2021

TWR Holding Group

TWR Biomass Technology
Gasifier 600 kw

600 kw Biomass Syngas Power Generation System

1. Biomass Energy - Green Energy

Today's human beings are facing huge pressure of energy and environment. Today's energy mainly comes from fossil fuels, including coal, oil, natural gas, etc. on the one hand, the application of fossil energy promotes social development, but its resources are increasingly exhausted. On the other hand, the excessive use of mineral energy has caused serious environmental problems, so it is necessary to develop and find new opportunities. Alternative energy has become one of the major problems to be solved urgently in human society.

Biomass energy is the most important alternative energy in the future and the inexhaustible warehouse of solar energy. Using biomass energy instead of fossil fuel can not only reduce the emission of CO_2 greenhouse gas, but also reduce the emission of SO_2, NOx and other pollutants due to the use of fossil fuel, so as to protect and improve the environment. Biomass syngas power generation will be the main alternative to fossil fuel power generation in the future. The conversion of biomass raw materials into combustible syngas solves many problems in the power generation of solid biomass raw materials. The conversion rate of syngas is very high. The most common way to use biomass syngas is to generate heat through combustion. This kind of application is very extensive. It includes various applications in industry and life, such as drying, boiler, kitchen, etc. in most of the application process, the technology of using biomass synthesis gas for power generation is the most advanced among various methods.

According to the scale, biomass synthesis gas power generation can be divided into three types: small, medium and large. The power generation of small-scale power generation system is less than 200 kW. It is characterized by simplicity and flexibility, especially when the power shortage area is used as a distributed power station, or as a self-contained power generation unit of small and medium-sized enterprises. The power generation of medium-sized power generation system is generally around 500 kW, with strong practicability. Although it is still very small compared with conventional energy, under the dual pressure of energy and environmental protection, it will be one of the main alternative fossil fuel power generation methods in the future. In addition, syngas directly into the internal combustion engine can save a lot of petroleum fuel. The use scale can be large or small (tens to hundreds of kilowatts), so it is very ideal to use it in a decentralized way.

After market application feedback and continuous research, the TWRTM series biomass gasification equipment produced by our company has been upgraded gradually, More suitable for the market requirements, with small installed volume, flexible layout, less investment, compact structure, reliable technology, low operating cost, significant economic benefits, simple operation and maintenance, fully in line with the requirements of gas generating units for the quality of syngas, has been a direct praise and recognition of users at home and abroad.

1.2. Biomass Syngas Power Generation System

Biomass syngas power generation technology, also known as biomass power generation system, is a technology that converts various low calorific value solid biomass energy resources (such as agricultural and forestry wastes, crop straw, domestic organic waste, edible mushroom residue, livestock manure and all combustible substances) into biomass syngas through gasification, and then enters into the syngas power generation unit after cooling and purification.

The biomass syngas power generation system is composed of biomass gasifier, syngas generator set and auxiliary equipment. The TWRTM series biomass gasifier produced by our company is a down suction and fluidized bed biomass gasifier independently designed and developed for the need of biomass synthesis gas power generation. The series of biomass gasifier is controlled by PLC intelligent system, which fully realizes long-term

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and full-automatic work. And the dry purification technology adopted by the gasifier can avoid the secondary water pollution to the natural environment. And the adaptability of raw materials is strong, only the size of biomass raw materials is required to be ≤ 30mm, and the moisture content is required to be ≤ 20%.

Drying and cracking of various biomass raw materials through gasifier oxidation and reduction, production of raw material syngas, followed by cooling, dedusting and cooling of the biomass syngas, removing the tar and impurities in the gas, and delivering the treated high-quality and pure biomass syngas to the syngas generator unit for power generation. In this way, the transformation of low value biomass energy from solid to gas state is realized, while the solid state is greatly improved Utilization efficiency of biomass energy. The whole biomass synthesis gas power generation system adopts modular design, which is convenient for transportation and installation. The 600 kw biomass syngas power generation system including one sets of TWRTM-1800 biomass gasifier, one sets of 600 kw syngas power generation units and auxiliary equipment.

2. Gasification Principle

Biomass gasification is the process of transforming solid biomass (wood chips, branches, organic household garbage, agricultural and forestry wastes, etc.) into combustible biomass syngas. By controlling the reaction process, carbon, hydrogen and oxygen elements are synthesized into combustible components such as carbon monoxide, hydrogen and methane through chemical reaction, and most of the energy in biomass raw materials is transferred to biomass syngas. This is the gasification process of biomass gasifier.

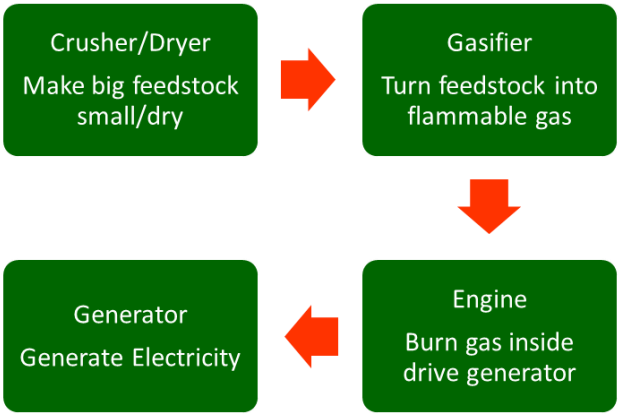

Image of Biomass Syngas Power Generation System

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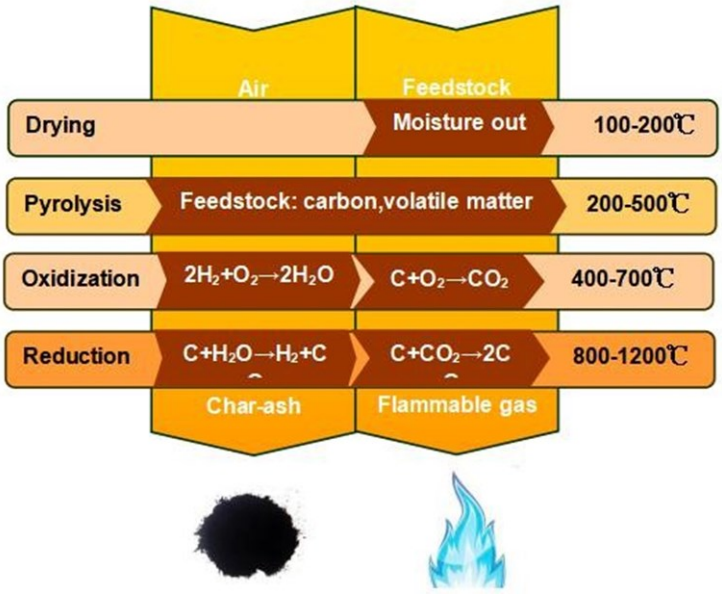
Generation principle of biomass syngas: biomass raw material enters the reactor of gasifier, is heated and dried, and then with the temperature rising, its volatile matters are separated out and pyrolyzed (cracked) at high temperature. The pyrolyzed gas and biomass react with the air supplied in the oxidation zone to generate CO2 and water vapor. The heat generated by combustion is used to maintain drying, pyrolysis and lower part Endothermic reaction in the original region. The gas generated after combustion reacts with high temperature carbon layer through reduction zone (C + CO2 = 2CO, C + HO2 = H2 + CO) to generate biomass synthesis gas containing CO, H2, CH4, CMHN and other components, which is led out from the lower part and sent out for use after removing impurities such as tar through purification system. The ash is discharged from the lower part of the gasifier.



3. Biomass Raw Materials

The biomass syngas power generation system is applicable to various kinds of palm biomass, biomass straws, such as peanut shell, rice shell, corncob, cotton straw, corn straw, wood chips, branches, and other wood materials, chicken manure, pig manure, cow manure and other animal manure, organic urban garbage, industrial organic garbage, such as plastic, rubber, cloth, paper shell, etc. (the total content of plastic and rubber is less than 30%).

The requirements of biomass gasifier for raw materials are as follows:

- Requirements for raw material size: biomass raw material in block or particle shape ≤ 30mm.
- Moisture content of raw material: ≤ 20%.

For every 1 kW of electricity produced in the biomass syngas power generation system, the raw material needed is 1 kg - 1.5 kg.

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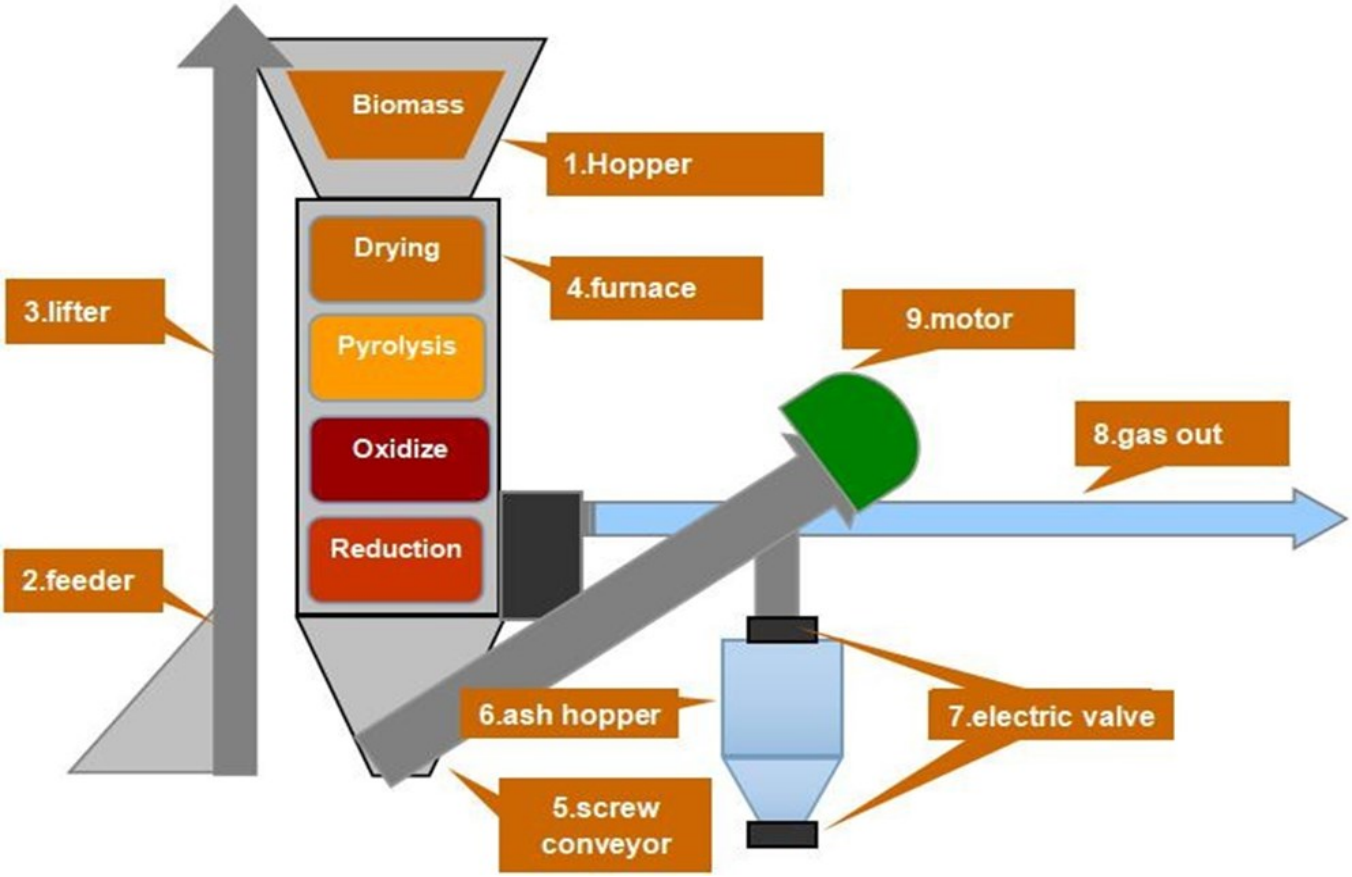
4. Equipment Composition

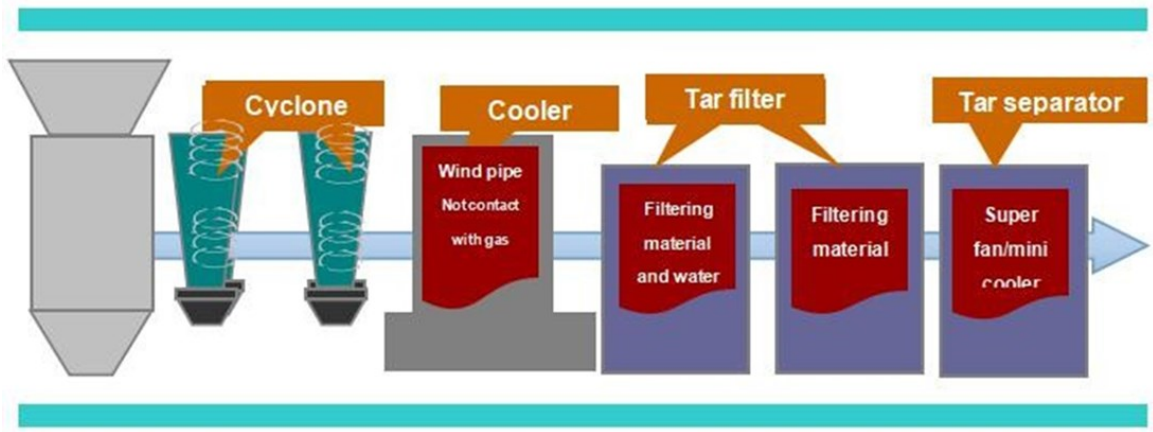
Biomass syngas power generation system mainly includes biomass gasifier and syngas generator, as well as auxiliary equipment. Biomass gasifier consists of furnace system, dedusting system, cooling system, tar purification system, tar separation system, roots blower, electrical control system, etc.

The syngas generator set is mainly composed of gas engine, three-phase AC synchronous engine, control cabinet, common chassis and air source connection part. Auxiliary equipment include shredder, dryer, conveyor, etc.

4.1. Furnace Body System



4.2. Dedusting Cooling and Purification System



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Dust Remover. Six cyclones are installed in the dust removal system to separate dust and other impurities in the synthesis gas.

Cooler - Air duct structure. The syngas passes through the inside of the air duct and is cooled by the outside cold air through the outside of the air duct. It condenses the moisture and tar in the syngas.

Tar Purifier. Tar purifier is composed of four tar removers, which are immersed in water for operation.

Tar Separator. The tar separator adopts dry filtration, and the inner part contains a cooling device, which condenses the water vapor and tar, and then carries out centrifugal separation. There are filter materials (active carbon and stainless steel vapor-liquid separation net) inside the tar separator to filter water and tar.

Roots Blower. The main power system of biomass gasifier. The roots blower takes the air into the gasifier as oxidant to react and generate synthesis gas. Syngas is compressed by roots blower and sent to diverter. The whole gasification system works under negative pressure.

Shunt. The separator consists of 3 sets of filters, diverter valve and flare to test the quality of syngas. The syngas delivered by roots blower is finally filtered by diverter, and then distributed for output.

Touch Screen. Touch screen is the operation panel of PLC control system, which is the core of the control and operation of biomass gasifier.

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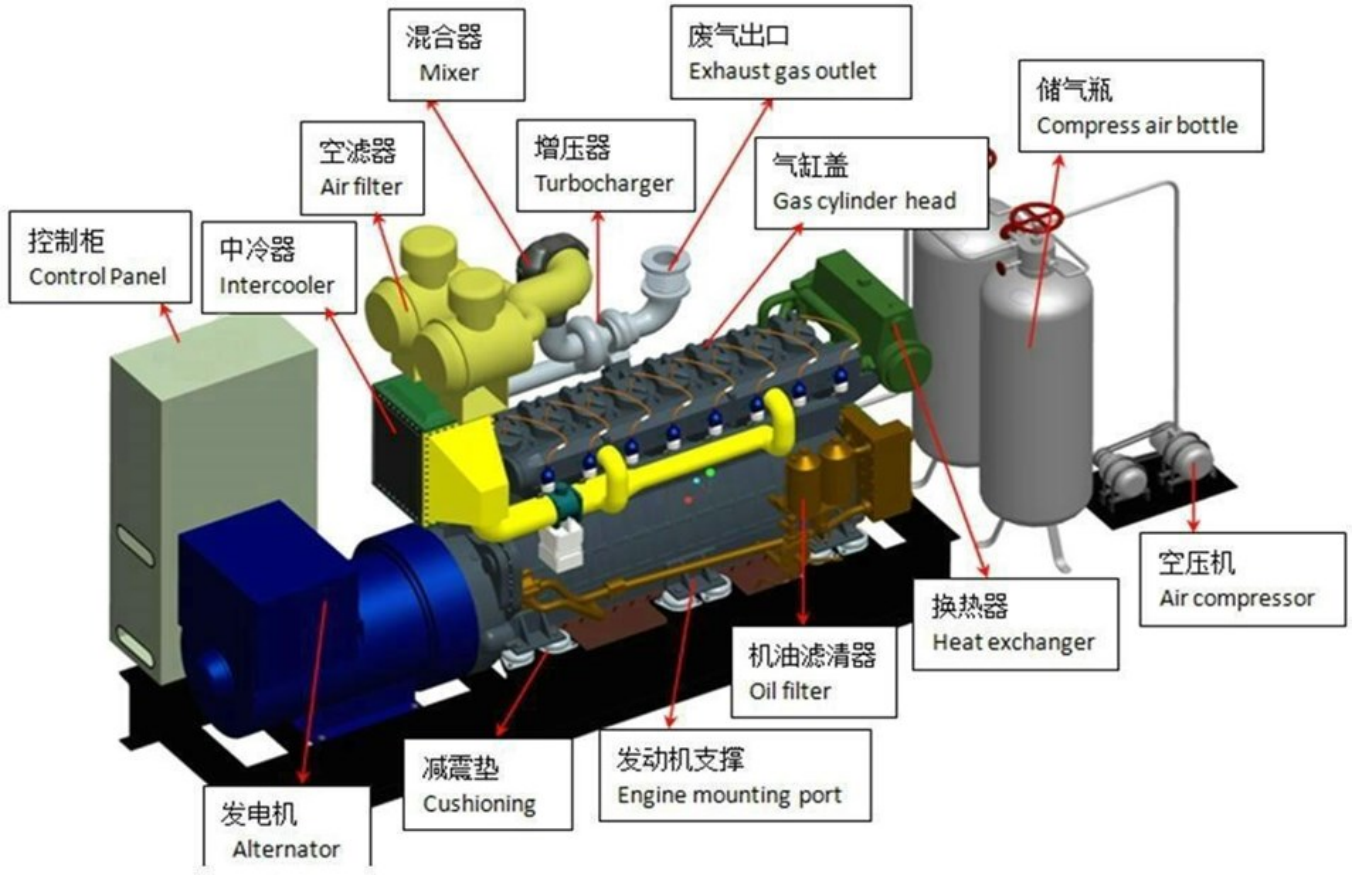
Video Detector. There is a video viewer on the top of the gasifier, through which the operator can observe the working process inside the gasifier chamber.

4.3. Syngas Generator Set



The control module of generator set adopts the control technology of generator set with microprocessor as the core, which has many functions such as automatic data recording, automatic operation, automatic control, automatic protection, and has good reliability and stability performance. The operation parameters of the unit are displayed by large screen liquid crystal, and the displayed data is large and accurate.

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5. TWRTM-1800 Parameter of Gasifier

Design Parameters			
Gas Production	1800 m³/h	Syngas Caloric Value	1000 - 1200 kcal/m³
Fuel Consumption	900 kg/h	Power Supply	380V 50/60HZ
Gasification Efficiency	>72%	Device Power	89 kW
Matching Engine	600 kW	Fuel Size	< 30 mm
		Fuel Moisture Content	< 20%
Certificate	CE	Place of Origin	China
Installation Size m	(Length x Width x Height) 29.1 x 5.86 x 7.2		
Gas Quality			
Gas Composition	CO	15 – 20%	Energy Density: 4600 – 6300 kj/Nm3 1100 – 1500 Kcal/Nm3
	H_2	10 – 15%	
	CH_2	5 – 10%	
	CnHm	1 – 5 %	
	CO_2	15 – 20%	
	N_2	34 – 43%	
	O_2	< 1%	
Gas Quality	Temperature	< 40°C	The gas quality can meet the request of generator running.
	Dust Size	< 5 μm	
	Dust Quantity	< 30 mg/Nm³	
	Tar	< 50 mg/Nm³	
	H_2S	0	
	Acid	0	

Fuel Consumption for Reference		
Material Name	Fuel Consumption of Each kw (kg/kw.h)	Gas Producing Volume of Each kg Fuel (Nm3/kg)
Rice Husk	1.4 – 1.6	1.6 – 2.1
Corn Straw	1.3 – 1.5	1.6 – 2.2
Rice Straw	1.4 – 1.7	1.6 – 2.3
Sawdust	1.3 – 1.4	1.9 – 2.1
Wood Chips	1.3 – 1.5	1.9 – 2.1
Coconut Fiber Dust	1.6 – 2.0	1.5 – 2.0

1. ***Because of the diversity of biomass materials, their volatile & moisture content are different, so the consumption of raw materials fluctuate within certain range.***
2. ***These data are based on our generators, if adopt other brands generators, the data will be floating.***

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6. 600 kw Biomass Syngas Power Generation System

No.	Name	Number	Model
1	Biomass gasifier	1	TWRTM-1800
2	Low Rev Motor	1	600 KW
3	Ocean freight	5	40 HC

7. System Images

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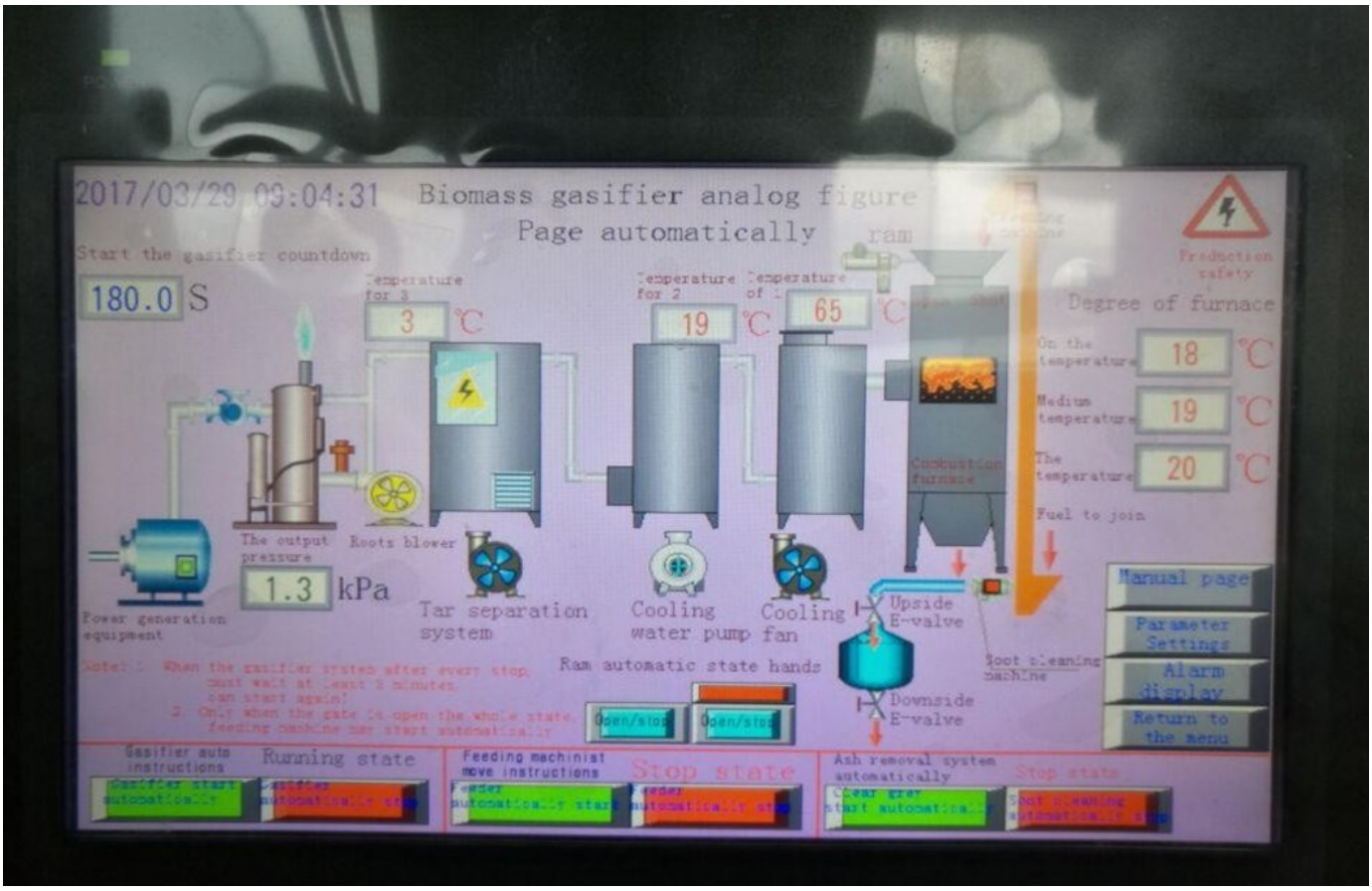

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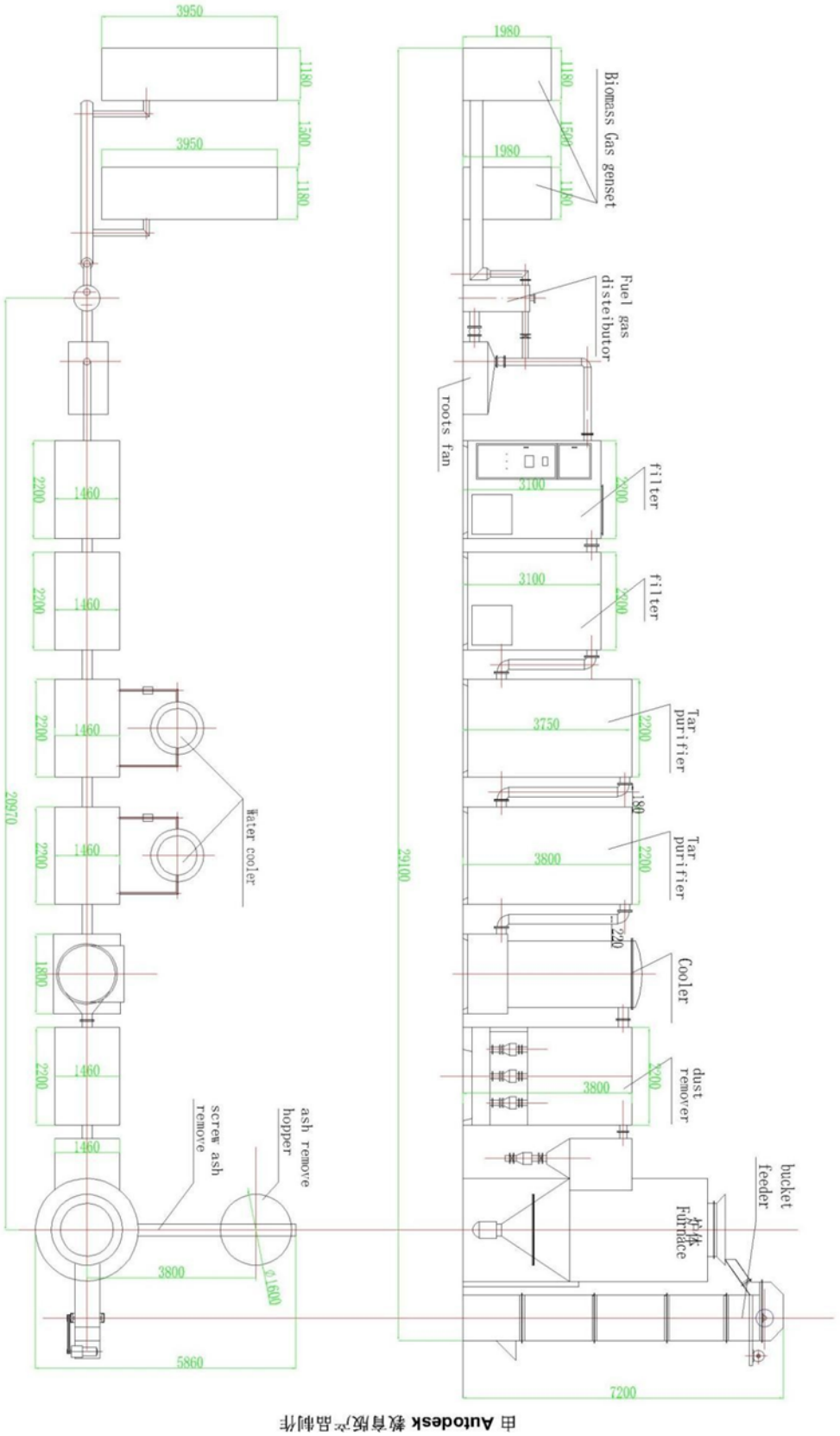

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Is committed to put all effort to make this project happen, commitment founded by our slogan,

"People Helping People"

We appreciate your valuable time

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