DP CleanTech
Creating value from waste

Advanced straw-fired power plant

(Corn & wheat straw)

Nangong Hebei Province, China

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Introduction

- Nangong is DP CleanTech's 23rd biomass power plant in China. The project is located north east of Xingtai City, in Nangong County, southern Hebei.
- The Nangong power plant is owned by State Grid Co (formerly owned by National Bio Energy Group). It is the 4th project delivered to NBE in Hebei province, and the 2nd project in Xingtai City.
- Nangong is the 21st project delivered by DP CleanTech to NBE.
- The plant became operational in November, 2010.
- The plant has been instrumental in promoting the local rural economy. It has helped the local government improve energy infrastructure, protect the environment, and has greatly increased local farmers' income as well as providing local employment opportunities.

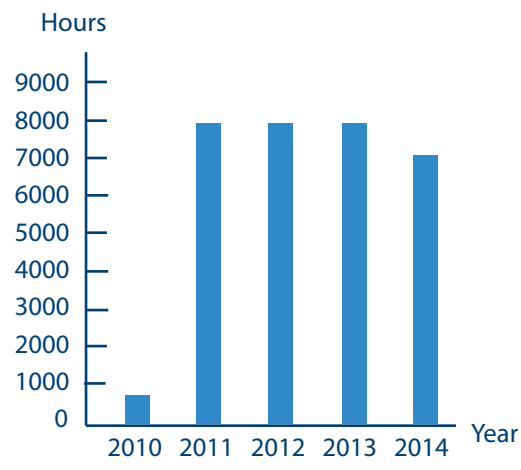
The 30 MWe plant at Nangong is one of the most advanced biomass plants in China. It consumes 250,000 tons of agricultural residue (corn and wheat straw) and generates 2*108 kWh of clean electricity every year. The plant is based on European patented High Pressure High Temperature technology, which enables very high boiler efficiency (91%). In addition, the plant's design and use of high-quality materials guarantee high reliability and resistance against corrosion and fouling.

Performance Data

Design Data

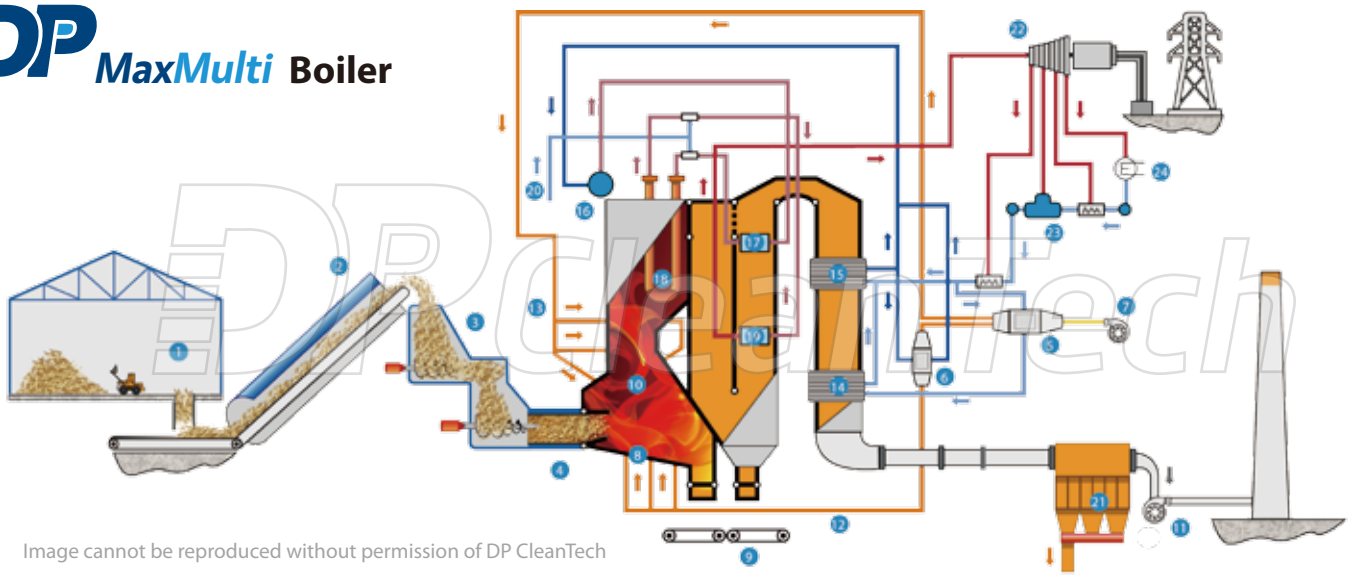
Fuel	Corn and Wheat Straw
Fuel Consumption	25tph
Plant Efficiency	>33%
Boiler Efficiency	>91%
Annual Operation Hours	>8000h
Main Steam Flow	130t/h
Main Steam Pressure	92 bar
Main Steam Temp	540 °C
Internal Consumption	10%

Full Load Operation Hours



The plant consumes 250,000 tons of agricultural and forestry residues each year, sourced from the surrounding area.

DP MaxMulti Boiler



1. Fuel storage
2. Belt conveyer
3. Dosing silo
4. Stoker
5. Low temperature air preheater
6. High temperature air preheater
7. FD fan
8. Vibrating grate
9. Slag conveyor
10. Combustion chamber
11. ID fan
12. Primary air
13. Secondary air
14. Flue gas cooler
15. Economizer
16. Steam drum
17. Superheater 1
18. Superheater 2
19. Superheater 3
20. Water for atemperators
21. Bag filter
22. Turbine
23. Deaerator
24. Condenser

Key Technology

The Fuel Feeding System is one of the core DP CleanTech technologies that has been introduced to clients in China. As one of the most advanced European biomass fuel feeding systems, it has been adapted specifically for varying fuel types and quality often found in China. At Nangong, the stoker and water cooling duct fuel feeding system has been specialized for soft straw; and tailored to enable handling of up to 50% hard straw. The combustion efficiency is high, and the automated system is very stable and easy to operate. Specialized safety features further protect fuel from fire, self-burning or jamming and also includes a fire-extinguishing water supply.

Water-Cooled Vibrating Grate

The WCVG system is a feature unique to DP CleanTech. Originally from Denmark, and already well developed for the combustion of biomass fuels, the Water Cooled Vibrating Grate system has been further adapted for optimum efficiency using local fuels. The grate vibrates periodically during biomass combustion to help ensure full burnout. In addition, an automated timer for fuel combustion helps prevent slagging on the grate segments.

Boiler

High efficiency and durability are key features of DP CleanTech's products and the design of the boiler and the materials used are fundamental to ensuring long term performance. The boiler itself is supported from the bottom, the placement of the centre of gravity and guiding devices ensures a uniform expansion in all dimensions, as well as supporting the boiler. In addition, the boiler is designed to resist earthquakes. In the event of seismic activity, any horizontal force that might affect the body of the boiler would be transmitted to its main and auxiliary steel frames, and from there to the foundations, thus preventing damage to the boiler itself. The boiler is manufactured using high grade materials to resist corrosion and extend life cycle.

Proprietary Technology for Handling Corrosive Fuels

Biomass fuels are significantly different from coal, having a higher content of chlorine and alkali metals, and lower sulfur content – all of which can heavily corrode heating surfaces. DP CleanTech uses proven, proprietary technology to reduce flue gas temperature and prevent low temperature corrosion. In essence, the temperatures within the Air Preheater and Flue Gas Cooler system are raised and cooled using recirculated feed water. This proprietary technology reduces flue gas temperature, which improves the efficiency of the boiler. At the same time, low temperature corrosion is reduced because the cold end average temperature【(130+90)/2=110℃】is higher than dew point.

External Air Preheater

Using DP's patented system for the Air Preheater also avoids problems such as low temperature corrosion, ash blockage and abrasion of the Air Preheater.

Superheaters

DP CleanTech's Superheaters are specifically engineered to resist corrosion and coking through both the structural design and the use of high grade materials. The structure consists of vertical tube panels and ASME SA-213TP347H extra thick pipe stainless steel materials, which together help to avoid high temperature oxidation (steam side); and to significantly reduce coking and high temperature corrosion (flue gas side).