ZORG BIOGAS

01

version

Proposal

Dry fermentation
235 tonnes/day pre-sorted municipal solid waste

Date:01/01/2026
Validity: 12 months

CONTENT

OVERVIEW

Herewith we offer a solution to process municipal pre-sorted solid waste into biogas with further power generation. The technology is based on a dry fermentation method, a single-step batch process.

The reactors look like garages or boxes with doors. Pre-sorted MSW is loaded into each reactor in several days and then digested without adding a new feedstock. After the cycle is finished the compost is unloaded. After the digestion it's recommended to install an additional screening drum 20 mm to remove the remaining pieces of plastic and paper. After the 15-20 day storage on the open air under a shed the compost becomes a valuable fertilizer.

Inside of a reactor there is no moving parts. No screw loaders, no mixers, no substrate pumps. Percolate liquid is sprayed from the nozzles in the roof of the reactor. The percolate penetrates inside of MSW and collected at the bottom channel. The penetration inside is possible because the impurities like plastic and paper serve as a scarifier.

One of the two main advantages of the batch type dry fermentation is that there is very little equipment. Nothing can be broken. The maintenace costs are very low. And electric energy consumption is very low.10 times lower then other methods like in plug-flow reactors or wet CSTR reactors.

The other name for dry fermentation is also anaerobic composting.
The technology is proven already for 25 years. In Germany there more than 100 MSW dry fermentation biogas plants. 90% of plants with MSW are using exactly this technology.

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 (%)	Biogas (m^3/year)
Municipal solid waste MSW	235	85 775	40	50	94,0	47,00	500	23 500	55	8 577 500

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

Biogas plant characteristics

Characteristics	Values	Figures
Quantity of feedstock	(tonnes/day)	235
Wet	%	60
Biogas production	m3/day	23 500
Methane content, CH4	%	55
Number of digesters	pcs.	20
Volume:		
Work	m^3	1152
Overall		1728
Temperature	^0C	52-55
Overall dimensions of the digester:		
LxWxH	m	6x48x6
Hydraulic retention time (gross/net)	days	28
Number of gasholders	units	1
Volume:	m^3	1690
Dimensions of the gasholder:		
diameter Height	m	10,8 8,4

Number of personnel

	Shift 1	Shift 2	Shift 3
Chief engineer	1	-	-
Operator	1	1	1
Driver	1	1	-
Electrician	1	-	-
Mechanic	1	-	-
Total	10		

Biogas plant working principle

Dry fermentation is a single-step batch process. The different stages of degradation (i.e., hydrolysis, acid and methane formation) take place in the same garage-type digester. In a batch system, biomass is added to the reactor at the start of the process. The reactor is then sealed for the duration of the process (retention time), the biomass is left to ferment in the digester until the end of retention time. The first stage of this process is hydrolysis. Hydrolysis produces organic acids and alcohols.

Organic compounds + $H_2O \rightarrow C_5H_7NO_2 + HCO_3$.

Further conversion of obtained dissolved compounds like organic acids and alcohols ($C_5H_7NO_2$, HCO_3) into gases: CH_4, CO_2. $C_5H_7NO_2 + HCO_3 + H_2O \rightarrow CH_4 + CO_2 + NH_4$. Biological process of consecutive (phasic) conversion of organic compounds take place in an anaerobic environment i.e. in an oxygen-free tank (biological reactor). In the first stage of fermentation, substrate hydrolysis takes place under acidogenic bacteria influence. In the second stage, elementary organic compounds come through hydrolysis oxidation by means of heteroacidogenic bacteria with the 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 feed stock for methanogenic bacteria in the third stage. This stage flows in two processes of A and B type. The character depends on the 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 particular to their living environment compared to acidogenic bacteria. They require a complete anaerobic environment and need a longer reproduction period. The speed and scale of anaerobic fermentation depends on the bacteria's metabolic activity.

That is why the biogas plant chemical process includes hydrolysis oxidation, and methanization stages. For that kind of substrate these processes take place within the same garage-type digester.

Technological process of biogas production

Feedstocks are transported to the biogas plant area and loaded into digesters one-by-one. Because of the large contact surfaces (floor and wall heating), the fermentation substrate is very quickly heated to the target temperature of approx. 55 °C. After closing and sealing the gate, blowing with CO2 (from BUP or CHP) has to be done. After removing oxygen from the digester, spraying with preheated percolate is started. As a result of these procedures, the reactor quickly collects heat and reaches the necessary conditions for anaerobic fermentation. The fermentation process is maintained at a temperature of approx. 55 °C for approx. 28 days. During this period, a great quantity of available biodegradable organic elements is converted to biogas.

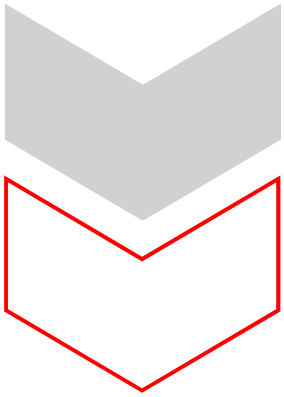
During the anaerobic phase, the process is monitored for the parameters of temperature, gas production, gas quality (CH4, CO2, H2S, O2) and percolate supply or amount. As necessary, temperature and the amount of percolate introduced are readjusted fully automatically. In batch operation, the substrate is anaerobically fermented throughout the entire retention time in the digester without additional mixing or agitating. Because no pumps, agitators, or other mixing or conveying equipment is needed, the technology is characterized by extremely high tolerance to mechanical impurities in the substrate. Susceptibility to malfunction or the requisite maintenance or repair expenditure during the gas process is therefore also very low, which applies as well to the operation of the entire facility. To accelerate the anaerobic fermentation process after the digester gates are sealed and immediately stimulate biogas production, the newly filled gas zone of the box digester is once again specifically inertised with gas. This process method occurs early resulting in high gas yields of good quality. At the end of the fermentation cycle, the rinse process is reinitiated in the digester (see above description). The garage-type digesters are equipped with percolate sprinklers with nozzles developed especially by Zorg, to ensure a particularly even and effective percolate distribution over the biomass. The sprayed percolate provides an optimal continuous moistening of the substrate to guarantee the greatest possible gas yields. Leaching percolate is drawn off at the digester floor through a drainage channel with additional side drainage, purified through a separate filter system, tempered in a percolate tank, temporarily stored, and when required, resprayed over the substrate to moisten it. At approx. 55 °C, the fermentation process takes place in the digester within the temperature range of thermophilic bacteria; temperature is modulated by floor and wall heating. Such design ensures optimal heat transfer to the substrate.

Because the heating pipes were already incorporated into their concrete walls during construction of the digesters, no interventions within the digesters themselves are required.

All of this combines to facilitate optimal temperature control within the digesters. After the pre-treatment of the biogas, the biogas is compressed to the necessary pressure for

Biogas is supplied to cogeneration power plant, where it is used as fuel for production of electricity and heat. Heat from the cogenerator is fed to a heat exchanger for heating the digesters. Heating equipment is used for distribution of heat between biogas plant facilities.

MAIN EQUIPMENT



Digester (D-01..20)

The digesters are gas-tight concrete garage-type chambers, where raw materials are loaded using a front loader.
The digesters are located side by side with a common wall to save building materials. The number of reactors is selected in such a way as to have a continuous loading of the daily feed of raw materials to the biogas plant.
The temperature in the insulated digester is controlled by heated floors and walls, as well as the temperature of the bacterial liquid supplied for irrigation (percolate). Heating pipes are installed in the walls and floor of the fermenter during construction, so there are no protruding elements in the digester. The digesters are equipped with hydraulically operated gas tight steel gates.

Specifications

Height:	**6,0 m**
Length:	**48,0 m**
Width:	**6,0 m**
Total volume:	**1728 m^3**
Quantity:	**20 pcs.**

Digester gate (DG-01..20)

Digesters have hydraulically operated, gas-tight, steel gates. They have a seal which, when inflated towards the cement entry wall, make the entrance gas-tight. Before the gates are opened, the air in the seal is released. The inflatable seal lies within the gate's edge and is therefore protected from damage. The system is run under light overpressure at 20 hPA, thus categorically preventing any potential form of gas-air explosion, even in the case of leakage.

Specifications

Height:	**5,5 m**
Width:	**5,0 m**
Quantity:	**20 pcs.**

Spray nozzle (set)

In the tunnels the set of spray nozzles is using for spraying the percolate. The spray nozzles have the non clogging nozzle without swirl insert, dust suppression and can use for broadcast spraying, wide area spray (G1'').
(The number of nozzles in one set depends on the geometric dimensions of the tunnel).

Specifications

Connection diameter:	**1”**
Nozzle's diameter::	**100mm**
Quantity (set):	**20**

(1 set- 48 spray nozzles)

Pump equipment (PU-01...PU-06)

Pumps are used to transport percolate to digesters and back to the percolate tank. Design of a biogas plant provides fast access to all pumps as required. The clear benefit is in the low lifecycle costs. This universally usable pump works with almost every low and extremely high viscous mediums.
Good pumping performance is provided in high pressure operation with high operational reliability.
Pumps are modular for high flexibility, low stocking of spare parts, short downtimes for maintenance and repairs, while providing pulse-free transfer, and a long
service life, even with difficult media.

Specifications

Engine power:	**5,5-22 kW**
Flow rate:	**25-80 m3/hour**
Pressure:	**6 bar**
Quantity:	**6 pcs**

Percolate tank (PT-01)

Percolate tank is concrete tank with heat system for storing and circulating percolate to digesters. A heating system is installed on internal walls. The tank is equipped with submersible mixers and pump station.

Specifications

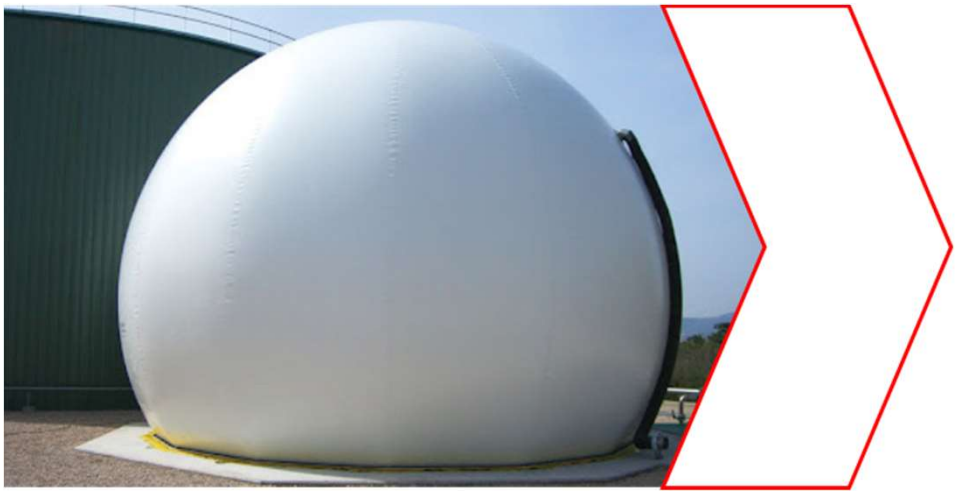
Diameter:	**14,0 m**
Height:	**5,0 m**
Total volume:	**769 m^3**
Quantity:	**1 pcs**

Submersible mixer (AG-01)

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 percolate tank	**(AG-01)**
Nominal power:	**7,5 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 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:	**8,4 m**
Diameter:	**10,8 m**
The total volume :	**500 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:	**1000 m^3/hour**
Gas inlet temperature:	**+55°C**
Gas outlet temperature:	**+10°C**
Electric power:	**35,0 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:	**1000 m3/hour**
Pressure:	**150 mbar**
Engine power:	**8,5 kW**
Quantity:	**2 pcs**

Desulphurization system

The desulphurization system is a 2-step system. Stage 1 is using Scrubber. After 1 steps the sulphur contcentration is 80 ppm. Stage 2 - 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:	**500 kg**
Quantity:	**1 pcs**

Scrubber for biogas (SC-01, SC-02)

The scrubber for biogas works due to the close contact of the gas flow with the liquid with the washing reagent. As a result of this contact, the target gaseous components, for example H2S, dissolve and remain in the water. Thus, there is a transfer of components from the gas phase to the liquid phase, which is also called absorption. The solubility of particles in a liquid determines the extent to which gaseous components are dissolved in this phase. Scrubbers are made of fiberglass-reinforced polyester (PRFV). The completely smooth inner surface made of polyester provides ideal evacuation and high chemical resistance to various products to be stored. Specially developed for gas flows formed in industry and at biogas plants. Each scrubber is manufactured with the use of resins most suitable for each specific product, and all equipment has factory guarantees and a production certificate.

Specifications

Gas volume flow:	**500 m3/hour**
Diameter:	**4,5 m**
Height:	**12 m**
Electric consumption:	**1,5 kW**
Quantity:	**1 pcs**

Reservoir for storage and dosing of reagents(FPDS)

Reservoir for storage of liquid types of reagents. The tank is a ready-to-install system with automation and a control cabinet for managing processes from filling, mixing to dosing with a pump. The tank is made of high-quality plastics, such as PE, PP, PVDF and PVC. It is possible to use in various climatic zones and for contact with the most aggressive environments. Resistance to temperature changes and use at temperatures from -40°C to +100°C. Pressure- and impact-resistant welded and glued joints - created in accordance with DVS recommendations - are as strong as the sheet material itself.

Specifications

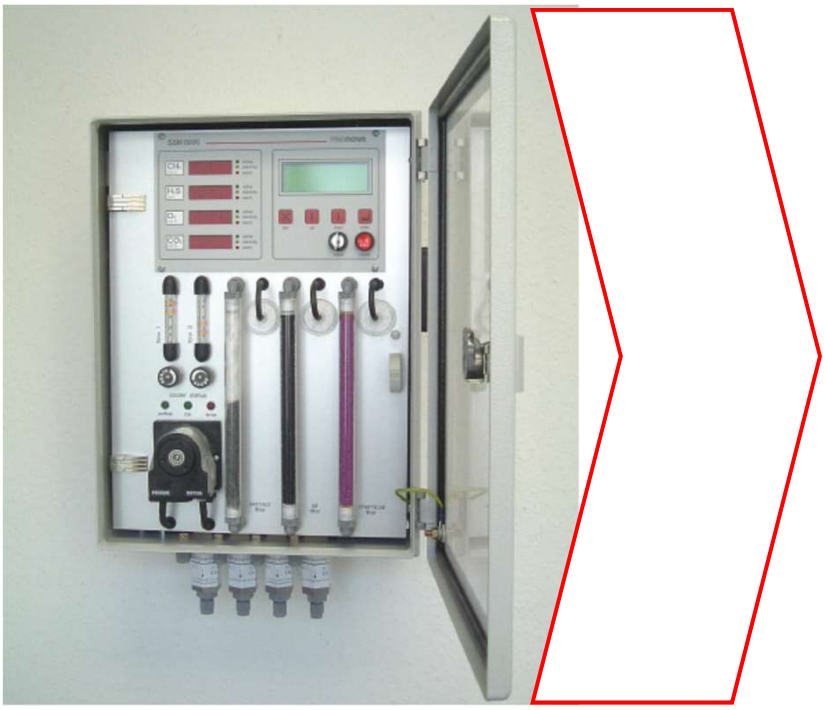
Total volume:	**40 m3**
Quantity:	**1 pcs**

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:	**1000 m^3/hour**
Pressure:	**min 10 mbar-max 60 mbar**
Quantity:	**1 pcs**



Gas analyzer (CH4, CO2, H2S) (GA-01)

The gas analyzer is a combined measuring device. It consists of a fixed Control block and a mobile gas measuring device.
The Control block is designed for the automatic measurement and monitoring of the amount* and composition of gases produced in biogas plants.
The device measures the gas compositions at the individual measuring locations sequentially.
The mobile gas measuring device is usually docked to the Control box via the docking station (stationary measurements).
As an option, mobile measurements can be taken at selected measuring locations. The gas measuring device is removed from the Control docking station to carry out the measurement.

Specifications

Set included:
Device for wall mounting
LCD display menu
Flow meter / control valve
Sensors

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:	**2300 kW**
Produced heat power:	**2206 kW**
Generator:	**120V, 60Hz**
Количество:	**1 шт.**

Emissions
NOx <500 mg / Nm³ (5% O2)

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

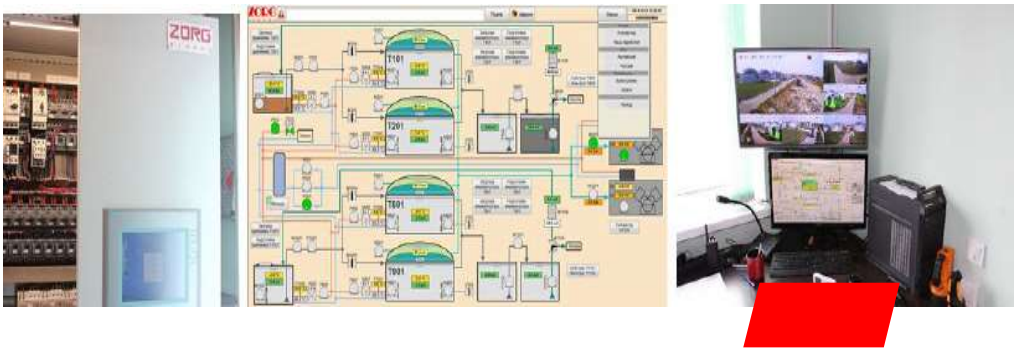
Engine power:	**0,7 kW**
Flow:	**1 m^3/hour**
Pressure:	**4 bar**

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:	**20 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

Laboratory

Monitoring and control of parameters of raw materials and fermentation processes is important for the efficient operation of a biogas plant. The laboratory allows you to assess the content of dry matter in the input raw materials, fermented mass, determine the ratio of volatile organic acids to total inorganic carbon (FOS/TAC parameter), determine the degree of substrate fermentation in fermenters, the level of biogas output, and evaluate the efficiency of separator.

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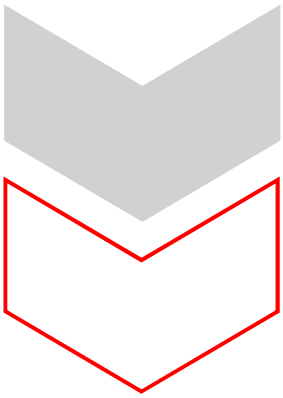
Equipment

Analytical scales
Moisture analyzer
Automatic titrator
Laboratory pH meter
Centrifuge
A set of flasks

Equipment specification list



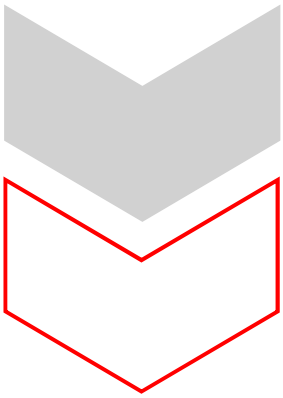
№	Equipment	Characteristic	Quantity
1	**Safety valve**	**set**	**20**
2	**Digester equipment**		
2.1	Hermetic gate	pcs	20
2.2	Spray nozzles	set	20
2.3	Sewage pipeline flanges	set	20
2.4	Heating pipes supporting structures	set	20
3	**Percolate pump**	**N=5,5 kW**	**3**
4	**Biogas flow meter**	**pcs**	**21**
5	**Air supply system**	**set**	**1**
5.1	Compressor	Q=210 l/min P=3,0 atm N=2,2 kW	1
5.2	Air fan	Q=800 l/h P=1500 Pa N=1,1 kW	1
5.3	Solenoid valve	set	1
5.4	Solenoid valve	1-50 m3	1
5.5	Filter-regulator	G1/2"	1
5.6	Manometer	G1/8 16 bar	1
5.7	Manometer	P=0...0.4 bar	1
5.8	Pressure regulator	M112; G1/2"	1
5.9	Back-flow prevention valve	G1/2"	1
6	**Submersible mixer**	**N=7,5 kW**	**1**
6.1	Airtight motor gearbox	set	1
6.2	Mixer control mechanism (high-quality structural galvanized steel)	set	1
6.3	Electric motor mount (high-quality structural galvanized steel)	set	1
6.4	Support (high-quality structural galvanized steel)	set	1

№	Equipment	Characteristic	Quantity
7	**Sewage percolate pump**	**N=7.5kW**	**3**
8	**PVC gas holder H/D =3/4**	**500 m3**	1
8.1	Weather protection film	Ø10,8m	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
9	**Safety valve**	**set**	**1**
10	**Air blower**	**0,5 kW**	**1**
11	**Biogas Cooling System**	**1000 m3/h**	**1**
11.1	Chiller		1
11.2	Heat exchanger		1
11.3	Polypropylene glycol tank		1
12	**Biogas compressor**	**Q=1000m3/h, H=150mBar, N=8,5kW**	**2**
13	**Desulphurizaton system**		**1**
13.1	Biogas scrubber	500 m3/hour	2
13.2	Reagent preparation and dosing station	set	1
13.3	Circulation pump		1
13.4	Numbers of charcoal columns	500 kg	1
14	**Gas analyzer (CH4, CO2, H2S)**	**set**	**1**
15	**Co-generator**	**2300 kW**	**1**
16	**Flare**	**1000 m3/h**	**1**
16.1	Compressor	set	1

№	Equipment	Characteristic	Quantity
16.2	Manual locking element	set	1
16.3	Deflagration fuse	set	1
16.4	On-site control cabinet	set	1
16.5	Auto ignition system	set	1
16.6	Auto Main Gas Solenoid Valve	set	1
17	**Gas equipment included**	**set**	**1**
17.1	Drainage pump with float	DN=50, Q=1m3/h, H=13 m	2
18	**The heat supply system**	**set**	**1**
18.1	Diaphragm expansion tank	V=1000 l,P=6Bar T=120°C	1
18.2	Circulating pump for supplying heat carrier	Q=30 m3/h,H=1bar	1
18.3	Propylene glycol feed pump station heating systems	Q=1,0 m3/h, H=4 bar	1
18.4	Circulation pump for supplying heat carrier to the digester	Q=18 m3/h, H=1.1 bar	1
19	**Dry cooler 100kW heat pow.**		**20**
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		20
22.2	Conductivity sensor		20
22.3	Pressure/level sensor		20
22.4	Ultrasonic sensor		20

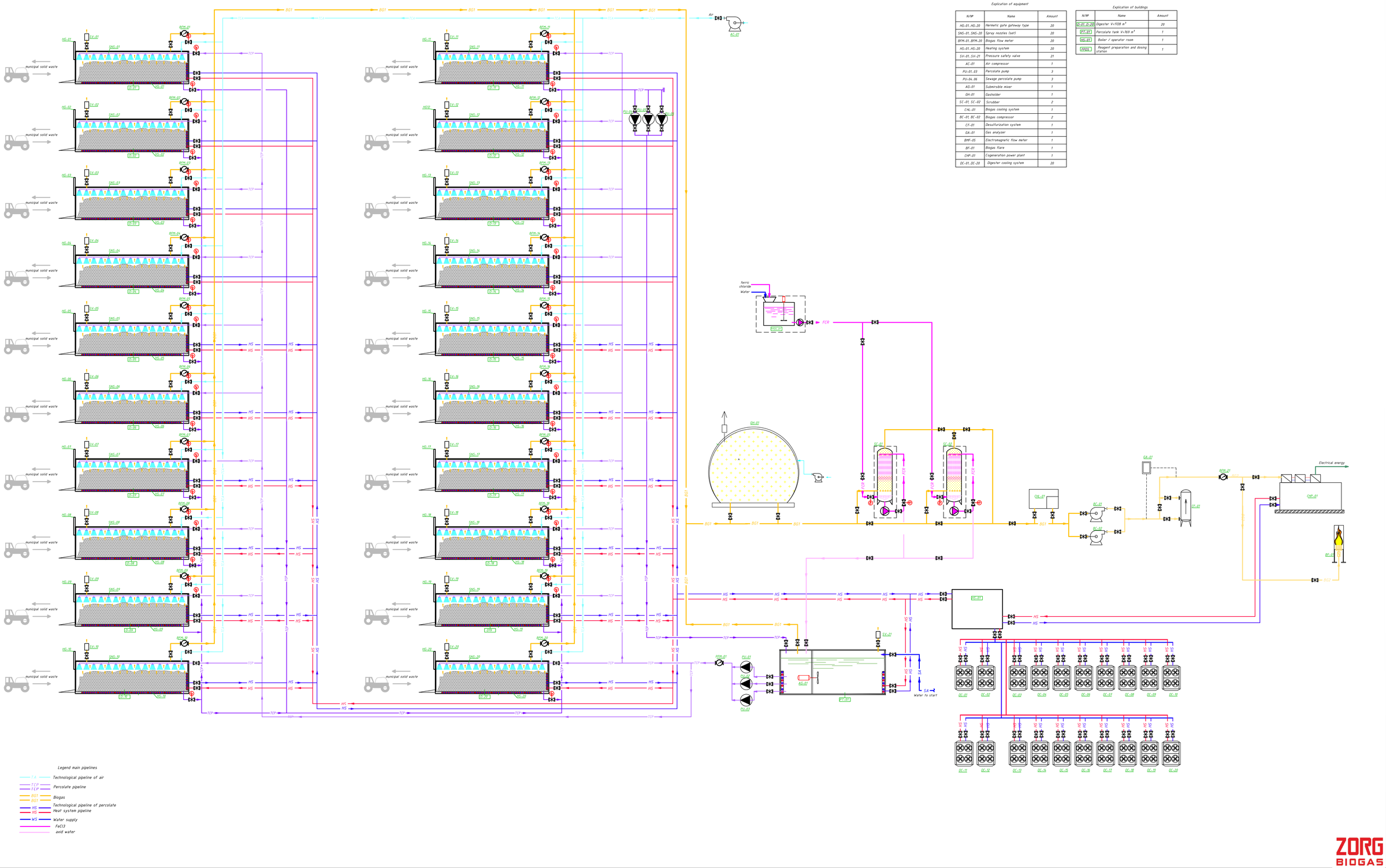
№	Equipment	Characteristic	Quantity
22.5	Resistive thermometer (gas temperature)		21
22.6	Thermal converter	TR10-B-M-DZZKTA-2-QRZZM-150-DCK-CE-R-00735-ZZ	21
22.7	Thermowells for thermocouples	TR10-B	21
22.8	Thermal converter heating circuit	TR30-P-Z-Z-A-ZZZ-13R-DBB-ZZZZ-B000025-ZZ	20
22.10	Substrate pressure sensor	SEN-3251 B055 G1 4Bar	2
22.11	Substrate pressure sensor	SEN-3251 B045 G1 2,5Bar	2
22.12	Immersion level sensor	LS-10 0,6 bar 4-20 mA	2
22.13	Coolant pressure sensor	SEN 3276 B065 G1/2 6Bar	20
22.14	Humidity and gas temperature sensor	ESFTF-I	20
23	**Laboratory**	**set**	**1**

ANNEXIES



Day	Digester 1	Digester 2	Digester 3	Digester 4	Digester 5	Digester 6	Digester 7	Digester 8	Digester 9	Digester 10	Digester 11	Digester 12	Digester 13	Digester 14	Digester 15	Digester 16	Digester 17	Digester 18	Digester 19	Digester 20
1	Loading																			
2	Loading																			
3	Percolate sprayed	Loading																		
4	Percolate sprayed	Loading																		
5	Percolate sprayed	Percolate sprayed	Loading																	
6	Percolate sprayed	Percolate sprayed	Loading																	
7	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading																
8	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading																
9	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading															
10	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading															
11	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading														
12	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading														
13	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading													
14	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading													
15	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading												
16	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading												
17	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading											
18	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading											
19	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading										
20	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading										
21	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading									
22	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading									
23	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading								
24	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading								
25	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading							
26	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading							
27	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading						
28	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading						
29	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading					
30	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading					
31	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading				
32	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading				
33	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading			
34	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading			
35	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading		
36	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading		
37	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	
38	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	
39	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading
40	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading
1	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
2	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
3	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
4	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
5	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
6	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
7	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
8	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
9	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
10	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
11	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
12	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
13	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
14	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
15	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
16	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
17	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
18	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
19	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
20	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
21	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
22	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed
23	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed
24	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed
25	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed
26	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed
27	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying	Percolate sprayed
28	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying	Percolate sprayed
29	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying	Drying
30	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying	Drying
31	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying	Drying
32	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge	Drying
33	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Drying
34	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge	Discharge
35	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge
36	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge	Discharge
37	Discharge	Drying	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge
38	Discharge	Discharge	Drying	Drying	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Percolate sprayed	Loading	Discharge

Basic diagram



Explication of equipment

N/M	Name	Amount
HG-01..HG-20	Hermetic gate gateway type	20
SNS-01..SNS-20	Spray nozzles (set)	20
RPM-01..RPM-20	Biogas flow meter	20
HS-01..HS-20	Heating system	20
SV-01..SV-21	Pressure safety valve	21
AC-01	Air compressor	1
PUI-01..03	Percolate pump	3
PUI-04..06	Sewage percolate pump	3
AG-01	Submirsible mixer	1
GH-01	Gasholder	1
SC-01, SC-02	Scrubber	2
CHL-01	Biogas cooling system	1
BC-01, BC-02	Biogas compressor	2
CF-01	Desulfurization system	1
GA-01	Gas analyzer	1
BMF-05	Electromagnetic flow meter	1
BF-01	Biogas flare	1
CHP-01	Cogeneration power plant	1
DC-01..DC-20	Digester cooling system	20

Explication of buildings

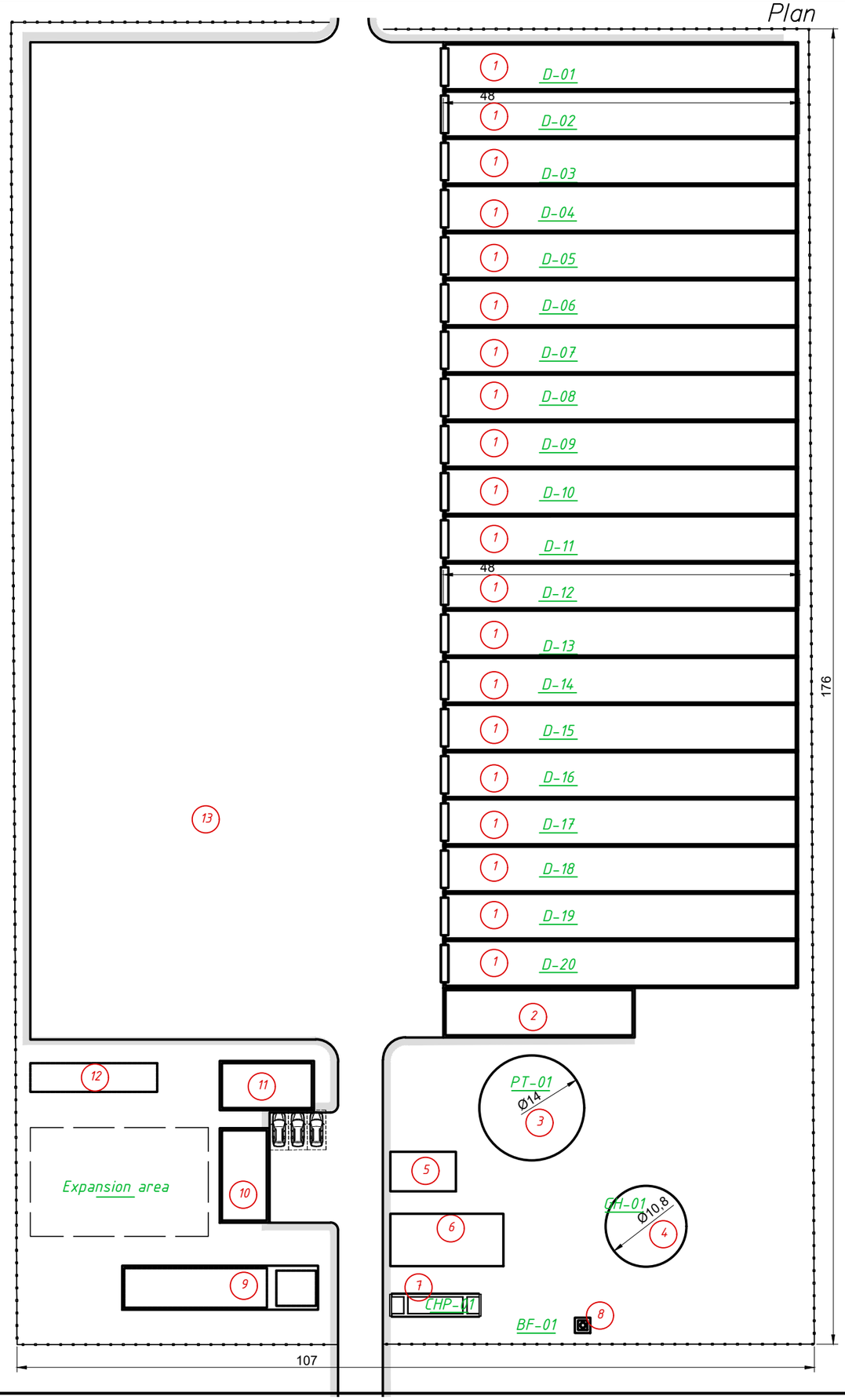
N/M	Name	Amount
D-01..D-20	Digester V=1728 m³	20
PT-01	Percolate tank V=769 m³	1
OG-01	Boiler / operator room	1
PWU-01	Reagent preparation and dosing station	1

Legend main pipelines

- TA — Technological pipeline of air
- TCP / TLP — Percolate pipeline
- BG1 / BG1 — Biogas
- HS / HS — Technological pipeline of percolate / Heat system pipeline
- WS — Water supply
- FeCl3 — axid water

ZORG BIOGAS

Plan



Explication

N/№	Name	Note
1	Digester (D01..20)	
2	Equipment room	
3	Percolate tank (PT-01)	
4	Gasholder (GH-01)	
5	The scrubber with a reagent station	
6	Gas preparation	
7	Cogeneration power plant (CHP-01)	
8	Flare (BF-01)	
9	Water supply pump station & water storage tanks	
10	Warehouse	
11	Administrative building	
12	Rainwater treatment facilities	
13	Composting area	

ZORG BIOGAS

Annex 4

Electrical load

Name equipment	Instal. Pow. (kW)	Q-y (pcs)	Total installed power (kW)	Working hours per day	Consumption kWh per day
Mixer in percolate tank	7,5	1	7,5	12,0	90,0
Biogas compressor	8,5	2	17,0	12,0	204,0
Biogas cooling system	35,0	1	35,0	24,0	840,0
Electric valve	0,1	40	5,6	0,5	2,8
Circulation pump for supplying network water to the digester	1,1	1	1,1	24,0	26,4
Percolate pump	1,5	3	4,5	24,0	108,0
Sewage percolate pump	1,5	3	4,5	24,0	108,0
Air compressor for gasholder lock	1,5	1	1,5	24,0	36,0
Air blower for double membrane	1,0	1	1,0	24,0	24,0
Scrubber	1,5	2	3,0	24,0	72,0
Co-generator 2300 kW	25,0	1	25,0	24,0	600,0
Circulating pump feeding water network at co-generator	5,0	1	5,0	24,0	120,0
Circulating pump feeding network water at technical building	1,5	1	1,5	24,0	36,0
Propylene glycol pump station	0,8	1	0,8	0,5	0,4
Drinage pump	2,1	2	4,2	0,5	2,1
Lighting of the biogas plant territory	1,0	1	1,0	12,0	12,0
Working lighting of switchboard	0,1	1	0,1	0,5	0,1
Digester cooling system	4,0	20	80,0	at t>55°C	
Circulation pump for supplying network water to the digester cooling system	2,0	20	40,0		
Desulphurization system compressor	1,5	1	1,5	24,0	36,0
Biogas analyzer	0,1	1	0,1	24,0	2,4
Total instal power, kW			**239,9**		
Total consumed electric energy, kWh per day					**2320,2**
Total consumer power, kWh per hour					**96,7**

ZORG BIOGAS

Prices for a biogas plant 235 tonnes presorted MSW/day

Pos	Name	Number of units	Unit price, EUR	Price sub-total, EUR	
1	Project documention	1	115 000	115 000	
2	Supervision	1	50 000	50 000	
3	Startup and training	1	50 000	50 000	
4	Living and travel expences	1	50 000	50 000	
5	Delivery of the equipment (containers)	10	8 000	80 000	
6	Digester gate (h= 6m)	20	35 000	700 000	
7	Spray nozzles (set)	400	200	80 000	
8	Percolate pump	3	29 000	87 000	
9	Percolate pump (drainage)	3	29 000	87 000	
10	Submersible mixer for percolate tank (7,5 kW)	1	19 000	19 000	
11	Gasoholder external 500 m³	1	75 000	75 000	
12	Water supply and canalization system	1	65 000	65 000	
13	Air supply system, as a unit.	1	22 500	22 500	
14	Heat supply station	1	85 000	85 000	
15	Digester dry-cooler 100 kW	2	37 000	74 000	
16	Automation and electric cabinet	1	450 000	450 000	
17	Motorized valves (set)	40	8 000	320 000	
18	Sensors (set)	22	20 000	440 000	
19	Biogas chiller (Biogas cooling system) 1000 m3/h	1	125 000	125 000	
20	Biogas blower 1000 m3/h	2	35 000	70 000	
21	Biogas scrubber 500 m3/h	2	260 000	520 000	
22	Reagent dosing station 20m3	1	85 000	85 000	
23	Desulphurization column with active coal 200 kg	2	35 000	70 000	
24	Biogas fflare 1000 m3/h	1	137 000	137 000	
25	Gas analyzer	1	27 000	27 000	
26	Gas conditioning unit 1000 m3/hour	1	64 300	64 300	
27	Biogas flow meter	1	22 000	22 000	
28	Cogeneration power plant 2,3 MW	1	927 000	927 000	
30	Construction and installation	1	1 500 000	1 500 000	Client
			by Zorg, EUR	**4 896 800**	
			by Client, EUR	1 500 000	
			TOTAL Zorg+Client, EUR	**6 396 800**	

Implementation terms and payment

Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Data collection																						
Project documentation		50%			50%																	
Obtaining permits																						
Equipment supply										50%			20%		20%			10%				
CHP unit										30%		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**

ZORG BIOGAS

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