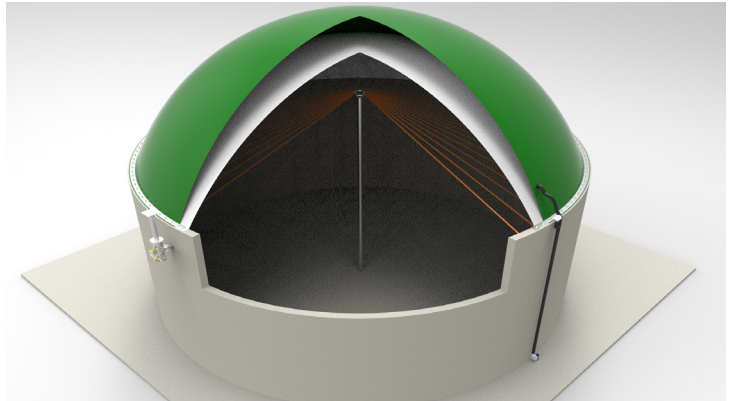
Tank Specification



Storth AD tanks are built to the same industrial standard as our slurry storage tanks, with premium quality epoxy coated steel sheets tested to 1100v. The only difference is the top ring of sheets, this ring works continuously in a gas producing environment therefore premium plus sheets are used. These have increased coating thickness tested to 1500v. All tanks are built with a starter ring which improves quality of construction, ability for future extension, and internal long term service access. The concrete floor as well as walls are insulated to reduce heat losses and maximize efficiency of the slurry anaerobic digestion process.

Technical Details

- Tank is built using our epoxy coated sheets (E-Fusion 1100v & 1500v)
- Starter ring is used for future proofing - Tank extension
- Cladding & insulation is used for heat retention
- At the top of the tank there is a window with wiper for internal inspection
- 65mm (2.5") Hot water circumference pipes are mounted inside the tank to maintain 40°C
- 100% High frequency welded parallel membrane cover
- Operating pressure up to 20 mBar



Inside the tank there are several loops of 65mm (2.5") hot water pipes which act as a radiator warming the slurry. These are fed continuously and at a fixed temperature via the engines Controlled Heat and Power system (CHP). With our system it does not matter where the engine is revving, the heat will be continuous and stable.

Tank Colour



RAL: 100 30 20

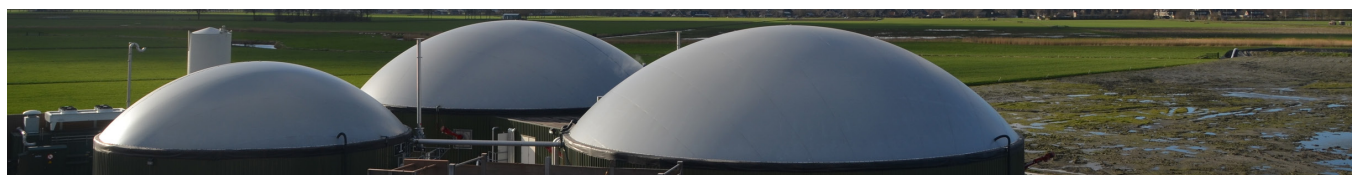


Double Membrane Cover

Our Double Membrane Covers allow gas to be stored within the AD plant and provides the opportunity to control the amount of gas that is being extracted. The roof is made up of 100% high-frequency welded membranes of parallel design, welded to the highest of standards this design gives a 60% reduction in weld area when compared to a radial design.

Operating pressure up to 20 mBar, the outer membrane is available in green (RAL 6005) or grey (RAL 7001). Models under 50kW rely on a self-supporting catcher construction, over 50kW come with a stainless steel column and crowning ring. Both designs incorporate PES polyester belts to ensure the inner membrane always stays at a certain height, even when the pressure is low and never falls into the slurry, these connect the membranes to tank clamping bands forming a gas tight seal.

The roof system further incorporates a rain guard around the tank ensuring water does not interfere with the tank insulation performance.



Desulphurisation Net

Desulphurisation Nets are fitted as standard and made of very strong PE material, with a mesh size of 10 x 10 cm. When the sulfur reacts with the oxygen inside the tank, the sulfur attaches itself to the net. Gradually, the sulfur will fall back into the slurry, where it is not harmful anymore.

Blower System

Inside the tank, there will be a varying amount of gas dependant on the slurry production levels, digestion activity etc. To ensure there is a continuous feed of gas from inside the tank, pressure between the two membranes can be adjusted by the use of the Blower System. Membrane and gas pressures are monitored automatically at the powerhouse and the Blower System adjusted accordingly by the control system.

Over/Underpressure Valves

The Over/Underpressure Valve is a system that can read and monitor the level of gas in the tank. The valve will ensure that the gas pressure inside the tank does not exceed the maximum pressure limit. These are mounted to the top of the tank to allow the highest level of slurry possible in the tank.

Cover Colour Options



RAL: 6005



RAL: 7001

Gas Volume Measurement System

This system measures the height of the inner membrane. A belt is run from one side of the tank to the other and lies between the inner and outer membrane. A weight is then attached to the belt on the outside of the tank and will determine the height of the membrane, therefore tank gas volume can be established. A sensor works in conjunction with this weight system, feeding information to the Powerhouse Control Room



Pumping

One of the first things we must consider is feeding the AD plant with slurry, Storth have vast experience with cow slurry management both in terms of mixing and pumping. To give best results a consistent slurry is required with good flowing characteristics, this should be at a maximum of 10% Dry Matter (DM).

To achieve a consistent slurry, as a rule of thumb a 4" (100mm) long shaft electric Superjet Pump would be employed. This pump has the facility to mix before pumping, both operations remotely and automatically controlled from the Powerhouse Control Room.

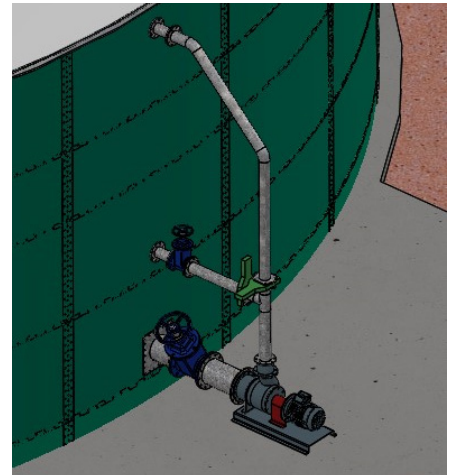
Alternative mixing and/or pumping solutions are available depending on individual customer requirements. This can be best resolved through on-site consultation with our sales team.



Slurry is introduced into the tank on a little but often basis, maintaining methane production without compromising the tanks 40°C target operating temperature. A 6" Krohne Flowmeter is built into the tanks feed in pipework, this accurately monitors slurry entering the tank enabling the Powerhouse Control Room to establish pump run times as well as slurry flow characteristics.

Mixing

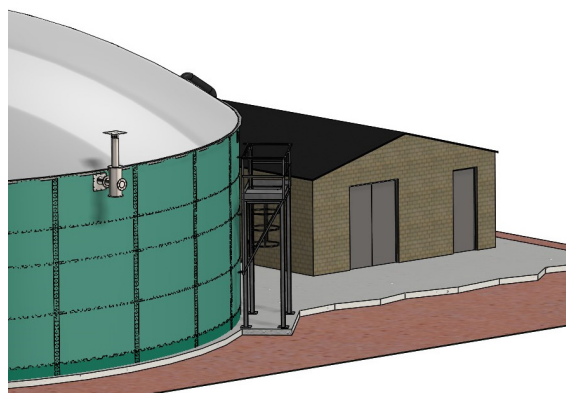
Mixing operations are undertaken by a 152mm (6") in-line chopper pump, on plants larger than 50 kW a second pump is employed on the opposite side of the tank to the first, increasing mixing capacity. These pumps work in conjunction with internal tank wall mounted jetters, slurry is taken from the base of the tank and jetted back into the tank further up to give agitation. This keeps the digestate in an active state of gas production, ensuring no crusting or foaming. Mounted externally to the tank the pump(s) and their respective pipework can be isolated using mechanically operated gate valves to enable ease of service without disturbing gas production. Only the jetter heads sit inside the tank, our focus in design has been continuous gas production with minimal plant down time through maintenance.



Overall control of the in-line chopper pumps running time and which jetter nozzles are in operation comes from the powerhouse control room. Different parameters can be programmed here to control the mixing system in terms of running time, frequency, jetter choice and tank discharge which is also operated via the pump(s).

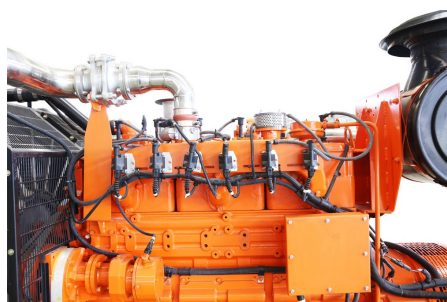
Powerhouse

The Powerhouse consists of two distinct rooms, a mechanical working environment for the engine and a more environmentally safe room for the electrical switch board controls. These two elements have been separated to minimise the dangerous combination of methane and electrics in one room.



Engine Room

Dependant on cow numbers and farm requirements we offer a bespoke EDEC-HTC model genset. Each genset is powered by Cummins Engines with Leroy Somer Alternators. The EDEC-HTC series has been specifically designed for the agricultural biogas market. The modular structure incorporates a high strength chassis, integrated lubrication oil filtration system and is capable of continuous operation at 100% load. Engines and Alternators have a design life of 120,000 hrs (approx. 15 years).



The genset not only provides electrical power, but also heat energy via the Combined Heat & Power (CHP) system. This is used to warm the slurry within the tank via the hot water pipe system described. Compared to conventional coal fired and fossil fuels the EDEC-HTC biogas genset uses lean combustion technology. NOx and CO2 emissions are reduced by 60-80% with dust emissions close to zero.

Control Room

This area is the nerve centre of the plant, a bespoke EDEC control panel with integrated export control is installed as standard, this allows the plant to run to maximise potential output. Standard cow slurry AD plant systems normally reach maximum export and shutdown. The EDEC control system means Storth's AD plant can run to match the required load, it adjusts how much electrical power is sent to the grid and will not be shut down. The system is capable of monitoring the grid and varying its output to suit, this makes it easier to obtain permissions to export electricity and plays a key part in keeping the areas electrical network stable.

Working alongside the export control system is the Programmable Logic Controller (PLC). The PLC based AD control system is a very robust system that can be tailored to any site, it is a small computer used for industrial automation. The system will receive data from the plant via various sensors allowing the plant to be fully automated. The Human Machine Interface (HMI) is the point of integration for the system, this looks after the state of the plant, along with any alarms etc., and will turn any complex data into useful information. Anything that is on the HMI can be accessed over the internet, making it a flexible and convenient system.



Ancillaries

There are multiple options for feeding the AD system. To enable the pumping of slurry from an underground tank etc. to a digester. You will need a pump, either our electric pump or the piston pump.

Electric Pump

Storth Electric Pumps all require 3 phase electric and are available in four different motor sizes, dependent on the application. Our Electric Pumps can be set up on float switches to allow the pump to start and stop automatically when the slurry reaches a certain level and can be controlled centrally by the AD control system.



Piston Pump

The Piston Pump is a hydraulically driven unit used to pump slurry/digestate over long distances with minimal power consumption for a low 3 phase electric running cost.

The piston moves upwards during the suction cycle. Reduced air pressure inside the machine and slurry pressure force the outlet valve to close and the inlet valve to open. The pump chamber is then filled with slurry.

The piston then moves downwards during the pumping cycle. The pressure of slurry inside the pump chamber forces the inlet valve to close and outlet valve to open. Slurry is then transferred out of the chamber to the discharge pipe.



Submersible Mixer c/w Winch & Guide Rail

The Submersible Mixer offers automatic slurry mixing management. The mixer can help to ensure that the slurry is crust free and consistent before it is pumped up to the digester. Well mixed slurry is an important part to keeping a steady production of gas inside the digester.



6" Flowmeter

Built into the pipework from the pump to the digester, the Flowmeter will send data to the control panel in the Powerhouse Engine Room containing information of how much slurry is going into the digester. This can be useful to ensure the digester is receiving sufficient fresh slurry to keep the system running efficiently.



Separation

Although not strictly part of the digester itself, a separator is a key part of almost every digester-based waste management system. A separator will remove the coarse fibres from the processed material as it comes out of the digester. This makes the liquid much easier to store, handle, and apply back to the land. In addition, it can save as much as 25% of the required storage volume when compared to the original slurry. It also leaves a fibre which can be heaped as with farm yard manure (FYM) and spread when required.

At Storth we sell, service & support the full range of EYS screw press separators. With over 25 years of experience our turn key solutions provide tailor made solutions for both raw slurry as well as digestate. For full details please refer to our Separating Systems brochure or website.



Digested separated liquid is very different from raw, untreated cow slurry. About half of the nitrogen present in cow slurry is readily available to plants, the rest is organic nitrogen which takes time (up to a year or more) to break down into an available form. The bacteria in the digester convert the organic nitrogen present in slurry into nitrates – the form in which they can most easily be absorbed by plants. This is essentially the same process by which the nutrients in raw slurry are broken down naturally in the soil without the risk of loss through wash off.

With improved accessibility to the slurry's nitrogen crops flourish, there is a vast reduction, or even elimination, for the requirement of expensive artificial fertilizers & large environmental benefits. We have also seen that animals no longer recognise digested liquid as their own waste and will graze land on which it has been applied far quicker than on untreated slurry.

Key Points

- The bacteria in the digester convert most of the organic nitrogen into a readily available form.
- Thin slurry is easy to apply accurately as a liquid fertiliser
- Nutrient content of separated digestate can be readily analysed & better matched to crop requirements
- Animals do not recognise digestate as their own waste, giving farms more control over application
- Odour, weed seeds and pathogens have been greatly reduced
- Digestate should be considered as a "liquid fertiliser" rather than a problematic waste as many see raw cow slurry.

SCRAPE IT



PUMP IT



SEPARATE IT



STORE IT



MIX IT



APPLY IT



STORTH

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