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# Brief introduction for pyrolysis technology with wood chips as raw material

## A. Background of project :

Pyrolysis process is a most advantage technologies at present. Compared with biomass gasifying generating , pyrolysis generating is a latest technologies in world . There are Some advantage below:

1. Technologies is advantage , easy operating .
2. These equipment only occupy less land for plant house. Easy adjusting and change position installed equipment.
3. Main feature fro biomass pyrolysis continues gas supplied, there is no tar in biomass gas, It is most useful of the gas heating value.
4. Dimension of purifying equipment is less , consumption of water is less , there is no waste Water , exhaust gas and power dust pollution .
5. More higher efficiency from the biomass pyrolysis :  $\geq 70\%$

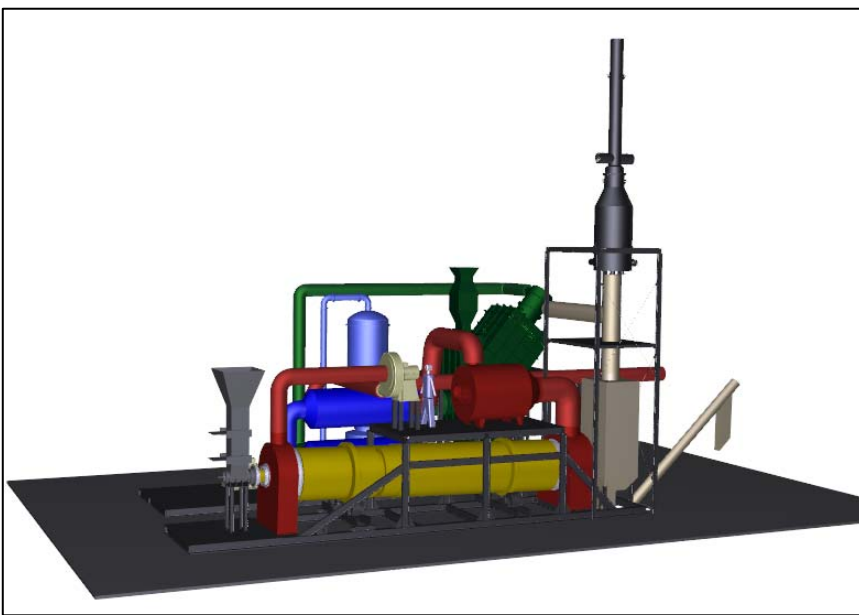
Picture 1.1



Picture 1.2 Biomass pyrolysis equipment

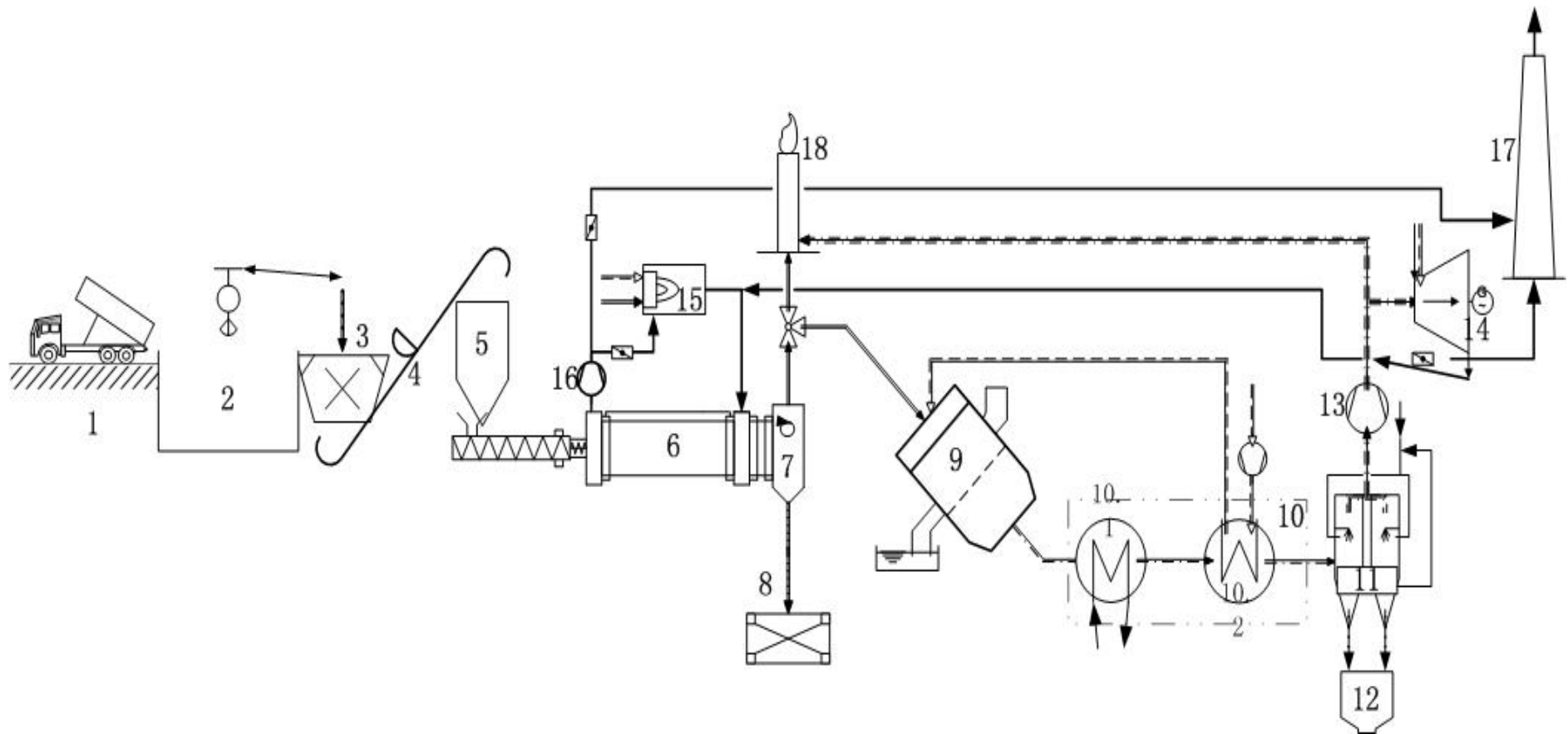


Picture 1.3 Biomass pyrolysis generating with 3D sight



## B . Process diagraeme for pyrolysis technologies

**Chart B :** Basic technology process of lower temperature pyrolysis device



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1 Transporting raw material 2 Storage and lifting raw material 3 Shredding machine for raw material 4 Feeder system 5 raw material storehouse 6 Dry carbonization drum 7 Cyclone dust catcher 8 solid Leftovers (biology carbon )

9 Splitting drum (De-tar in the gas ) 10 Heat - Exchanger 10-1 use remaining hot 10-2 Air pre-heater 11 Second stage washing the gas 12 Treatment of waste water 13 Pure air blower

14 Gas engine 15. Maker of hot smoke gas 16 Recycle blower of hot smoke gas 17 Chimney 18 Emergency torch

### C .Brief instruction for pyrolysis technologies with wood chips as raw material :

- 1) All kind of wood chips is transported by truck to biomass plant, these woods flour must conform with requirement for the pyrolysis drum ,which moisture is about 12 %, no higher is 25%. .Woods flour is transmitted into seal feeding raw material channel by the conveyer, final it will be transmitted into the pyrolysis drum .
- 2) Quantity of raw material in store house may used seven days for the pyrolysis furnace. A negative pressure dusting device is installed in the storehouse , it' s function is suction Wood flour and chips ,then transmitted it into biomass pyrolysis gasifying .
- 3) Before first starting pyrolysis drum , liquid gas (or natural gas ) is as source of heating ,burning it and produced heating smoking gas ,it will be as heating source for pyrolysis wood flour. This heating source will be transfered cycle by the blower . When completed to produce biomass gas in the pyrolysis drum , regular biomass gas produced in biomass pyrolysis drum may be as heating resource and replace liquid gas supplied by external . Whole pyrolysis drum system realized balance of power source , extra biomass pyrolysis gas is useful for generating in gas engine generator.
- 4) Passed automatic screw feeder system, a wood flour was transmitted to the pyrolysis furnace . rotating  
The pyrolysis drum is a indirectly pyrogenation of a wood flour at more 650°C .Heating source does not mix directly with a wood flour so keep heating gas to clearing and realized cyclely To use heating source . Produced a pyrogenation product is a compound gas with high heat value ( temperature is more 450°C )and biomass carbon ( containing carbon is more 50% )
- 5) A pyrogenation gas contain some tar .Under condition of more 450°C, tar is a state of gas .After pyrolysis drum , pyrogenation gas is transmitted into a gas converter and mix with air in jet nozzle .After burning in the gas converter , tar in biomass is completely split into a organic gas with short chain . After reaction of activator again , heating value in biomass gas is increased ,only less activator was consumed in the gas converter .
- 6) A pyrogenation gas from the pyrolysis drum contain less ash . After action in purifying device , ash will be removed completely and put down temperature of the biomass pyrolysis gas so that meeting temperature requirement of the gas for the gas engine (in normal the gas temperature lower 40°C )
- 7) A gas engine and generator system : a gas engine and a generator is standard equipment ,it was

widely used for biomass gas generating power plant.

8) emission of waste gas and waste water meet European standard 17.BImSchV.

## D . Primay proposal for 6MW biomass pyrolysis gas generating project with raw material (wood chips )

As per requirement of 6MW biomass pyrolysis gas generating , a primary proposal is made , including Balance of energy and some matters ,and matters and operator are required for operating this biomass power plant .

Picture D.1 appearance for biomass pyrolysis furnace made completed

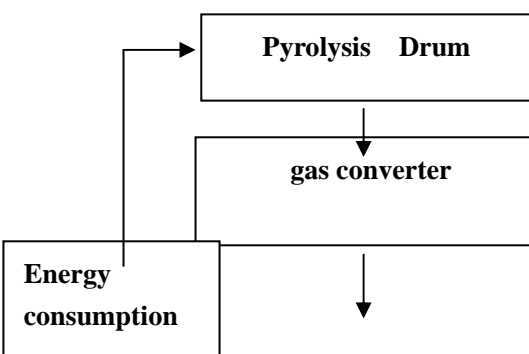


### 1. Energy balance caculating

Treating wood chips volume : 8.4 t/h

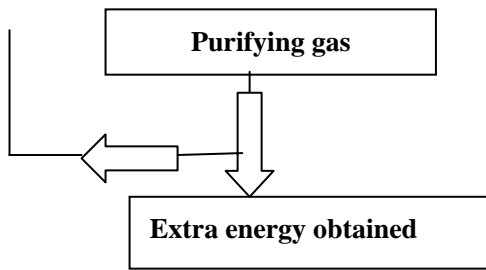
Natural gas consumption ( before no pyrogenation gas ):	230 Nm <sup>3</sup> /h
Heating value of natural gas :	36 MJ/Nm <sup>3</sup>
Pyrogenation gas consumption ( no use natural gas )	1742.89 kg/h
Pyrogenation gas for biomass pyrolysis furance	5936 kg/h (heating value :13~15MJ/Nm <sup>3</sup> )
Pyrogenatiuon gas after purifying	10201 kg/h (heating value:6 MJ/Nm <sup>3</sup> )
<b>Biomass carbon</b>	<b>2.8 t/h</b>

### 2..Distributing of biomass gas flow



Pyrolysis gas volume: 5936 kg/h

Pyrolysis gas volume: 10201 kg/h



Pyrolysis gas volume: 10201 kg/h  
 available energy : 61206 kW  
 available generating energy: 16062.2 kW for generating 6MW  
 (as per efficiency of generator , decide dtotal efficiency is 30%~35%)

### 3. Operating cost :

Operating pyrolysis drum system need all kind of energy and some matters . consumption of energy and matters is shown on the list below. This list is only reference values .After realized practice further ,these values should be revised. In list 3.C , shown main matters when operating 8.4t/h biomass pyrolysis drum production line :

List 3.C Basic condition of energy and matters required when operating pyrolysis device

Matters /energy consumption	Consumption volume	Used to dirction	Remarks
Natural gas	Most volume230 m <sup>3</sup> /h	Heating smoking gas furnace Pyrolysis furnace Jet nozzle in Pyrolysis furnace	Only used in first starting pyrolysis furnace ,230 Nm <sup>3</sup> /h natural gas is needed .After operating about four hours time , temperature may rise operating temperature of pyrolysis furnace and spliting furnace .
Power electricity	About 600 kW	Power consist of multi units Auxiliary warming gas Driven automatic equipment illumination	
water	about1000 kg/h	Cleaning gas and cooling water	(cycle water)
Compressed air	about12 m <sup>3</sup> /h	Cleaning filter	
Nitrogen gas	About 180 kg	Passivation pyrolysis furnace	Only use in occurred sudden condition
Activator	about50 kg/h	Splitting tar in the furnace	Passed water gas reaction, rising heating value of biomass pyrolysis gas

Other matters such as lubrication ,alarm torch , diesel and cleaning material , standard gas for verifying instrument ,etc , excluded in this list because its only used no more.

### 4 .Operator

Estimated operator for this project needs 40 person , operating person is 35 person as per three working team , each working team consist of 5 person for working 8 hours . Management person is 5

List 5.1.1 operator required for biomass pyrolysis furnace

Working position	Type of working	person	Team times	total
Cycle working Person for Pyrolysis furnace	Watcher for automatic equipment	1	5	5
	Operator for	1	5	5
	Repairing worker	2	5	10
	Electricity worker	1	5	5
Total				<b>25</b>
Technician in Day work	locksmith	3	1	3
	Electron engineers	1	1	1
	Mechanical engineer	1	1	1
	Capataz	1	1	1
	Calculated weight person	1	1	1
	journeywork	3	1	3
total				<b>10</b>
Management person in day work	General engineer	1	1	1
	Seller	1	1	3
	Secretary	1	1	1
total				<b>5</b>
total				<b>40</b>

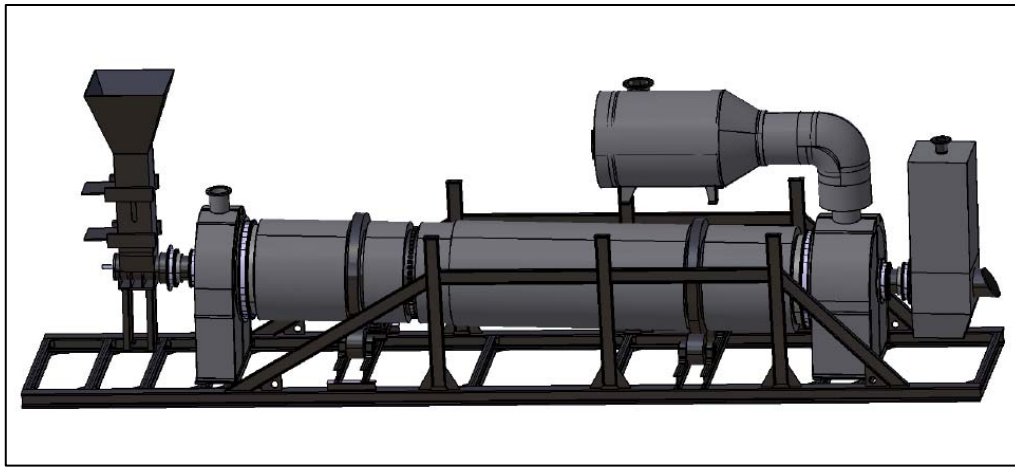
Main material of Complete equipment: refractory steel , stainless steel, low carbon steel ,etc. Period of designed , making and installation and commissioning for the complete equipment: about ten months

Main equipment including below for reference :

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Conveyer, screw feeder , raw material bucket ,pyrolysis furnace , heating smoking reactor, gas converter, heating exchanger device , sprinkling power, foam tower , roots blower, fan blower, closed blower ,water pump, cyclone device, Removing ash twist , ash bucket ,filter , electron control panel and instrument , driven equipment, gas engine and generator , parallel grid device , installation material , pipes and fittings , supporting frame and plate for equipment etc.

When decided final technologies process for project ,final equipment can be selected .



**Chongqing Welluck Trading Co., Ltd.**