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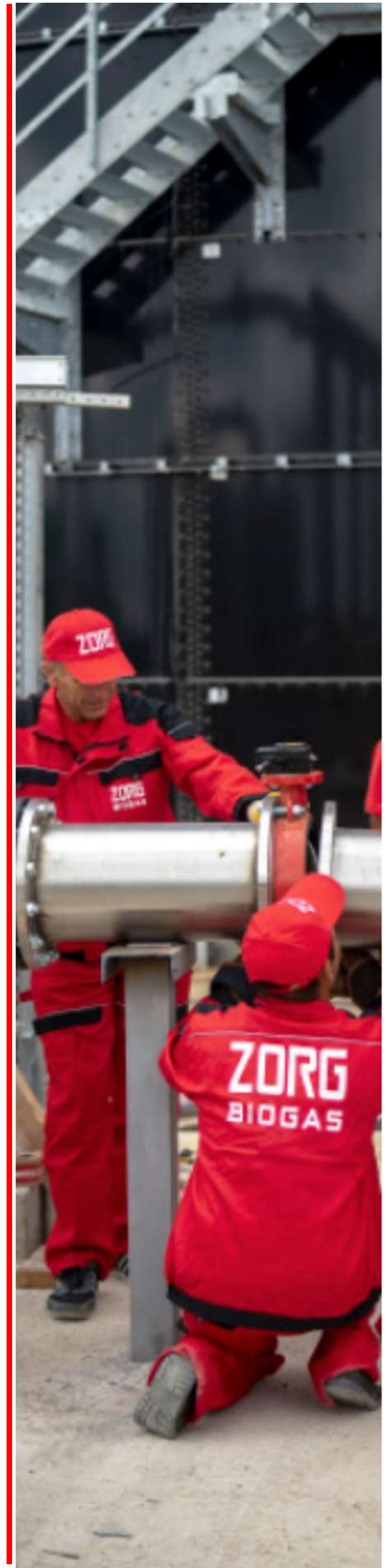
Proposal

Biogas plant at a cow farm
1297 kW gross / 1150 kW netto



Date: 01/10/2026

Validity: 1 year



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OVERVIEW

Zorg Biogas proposes a biogas plant for dairy farm manure based on continuously stirred tank reactor (CSTR) technology. The glass-fused-to-steel digester combines controlled feeding, mixing and temperature regulation for stable anaerobic digestion.

The plant processes 180 tonnes of semi-liquid cattle manure and 64 tonnes of manure with bedding per day. The calculated biogas yield is 12,209 Nm³/day. At this gas supply, the CHP unit produces 1,297 kW of gross electrical power, with approximately 1,150 kW available after the plant's own consumption. Recovered heat supports digester heating and provides useful heat for the farm.

Digestate separation produces approximately 116 tonnes/day of solid fraction and 113 tonnes/day of liquid fraction. Both retain valuable plant nutrients and can be used in a managed agricultural fertilisation programme. The project combines renewable energy generation with controlled manure treatment and nutrient recycling, helping the farm reduce purchased energy and mineral fertiliser use.

Raw material potential

Substrate	Quantity (tonnes/day)	Quantity (tonnes/year)	DM content (%)	oDM content (%)	DM quantity (tonnes/day)	oDM quantity (tonnes/day)	Biogas yield (m3/tonnesOD M)	Biogas (m3/day)	Methane content (%)	Biogas (m3/year)
Cattle manure (semi liquid)	180	65700	12	85	21,6	18,36	460	8446	60	3082650
Cattle manure (with bedding)	64	23360	35	80	22,4	17,92	210	3763	60	1373570
Total	244	89060			44,00	36,28		12209	60	4456220

***-DM- dry matters

***-oDM- organic dry matters

Biogas plant characteristics

Characteristics	Values	Figures
Reactor	units	1
Volume:		
Work	m ³	5629
Overall		6389
Temperature	°C	38
Overall dimensions of the digester:		
diameter	m	33.61
height		7.20
Organic load	kgODM/m ³	6,45
Hydraulic retention time (gross/netto)	days	26/23
Number of gasholders	units	1
Volume:	m ³	3002
Dimensions of the gasholder:		
diameter		33,0
Height	m	8,25

Number of personnel

	Shift 1	Shift 2	Shift 3
Chief Engineer	1	-	-
Operator	1	1	1
Total	4		



Biogas plant working principle

The technology is based on the biochemical conversion of organic materials from high molecular weight compounds to low molecular weight compounds. The first stage of this process is hydrolysis. Hydrolysis produces organic acids and alcohols.

Organic compounds + H₂O → C₅H₇N₀2 + HCO₃.

Further conversion of obtained dissolved compounds like organic acids and alcohols [C₅H₇N₀2, HCO₃] into gases - CH₄, CO₂. C₅H₇N₀2 + HCO₃ + H₂O → CH₄ + CO₂ + NH₄.

Biological process of consecutive (phasic) conversion of organic compounds take place in anaerobic environment i.e. in oxygen-free tank (biological reactor). At the first stage of fermentation, substrate hydrolysis take place under acidogenic bacteria influence. At the second stage, elementary organic compounds come through hydrolysis oxidation by means of hetero-acidogenic bacteria with production of acetate, carbon dioxide, and free hydrogen. The

other part of the organic compound including acetate forms C₁ compounds (elementary organic acids). Produced substances are the feedstock for methanogenic bacteria of the third type. This stage flows in two processes of A and B type the character which depends on caused by different bacteria type. These two types of bacteria convert the compound obtained during the first and second stages into methane CH₄, water H₂O and carbon dioxide CO₂. Methanogenic bacteria are more sensitive to the living environment compared to acidogenic bacteria. They require a complete anaerobic environment and a longer reproduction period. The speed and scale of anaerobic fermentation depends on bacteria metabolic activity. That is why the biogas plant chemical process includes hydrolysis stage, oxidation, and methanization stage. For that kind of substrate, these processes take place in the same reactor

Technological process of biogas production

Semi-liquid cattle manure is collected in a receiving tank fitted with a submersible mixer and level sensors. A pump feeds measured portions to the digester. Manure with bedding enters a solid feeder and is conveyed into the digester by screws.

The substrate is maintained at 38°C under mesophilic conditions. Paddle agitators mix the digester contents periodically. With 5,629 m³ of working volume and 244 tonnes/day of feedstock, the hydraulic retention time is approximately 23 days.

Digestate is pumped to screw press separators. The solid fraction is discharged for storage and agricultural use, while the liquid fraction flows to the filtrate tank.

Biogas collects under the double-membrane gasholder. The outer membrane protects the gas storage system from the weather; pressure protection devices safeguard the digester and gasholder.

Hydrogen sulphide removal uses three stages: iron hydroxide dosing, controlled biological treatment with air, and activated carbon polishing. Iron hydroxide consumption is 52 kg/day. Air is supplied to the digester at 5% of the biogas volume, equivalent to approximately 610 Nm³/day.

Biogas passes through the cooler and condensate removal system. Gas pressure after cooling is 0.5 mbar. The biogas compressor increases the pressure to 200 mbar.

The activated carbon filter removes residual hydrogen sulphide. Its pressure drop is 5 mbar, leaving a gas supply pressure of 195 mbar to the CHP unit. The specified H₂S concentration after final treatment is 0 ppm.

One 2020 V16 CHP unit converts cleaned biogas into electricity and heat. An automatic control system monitors process conditions, alarms and operating modes, with local and remote operator access.

MAIN EQUIPMENT





Solid feeder (SF-01)

Solid feeder machines have been proven in various situations. Solid feeder has the solid design, which guarantees a maximum functionality and less maintenance, combined to a low energy consumption. Because of the vertically oriented walls, there is no change for the material to get stuck or build bridges. The conveyor chains and the milling-unit allow continuous dosing by various types of materials. Furthermore, the material is loosened by this dosing process. The user is able to control the material flow up to 15 m³/h or more, regarding to the own consumption of electrical power by the machine. In addition, the corrosion protection, wear resistance and high quality allow customers to use our product for a long period of time.

Specifications

Height:	2,0 m
Length:	5,0 m
Width:	2,3 m
Volume:	20 m ³
Quantity:	1 pcs.



Reactor (R-01)

The digester is constructed from glass-fused-to-steel panels on a reinforced concrete foundation. The enamel coating protects the steel against the corrosive process environment. Bolted panel joints and a dedicated sealant provide a watertight tank structure and allow individual panels to be replaced.

The tank is assembled on site from prefabricated sections. Stainless steel fasteners and sealed connections support durable operation. Insulation limits heat loss and helps maintain the process temperature, while external cladding protects the insulation.

The selected reactor has a diameter of 33.61 m, a shell height of 7.20 m and a total volume of 6,389 m³. The operating substrate volume remains 5,629 m³, corresponding to approximately 23 days of hydraulic retention at the specified feed rate.

Specifications

Height	7.20 m
Diameter	33.61 m
Total volume	6,389 m ³
Working substrate volume	5,629 m ³
Quantity	1 unit



Reactor`s mixer Paddle-giant (AG-01..05)

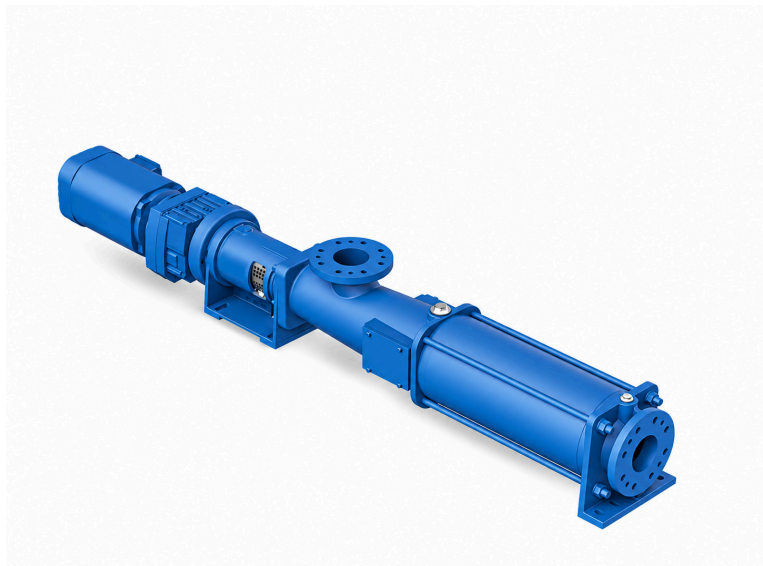
The paddle agitator mixes the digester contents and helps prevent floating layers and sediment build-up. Its large blades provide effective mixing of manure and fibrous feedstock at a low rotational speed.

The shaft and blade arrangement distribute the mixing action through the substrate. Bearings and service components are designed for the demanding conditions inside a digester. Accessible drive components simplify maintenance.

Five agitators, each with a 15 kW drive, are distributed around the reactor. Their operating sequence is controlled automatically to maintain a uniform substrate temperature and support gas release.

Specifications

Engine power:	15 kW
Quantity per reactor:	5 pcs
Total quantity:	5 pcs



Pump equipment (PU-01...PU-04)

Pumps are used to transport substrate to the equipment and facilities in the biogas plant and away. Biogas plant design allows to access easily to all pumps. Pumps are driven by helical geared motor. Stator has hopper inlet for optimum filling of the pumping chamber, wear-protected, robust universal joint with feeding screw, robust bearing pedestal with close-coupled drive and self-centering of the drive shaft. Pumps have modular design for high flexibility, low life-cycle-costs.

Specifications

Liquid substrate pump (PU-01)

Engine power:	18,5 kW
Flow rate:	60 m ³ /hour
Pressure:	4 bar
Quantity:	1 pcs

Substrate pump (PU-02. 03)

Engine power:	15,0 kW
Flow rate:	8-25 m ³ /hour
Pressure:	4 bar
Quantity:	2 pcs

Filtrate pump (PU-04)

Engine power:	18,5 kW
Flow rate:	60 m ³ /hour
Pressure:	4 bar
Quantity:	1 pcs



Separator (SR-01)

The Press Screw Separator covers a broad spectrum of applications, from agriculture to biogas and bioethanol plants. The innovative technology separates substrates in its solid and liquid elements. The secret of the versatility of the press screw separator is that it can adjust to different dry matter contents and Thick liquids (20% dry matter content). Slotted screens have different assortment and width of table cells and give possibility work with small solids and fiber contents. In the slotted screen, the solids are screened out from the liquid. The solids build up a layer which also acts as a filter to separate finer particles from the liquid. The auger flights convey this layer to the solids outlet. The screen surface is cleaned and a new filter layer is formed. The design of the screens is not conducive to plugging. The pressure in the first part of the screen is low but increases with the solid consistency to the solid output. The consistence of the gained solid can be varied with the help of a output regulator by the amount and position of counter weights. This way the required consistency of the final product for either further storage, use as fertilizer or the basis for compost can be reached. The liquid phase can easily be drained through a pipe or hose system.

Specifications

Engine power:	7,5 kW
Flow rate:	8-25 m3/hour

Quantity:	2 pcs
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Equipment
 Frame
 Screw
 Sieve for the filtration
 Counterweights
 The design of the protective room



Receiving tank (RT-01) and Filtrate tank (FT-01)

Reinforced concrete reservoir for reception of liquid kinds of raw materials. The reservoirs are equipped with level sensors and submersible agitators for mixing substrate.

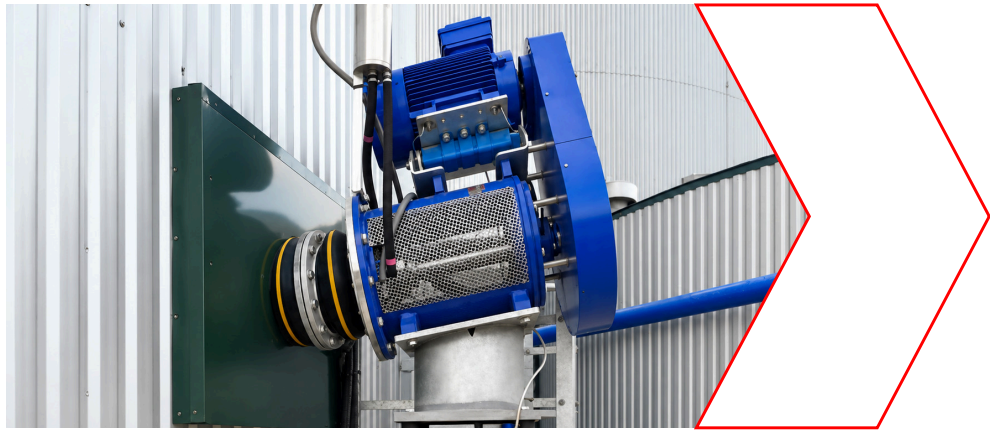
Specifications

Receiving tank (RT-01)

Diameter:	10,0 m
Height:	3,0 m
Total volume:	118 m ³
Quantity:	1 pcs

Filtrate tank (FT-01)

Diameter:	10,0 m
Height:	3,0 m
Total volume:	118 m ³
Quantity:	1 pcs



Submersible mixer (AG-06... AG-07)

The submersible motor agitator serves for mixing renewable raw materials (RRM), liquid substrate as manure and similar substrates. The electro-motor driven submersible agitator is designed for submersion operations in potentially explosive environments of Ex zone 2 and complies with Directive 94/9 EC. The submersible agitator can be attached to most sliding masts by means of the motor support. A mounting option for a hauling cable is provided on the motor support for height adjustment purposes.

Due to the 4-roller guidance of the motor support, the agitator can be lifted and lowered without friction and the square mast, even if the pull of the hauling cable is slightly angular. The motor support is designed for a 100 x 100 mm square sliding mast as standard, but can also be used for an 80 x 80 mm sliding mast by changing the rollers. The strain relief of the connecting cable can be positioned in the extension of the motor or towards the top on the motor support, depending on the requirements. This enables universal utilization with the most various installation kits.

The geared motor is made of spheroidal graphite iron (GGG40) and painted, the propeller is galvanized and the motor support is made of stainless steel. The submersible motor agitator is designed as a water pressure-tight monoblock unit for driving the three-vane propeller. The submersible agitator is of modular design, submersible electro-motor with flange-mounted planetary gear and bearing flange for holding the propeller. The conical shaft in the bearing flange is mounted in the oil bath by two angular roller bearings and sealed off from the agitating substrate with a mechanical seal.

Specifications

Submersible mixer for the receiving tank	(AG-06)
Nominal power:	5,0 kW
Quantity:	1 pcs
Submersible mixer for the filtrate tank FT-01	(AG-07)
Nominal power:	5,0 kW
Quantity:	1 pcs



Gasholder (GH-01)

The gasholder provides for biogas storage and for equalizing pressure and biogas composition. The gasholder system has a two-layer construction. The external material consists of a weather-proof film of PVC-coated polyester fabrics with UV protection. Both sides are finished with an external N/5cm, internal membrane PELD (gasholder) membrane.

The gasholder has a methane permeation maximum of $260 \text{ cm}^3/\text{m}^2 \cdot 1 \text{ bar}$ biogas resistance. The gasholder film temperature range allows operation from -30°C to $+60^\circ\text{C}$.

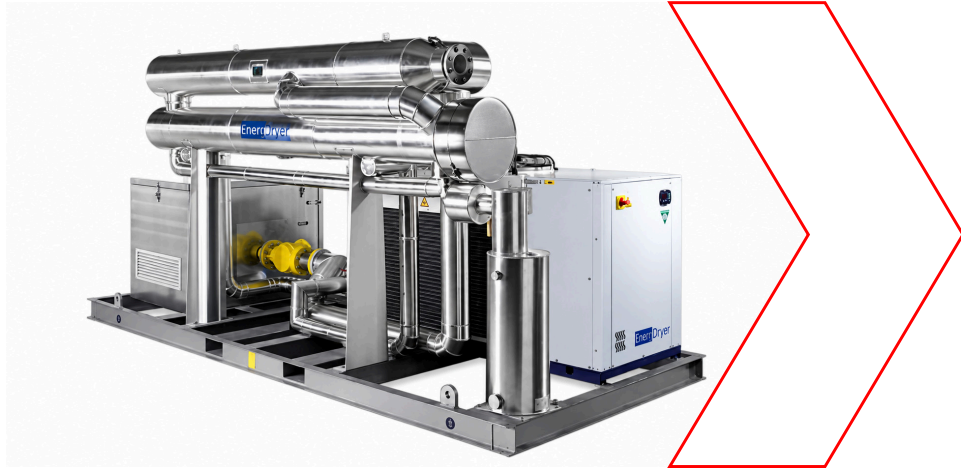
The internal film is stretched under normal biogas pressure. Air is blown into the space between the external and internal membranes to pressurize the internal membrane and form the shape of the external membrane.

The biogas pressure in the gasholder is 2-5 mbar. The membranes are designed and cut out on NC machines. Welding is executed by high frequency currents. These steps yield substantial improvements for quality and service life compared to handmade membranes welded by standard welding equipment.

To prevent damage to the gasholder as a result of overpressure conditions, a safety valve is installed. To survey the internal membrane, an inspection window is installed on the external membrane.

Specifications

Height:	8,25 m
Diameter:	33,0 m
The total volume :	3002 m ³
Quantity:	1 pcs



Biogas dryer and cooling (CHL-01)

Biogas dryer and cooling are provided with special equipment as GAS COOLER and AIR-COOLED LIQUID CHILLER. Biogas plants thanks to an extensive range of dedicated Biogas solutions, low pressure heat exchangers, a comprehensive range of water chillers and RWD Dry Coolers. Designed as one-way shell-and-tube heat exchanger. Process gas inside of the tubes; cooling water in the shell. All parts in contact with the process gas made of stainless steel 316Ti or 316L; heat exchanger shell made of stainless steel/ Designed with gas outlet chamber outlet connection radial; inspection opening axial Official acceptance according to PED 2014/68/EU in accordance with ADMerkblätter and factory pressure test.

Specifications

Gas volume flow:	510 m ³ /hour
Gas inlet temperature:	+38°C
Gas outlet temperature:	+10°C
Electric power:	25,2 кВт
Quantity:	1 pcs



Biogas compressor (BC-01..02)

The biogas blowers convey gas from the cooling and condensate removal system to the activated carbon filter and CHP unit. Each blower is rated for 510 m³/h.

The specified discharge pressure is 200 mbar. The gas system includes isolation fittings and instrumentation for controlled operation.

Specifications

Gas flow rate	510 m ³ /h
Discharge pressure	200 mbar
Motor power	7.5 kW
Quantity	2 units



Desulphurization system

Biogas desulphurisation combines iron hydroxide dosing, controlled biological treatment and activated carbon filtration. Iron hydroxide is dosed at 52 kg/day. Air is supplied to the digester at 5% of the biogas volume to support biological conversion of hydrogen sulphide.

The specified H₂S concentration after the first two stages is 80 ppm. The activated carbon filter provides final polishing to 0 ppm. A pressure drop of 5 mbar across the filter reduces the pressure from 200 to 195 mbar before the CHP unit.

Specifications

Activated carbon charge	300 kg
H ₂ S after polishing	0 ppm
Filter pressure drop	5 mbar
Outlet pressure	195 mbar
Quantity	1 unit



Cogeneration power plant 2020 V16

The containerised CHP package converts cleaned biogas into electricity and useful heat. It comprises a gas engine, alternator, control system, ventilation, cooling and service systems in a weather-protected enclosure.

Heat recovered from the engine and exhaust system is integrated with the plant heating circuit. Automatic controls supervise engine operation, electrical protection and communication with the biogas plant control system.

Project configuration

Engine model	2020 V16
Installed electrical capacity	1,560 kW
Electrical output at available biogas	1,297 kW gross
Net electrical output	1,150 kW
Thermal output at available biogas	1,302 kW gross
Engine configuration	V16, 70.8 litres
Rated speed / frequency	1,500 rpm / 50 Hz
Fuel / supply pressure	Cleaned biogas / 195 mbar
Quantity	1 containerised unit

Photograph illustrates typical containerised execution.

CHP unit - container and engine compartment



External view: enclosure, cooling and ventilation



Internal view: engine, alternator and service access

The enclosure provides weather protection, ventilation and access for routine maintenance. The engine and alternator are mounted on a common base, with auxiliary systems and service connections arranged inside the container.

The control panel displays operating measurements and alarms. Protective functions coordinate the engine, generator and gas supply. Access passages and removable panels allow inspection and servicing of the main components.

Photographs illustrate typical execution of the containerised CHP package.



Flare

Flare is designed for the temporary or periodical complete combustion of the biogas produced by biogas plants without the possibility of its use as an energy source. The burn system consists of a burner and additional equipment. The burner is designed on the principle of injection and consists of a combustion nozzle with an injector with an air supply control system, flame protection tube, fitting and burner control system. The biogas combustion system is made of stainless steel.

The supporting structure holds the burner and vertically mounted socket. The burn control system is installed in a case, which is mounted on the supporting structure of the combustion system and contains all the elements for monitoring and controlling ignition and flame.

Specifications

Flow rate:	510 m ³ /hour
Pressure:	min 10 mbar- max 60 mbar

Quantity:	1 pcs
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Water supplying and sewerage system



Water supplying system provides biogas plant feed water, water for network circuits, the domestic water and fire safety systems. As used centrifugal single stage pumps as main pumping elements. These pumps are designed for pumping waste water, household / domestic water and sewage. Pressure Boosting Systems are designed for pure water pressure boosting in industrial plants. The booster comprises 2 to 3 (connected in parallel pumps) installed on a common base frame, and provided with all the necessary fittings.

Specifications

Drain pump
Pressure 4m
Flow 2-3 m³ / h
Engine 0,24 kW

Equipment
Pump case control
Stove-base
gauges
Check valves
Float switches
Brackets
Valves



Heating system

Heating equipment is used for biogas plant heating and for sustaining constant temperature in the fermenter. Heating equipment includes circulation pumps, heat exchanger, heating manifold and pipes. The heat from the boiler is transferred to the biogas plant by using heat exchanger, and then is pumped through the biogas plant by circulation pumps. A heat carrier prepares water with an additive of ethylene glycol. Inlet temperature in the fermenter is 60°C, the outlet is 40°C.

Specifications

Circulating pump feeding heat carrier

Engine power:	3,5 kW
Flow:	28 m ³ /hour
Pressure:	1 bar

Circulating pump feeding heat carrier

Engine power:	2,0 kW
Flow:	12m ³ /hour
Pressure:	1 bar

The pumping station feeding propylene glycol

Engine power:	0,7 kW
Flow:	1 m ³ /hour
Pressure:	4 bar



Automation and electrical equipment

Process control equipment is used for supervision and regulation operation of the plant and for the limitation of damage. In case of emergency (for example, breakdown of the electrical power supply) the biogas plant is automatically transferred to safe operating conditions by the process instrumentation. Critical electrically driven devices are supplied with emergency power. An automatic system allows the supervision of the plant in real time and to recognize and correct aberrations immediately; to run the plant at its optimum saving resources and costs; and to record for the electronic database operation parameters. The automatic system consists of a control cabinet and sensors for parameter control of technological processes and execution devices.

The control cabinet is designed based on the industrial controller Siemens CPU315-DP2, using periphery distributing system Simatic ET200S, and operator panel OP277 Touch with touch-sensitive controls. Communications is executed by PROFIBUS and MPI with physical interface RS-485. The control program is designed based on the Simatic Step7. The control cabinet is a modular design. The upper part has a power box with central and front-end processor. The periphery distributing system, Simatic ET200S, is installed with input - output units. The lower part with interface relay and clips is installed for connecting execution devices. The entire plant is controlled by a single operator.

Specifications

Incoming control case with automatic set ASE-1, 2, 3

Base Siemens CPU315-DP2 controller

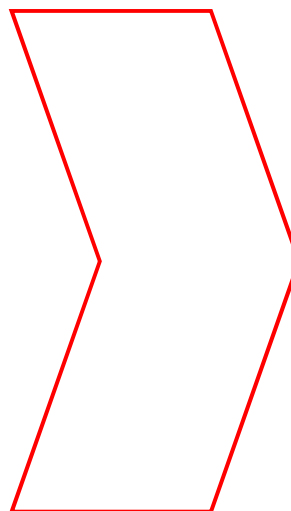
Peripherals Simatic ET200S

Control panel OP277 touchscreen

Communication PROFIBUS and MPI

Interface RS-485

Control system Simatic Step7



Gas analyzer (CH₄, CO₂, H₂S, O₂)



Gas analyzer is a measuring device for determining the qualitative and quantitative composition of a gas mixture. In absorption gas analyzers installed at biogas plants, the components of the biogas mixture are sequentially absorbed by various reagents. Automatic gas analyzers continuously measure any physical and physicochemical characteristics of the gas mixture or its individual components. Their operation is based on physical analysis methods, including auxiliary chemical reactions.

Specifications

The kit includes
Wall mounting bracket
LC display
Flow meter / control valve
Sensors



Sensors set

Sensors are used to measure physical quantities (temperature, pressure, level of moisture) data collection.
installation kits

Specifications

Conductometric sensor
Pressure Sensor / level
Ultrasonic sensor
Gas Pressure Sensor
Temperature converters with protective sleeves
The moisture sensor and the gas temperature

Equipment specification list



Nº	Equipment	Characteristic	Quantity
1	Loader	V=20m3	1
1.1	Container bunker		1
1.2	Feeding screws	set.	1
2	Reactor`s agitator	N=15 kW	5
2.1	Airtight motor gearbox		5
2.2	Hydraulic screw (wear-resistant steel)		5
2.3	Shaft (adapted to the height of the fermenter)		5
2.4	Blade		5
2.5	Frequency converter		5
2.6	Mounting bracket to bottom of the mixer		5
3	Safety valve of digesters		5
4	Liquid substrate pump	60 m3/hour N=18,5 kW	1
5	Substrate digested pump	8-20 m3/hour N=15,0kW	2
6	Filtrate pump	60 m3/hour N=18,5 kW	1
7	Separator	N=7,5 kW, 10-15m3/h	2
7.1	Body		2
7.2	Substrate Supply Pipe 4 ''		2
7.3	Engine - Gearbox	N=7,5 kW	2
7.4	Frame		2
7.5	Screw		2
7.6	Sieve for filtration		2
8	Submersible mixer	N=5,0 kW	2
8.1	Airtight motor gearbox		2
8.2	Hydraulic screw (wear-resistant steel)		2
8.3	Mixer control mechanism		2
8.4	Electric motor mount		2

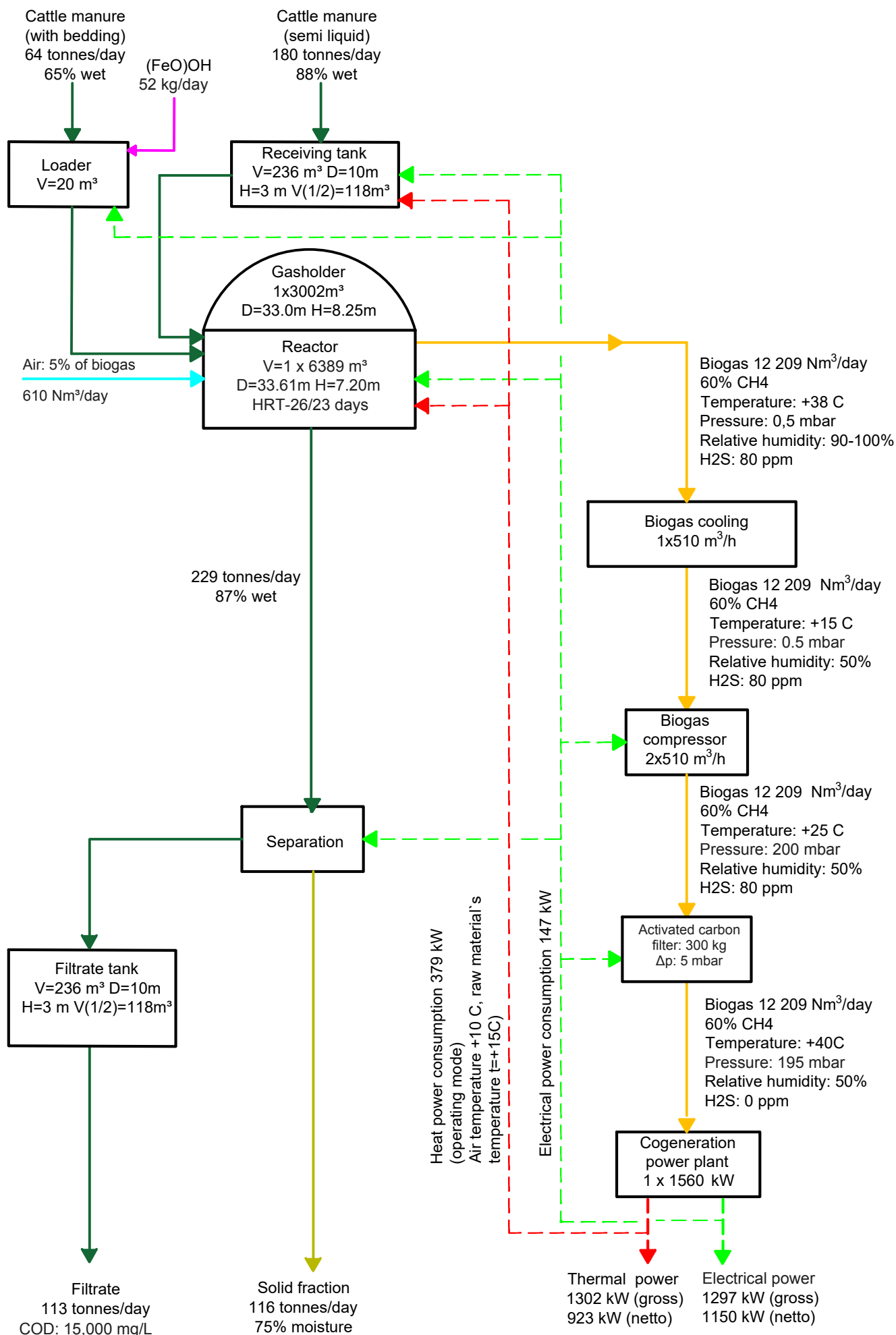
Nº	Equipment	Characteristic	Quantity
8.5	Set of fasteners		2
9	PVC gas holder	3002 m3	1
9.1	Weather protection film	Ø33,0m	1
9.2	Gasholder film PELD methane permeation max.260 cm3/m2*d*1 bar, 650 N/5cm biogas resistant		1
9.3	Air blower	16A, 0,5kW	
9.4	Excess and minimum pressure valve		1
9.5	Dome level sensor		1
9.6	Mounting system		1
9.7	Accessories		1
9.8	Safety valve		1
10	Biogas Cooling System	510 m3/h	1
10.1	Chiller		1
10.2	Heat exchanger		1
10.3	Polypropylene glycol tank		1
11	Desulphurization system		1
11.1	Numbers of charcoal columns	300 kg	1
12	Biogas compressor	Q=510 m³/h H=200 mbar N=7.5 kW	2
13	Electromagnetic flow meter		1
14	Gas analyzer		1
15	Flare	510 m3/h	1
16	Gas equipment included	set	1
16.1	Drainage pump with float	DN=50, Q=1m3/h, H=13 m	2
17	The heat supply system	set	1
17.1	Diaphragm expansion tank	V=1000 l,P=6Bar T=120°C	1
17.2	Circulating pump for supplying heat carrier	Q=30 m3/h,H=1bar	1
17.3	Propylene glycol feed pump station heating systems	Q=1,0 m3/h, H=4 bar	1
17.4	Circulation pump for supplying heat carrier to the digester	Q=18 m3/h, H=1.1 bar	1
18	Water supply and sewerage system, complete, disassembled	set	1

Nº	Equipment	Characteristic	Quantity
19	Automation with electrical equipment	set	1
19.1	Incoming distribution cabinet with a set of automation DB-1		1
19.2	Incoming distribution cabinet with a set of automation DB-2		1
20	Sensors, set		1
20.1	Gas pressure sensor 0,025Bar		1
20.2	Gas pressure sensor 0,4Bar		1
20.3	Pressure sensor(substrate level) 1,0Bar		2
20.4	Pressure sensor (substrate pressure) 2,5bar		2
20.5	Resistive thermometer (gas temperature)		3
20.6	Resistive thermometer with thermo well (fermenter substrate temperature)		3
20.7	Resistive thermometer with thermo-well (digester tank substrate temperature)		3
20.8	Resistive thermometer (heat conductor temperature)		3
20.9	Conductometric sensor of maximum level		3
20.10	Conductometric sensor of water level		3
20.11	Dome position sensor		1
20.12	Coolant pressure sensor	SEN 3276 B065 G1/2 6Bar	7
20.13	Humidity and gas temperature sensor	ESFTF-I	1
21	CHP 2020 V16	set	1

ANNEXES

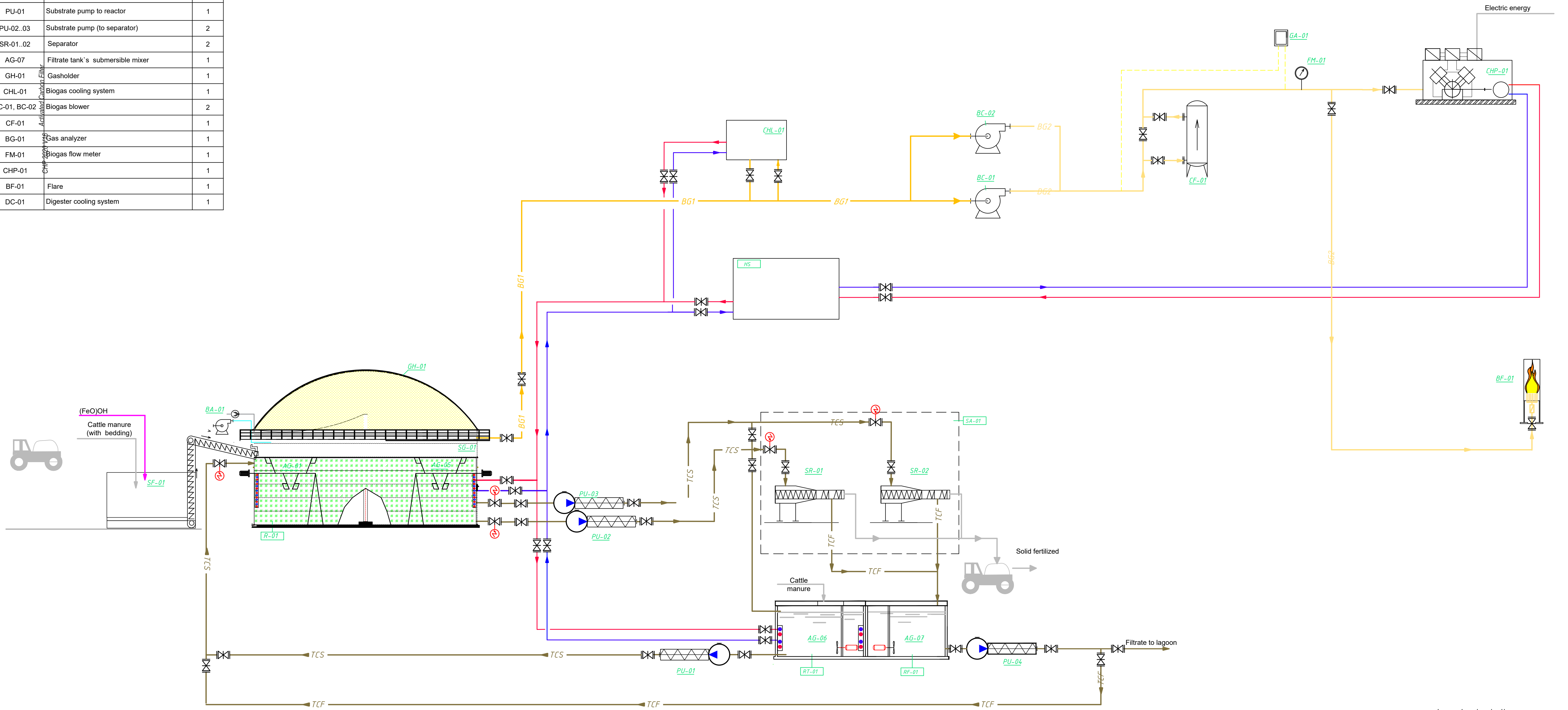


Material flow diagram



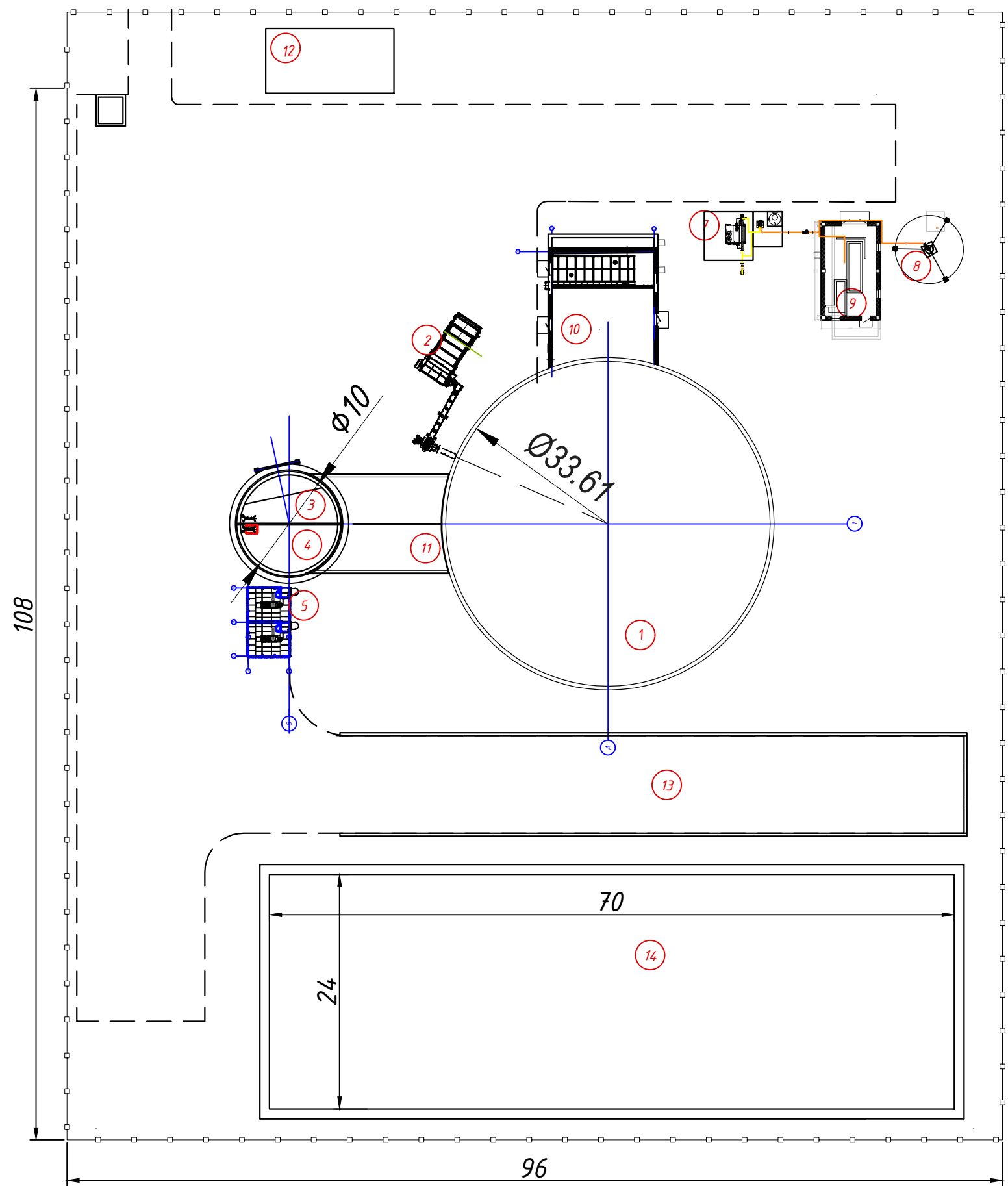
Specification		
N/№	Name	Q-ty
SF-01	Loader machine	1
AG-06	Receiving tank's submersible mixer	1
AG-01..05	Mixer Paddle-gigant	5
SV-01	Safety valve	1
SG-01	Inspection windows	1
PU-01	Substrate pump to reactor	1
PU-02..03	Substrate pump (to separator)	2
SR-01..02	Separator	2
AG-07	Filtrate tank's submersible mixer	1
GH-01	Gas holder	1
CHL-01	Biogas cooling system	1
BC-01, BC-02	Biogas blower	2
CF-01	Activated Carbon Filter	1
BG-01	Gas analyzer	1
FM-01	Biogas flow meter	1
CHP-01	Combined Heat and Power Engine	1
BF-01	Flare	1
DC-01	Digester cooling system	1

Structure		
N/№	Name	Q-ty
R-01	Reactor	1
SA-01	Separator area	1
RT-01	Receiving tank	1
RF-01	Filtrate tank	1
HS	Boiler room	1



- Legend main pipelines
- TCS Substrate
 - TCF Filtrate
 - BG1 Biogas
 - BG2 Biogas
 - HS Heat system pipeline
 - HS Heat system pipeline

Plan



Explication

N/Nº	Name	Note
1	Digester	
2	Pre-tank	
3	Filtrate tank	
4	Separator platform	
5	Lagoon	
6	Gas compressor	
7	Biogas burner	
8	CHP room (In a building)	
9	Technical room	
10	Equipment room	
11	Staff trailer	
12	Composting site	

Appendix 4

Biogas plant					
Name equipment	Instal. Pow. (kW)	Q-y (pcs)	Total installed power (kW)	Working hours per day	Consumption kWh per day
Loader V=20 m ³	12,0	1	12,0	4,6	55,2
Screw set.	12,0	1	12,0	4,6	55,2
Liquid substrate pump	18,5	1	18,5	3,0	55,5
Reactor's mixer	15,0	5	75,0	18,0	1350,0
Submersible mixer in receiving tank	5,0	1	5,0	12,0	60,0
Submersible mixer in filtrate tank	5,0	1	5,0	4,0	20,0
Biogas compressor	7,5	2	15,0	12,0	180,0
Biogas cooling system	25,2	1	25,2	24,0	604,8
Separator	7,5	2	15,0	11,0	165,0
Substrate pump to separator	15,0	2	30,0	11,0	330,0
Filtrate pump	18,5	1	18,5	1,9	35,2
Air compressor for gasholder lock	1,5	1	1,5	1,0	1,5
Air blower for double membrane	1,0	1	1,0	24,0	24,0
Circulation pump for supplying heat carrier to the digester	0,8	1	0,8	24,0	18,0
Cogeneration power plant	19,0	1	19,0	24,0	456,0
Circulation pump for Cogeneration power plant	5,0	1	5,0	24,0	120,0
Circulation pump for supplying heat to the technical building	0,8	1	0,8	only ambient temp +15°C	
Circulating pump feeding hot water at technical building	0,1	1	0,1	24,0	1,9
Propylene glycol pump station	0,8	1	0,8	0,5	0,4
Drinage pump	1,0	1	1,0	0,5	0,5
Lighting of the biogas plant territory	0,6	1	0,6	8,0	4,8
Spot light for digesters inspection windows	0,1	1	0,1	0,5	0,0
Working lighting of switchboard	0,1	1	0,1	0,5	0,1
Total installed power, kW			262		
Total consumed electric energy, kWh per day					3538
Total consumed power, kW					147

ZORG
BIOGAS

Prices for a biogas plant 1300 kW max at a milk farm 6000 cows

Pos	Name	Number of units	unit price, EUR	price sub-total, EUR	
1	Project documentation	1	44.100	44.100	
2	Supervision	1	30.000	30.000	
3	Startup and training	1	30.000	30.000	
4	Living and travel expences	1	25.000	25.000	
5	Delivery of the equipment (trucks)	14	8.000	112.000	
6	Reactor V=6150 m3	1	245.000	245.000	
7	Solid feeder 20 m3	1	75.000	75.000	
8	Screw conveyor	1	65.000	65.000	
9	Digester horizontal agitator 15 kW	5	29.400	147.000	
10	Frame for Digester agitator pos 9	5	4.900	24.500	
11	Liquid substrate pump 18,5 kW	1	20.300	20.300	
12	Digested substrate pump 15,0 kW	2	16.100	32.200	
13	Substrate separation unit 7,5 kW	2	36.400	72.800	
14	Filtrate pump 18,5 kW	1	20.300	20.300	
15	Submersible agitator for receiving tank 5,0 kW	1	9.100	9.100	
16	Submersible agitator for filtrate tank 5,0 kW	1	9.100	9.100	
17	Over- and under pressure safeguard	1	3.000	3.000	
18	Water supply and canalization system	1	20.300	20.300	
19	Heat supply station	1	24.500	24.500	
20	Automation and electric cabinet	1	135.000	135.000	
21	Motorized valves (set)	8	5.600	44.800	
22	Sensors (set)	3	21.000	63.000	
23	Gasholder	1	51.800	51.800	
24	Biogas blower 510 m3/h	2	3.500	7.000	
25	Desulphurization column with active coal 300 kg	1	16.100	16.100	
26	Biogas flare 510 m3/h	1	33.600	33.600	
27	Gas analyzer (portative)	1	4.550	4.550	
28	Gas conditioning unit	1	18.900	18.900	
29	Cogeneration power plant 1560 kW with drycoolers, oil system, silencer, container assembly	1	575.000	575.000	
30	Construction	1	500.000	500.000	Client
				1.958.950	
					2.458.950,00

Implementation terms and payment

Year	2025			2026									
Months	10	11	12	1	2	3	4	5	6	7	8	9	10
Project documentation	50%		50%										
Approvals and permits													
Equipment				30%		25%	25%	20%					
Delivery						25%	25%	25%	25%				
Construction													
Supervision				50%			50%						
Biogas plant start-up											50%	50%	

Contracts

Project implementation is executed simultaneously under several contracts

- Engineering contract
- Equipment supply contract
- Supervision contract
- Start-up and training contract

List of exclusions:

- 1) Local permits, authorisations and adaptation of the project documentation by a licensed local engineering organisation: EUR 10,000-15,000.
- 2) Topographic and geological surveys: EUR 3,000-7,000.
- 3) Electrical transformer and external power connection for 130 kW start-up demand.
- 4) External roads.
- 5) Temporary water supply during construction and reactor hydraulic testing: at least 7,100 m³ of non-saline technical water.
- 6) Machinery for transporting filtrate and digestate to agricultural fields, including a truck, front loader and tractor.
- 7) Activated carbon: 0.3 tonne every two years × EUR 1,800/tonne = EUR 540.
- 8) Iron hydroxide: 52 kg/day × 365 days = 18.98 tonnes/year; at EUR 800/tonne = EUR 15,184/year.
- 9) Demineralised water for the heating system: 1.5 tonnes.
- 10) Spare parts for two years: EUR 80,000.



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