01

version

Proposal

Biogas plant
986 kW (netto)/1135 kW(gross)
using pig manure

Date:04/09/2025
Validity: 3 months

CONTENT

OVERVIEW

We offer a solution to process pig manure into biogas and power in a single-stage CSTR digester. For 986 kW (netto)/ 1135 kW (gross) electrical power just 1 CSTRs x 10747 m3 is enough.

Zorg makes the detailed engineering, supplies equipment and provides supervision during construction as well as training and start-up.

The construction and installation are done by Client under Zorg's supervision

Raw material potential

Substrate	Quantity (tonnes/day)	Quantity (tonnes/year)	DM content (%)	oDM content (%)	DM quantity (tonnes/day)	oDM quantity (tonnes/day)	Biogas yirld (m^3/tonnesODM)	Biogas (m^3/day)	Methane content (%)	Biomethane (m^3/year)
Pig manure	450	164 250	5	85	22,5	19,13	550	10 519	60	3 839 435

**-DM- dry matters
***-oDM- organic dry matters

Biogas plant characteristics

Characteristics	Values	Figures
Reactor	units	1
Volume:		
Work	m^3	9994
Overall		10747
Temperature	^oC	38
Overall dimensions of the digester:		
diameter	m	37
height		10
Organic load	kgODM/m3	1,69
Hydraulic retention time (gross/netto)	days	24/22
Number of gasholders	units	1
Volume:	m^3	3151
Dimensions of the gasholder:		
diameter	m	37,0
Height		7,4

Number of personnel

	Shift 1	Shift 2	Shift 3
Chief Engineer	1	1	-
Operator	1	1	1
Total	5		

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 + H_2O→ $C_5H_7NO_2$+HCO_3.
Further conversion of obtained dissolved compounds like organic acids and alcohols ($C_5H_7NO_2$,HCO_3) into gases - CH_4, CO_2. $C_5H_7NO_2$ + HCO_3 + H_2O → CH_4+CO_2+NH_4.
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 CH_4, water H_2O and carbon dioxide CO_2. 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

Pig manure is pumped into a receiving tank. The receiving tank is equipped with a submersible mixer, level sensors. Substrate from the receiving tank is loaded into the reactor by portion with pump.

In the reactor the substrate is brought up to a temperature of +38°C. Constant temperature is sustained for the entire digesting period. To prevent a rise in temperature (for example, in summer), the biogas station is equipped with a cooler (dry cooling). The reactor operating regime is mesophilic. The heated substrate in the digester is blended periodically. Mixing is performed by submersible agitators. The average time of processing in the reactors is 24 days. After the reactor, the substrate is fed by pump to a separator area where it is separated into solid and liquid bio-fertilizer. Solid bio-fertilizer is discharged from the separation area and transported for storage; liquid filtrate is directed to a lagoon. Biogas goes up under overlap and delivered into a gasholder through pipeline. The gas holder's weather protective film protects the gasholder from precipitation and damage by foreign objects. The weather protective film is fixed firmly by a special system. To protect the gasholder from overpressure, digesters are equipped with safety valves, which start working at a pressure of 5 mbars and bleeds biogas to the atmosphere.

Air is supplied in portions to the digester for biogas bio-purification from hydrogen sulfide.

Desulfurization system is three-stage purification of sulfur that is contained in the biogas:

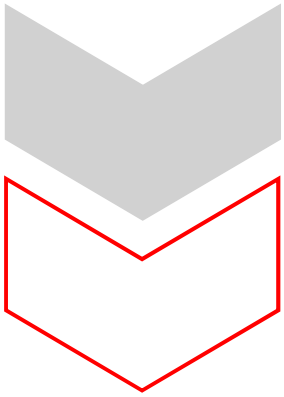
-ferric chloride adding – the first stage;

-by air- second stage of purification;

-coal column - the third stage. Accumulated in gasholder biogas goes through a gas pipeline to a biogas cooler with a condensate discharge unit and then to a compressor, where the pressure is raised up to 80-150 mbar to meet engine requirements. After the compressor, biogas is fed to activated coal filters to remove hydrogen sulfide (H2S). After filters, the biogas goes to the co-generator to produce electric and heat energy.

All technological processes are controlled and operated by an automatic system. Biogas plant work is monitored at the central control room monitor. The control room is equiped with a central control unit, which allows the switching of any biogas plant module into automatic or manual mode with local or remote control.

MAIN EQUIPMENT



Reactor (R-01)

The fermenter is an important part of the biogas plant, made of sheet metal with an enamel coating. Reactor is a tank of cylindrical form (for better mixing during the fermentation). It is built of cast-in-situ reinforced concrete based on sulphateresistant cement with thickness of walls and bottom - 0,25m. Overlap of reactor is reinforce concrete plate. On the tank's wall and in the bottom there is to be installed pipelines for heating, intended for assurance and maintenance of the optimal fermentation process temperature at thermophilic conditions. For heat conservation and reduction of heat energy consumption, the reactor walls, overlap and bottom are insulated outside with 100 mm slabs of extruded polystyrene foam. Over the heater, the substructure walls and bottom are insulated with roll damp proofing. Superstructure and substructure heat insulation is protected by shaped sheet from the outside mechanical damages and rodents. The reactor`s bottom has a slope 1%.

Specifications

Height:	**10,0 m**
Diameter:	**37,0m**
Total volume:	**10747 m^3**
Substrate volume	**9994 m^3**
Quantity:	**1 pcs.**

Submersible mixer (AG-01... AG-08)

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 reactor	**(AG-01..07)**
Nominal power:	**15,0 kW**
Quantity:	**7 pcs**
Submersible mixer for the receiving tank	**(AG-08)**
Nominal power:	**7,5 kW**
Quantity:	**1 pcs**

Window with spotlight (SG-01, SG-02)

Inspection windows are designed for visual control of processes inside the fermenter. Spotlights were made in explosion-proof with automatic disconnection. Inspection windows are equipped with a cleaning washing system.

Specifications

Inspection windows:	**Ø300**
Spotligh: **VISULUX UL50 -G -H**	**230V, 50W, IP65**

Pump equipment (PU-01...PU-03)

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 m3/hour
Pressure:	4 bar
Quantity:	1 pcs

Substrate pump (PU-02. 03)

Engine power:	7,5 kW
Flow rate:	8-25 m3/hour
Pressure:	4 bar
Quantity:	2 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 cm3/m2 * 1 bar biogas resistance. The gasholder film temperature range allows operation from -30°C to +60°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:	**7,4 m**
Diameter:	**37,0 m**
The total volume :	**3151 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:	**440 m^3/hour**
Gas inlet temperature:	**+38°C**
Gas outlet temperature:	**+10°C**
Electric power:	**18,0 кВт**
Quantity:	**1 pcs**

Biogas compressor (BC-01, BC-02)

Biogas blower is a device used to move gas and increase pressure thanks to a rotating impeller within a toroidal channel, so there is a progressive increase of energy.
Blower is used to transporting biogas from gasholder storage to consumer (biogas upgrading plant in our case).

Specifications

Flow rate:	**440 m3/hour**
Pressure:	**150 mbar**
Engine power:	**4,2 kW**
Quantity:	**2 pcs**

Desulphurization system

The desulphurization system is a 3-step system. Stage 1 is adding Iron Hydrooxide. Stage 2 - biological. Adding a certain portion of air to the fermenter. Air by special bacteria, converting H2S into S. After 1 and 2 steps the sulphur contcentration is 80 ppm. Stage 3 - activated charcoal filtration, as activated charcoal has the capability to absorb sulfur. After passing through activated charcoal filters, the sulfur concentration is reduced to 0 ppm.

Specifications

Charcoal filter	(CF-01)
The volume of charcoal:	200 kg
Quantity:	1 pcs

Cogeneration Power Plant (CHP-01)

A cogeneration power plant (CHP) is used for producing electricity and heat. CHP is a very efficient technology for generating electricity and heat together. A CHP plant is an installation where there is simultaneous generation of usable electric power and heat in a single process, and it can provide a secure and highly efficient method of generating electricity and heat at the point of use. Due to the utilization of heat from electricity generation and the avoidance of transmission losses, due to electricity being generated on site, CHP typically achieves a 35 per cent reduction in primary energy usage compared with power stations and heat only boilers. This allows for economic savings where there is a suitable balance between heat and power loads. Another important factor, showing the benefits of cogeneration and CHP, is its low environmental impact. CHP produces lower quantities of pollutant emissions and heat pollution of the atmosphere. The current mix of CHP installations achieves a reduction of over 10 per cent in CO2 emissions in comparison with combined-cycle gas turbines.

Specifications

Produced electric power:	**1200 kW**
Produced heat power:	**1196 kW**
Generator:	**60Hz**
Количество:	**1 шт.**

Emissions
NOx <500 mg / Nm³ (5% O2)

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:	**440 m^3/hour**
Pressure:	**min 10 mbar-max 60 mbar**
Quantity:	**1 pcs**

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 using 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 of biogas plant by circulation pumps. A heat carrier prepares water with an additive of ethylene glycol. Inlet temperature in the fermenter is 60C, the outlet is 40C.

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

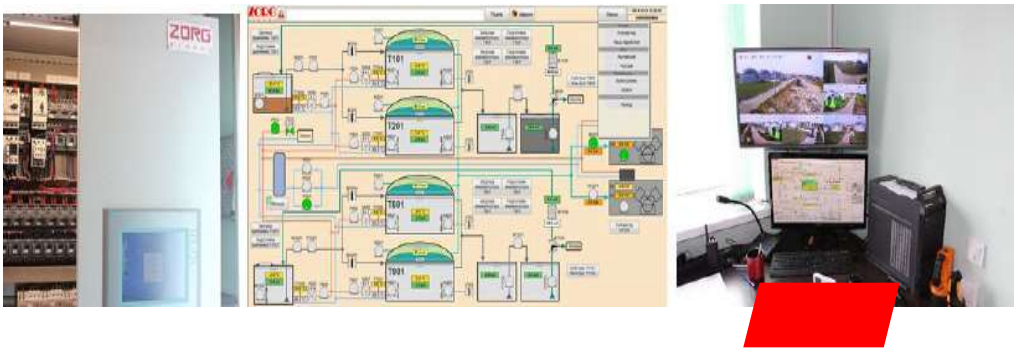
Engine power:	0,7 kW
Flow:	1 m^3/hour
Pressure:	4 bar

Dry cooler (cooling substrate system)

Device is designed to cool the substrate to working temperature according to technological regime. When use high temperature substrate, there is a chance of uncontrolled heating. The cooler is connected to the heating pipes, heat exchangers and it will be activated if it is need.

Specifications

Heat power:	100 kW
Electric power:	4 kW
Quantity:	1 pcs



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 ET2005, 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

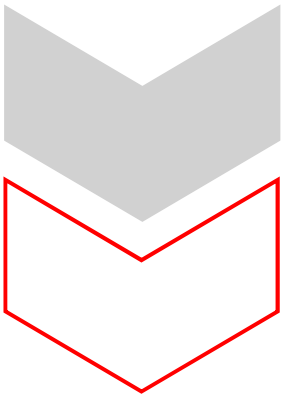
Sensors set

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

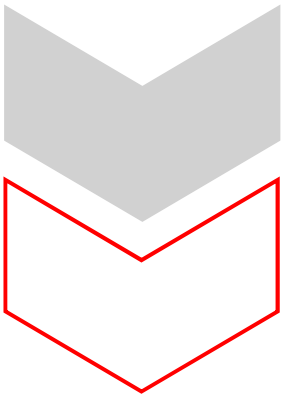


№	Equipment	Characteristic	Quantity
1	**Reactor`s agitator**	**N=15 kW**	**7**
1.1	Airtight motor gearbox		7
1.2	Hydraulic screw (wear-resistant steel)		7
1.3	Shaft (adapted to the height of the fermenter)		2
1.4	Blade		7
1.5	Frequency converter		7
1.6	Mounting bracket to bottom of the mixer		7
2	**Safety valve of digesters**		**1**
3	**Window with a searchlight**	**set**	**1**
3.1	Inspection window RD300 (mounts and sealant included)	Ø300	2
3.2	Spotlight (mount system bundled) VISULUX UL50 -G -H	230V, 50W, IP65	1
4	**Liquid substrate pump**	**60 m3/hour N=18,5 kW**	**1**
7	**Substrate digested pump**	**8-20 m3/hour N=11.0 kW**	**1**
8	**PVC gas holder**	**3151 m3**	1
8.1	Weather protection film	Ø37,0m	1
8.2	Gasholder film PELD methane permeation max.260 cm3/m2*d*1 bar, 650 N/5cm biogas resistant		1
8.3	Air blower	16A, 0,5kW	
8.4	Excess and minimum pressure valve		1
8.5	Dome level sensor		1
8.6	Mounting system		1
8.7	Accessories		1
8.8	Safety valve		1

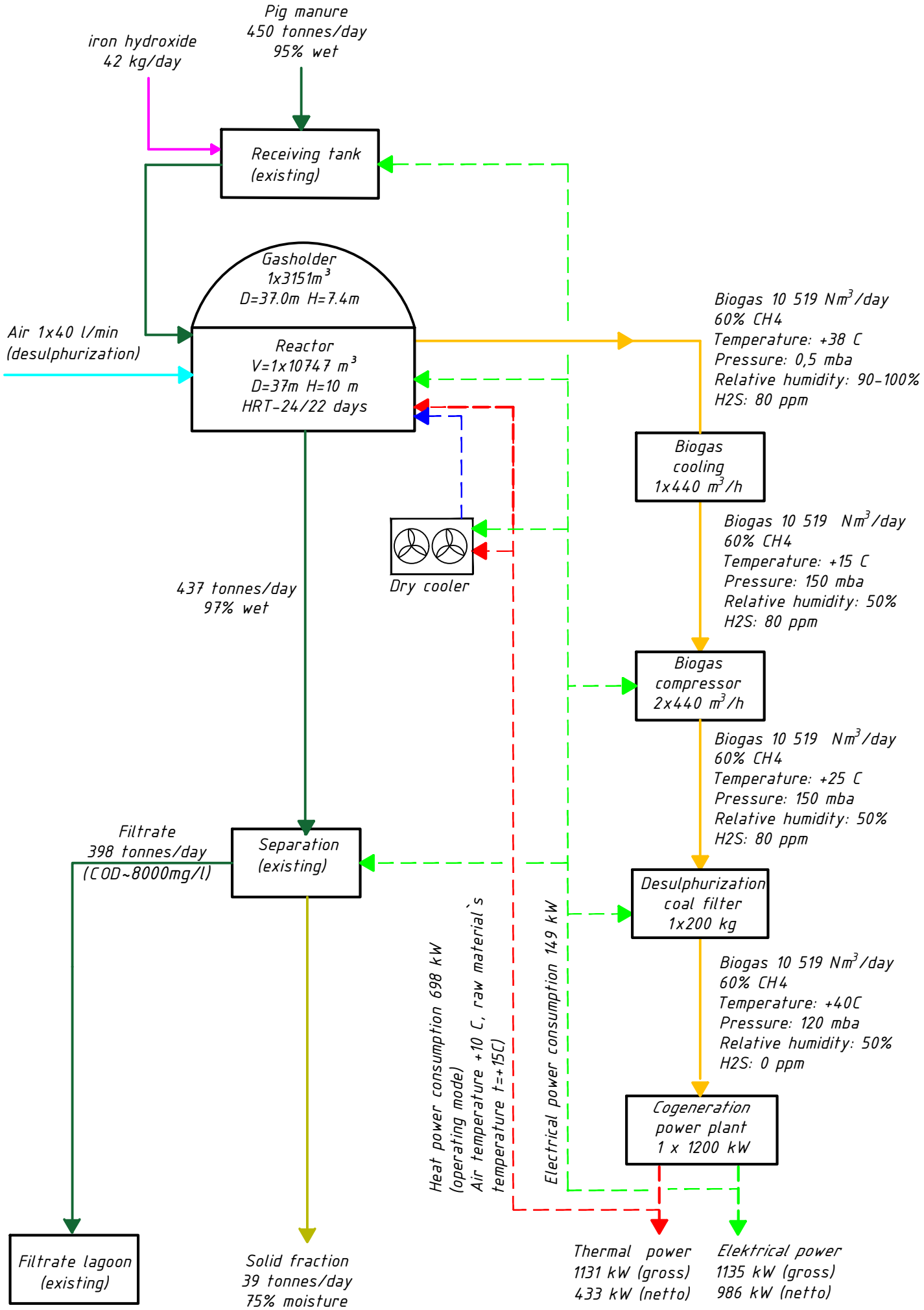
№	Equipment	Characteristic	Quantity
9	**Biogas Cooling System**	**440 m3/h**	**1**
9.1	Chiller		1
9.2	Heat exchanger		1
9.3	Polypropylene glycol tank		1
10	**Desulphurization system**		**1**
10.1	Numbers of charcoal columns	200 kg	1
11	**Biogas compressor**	**Q=440m3/h, H=150mBar, N=4,2kW**	**2**
12	**Electromagnetic flow meter**		**1**
13	**Flare**	**440 m3/h**	**1**
14	**Gas equipment included**	**set**	**1**
14.1	Drainage pump with float	DN=50, Q=1m3/h, H=13 m	2
15	**The heat supply system**	**set**	**1**
15.1	Diaphragm expansion tank	V=1000 l,P=6Bar T=120°C	1
15.2	Circulating pump for supplying heat carrier	Q=30 m3/h,H=1bar	1
15.3	Propylene glycol feed pump station heating systems	Q=1,0 m3/h, H=4 bar	1
15.4	Circulation pump for supplying heat carrier to the digester	Q=18 m3/h, H=1.1 bar	1
16	**Electromagnetic flow meter**		**1**
17	**Flare**	**440 m3/h**	**1**
18	**Gas equipment included**	**set**	**1**
18.1	Drainage pump with float	DN=50, Q=1m3/h, H=13 m	2
19	**The heat supply system**	**set**	**1**
19.1	Diaphragm expansion tank	V=1000 l,P=6Bar T=120°C	1
19.2	Circulating pump for supplying heat carrier	Q=30 m3/h,H=1bar	1
19.3	Propylene glycol feed pump station heating systems	Q=1,0 m3/h, H=4 bar	1
19.4	Circulation pump for supplying heat carrier to the digester	Q=18 m3/h, H=1.1 bar	1

№	Equipment	Characteristic	Quantity
20	**Water supply and sewerage system, complete, disassembled**	**set**	**1**
21	**Automation with electrical equipment**	**set**	**1**
21.1	Incoming distribution cabinet with a set of automation DB-1		1
21.2	Incoming distribution cabinet with a set of automation DB-2		1
22	**Sensors, set**		**1**
22.1	Gas pressure sensor 0,025Bar		1
22.2	Gas pressure sensor 0,4Bar		1
22.3	Pressure sensor(substrate level) 1,0Bar		2
22.4	Pressure sensor (substrate pressure) 2,5bar		2
22.5	Resistive thermometer (gas temperature)		3
22.6	Resistive thermometer with thermo well (fermenter substrate temperature)		3
22.7	Resistive thermometer with thermo-well (digester tank substrate temperature)		3
22.8	Resistive thermometer (heat conductor temperature)		3
22.9	Conductometric sensor of maximum level		3
22.10	Conductometric sensor of water level		3
22.11	Dome position sensor		1
22.12	Coolant pressure sensor	SEN 3276 B065 G1/2 6Bar	7
22.13	Humidity and gas temperature sensor	ESFTF-I	1
23	**Dry cooler 100kW heat pow.**		**1**
24	**Cogeneration power plant**	**set**	**1**

APPENDICES



Material flow diagram

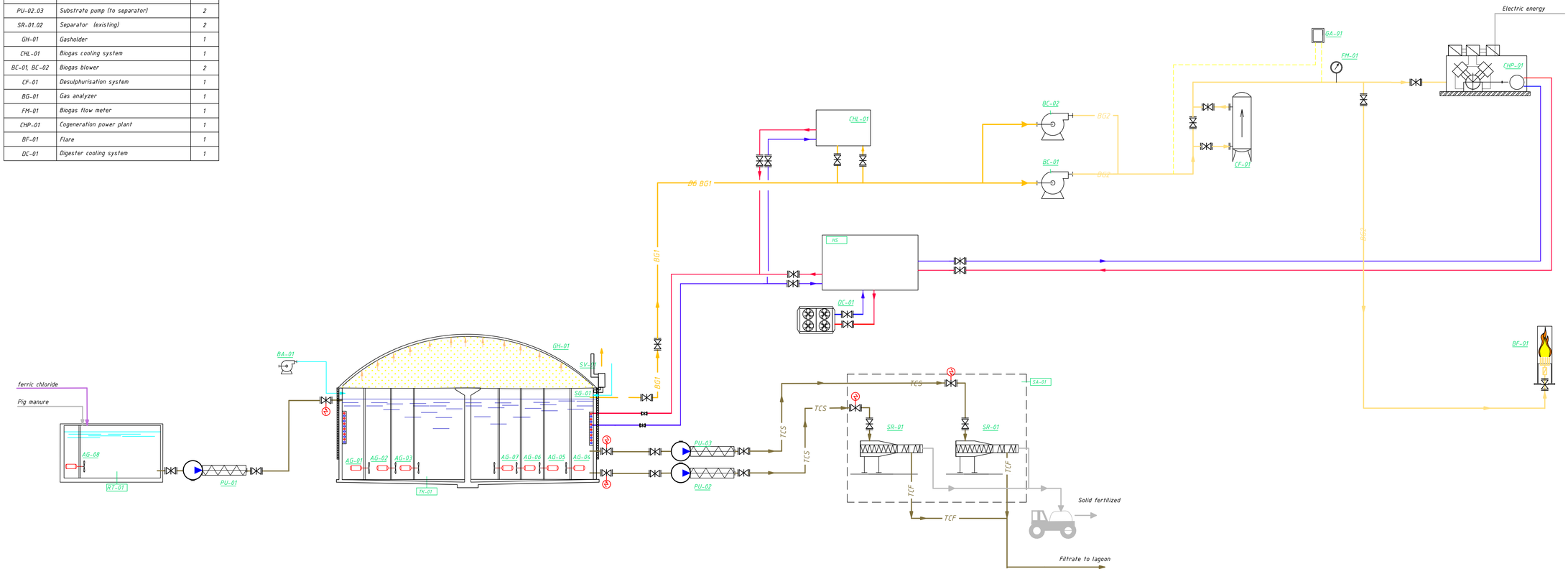


Specification

N/№	Name	Q-ty
AG-08	Receiving tank`s submersible mixer	1
AG-01..07	Submersible mixer	7
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 (existing)	2
GH-01	Gasholder	1
CHL-01	Biogas cooling system	1
BC-01, BC-02	Biogas blower	2
CF-01	Desulphurisation system	1
BG-01	Gas analyzer	1
FM-01	Biogas flow meter	1
CHP-01	Cogeneration power plant	1
BF-01	Flare	1
DC-01	Digester cooling system	1

Structure

N/№	Name	Q-ty
R-01	Reactor	1
SA-01	Separator area (existing)	1
RT-01	Receiving tank (existing)	1
HS	Boiler room	1

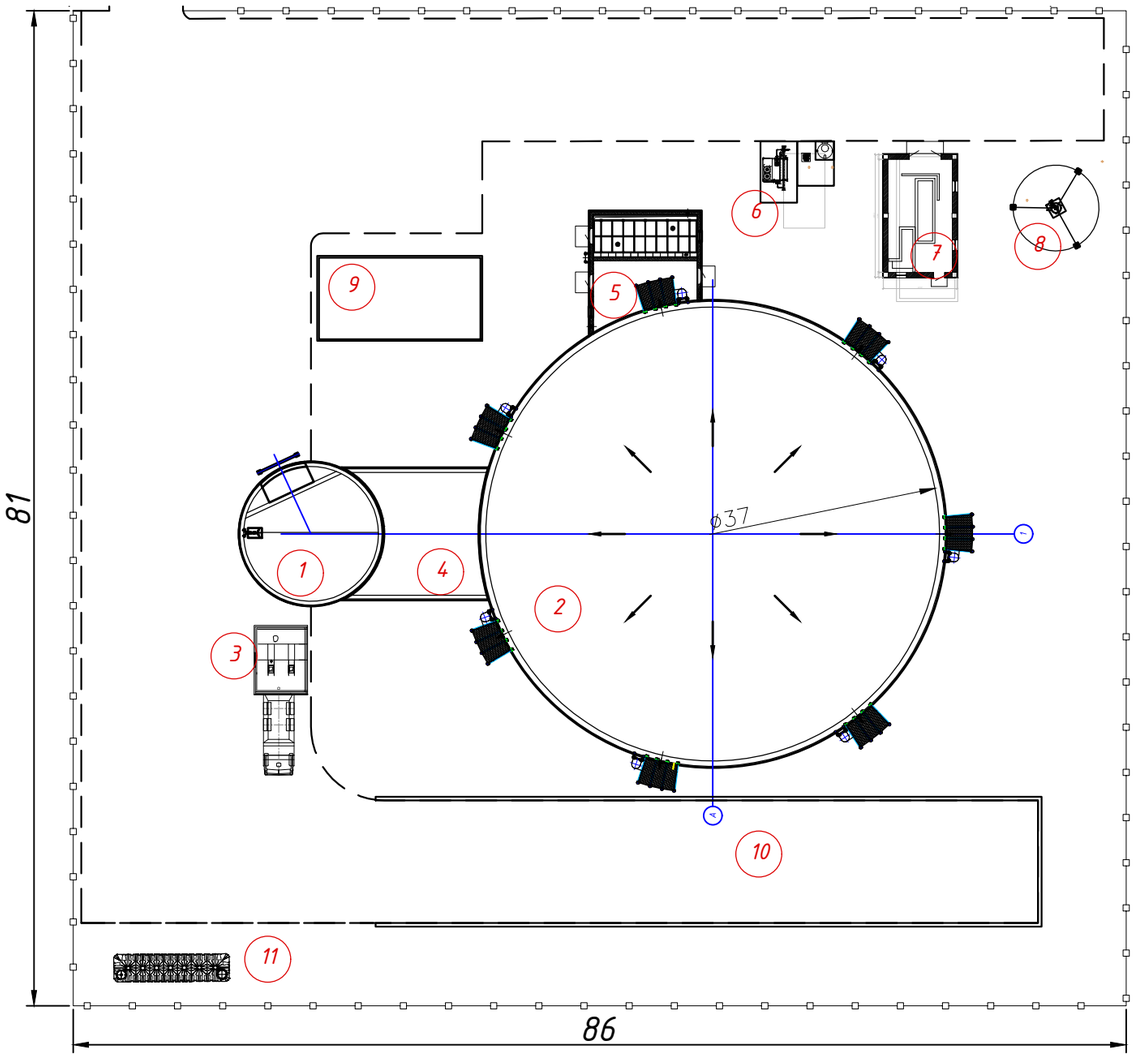


Legend main pipelines

- TCS — Substrate
- TCF — Filtrate
- BG1 — Biogas
- BG2 — Biogas
- HS — HS — Heat system pipeline

ZORG BIOGAS

Plan



Explication

N/№	Name
1	Receiving tank (RT-01)(existing)
4	Reactor (R-01)
3	Separator area (SA-01) (existing)
4	Equipment room
5	Technical room
6	Gas preparation
7	Cogeneration power plant (CHP-01)
8	Flare (BF-01)
9	Operator's room
10	Composting site
11	Lagoon (existing)
12	Rainwater treatment plants

ZORG BIOGAS

Appendix 4

Biogas plant					
Name equipment	**Instal. Pow. (kW)**	**Q-y (pcs)**	**Total installed power (kW)**	**Working hours per day**	**Consumption kWh per day**
Liquid substrate pump	18,5	2	37,0	3,8	140,6
Reactor's submersible mixer	15,0	7	105,0	18,0	1890,0
Submersible mixer in receiving tank	7,5	1	7,5	12,0	90,0
Biogas cooling system	18,0	1	18,0	24,0	432,0
Biogas compressor	4,2	2	8,4	12,0	100,8
Separator	7,5	2	15,0	14,6	219,0
Substrate pump to separator	7,5	2	15,0	14,6	219,0
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	18,0	1	18,0	24,0	432,0
Circulation pump for supplying heat to the technical building	0,8	1	0,8	only ambiant temp +15°C	
Digester cooling system	4,0	1	4,0	at t>40°C	
Circulation pump for supplying network water to the digester cooling system	2,2	1	2,2		
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	1,2	1	1,2	8,0	9,6
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			**237**		
Total consumed electric energy, kWh per day					**3579**
Total consumed power, kW					**149**

ZORG BIOGAS

Prices for equipment and services for biogas plant

Pos	Name	Number of units	Unit price, EUR	Discounts *	Discounted unit price, EUR	Discounted price sub-total, EUR	
1	Project documention	1	59 000	0%	59 000	59 000	
2	Supervision	1	30 000	0%	30 000	30 000	
3	Startup and training	1	30 000	0%	30 000	30 000	
4	Living and travel expences	1	35 000	0%	35 000	35 000	
5	Delivery of the equipment (container)	7	8 000	0%	8 000	56 000	
6	Digester submersible agitator 15 kW	7	29 000	0%	29 000	203 000	
7	Liquid substrate pump	1	32 000	0%	32 000	32 000	
8	Digested substrate pump	2	32 000	0%	32 000	64 000	
9	Submersible agitator for receiving tank 7,5 kW	1	21 000	0%	21 000	21 000	
10	Over- and under pressure safeguard	1	8 000	0%	8 000	8 000	
11	Sight glasses/viewing windows with projector	1	6 000	0%	6 000	6 000	
12	Water supply and canalization system	1	29 000	0%	29 000	29 000	
13	Heat supply station	1	35 000	0%	35 000	35 000	
14	Dry-cooler cooling system for reactors	1	28 000	0%	28 000	28 000	
15	Automation and electric cabinet	1	155 000	0%	155 000	155 000	
16	Motorized valves (set)	5	11 000	0%	11 000	55 000	
17	Sensors (set)	3	25 000	0%	25 000	75 000	
18	Gasholder	1	115 000	0%	115 000	115 000	
19	Biogas chiller (Biogas cooling system) 440 m3/h	1	85 000	0%	85 000	85 000	
20	Biogas blower 440m3/h	2	8 000	0%	8 000	16 000	
21	Desulphurization column with active coal 200 kg	1	35 000	0%	35 000	35 000	
22	Biogas flare	1	87 000	0%	87 000	87 000	
23	Gas analyzer (portative)	1	7 500	0%	7 500	7 500	
24	Gas conditioning unit	1	37 000	0%	37 000	37 000	
25	Cogeneration power plant MWM Caterpillar 1200 kW with drycoolers, oil system, silencer, container assembly	1	690 000	0%	690 000	690 000	
27	Construction	1	800 000	0%	800 000	800 000	Client
	TOTAL by ZORG, EUR					1 993 500	
	TOTAL by Client, EUR					800 000	
	TOTAL by ZORG+Client, EUR					**2 793 500,00**	

Implementation terms and payment

Months	10.25	11.25	12.25	01.26	02.26	03.26	04.26	05.26	06.26	07.26	08.26	09.26
Data collection												
Project documentation		50%	50%									
Equipment manufacturing												
Equipment supply					30%		20%	20%	30%			
CHP unit			30%							70%		
Construction												
Supervision					50%				50%			
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 for 1200 kW biogas plant:

1) Project report, civil permits and authorizations, adaptation of the project documentation by a licensed local engineering organisation for the permit purposes. Namely the organisation puts their stamp and acts act the face of the project. The design documentation is not changed in fact. 10 000 – 15 000 EUR
2) Topographic and geological surveys 3000-7000 EUR
3) Electric transformer and the external electric line 130 kW for start-up
4) External roads
5) Temporary water supply during the construction and the hydraulic test of reactors at least 1000 m3 water per day. It can be a technical quality water from a river, lake, well. Not salty.
6) Machinery to transport filtrate and the digested mass from the biogas plant to the agricultural fields (a truck, a frontal loader, a tractor)
7) Activated carbon 0,2 tonne per two years x 4800 EUR/tonne = 960 EUR
8) Ferric chloride-15.3 tonnes per year x 900 EUR/tonne = 13 700 EUR
9) Demineralized water to the heating system 0.5 tonnes
10) Spare parts for two years 80 000 EURO

ZORG BIOGAS

Business center “Twin Yards”
Walter-Gropius-Straße 23,
DE-80807, München, Germany

Mob. +49 1511 457 29 45 (WhatsApp, Viber, Telegram)

igor.reddikh@zorg-biogas.com
www.zorg-biogas.com