



Commercial offer Biogas plant

60 t/day corn silage



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Resume

Biogas plant construction will perform production 4 300 000 m³/year of biogas.

Corn silage will be used as feed stock for biogas production (and green biomass during the summer period). Feed stock volume is 21900 t/year.

Produced biogas after conditioning will be directed to co-generation unit for production of 8 760 000 kWh of electric power and 10 500 000 kWh of heat power per year.

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Biogas yield calculation

Customer:
Project No.: 1201-10

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Biogas plant operational period: (52 weeks, 7 days a week, 24 hours day)
Production period: (52 weeks, 7 days a week, 24 hours day)

365 Working days per year
8 760 Machine hours per year
24.0 Working hours per day

Substrate	Quantity per day (t)	Quantity per year (t)	DM (dry matter) (%)	DM (kg/day)	ODM (organic dry matter) (%)	ODM (kg/day)	Biogas yield (m ³ /kg ODM)	Biogas yield (m ³ /day)	Biogas yield (m ³ /year)	Methane content (%)	Biogas caloric value (kW/m ³)
Corn silage	60	21900	30	18000	94	17000	0,69	11800	4 300 000	62	26 400 000

Co-generation unit

Electric power kWh	1000
Heat power kWh	1200

Biogas plant technical performances

Characteristics		Values	Figures
1	Efficiency	t/h	2,5 силос
2	Substrate humidity	%	70
3	Biogas yield	m ³ /h	492
4	Produced electric power	kW	1000
5	Produced heat power	kW	1200
6	Biogas plant energy consumption	kW	60
7	Biogas heat power consumption (at T= -15°C)	kW	300
	Maintenance personal	person	1
	Area required	Ha	0,8

Scope of supply

Biogas plant consists of constructed facilities and equipment. Construction part of the project (concrete tanks) can be executed by the Customer at net price and under our supervision. All equipment is of high quality produced in EU, USA or under German license in Ukraine.

Price list

	Price, Euro			
	Project documentation	Supervision, start-up and adjustment, training	Equipment (FCA)	Construction*
Biogas plant	47.000	20.000	560.000	500.000
Co-generation unit 1 MW		10.000	785.000	

* Can be executed by the Customer under Zorg's control and supervision.

Conditions for project implementation

Contracts

Project implementation is executed simultaneously under 3 contracts:

- Engineering contract,
- Equipment supply contract (FCA),
- Construction contract (or supervision contract in case Customer executes construction).

Implementation terms

Months	1	2	3	4	5	6	7	8	9	10
Project documentation	■	■	■	■						RESERVE
Equipment supply	■	■	■	■	■					
Construction			■	■	■	■	■			
Start up								■	■	

Payment order

Under project engineering contract:

- 50% down payment,
- 50% of the contract price after one month.

Under equipment supply contract:

- 50% down payment,
- 40% payment from the contract price after 2 months,
- 10% after notification of readiness for shipment.

Construction contract (or supervision contract in case of construction executed by the Customer):

- Against executed works acts.

Biogas plant working principle

Corn silage is transported to biogas plant.

The feed stock is supplied to digester in portions 8-12 times a day with the help of screw loader. Feeding intervals are controlled by automatics.

The hydraulic retention time for corn silage in anaerobic reactor makes 65-70 days at a 30-40 °C temperature. Reactors are gas and leak proof tanks made of metal and concrete. Mixing system inside the reactors makes even substrate mixing.

Digesters equipped with floor and walls heating system that supports constant operational temperature.

The fermented substrate is discharged in automatic mode with the same periodicity as substrate loading. Plant operational control is made by programmed module in a time-program mode that is based on control gauges limiting values.

Produced biogas is collected to gasholder. Inside the gasholder pressure and biogas composition is evened. ZORG™ gasholder is a high-tensile and distensible membrane. The membrane material is resistant to sunlight and internal bioreactor sediments and evaporations. Gasholder service lifetime is 15 years. Gasholder volume capacity is 0.5 – 1 operational day. Bioreactor hermetically sealed by the gasholder from the top side and covered by additional tilt cover. The space between the gasholder and tilt cover is pumped with an air in order to form pressure and heat insulation. From gasholder biogas is constantly fed into co-generation unit or gas treatment system. Gas transportation is made by pipeline that is equipped with condensate discharge unit and pressure excess safeguard system. All the unit work based on gauges limiting values. The plant is equipped with an emergency flare for instances of engines malfunction and the necessity to burn the excessive biogas.

Treated substrate after biogas plant directed to the separation unit. Mechanical separation unit operated in a program mode and detach liquid and solid bio-fertilizer fraction. Bio-fertilizer can be directed to packing and granulation line.

Biogas plant work is visualized at central control room monitor. The control room is equipped with central control unit, which allows switch of any biogas plant module into automatic or manual mode with local or remote control.



Digester



Pump station



Automatics



Digester inside view

Scope of equipment and facilities

Main scope of equipment

No	Equipment	Description	Quantity
1	Substrate loading system:		1
1.1	Frame	profiled iron	1
1.2	Bunker	profiled iron	1
1.3	Screw feeder (motor drive 1pc. included)	Q=20 t/h, N=5 kW	1
1.4	3 stage disintegrator (motor drive 1pc. included)	Q=20 t/h, N=5 kW	1
1.5	Screw conveyor (motor drive 1pc. included)	Q=20 t/h, N=2.5 kW	1
1.6	Screw conveyor (motor drive 1pc. included)	Q=20 t/h, N=1 kW	1
1.7	Weight sensor	Q=4...10 t/h	4
1.8	Auxiliary steel structures	profiled iron	5
2	Mixing equipment:		
2.1	Horizontal paddle mixer (motor drive 1 unit included) MG-04.00.000.	N=11kW, n=11r/min	2
2.2	Horizontal paddle mixer (motor drive 1 unit included) MG-05.00.000.	N=11kW, n=11 r/min	2
2.3	Submersible pump		2
3	Substrate separation unit:		1
3.1	Frame	profiled iron	1
3.2	Separator (motor drive 1pc., vibrator 1pc.)	Q=20 t/h, N=5.5 kW, vibrator ИВ-99Б	1
3.3	Auxiliary metal structures	profiled iron	
4	Gas conditioning unit:		1
4.1	Gas filter	Filtration rate 50 nm	1
4.2	Gas flow meter	Qmax=500 m ³ /h	1
4.3	Compressor	N= 5kW, Q=320 m ³ /h	1
4.4	Emergency valve	P= 1 kPa – 20 kPa	1
4.5	Manometer radial execution	0-0,6 bar	2
4.6	Angle thermometer	0.100°C, G1/2 L=63	1
4.7	Gas analyzer	CH ₄ , CO ₂ , H ₂ S	1
4.8	Pressure regulator	Pmax=1 bar	1
4.9	Supporting and auxiliary structures	Stainless steel	
4.10	Piping	Stainless steel	
5	Heat supply station:		1
5.1	Heat exchanger	Q=300 kW	1
5.2	Surge tank	V=300 L	1
5.3	Electrical boiler	Q=120 kW	2

5.4	Circulation pump	Q=30 m ³ /h, N=0.87kW	1
5.5	Circulation pump	Q=16 m ³ /h, N=0.34kW	1
5.6	Circulation pump	Q=44 m ³ /h,	1
5.7	Temperature control valve	Dy50, U = 24 v Kvs = 16 m ³ /h,	2
5.8	Thermometer	T=0..120 C	2
6	Automatics		1
6.1	Automatics station		1
6.2	Level sensor	P=0...0.6 bar,	3
6.3	Temperature sensor		3
6.4	Foam sensor		3
6.5	Substrate excess pressure relay		1
6.6	Gas pressure sensor	P=0 0.1 bar, 4-20 mA	1
7	Electric equipment:		1
7.1	Light signal device		1
7.2	Distribution box with counter		1
7.3	Distribution box		1
7.4	Starting box		1
7.5	Lighting panel		1
8	Air supply system:		1
8.1	Compressor	P=7 bar,	1
8.2	Compressor	P=0.1 bar,	1
8.3	Rotameter	1-10 m ³	1
8.4	Air blower	N=0.75 kW	1
8.5	Manometer	P=0...0.4 bar	1
8.6	Piping end fitting	PVC, stainless steel,	steel
9	Gas holder:		2
9.1	Gas holder	Ø26 m	1
9.2	Cover dome	Ø26 m	1
9.3	Air blower	16 A, 0,5 kW	1
9.4	Emergency valve		1
9.5	Excess and minimum pressure valve		1
9.6	Dome level sensor		1
9.7	Mounting system	set	1
9.8	Inspection hole		1
9.9	Accessories		
10	Co-generator:	Capacity =1000 kW	
10.1	V-engine		1
10.2	Generator	400 V	1
10.3	Power distributor		1
10.4	Heat exchanger water-water		1
10.5	Heat exchanger combustion products-water		1
10.6	Gas and fire alarm system		1
10.7	Gas pressure amplifier		1
10.8	Sensor system		1
10.9	Muffler		1
10.10	Gas piping with stop valves		1
10.11	Cooling system		1
10.12	Sound proof container		1

Scope of facilities

No	Item	Type	Qu-ty	Materials
1	Digester 2400 m ³	Reinforced concrete structures	2	Concrete, reinforcing steel ø 12-25, embedded steel parts.
2	Open tank for digested biomass 200 m ³	Reinforced concrete structures	1	Concrete, reinforcing steel ø 12-25, embedded steel parts.
3	Utility and service building	Reinforced concrete structures	1	Concrete, reinforcing steel ø 8-12, embedded steel parts.

Scope of documentation

Explanatory note Statistic calculation
Drawings Layout and transport Architectural solutions Concrete structures Wooden structures Metal structures
Drawings Gas supply Air supply Water supply and sewage Ventilation and heat supply
Drawings Production technology
Drawings Power equipment Illumination and protection facilities Plant automatics
Start-up and adjustment instructions Plant schedule Operational instructions

Scheme

