



BROWN'S GAS HHO OXY-HYDROGEN INDEPENDENT EXPERT ENERGY SAVING EVALUATION REPORT

Technological transformation of a 6-ton biomass chain boiler with a 6,500 liter per hour Brown's Gas HHO ox-hydrogen gas generator to improve catalytic combustion for an industrial boiler.

Evaluation agency: Hunan Energy Conservation Evaluation Technology Research Center
Responsible: Professor Jiang Li
Date: October 19, 2017

Commission:

The evaluation team conducted on-site investigations on the authenticity of the combustion-supporting energy-saving transformation of a Brown's Gas BG HHO energy machine on the 6-ton biomass chain boiler of Zhongshan Yihao Energy Co., Ltd., Hunan Province, People's Republic of China.

ABSTRACT

The Brown's Gas BG HHO is burned in the furnace to generate water vapor, which increases the volume content of triatomic gases in the furnace gas, increases the heat capacity of the furnace gas and the heat radiation heat transfer capacity of the high temperature furnace gas, and improves the comprehensive heat transfer coefficient of the heating surface of the boiler.

OUTCOMES

The test of the 6-ton biomass chain boiler shows that the boiler energy efficiency ratio can be increased from the original 4.8 to 5.3, the daily coal saving rate is about 12.5%, the flue gas dust volume is reduced by 80%, and the NO is reduced by 20%.

Table 3 Comparison of technical and economic index of chain furnace before and after installation of HHO generator

| Compared items | Before installation | After installation |
|--------------------------------------------------|---------------------|--------------------|
| Exhaust gas temperature/°C | 275 | 248 |
| Ringelman Blackness/level | 0.8 | 0.5 |
| Flue gas CO emissions Concentration/mg.m-3 | 450 | 58 |
| Furnace flame color And transparency | Orange red | Yellow white |
| Boiler structure and operation adjustment method | Same | |

On October 17, 2017, the evaluation team, Professor Jiang Li, engineer Zhou Hongfei, and Luo Zhengyi arrived at Yixian Industrial Park in Zhongshan City to conduct an on-site evaluation of the energy consumption and energy saving of the 6-ton biomass chain boiler of Zhongshan Yihao Energy Co., Ltd.

On October 19, the evaluation team completed the compilation and analysis of the industrial boiler operation data before and after the application of the Brown's Gas BG HHO energy machine. On October 20, it completed the preparation of the "third-party energy-saving evaluation report" and ended the on-site evaluation.

Member list of project energy conservation evaluation

| | Name | Major | Title | Affiliation | Signature |
|---------------------|---------------|------------------------------------|-----------|-----------------------------------------------------------------|-----------|
| Leader | Jiang Li | Thermal Engineering | Professor | Hunan Energy Conservation Evaluation Technology Research Center | |
| Member | Zhou Hong fei | Mechanical engineering | Engineer | Hunan Energy Conservation Evaluation Technology Research Center | |
| Members and liaison | Luo Zhengyi | Building environment And equipment | Master | Hunan Energy Conservation Evaluation Technology Research Center | |

Similar Installations cited:

In March 2016, Ezhou Huashuo Technology Co., Ltd., 4T boiler carried out the technological transformation with a Brown's Gas BG HHO energy machine;

In May 2016, Wuhan Fenghe Industrial Park, a 1T boiler carried out the technological transformation with a Brown's Gas BG HHO energy machine;

In July 2016, Xiangxiang Jinlong Gelatin Co., Ltd., 4T boiler carried out the technological transformation with a Brown's Gas BG HHO energy machine;;

In 2017, Zhongshan Lehua Food Co., Ltd. carried out the technological transformation with a Brown's Gas BG HHO energy machine;

In 2017, Zhongshan Senmei Furniture Co., Ltd., the 1t ton thermal oil boiler carried out the technological transformation with a Brown's Gas BG HHO energy machine;

In 2017, Zhongshan Yihao Energy Co., Ltd. and Zhongshan Fuzhou Adhesives Co., Ltd. 6T boilers of carried out the technological transformation with a Brown's Gas BG HHO energy machine.

After the technological transformations, the s reduction effect is significant, and the social benefits are obvious; the energy-saving effect is well received by users.

Technological Transformation Process Characteristics

Brown's Gas BG HHO energy generation machines are arranged on the side of the chain furnace or in front of the furnace. The Brown's Gas BG HHO output from the generator is fed into the furnace through the air inlet of the combustion-supporting fan of the boiler through the combustion-supporting fan and primary air duct, and the remaining part is passed through the secondary air duct of the boiler Enter the furnace.

When the primary air mixed with Brown's Gas BG HHO meets the ignition source in the coal seam area, it has the fastest speed to be quickly burned and consumed, and releases all heat at the combustion point, accelerating combustion of the oxygen in the air and carbon monoxide and fixed carbon around the combustion point. Carbon monoxide (CO) is a compound of carbon and oxygen, a colorless, odorless, and tasteless flammable gas that is slightly less dense than air.

All compounds are caused to rapidly heat up to the temperature above the ignition point. First, the coal seam carbon monoxide and fixed carbon are ignited and burned in advance, which then triggers "synchronous combustion of all coal seams", which increases the volume of the coal seam that burns. Fixed carbon represents the portion of the coal that must be burned in a solid state.



Figure 3 Photo of combustion chamber in the chain boiler(HHO generator installed)

Technological Transformation Process Characteristics...

The second is to increase the coal seam temperature and prolong the fixed carbon burning time. -The comprehensive heat transfer coefficient and heat transfer temperature difference of the water wall increase, and the heat transfer rate of the coal seam to the water wall increases. The combustion intensity per unit volume of the coal seam is increased, and the combustion efficiency of the coal seam is improved, which reduces the carbon content of the ash and slag.

When the secondary air mixed with Brown's Gas BG HHO meets the ignition source in the gas phase space, the Brown's Gas BG HHO at the faster speed to be quickly burned and consumed, and all heat is released at the combustion point, prompting the rapid temperature increase of carbon monoxide around the combustion point to the temperature above the ignition point, firstly, the carbon monoxide in the gas-phase space is ignited and burned in advance, which prolongs the carbon monoxide burning time and increases the gas-phase space temperature.

1. The gas-phase space flame-water wall comprehensive heat transfer coefficient increases,
2. the heat transfer temperature difference increases, and
3. the flame-water wall heat transfer rate increases,
4. the adhesion of ash and jelly on the water wall surface is weakened and
5. jelly on the wall surface gradually falls off,
6. the heat transfer rate of the water wall is enhanced, and
7. the increase in the combustion intensity per unit volume of the gas phase space,
8. the coal bed combustion efficiency increases, and
9. the flue gas concentration of carbon black and CO emissions is reduced.

When burning high volatile bituminous coal or biomass fuel, the combustion is mainly in the form of volatile compartments, and the Brown's Gas BG HHO is mainly mixed into the secondary air duct. When burning low volatile anthracite coal, the fixed carbon layered combustion is mainly used, and the Brown's Gas BG HHO are mainly mixed into the primary air duct.

Technological Transformation Process Characteristics...

The Brown's Gas BG HHO is burned in the furnace to generate water vapor, which increases the volume content of triatomic gases in the furnace gas, increases the heat capacity of the furnace gas and the heat radiation heat transfer capacity of the high temperature furnace gas, and improves the comprehensive heat transfer coefficient of the heating surface of the boiler. The furnace temperature rises by 50~100 °C , which accelerates the speed of coal seam volatilization analysis, the high-temperature cracking speed of long hydrocarbon chains, and the reaction speed of gas-phase space elementary combustion (H₂, CH₄, CO combustion). At this time, combustibles ignite and burn ahead of time extending the combustion reaction time and ultimately reduces the CO content of the flue gas.

The element ratio of hydrogen and oxygen in the precise 2:1 ration in the Brown's Gas BG HHO machine delivers the best stoichiometric ratio, and is the best complete premixed state for a combustion reaction to occur, as it is prone to deflagration (burns immediately) with extremely fast combustion reaction speed.

Part of the Brown's Gas BG HHO machine output is delivered into the primary air duct, and the other part is mixed into the secondary air duct. This prevents the Brown's Gas BG HHO from being directly introduced into the furnace to support combustion without being diluted by the mainstream combustion air.

Mixing Brown's Gas BG HHO into the furnace to pre-ignite the hydrogen and oxygen to aid combustion and energy saving is different from the traditional method of spraying an appropriate amount of water vapor into the furnace to save energy.

Brown's Gas BG HHO is produced through electrolysis, which causes the production of hydrogen and oxygen from water. The energy saving benefit is obvious when the Brown's Gas BG HHO energy machine is connected to the chain furnace.

Technological Transformation Process Characteristics...

Brown's Gas BG HHO generator integrates energy-saving and environmental protection technologies such as high-efficiency Brown's Gas BG HHO by electrolysis of water outside the furnace, early ignition of Brown's Gas BG HHO in the furnace, high-temperature combustion in the furnace, safe combustion of Brown's Gas BG HHO, and simultaneous combustion of all coal seams in the furnace.

The field application shows that the overall temperature of the chain furnace using the Brown's Gas BG HHO energy machine increases, the gas production is rapid, and the steam pressure rises quickly, the fuel saving rate is more than 10%, the ash and slag carbon content, flue gas, dust and CO emissions are reduced.

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