ANAEROBIC DIGESTION PLANT (MONA) TECHNICAL SPECIFICATION

Silage Clamps (main contract civil works)

Given the constraint of available space on the site, the size of the clamps has been made as large as possible with a vertical wall silage panel system. Each clamp offers about 2.00 m^3 storage. Depending on the crops and their harvest timing as will occur in operations, this allows 9 to 12 months of storage, assuming volumes of crops between 6.000 to 10.000 t/a and using compression density of 0.75 t/m^3.

Liquid Feedstock Buffer Tanks

DAF Source A

The feedstock prepared as agreed is supplied in tank wagons and will be pumped into the buffer tank in the location shown in the layout, from where it will be loaded by pumps under control of the AD Plant into the digester. The buffer tanks will if needed have a facility (e.g. chimney or connection to a bio filter) to release gasses which may be produced before being transferred to the digester.

The two buffer tank have

a holding capacity of at least 3 days.

Pump, which pumps the feedstock from the buffer tank to the digester

Control, supervision and piping to buffer tank per agreed layout

Technical data (each tank)

Diameter (inside):	approx. 3.9 m
Height (clear):	approx. 10.5 m
Gross volume:	approx. 120 m^3

DAF Source B

The feedstock prepared as agreed is supplied in tank wagons and will be pumped into the buffer tank in the location shown in the layout, from where it will be loaded by pumps under control of the AD Plant into the digester. The buffer tank will if needed have a facility (e.g. chimney or connection to a bio filter) to release gasses which may be produced before being transferred to the digester. The buffer tank has a holding capacity of at least 3 days.

Pump, which pumps the feedstock from the buffer tank to the digester

Control, supervision and piping to buffer tank per agreed layout

Technical data

Diameter (inside):	approx. 3.6 m
Height (clear):	approx. 9.0 m
Gross volume:	approx. 80 m^3

Glycerine (NON WASTE)

The feedstock prepared as agreed is supplied in tank wagons and will be pumped into the buffer tank in the location shown in the layout, from where it will be loaded by pumps under control of the AD Plant into the digester. The buffer will if needed have a facility (e.g. chimney or connection to a bio filter) to release gasses which may be produced before being transferred to the digester. The buffer tank has a holding capacity of at least 3 days and preferably 2 tank HGVs

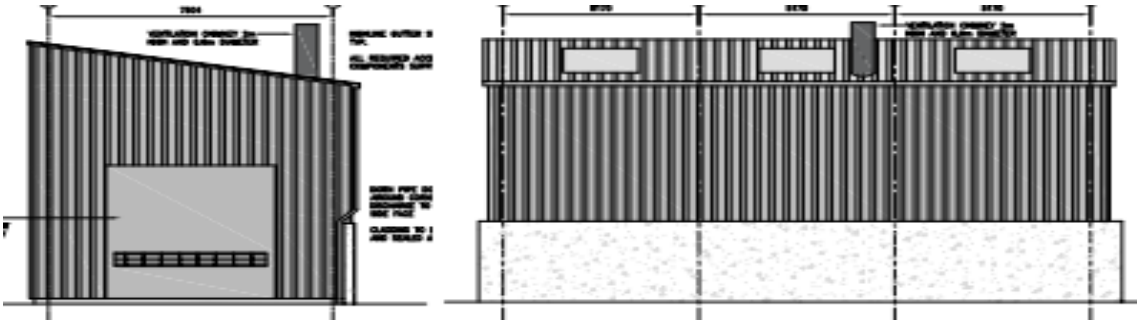
Pump, which pumps the feedstock from the buffer tank to the digester

Control, supervision and piping to buffer tank per agreed layout

Technical data

Diameter (inside):	approx. 4.3 m
Height (clear):	approx. 7.0 m
Gross volume:	approx. 90 m³

Chicken Recerption Hall Shed



Chicken Dung Reception hall and store with inside push walls against which load from trailers can be pushed for longer period storage (weekend), or can be shoveled out and fed into the feeding system (next chapter)

Dimensions:	approx. 16.0 m x 6.0 m x 6.0 m (W x L x H)
Push wall thickness:	approx. 0.3 m
Material:	concrete class C25/30, waterproof
Details:	to be defined as part of civil works

FEEDING SYSTEM

Hoppers with Chain and Milling DrumsThe sturdy, durable hopper feeder is well suited for energy crops and mechanically more demanding feedstocks like agricultural waste. Feeding from the system to the digester takes place automatically at regular intervals set by the AD plant control system. The chain at the bottom of the hopper moves the feedstock to milling drums at one end of the hopper, where the feedstock is lifted by the conveyor to the digester.

Hopper Holding Container

Technical data

Type:	H100-50
Volume:	approx. 50 m³
Fillings/day with above volume	1x
Max. bulk density:	approx. 650 kg/m³
Max. grain size:	250 mm
Cutting length of feedstock:	max. 30 mm

Technical data

Steel structure to cover the entire length of the container

Hinged sturdily

Double-sided protrusion

Inclination of the roof

Roofing with trapezoidal sheets

The bottom side of the covering is executed as a baffle wall lined with steel sheets

Rubber sealed shock connection

Electric lifting device

Deneutraliser spray odour control to operate when lids are opened for loading

Digestion Tank (Digester)

High-quality prefabricated digestion tank made of horizontally casted elements including concrete ceiling and central column.

Assembled from precast factory inspected elements

At the area where the digestate inside the tank is held at a constant level, the side wall elements are protected by a PE-HD coating (height approx. 1 m)

Insulation of ceiling, wall and base

Prefabricated concrete tank

Height :	approx. 11.0 m
Diameter (inside):	approx. 17.9 m
Gross volume:	approx. 2,770 m^3
Permissible media temperature:	45 °C (insulated tank)
Permissible gas overpressure:	up to 10 mbar

Wall design

Material:	concrete C35/45
Class of resistance:	XC4, XF3, XA2
Coating (wall and column):	upper area (approx. 1.00 m)
Coating material:	wall, HD PE (thickness approx. 2.0 mm)
	Column: HD PE + epoxy (approx. 2.0 mm
Insulation:	thickness approx. 0.10 m
Insulating material:	polystyrene
Facade:	trapozeidal steelsheet, thickness approx. 0.07 m
Embedding:	up to approx. 1.0 m

All necessary shaft linings, openings and sight gauges are provided.

Base slab Material: concrete class C35/45

Class of resistance: XC4, XF3, XA2

Slab thickness:	0.23 m
Double layer reinforcement:	steel BST 500 M / 500 S

Insulation of base slab:	outside, under the slab
Insulation thickness	approx. 0.05 m
Insulating material	polystyrene
Sump	Pump sump approx. 1.0m x 1.0m x 0.1m

Ceiling

System of precasted elements with centre column

Material:	concrete class C35/45
Class of resistance:	XC4, XF3, XA2
Thickness:	0.2 m (spacings), 0.35 m (load bearing)
Insulation	0.15 m (in spacings)
Coating:	entire ceiling inside
Coating material:	HD-PE, thickness approx. 2.0 mm)

Tank openings

Ceiling frame:	1.8 m x 0.6 m for paddle agitator

Wall frame to mount additional shaft mixer, closed by a sealing plate

Wall frame dimensions:	0.6 m x 0.8 m or 0.7 m x 0.9 m
Inspection door:	⌀: 750 mm, including stainless steel frame and blind cover

Leackage detection system

Secondary containment is prime leackage detection system

Any additional requirements, e.g. by permitting authorities, will incur surcharges

Measurement equipment

Temperature measurement

Level measurement

Foam sensor

The tank is designed for mounting on secondary containment slab

Digester Equipment

Tank Heating

Insulated district heating pipeline for efficient heat transport to the industrial heating distributors. The heating distributors are mounted to the outer wall of the digester frost-free inside the machine room

Supply of the single heating circuits from central heating distributors

Heating coils are mounted inside on the tank wall

Temperature – and pump control is done electronically via the PLC

Sight Gauges

Position of the sight gauges:	approx. 0.5 m below the upper edge of the tank wall
Diameter:	approx. 30 cm
Equipment:	Lighting, manual wiper

Burst Disc

Position:	The burst discs are mounted into the mounting frames at each vertical paddle agitator
Protection hood:	To protect the burst discs from accidental access they are covered by a hood

Overpressure Protection

Low-maintenance safety valve

Set pressure adjustable by weight loading

Note:

The AD plant design is such that the post-digester is operated at a set pressure of 5.0 mBar (plus/minus 10%). The safety valve at the post digester is set to begin opening at 5.0 mBar and open fully at 7.0 mBar, or reversily open at an underpressure of -1 mbar and fully at -2mBar.

The operating pressure in the digester is due to a pressure loss of about 2.0 mBar over the gas pipe from the digester to post digester as a consequence about 7.0 mBar. Under normal operating conditions any pressure beyond the set point is dealt with at the post digester. If under exceptional circumstamces the flow from the digester to post digester is interrupted or locked, the safety valve on the digester will operate at 12.0 mBar. Further safety mechanism are the burst discs, desigend to break at a pressure of 18 mBar (accuracy: plus/minus 3 mBar), where the digester tank itself is designed to safely (no leaks) withstand a 20 mBar pressure.

Biological Desulphurisation (Air-Based)

The biological process binds the sulphur with oxygen from air. Therefore air is constantly and uniformly blown into the digester.

Technical data

Introduction of air via compressor or blower (flow rate: 5 % of biogas production, power rating from 0.5 to 1 kW).Air filter and blower are installed frost-free in the technical building.A ball valve allows condensate to drain from the air pipes

For monitoring the airflow, the state of floating bodies in the flow is measured

Air is introduced through digester roof over at least two distribution lines

Injection points at the top of the digester are equipped with a “kickback” security valve to avoid leakage of biogas. In case the feedstock does lead to higher sulphur levels than taken into account for the design (average 600 ppm), additional chemical desulphurisation will be required. When due to feedstock H2S levels are exceeding typical values the addition of FeCl in the digester can reduce these levels. The simplest solution to add additives is through a dosing support mountedf on the roof, this option requires a daily manual addition, while at the same time an equipment check (stirrers etc.) is executed.

Stirring Mechanism Digestion Tank

Vertical paddle agitator. Extremely stable vertical paddle agitator, specifically designed for plants processing agricultural waste and purpose grown energy crops with high content of dry solids on which Agraferm holds a patent. The paddle agitator with integrated rolling-contact bearing can be removed for maintenance purposes or be replaced without emptying of the tank or removal of the ceiling. Low maintenance and freely accessible agitator engine not affected by the high temperature in the digester

Post Digestion Tank (Post Digester)

High-quality prefabricated post digestion tank made of horizontally casted, elements.

Prefabricated concrete tank

Diameter (inside):	approx. 24.0 m
Height:	approx. 8.0 m
Volume:	approx. 3,610 m^3
Permissible fluid temperature:	35 °C
Permissible gas overpressure:	10 mbar

Wall design

Material:	concrete C 35/45

Class of resistance:	XC4, XF3, XA2
Thickness:	0.20 m
Coating:	upper wall area (height: approx.: 1 m)

Coating material:	HD PE (thickness approx. 2.0 mm)
Load bearing element:	0.16 – 0.20 m
Insulation thickness:	approx. .10 m
Insulation material:	polystyrene
Cladding of wall insulation:	weatherproof profiled steel sheating

Inspection door / manhole (⌀: 750 mm), including stainless steel frame and blind cover

Base slab

Material:	class C35/45 concrete
Class of resistance:	XC4, XF3, XA2
Slab thickness:	approx. 0.22 m
Insulation:	outside, under the base slab
Insulation thickness:	approx. 0.05m
Insulation material:	polystyrene
Sump	Pump sump approx. 1.0m x 1.0m x 0.1m

Measurement equipment

Temperature measurement

Level measurement

Level control

Leackage detection system

Secondary Containment

The tank is designed for mounting on the secondary containment slab.

Double-Membrane Gas Holder

Double-membrane gas holder as cover of the post digestion tank. Inner- and outer membrane are PVC coated. The outer membrane is resistant to UV. The gas holder is sized in accordance with static requirements.

Inner gas membrane

Height (external):	approx. 6 m
Gas storage volume:	approx. 1,000 m^3
Working temperature:	-30 °C to +70 °C
Maximum working pressure:	approx. 5.0 mbar
Material middle carrier:	steel in corrosion-resistant execution (e.g.: epoxy coated)

Includes leak test after installation

The medium stored is not allowed to contain any fractions of solvent-containing or solvent-like substances.

Outer membrane

Operating temperature:	-30 °C to +70 °C

Maximum permissible snow load: according to static calculations for the climate conditions of Anglesey

If the snow load exceeds the maximum, the gas holder needs to be cleared

Under normal operating conditions, when the dome is pressurised, snow will slide of the holder dome. However when the dome is not pressurised, the maximum permissible snow load shall not be exceeded as it would destroy the underlying supporting structure

The membrane made of PVC coated polyester fabric is UV- and abrasion resistant (counterpart membranes) and provided with fungicidal treatment

Colour: ligth grey

Including Agraferm Logo

Including rain deflector

Including blower

Gas level measurement

Gas level indication according to the “electronic water scales principle” with transducer and signaling for control

Overpressure Protection

Low-maintenance safety valve

Set pressure adjustable by weight loading

Post Digester Tank Heating

Insulated district heating pipeline for efficient heat transport to the industrial heating distributors

The heating distributors are mounted to the outer wall of the post digester frost-free inside the machine room

Supply of the single heating circuits from central heating distributors

Heating coils are mounted inside on the tank wall

Temperature – and pump control is done electronically via the PCS

Stirring Mechanism Post Digestion Tank

Horizontal paddle agitator. Horizontal paddle agitator for stirring the digestate

The paddle agitator is sealed to the outer side by an axial face seal

Engine mounted to the outer wall of the tank

Components outside the tank are lacqered with two component lacquer

Not suitable for fluctuating filling level

Frame for transmission of turning moment to the base slab included

Including net intercept device to avoid interference with gas holder belt net

Post Digestate Storage Tank

Prefabricated post digestion tank with integrated gas holder

Prefabricated concrete tank

Diameter (inside):	approx. 24.0 m
Height (clear):	approx. 8.0 m
Volume:	approx. 3,610 m³
Permissible fluid temperature:	35 °C

Wall design

Material:	concrete C 35/45
Class of resistance:	XC4, XF3, XA2
Coating:	wall area (height: approx.: 1 m)
Coating material:	HD PE (thickness approx. 2.0 mm)
Load bearing element:	0.16 – 0.20 m
Earth integration:	up to 1.0 m

Inspection door / manhole (⌀: 750 mm), including stainless steel frame and blind cover

Base slab

Material:	class C35/45 concrete
Class of resistance:	XC4, XF3, XA2
Slab thickness:	approx. 0.20 m
Sump	Pump sump approx. 1.0m x 1.0m x 0.1m

Measurement equipment

Temperature measurement

Level measurement

Level control

Leackage detection system

Secondary Containment

The tank meets all the requirements for liquid manure tanks as stipulated in SSAFO Guidance.

Double-Membrane Gas Holder (with sight gauges)

Double-membrane gas holder as cover for the digestate storage tank. Inner- and outer membrane are PVC coated. The outer membrane is resistant to UV. The gas holder is sized in accordance with static requirements.

Inner gas membrane

Height (clear):	approx. 6.4 m
Gas storage volume:	approx. 1,000 m^3
Working temperature:	-30 °C to +70 °C
Maximum working pressure:	5 mbar
Material middle carrier:	steel in corrosion-resistant execution (e.g.: epoxy coated)

Includes leak test after installation

The medium stored is not allowed to contain any fractions of solvent-containing or solvent –like substances.

Working temperature: -30 °C to +70 °C

Maximum permissible snow load: according to static calculations for the climate conditions of Anglesey

If the snow load exceeds the maximum, the gas holder needs to be cleared

Under normal operating conditions, when the dome is pressurised, snow will slide of the holder dome. However when the dome is not pressurised, the maximum permissible snow load shall not be exceeded as it would destroy the underlying supporting structure

The membrane is made of PVC coated polyester fabric is UV- and abrasion resistant (counterpart membranes) and provided with fungicidal treatment

Colour: light grey

Including Agraferm logo

Including rain deflector

Including blower

Gas level measurement

Gas level indication according to the “electronic water scales principle” with transducer and signaling for control 4 – 20 mA

Overpressure Protection

Low-maintenance safety valve

Set pressure adjustable by weight loading

Stirring Mechanism Digestate Storage Tank

Shaft mixer. Adjustable shaft mixer to stir up the digestate

Horizontally adjustable by gear ring (angle +/- 30°)

Vertically adjustable by a hydraulic hand pump (angle +/- 30°)

Gas-tight through doubled rubber seal at wall opening

Entire drive system located outside the tank

Mixer can be easily replaced for maintenance or repair; with no need to enter the tank

Bearing box completely oil filled including oil-sight-glas as service-indicator

Technical data

Length:	approx. 5.5 m
Seal membrane:	EPDM60 (2x)
Hydraulic adjustment	
Mechanical seal:	SiC/SiC
Material (mixer blade):	Stainless steel
Power rating:	15 kW

Certified for ATEX environment

Plant Technology

Electrical, Measuring and Control Technology

Control and automation

Centralized control of the plant by a programmable logic controller (PLC)

Customized programming for the process of a biogas plant

Operation of all machines at the switching- or local control station

Battery-buffered coflow power supply unit to ensure operation of the controller during a power failure (UPS)

Monitoring, storage and logging of the operating data, measuring values, filling levels and temperatures

Safety concept

System failures are remedied by monitoring functions which restart applications or reboot the system

Power failures at the computer are buffered for a certain period of time by an uninterruptible power supply system

Measurement methods and technology

Detection of quantity in feeding system by weighing cells

Measurement of digestion tank filling level by pressure sensor / radar sensor

Foam measurement in digestion tank by foam sensor

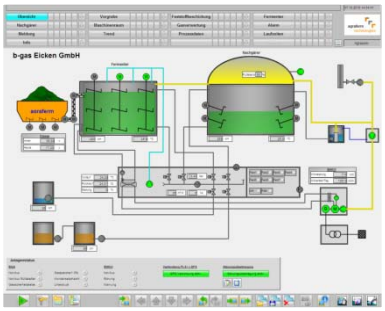
Temperature measurement in digestion tank

Measurement of gas holder filling level

Signal evaluation by PLC

Process Control Technology

Based on many years of experience and developed exclusively for Agraferm biogas plants. Particularly clear layout and ease of operation. Automatic alerting in case of disorders



Process control system functions

Monitoring of the plant

Documentation of the process

Evaluation of the operating condition also over extended periods of time

Evidence and documentation of the operating condition in the form of daily, monthly and annual reports

In the event of malfunctions, the process control system sends a message to the plant owner and indicates cause and location of the malfunction

Visualisation

Representation of process and of overall plant in dynamic overview display

Colour display of operating condition of the machines

Indication of all analog values at the measuring point

Status bar with important messages

All archived data and the current data can be evaluated in graphical form to optimize operation

Archiving

Continuous storing of the process data

Free access to customised evaluations

Manual input menu enables evaluation and logging of data which are not collected automatically (e.g., type of feedstock (substrate))

Logging

Logging of operating condition, regular creation of records and evaluations

The plant owner has unrestricted access to the logs and can make further use of them at his discretion

Electrical Engineering and Technology

Cabling and installation technology

Cable bundles inside the buildings are laid either on cable racks (galvanized design) or in cable ducts

Individual lines are mounted to the surface with aluminium plain conduit with spacing manacles

For outdoor installation, cables are always laid in UV resistant conduits

Lines buried in the ground in NYY / NYCWY design; lines inside buildings NYM versions (PVC sheath)

Measuring and signal lines in shielded design

Buried measuring and data lines in A-2YF design (approved for burying in the ground)

Low voltage main distribution

Switching station in rugged steel cabinets with interior lighting

Forced ventilation to avoid heat accumulation

Electrical heating (thermostat controlled), to prevent formation of condensation water at external control units

For protection of the machinery and pipelines, surgecurrent protections are mounted into the bar-mounted fuse elements

Measurement and display of the most important electricity values on in the process control system

On the front side of the switchgear cabinets are located:
Main switch to enable the system; emergency stop pushbutton; measuring and indicating instruments, flush-type switches / pushbuttons on front wall for operation of the machines

Design of outgoing circuits

Protection by circuit breakers, motor protection switches or automatic circuit breakers

Frequency inverter, soft start, star-delta connection or instant start, depending on requirements

Earthing and equipotential bonding

Steel strip in stainless steel

All connecting elements, terminals in the ground in stainless steel

Earth conductors connected with central equipotential bonding strip

Evidence of the efficiency of equipotential bonding and earthing by a test record

Surge protection, lightning protection

Lightning protection system to TÜV requirements, internal and external earthing and full equipotential bonding. Protection of all ATEX zones.

Coarse and medium protection by surge diverter in the switchgear behind the supply

Fine protector for protection of the control circuits and the measuring and signal lines against overvoltage

Gate Valves

The discharging pipe installed at the digestion tank features a gate valve in handwheel design. For safety reasons, operation of the gate valve by hand must be possible at all times.

Pneumatic gate valves

Gate valve plate of stainless steel 1.4301

Pneumatic drive

Control via PLC, 24 V control voltage

Pipe end gate valve design

Compressed Air Distribution

Air-cooled compressor block with ring oil lubrication

Suction air filter with silencer

Aluminium cylinder heads and additional cooling pipes for optimum heat dissipation

Lightweight low-noise reed valves

Compressor and motor directly coupled

Integrated axial fan for cooling of compressor and motor

Four-pole motor, 1,500 rpm, three-phase current 400 V/50 Hz

Piping

Digestate pipes

Pipes laid above ground of stainless steel (transition above soil)

Pressure rating: PN 10

Pipe bushings of stainless steel, sealed by an annular space seal

Gas pipes

Pipes laid above ground of stainless steel with screwed flange

Pressure rating: PN 6

Annular space seal

Gradient to the condensate separator

Butterfly valves

Steel Work

Digestate storage tank and post digestion tank are where needed equipped with maintenance platforms and ladders to access the stirring mechanism or sight gauges.

Staircases (width approx. 0.8 m) and railing to the roof of digester. Grid irons as standard where covers are needed.

Liquid Feedstock Loading and Digestate Removal Station

Phase 1

The digestate will be taken away from the post digester. A pipe will be fitted from the Post Digester tank to the Storage tank to supply additional storage of digestate for any emergency events such as when land is not available for landspreading the digestate. Refer to Layout Plan for the location where liquid feedstock can be loaded or liquid digestate be taken out of the tanks.

The Digestate removal station consists of Perrot- or other (e.g Bauer) coupling. Any spills will be collected in sump connected to the leachate draingae system

Material pipes: V2A

Connection: DN200

Digestate can be pumped out by manual adjustment of the valve

Reserve Fitting

Reserve fitting placed on each tank outside housings

Blank flange backed up by a manual valve

Reserve fitting can be used to fill tanks with inoculum or to empty tanks

Sampling Point

Sampling points are situated in the technical building (1 per digester)

T-Piece on suction side of digester pumps ending in DN 50 cock

Gas Analysis

High grade equipped gas analysis system for process control.

Technical Data

Provided housing for wall mounting

Graphic display of the course of measured values

Up to 50 measurements a day

3 measuring points

Measuring range

Methane (CH_4):	0-100 Vol.-%
Carbon dioxide (CO_2)	0-100 Vol.-%
Hydrogen sulphide (H_2S)	0-2000 ppm to be decided in detailed engineering

Emergency Flare

Technical data

Flare system consisting of base plate, tubing with connection flange, casing with injector, mixing and combustion chamber and wind protection ring

Flow rate:	design point 800-850 Nm^3/h
Sound level:	approx. 65 dBA
Engineering grades:	made of stainless steel
Material gas touching parts:	material 1.4571
Material combustion chamber:	material 1.4828
Material other components:	material 1.4301

Fully assembled including wiring

Equipped with:

Shut-off device for manual operation

Deflagration arrester, BAM-certificate

On-site switchboard; protection type: IP 56

Automatic ignition device with ignition electrode (ignition transformer 7.5 kV)

Automatic main gas-valve (free from non-ferrous metals); slow resolve / quick shutoff

Condensate stripper with drain plug

Alternative Biogas Conditioning

In case no biological desulphurisation is foreseen, H_2S-levels above 600 ppm average must be controlled through a chemical desulphurisation.

Gas Drying

Water is removed from biogas as condensate to prevent corrosion, caused by ingredients of the biogas. Furthermore some substances that could settle in the combined heat power unit or motor oil are removed. This leads to reductions in abrasion of the combined heat power unit and increases standing time.

Gas drying unit consisting of a cooling unit and heat exchanger

Biogas is cooled by a water water flow in the opposite direction

By temperature reduction, water condensates and can therefore be removed from the biogas

Integrated condensate trap to prevent slip of methane

Cooled and dryed gas leaves the heat exchanger

Technical data

Base frame:	galvanised
Material to prevent corrosion:	stainless steel (1.4571) / PEHD

Fine Desulphurisation

H_2S causes creation of acids, damages to gas using components (e.g.: combined heat power unit) and must therefore be removed.

Design data

Amount of activated carbon (every 2x): approx. 1,300 kg

Biogas is led through an activated carbon filterThe activated carbon adsorbs the H_2S.

On the surface of the activated carbon H_2S is catalytically oxydised to elementary sulphur.

Dual activated carbon filter

For continous supply of biogas to the gas using components, the fine desulphurisation is equipped with two seperate filter units
For full utilisation of the load capacity the filters are passed through in series

Gas Pressure Increasement

For the supply of biogas to the biogas consuming components, the pressure of biogas is increased by a compressor. The Engine is directly mounted to the stainless steel cabinet

Biogas Conditioning – combined drying / pressurizing system

To fulfill the inlet biogas specification of the gas consuming units (T, p, H2O- and H_2S-content) a biogas condition unit will be installed.

Design data

Gasmedium:	Biogas
Gas flow:	design point 800 to 850 Nm^3/h

In case no biological desulphurisation is foreseen, H_2S-levels above 600 ppm average must be controlled through a chemical desulphurisation. Gas drying unit consisting of a heat exchanger against air and a cold water aggregate. By cooling the gas flow, water condenses and is removed from the stream

Including integrated condensate trap to prevent slip of methane

The gas outflow is cooled and dryed to a dew point of min. 15°C

The gas is then pressurised by a compressor such that it can be transported to the gas consuming units (CHP and/or gas upgrading)

Gas outlet pressure	min. 150 mBar
Material	steel

Combined Heat Power Unit (CHP) with Gas Engine

The long term advantage of a single unit is lower Opex. The disadvantage is that as units require at least 50% of nominal gas flow, at start up or if feedstock would perform poorly, the unit can not operate or operates at less efficiency. Efficiency drops quickly when operated below 80% of rated power

Technical data

Manufacturer:	MWM
Type:	TGC 2020 V20
Electrical power output:	2,000 kW
Drive:	1,500 rpm
Engine:	Gas engine, V20
Fuel:	CH_4:CO_2 = 0.55/0.40
Consumption:	4,684 kW (Tolerance: +5%)
Electric efficiency:	42.7%
Thermal efficiency:	41.7% (incl. EGHE)
Heating flow:	90 °C
Heating return:	70 °C
Max. H_2S-concentraton:	approx. 750 ppm

The above figures refer to the manufacturer at full load operating under standard conditions. Deviations from these standard conditions can lead to shifts in heat balance and efficiency.

CHP Container

Machine container 40‘-special container

Fire extinguisher: 12 kg

Two-leaf door at front end side and 2 additional single-leaf doors

Fire retardant and tested structural analysis

Plate with lug pattern, beamed upturn to 60 mm height, welded oilproof as an oil pan

Sound insulation cassettes made of galvanised perforated sheeting with 100 mm highly compressed mineral wool, designed for a sound pressure of 65 dB(A) at a distance of 10 m

Equipped with a fire / smoke alarm system

Table cooler on the roof

Eurozone socket: 400 V, 16 A

2 moisture-proof sockets: 230 V

Site and Grid Power Supply

The grid operator will deliver the 11 kV to the site. Transformer and other power distribution will be supplied, these cover (not comprehensive)

Transformer 3.5 MWA (11.000 to 415 V)

Outgoing 2000 kW (CHP)

Incoming Supply up to 600 kVA

Low Voltage Switch Cabinets, supplying

- Control room
- Gas conditioning
- Evaporators
- Belt drier (Phase 2)
- Separation/Composting (Phase 2)

- CHP

On site cabling to AD Plant equipment

On site lighting, per proposed lighting scheme, minimal impact for environment (on demand on only)

Standby Power Supply System

Standby power supply system to supply the system with power when the grid fails and as prime design objective to assure the maintenance of important and relevant functions of the biogas plant.

Technical data

Power: 130 kVA
Main source switching 400 A, 4 Pole
Including sound enclosure
Tank for fuel supply sufficient for eight hours
Frame with anti-vibration device
Cooler 50°C
Control cabinets
Protected switch
Size approx: 3 x 2,3 x 2,6 m