TWR-600 kW
Biomass Gas Energy Generator

TWR Holding Group

2020

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600 kW Biomass Gas-fired Power Generator (three-phase, 60HZ, 127 / 220V, PF = 0.8)

1. Operating Conditions

1.1. Environmental Requirement

The genset can operate stably, reliably and continuously under such environmental conditions: Ambient temperature -20°C ~ +40°C; Relative humidity < 90% (20°C); Altitude ≤ 2000 m.

1.2. Lubricating Oil Requirement

Combined gas generator set with complete lubrication oil system. Lubricating oil class: 15W-40CD， adaptation temperature -20°C ~ +40°C. If the gas has higher sulfur content, it is suggested to choose ammonia oil.

1.3. Cooling water requirement

The cooling water of the generator adopts softened water (or antifreeze). The cooling water should be slightly alkaline clean water, should not contain corrosive compounds, such as chloride, sulfate or acid, etc. The main index is as follows:

- Total hardness ≤100 ppm.
- Chloride ion content <150 mg/L.
- PH value 7.0 ~ 8.5.

2. Main performance parameter

2.1. Technical specifications of gas generator set

	Item	Specification
Engine	Type	8300D/M-3
	Style	In-line, water-cooled, four-stroke, four-stroke, ignition by spark plug, open combustion chamber, no turbocharger
	Number of Cylinders	8
	Cylinder Diameter	300 mm
	Total piston displacement	215 L
	Piston stroke	380 mm
	Nominal speed	600 rpm
	Main power	kW
	Rated load thermal consumption	≤11 MJ/kWh
	Start-up method	Compressed air start
	Exhaust temperature	≤600 °C
	Gas pressure	≥2.5 kPa
	Inlet gas temperature	≤40 °C
	Oil consumption	≤0.8 g/kWh
Group Generator	Type	600GFM
	Power rating	600 kW
	Nominal voltage	60HZ, 127/220V, PF=0.8
	Rated current	1968A
	Power factor	0.8 (lagging)
	Excitation mode	Brushless
	Phases and connection modes	3 phases 4 wires
	Relation to stationary voltage regulation	±2.5%
	Instantaneous voltage regulation ratio	±20%
	Stable voltage time	≤5 s
	Voltage fluctuation ratio	≤1%
	Stationary frequency regulation ratio	≤5% (0～5 Adjustable).
	Instantaneous frequency regulation ratio	-20～+12%
	Stable frequency time	≤10 s
	Size (L × W × H)	6400 x 1600 x 2900 mm
	Weight	22000 kg

Engine: technology from Germany.
Alternator: produced under Siemens license.

3. Technical characteristics

As the low-speed gas power generation products, in practice, the 300 series gas engine has obvious advantages compared with similar products:

- Gas engine is in-line exhaust pipe, regular type, inlet, arranged on the two sides of the gas engine, more intuitive, simple, not only greatly facilitate the maintenance of the machine and save a lot of maintenance time and maintenance costs. Unit overhaul, shaft maintenance as detachable, maintenance can be carried out in the field, no need to return to the factory.

- The gas engine mainly accelerates at 500 or 600 r/min, the low speed reduces the wear of the gas engine, prolongs the service life of the machine and improves the economic benefit of the user. Low speed can also reduce the wear of parts, prolong the using time and reduce the maintenance cost. Overhaul time up to 60000 - 65000 hours.

- Low speed, realizing prolonged combustion of fuel gas and air in the cylinder, complete combustion of gas completely, the corresponding exhaust temperature is low and the thermal efficiency is high.

- High quality material used, improve the strength of parts and wear resistance. Using high strength and wear resistance niobium alloy (Nb) cast iron as the cylinder liner material, and ensure that the cylinder liner has good abrasion resistance, corrosion resistance and higher manufacturing precision, thus prolonging the overhaul cycle, ensuring the power and economy of the gasoline engine.

- Large cylinder bore, ensure constant output. Our products have advantages of large diameter, long stroke, large power reserve, it is more suitable for low gas pressure characteristics, ensures continuous and steady power output.

- Natural aspiration ensures high adaptability to gas pressure fluctuations.

- Natural aspirants cause low-pressure gas and air to enter naturally.

- Using ALTRONIC ignition system, ignition control is guaranteed. The ignition system including digital ignition module, high voltage coil and high voltage wire, spark plugs, etc., all imported.

from the U.S. company ALTRONIC, ensures that the ignition is controlled.

- Avoid counterproductive effect, to ensure the safety of gas transportation.

  The adoption of air-fuel ratio control technology ensures a more ideal air-gas mixture ratio with the engine.

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  High-quality manufacturing techniques ensure tight valve sealing and precise timing to avoid quenching.

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  The flame arrester attached to the pipes has an extinguishing effect that prevents the flame from spreading.

  In the event of a dangerous situation, the emergency shut-off solenoid valve closes quickly to shut off the gas and the safety valve opens quickly to vent excess pressure and ensure safety.

4. Description of the design of each system

4.1. Gas intake system

4.1.1. Design range

Processing, gasification, purification of raw materials for all equipment between clean gas and gas generator, including gas pipeline, butterfly valve, flame arrester and auxiliary protection and control equipment, etc.

4.1.2. Technological process

After the processing of biomass materials transported to produce biomass gasification furnace gas, gas generated after cleaning the gas purification system, clean gas through the gas branching pipeline, butterfly valve in the gas generator set. To ensure the normal operation of the gas generator set, butterfly valves, emergency shutdown solenoid valve, dry fire suppressor are installed in the gas conveying pipeline, which ensures the safety protection of the gas generator set and automatic control of gas inlet.

- Biomass materials.
- Gasification furnace.
- Gas purification equipment.
- Gas.
- Bifurcation piping.

- Butterfly valve.
- Emergency shut-off solenoid valve.
- Dry fire suppressor.
- Butterfly valve.
- Gas generator set.

4.1.3. Pipe diameter

According to the gas required by the gas genset, use a pipeline from the storage tank to the gas genset to transport the gas, the diameter of the pipeline is 150 mm calculated according to the gas flow velocity in the pipeline not more than 15 m / s, the calorific value of the gas is 5.2MJ/m³.

4.1.4. Pipe selection

Pipe below DN200 using ordinary welded steel pipe produced in accordance with GB / T3091-2001 standard low pressure fluid conveying welded steel pipe; pipe larger than DN300 adopts spiral seam submerged arc welding steel pipe in accordance with Y / T5037-2000 standard low pressure fluid pipelines conveying spiral seam submerged arc welding steel pipe.

4.2. Cooling system

4.2.1. Design range

The cooling circulation includes: gas genset cooling water circulation system and internal water filling system.

4.2.2. Circulating water flow

According to the performance requirements of the gas genset, the cooling system can be divided into high-temperature and low-temperature system, the heat transfer between these two systems through the heat exchanger. The high-temperature system (also called inner loop) mainly cools the engine body, cylinder liner, cylinder head and other parts. The low-temperature system (also called external loop) mainly cools the high-temperature circulating water and lubricating oil through the heat exchanger, and the low-temperature system is cooled by a cooling tower, the water temperature is about 40 ~ 50 ° C. The water flow of the low temperature system is 60 m³ / h, the temperature rises about 10 ° C through the heat exchanger, the high temperature system uses softened water, the consumption of each generator is about 10 kg / d.

4.2.3. Cooling system solutions

- Low temperature water flow: cooling tower → water pump → lube oil cooler → water cooler → cooling tower.
- High temperature water flow: water pump → water inlet manifold → gas engine → water chiller → water pump.

4.3. Start-up system

air compressor → air bottle → balloon valve → air pipe.
compressed → gas engine.

4.4. Exhaust system

4.4.1. Design range

All equipment, from gas genset exhaust to atmosphere, including corrugated expansion joint, exhaust pipe, muffler and muffler support.

4.4.2. System process

Exhaust system including exhaust pipe, corrugated expansion joint, muffler and muffler holder, etc.

Gas genset breather → expansion joint → piping → muffler → atmosphere.

Exhaust temperature of approximately 550°C, all exhaust system components use high temperature resistant material. The exhaust pipe is hung from the roof by means of a hoop and a lifting rope. The muffler is installed on the muffler bracket.

4.5. Electrical system

4.5.1. Design range

The electrical system includes: genset control cabinet, generator set control panel, power switchboard and
distribution and power distribution cabinet.

4.5.2. System summary

Each gas genset equipped with a genset cabinet and a switchgear, the electricity is controlled by the switchgear, then to the electrical equipment or external power grid. The distribution board mainly has protection

against over current, reverse power, over voltage, overload and under voltage, and controls the breaking, opening, parallel, active and reactive power regulation of the gas generator set. The power distribution cabinet is mainly used for power distribution in the plant.

4.5.3. Generating set safety control system

Suitable for JB / T9583.1-1999 standard, and has the following safety devices:

1. Low oil pressure, engine shutdown alarm.
2. Over speed, alarm and engine shutdown.
3. High cooling water temperature, alarm.
4. High lubricating oil temperature, alarm.
5. Generator standby power protection.
6. Generator under voltage protection.
7. Generator over current protection.
8. Low frequency generator, over frequency protection.

All rotating parts have protective screen as protective devices. There is a lightning protector on the board to prevent the generator from falling down.

5. Commitment to service and quality assurance

5.1. Pre-sales services

According to the actual situation, power plant layout drawings, circulating cooling system drawings, installation drawings, foundation drawings and electrical wiring drawings, etc., which can meet the design and construction requirements, will be provided.

5.2. Sales service

Provide technical support via telephone or Internet, the customer can also visit and communicate.

5.3. Quality insurance

Manufacture the gas generator set in accordance with the "general technical conditions of gas generator JB / T9583.1- 1999" and comply with all the provisions of the standard, the technical data provided can meet the requirements of design, installation, operation, safety operation and maintenance. Under conditions that comply with the installation, debugging, operation and maintenance instructions listed in the manual, the warranty time is 12 months from the date of delivery or the unit operates 6000 hours (subject to the order of

arrival); The influence of the main performance index or the damage of parts due to the manufacturing quality, we will be responsible for processing.
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5.4. Others

- No warranty is assumed for normal wear and tear of machine parts.
- For improper storage, poor maintenance, improper operation, gas, oil, cooling water not conforming to supply, poor infrastructure, improper installation, electrochemical corrosion and other abnormal damage not due to manufacturing, we will not be liable for compensation.
- We guarantee to provide customers with qualified products, suitable accessories and qualified services to customers from the service content and service quality.

6. Supply list of gas generator sets (2 units for one gasifier) .

No.	Name	Type	Quantity	Observation
1	Gas engine	8300D/M-3	2	
2	Alternator		2	
3	low voltage circuit breakers	GGD-500	2	
4	Elastic coupling		2	
5	Common base		2	
6	By-pass control cabinet	JPX-02B	2	
7	Included accessories		2	
8	Random spare parts		2	
9	Tools		2	
10	Standard parts		2	
11	Technical Documents		2	
12	synchronized operating cabinet	GGD-2500	2	Use of 2 units
13	Wedge adjustment	350×180×100	2	
14	Mufla	ZC-XSQ-300L	2	
15	Dilation	DN300	2	
16	Expansion joint flange	8L250-10-035	4	
17	Adjustable seals	500GFW-03-103	2	
18	Low voltage distribution cabinet	GGD-1	2	Prepared by the customer
19	Cooling tower	GBNL3-500	2	Customer Prepared (500L / H)
20	Cooling water pump	KWH-125-160A	2	One in use, the other on standby
21	Exhaust heat boiler		2	
22	Electrical Materials		1 Set	The user can prepare by himself
23	The driving material		1 Set	The user can prepare by himself

7. Related images

Genset layout plan

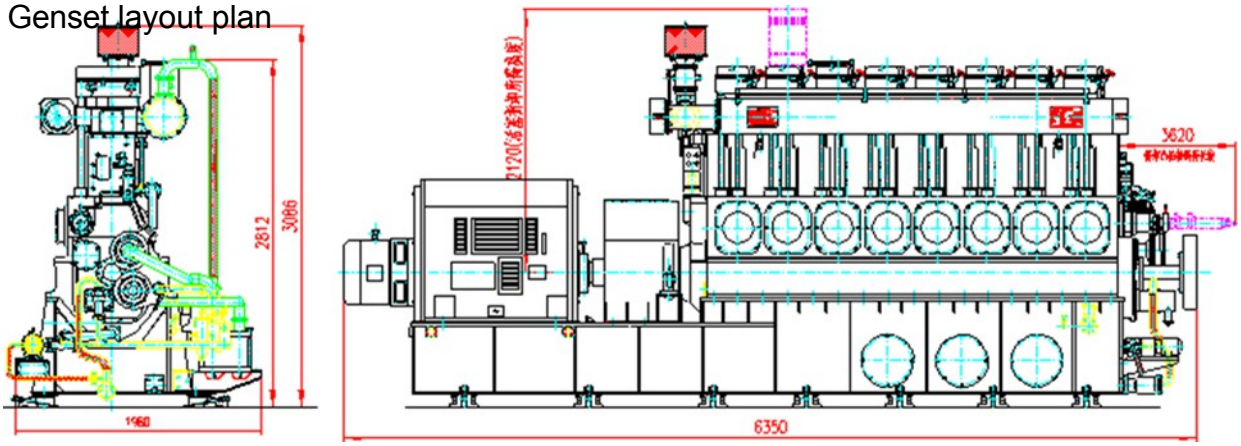

Image of the gas generator