BONUS website columns and content

About Us

- **contact us**

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- **company introduction**

Shanghai BONUS Environmental Technology Co., Ltd. is dedicated to providing safe, efficient, and low-pollution burner systems and energy-saving engineering solutions for fuel gas boilers, kilns, and incinerators across various industries. The company has been honored with multiple accolades, including recognition as a "High-Tech Enterprise" and "Specialized, Refined, Unique, and Innovative Enterprise" in Shanghai, along with innovation fund support.

BONUS, based on user requirements and in accordance with European and American standards as well as China's regulatory specifications, introduces advanced technologies to professionally design various auxiliary equipment such as fuel burners and unmanned automatic control systems required for different types of boilers. By employing advanced production techniques, sophisticated manufacturing processes, and controllable quality systems, BONUS ensures professional manufacturing, supporting systems, and commissioning. BONUS combustion equipment is characterized by stability, high efficiency, ultra-low pollutant emissions, and demonstrates extensive applicability and rationality.

BONUS consistently delivers superior solutions and technologies to clients, providing high-quality products and services at competitive prices. The company customizes production processes for products, including rigorous procedures such as data acquisition, computation, 3D modeling, simulation, construction drawing design, manufacturing, procurement of components, complete assembly, quality inspection, and packaging for shipment. BONUS's advanced technologies in the fuel and gas burner sector, combined with its extensive implementation experience, have earned full recognition from clients across various industries.

- **Quality and service**

The custom-designed Platinum Sodium Burner follows a rigorous production process that integrates data acquisition, computational analysis, simulation, design, manufacturing, component procurement and assembly, quality inspection, packaging, and final delivery. Leveraging decades of practical experience in developing advanced combustion technologies for natural gas, oil, and industrial fuel systems, we provide reliable product solutions and comprehensive service support to both suppliers and end-users.

product center

- **Product list**

Products are divided into the following series according to capacity, structural form and fuel category:

Product Series	Fuel and Condition	Power Range	Model
BIU-Q	Natural Gas	0.5-14MW	Monoblock burner
BIT-Q	Natural Gas, without FGR	0.5-14MW	
BIU-/P/B/W	LPG, Biogas, High-calorific Industrial Off-gas	0.5-14MW	
BIS-W/J/H/L	Low-calorific Industrial Off-gas, Coke Oven Gas, Hydrogen, Others	0.5-7MW	
BIQ-Y/Z/C/S	Light Oil, Heavy Oil, Alcohol-based Fuel, Biomass Oil	0.5-7MW	
BISM-	Two or More Fuels (Various Gases or Liquids)	0.5-7MW	
BSU-Q	Natural Gas	2.8-100MW	Split Burner
BST-Q	Natural Gas, without FGR	2.8-100MW	
BSU-/P/B/W	LPG, Biogas, High-calorific Industrial Off-gas	2.8-100MW	
BSS-W/J/H/L	Low-calorific Industrial Off-gas, Coke Oven Gas, Hydrogen, Others	2.8-35MW	
BSQ-Y/Z/C/S	Light Oil, Heavy Oil, Alcohol-based Fuel, Biomass Oil	2.8-35MW	
BSSM-	Two or More Fuels (Various Gases or Liquids)	2.8-35MW	
BR/BM/BAF	Coke Oven Gas, Natural Gas, etc.	0.5-10MW	Specialized Industrial Burners

The product also includes the following performance:

· The adjustment ratio is sufficient to meet the operation needs of fuel and gas boilers

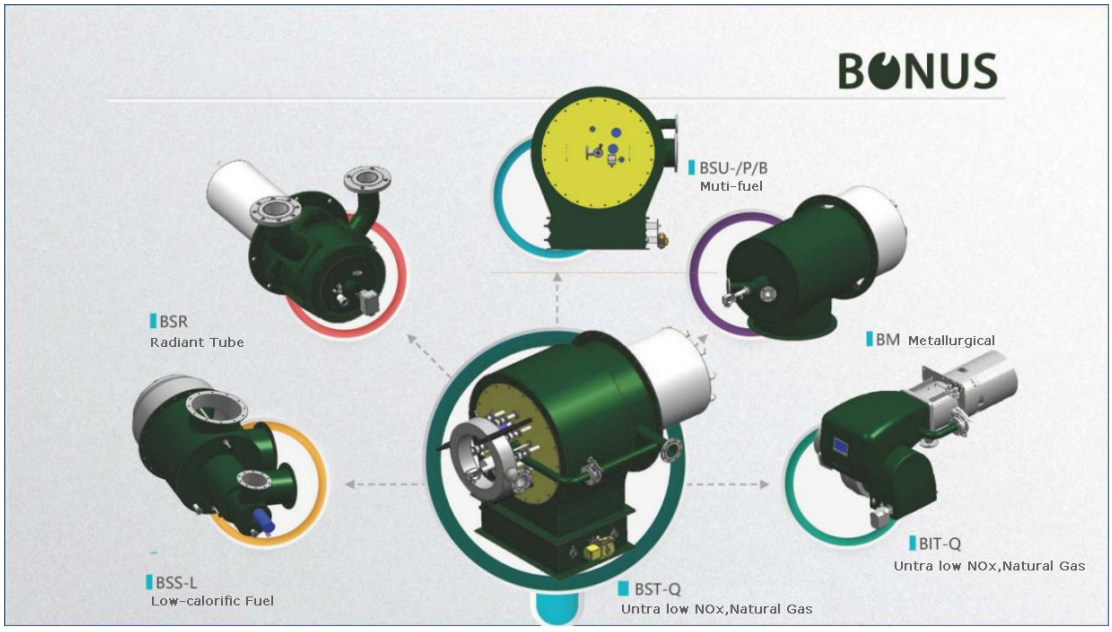
· Low nitrogen oxide and carbon monoxide emissions, low oxygen combustion

· PLC control/programmer control can also be used, or DCS control mode can be used, automatic electronic proportional continuous adjustment

· Using combustion simulation technology to achieve personalized design, flame size and boiler furnace structure matching

· The flow field of the windbox is optimized to minimize air pressure drop

● product presentation



BONUS burners are used in metallurgy, thermoelectric, petrochemical, petroleum and other manufacturing industries. They are mainly used as combustion equipment for industrial boilers, power station boilers, hot blast stoves, industrial kilns and other production heating devices.

Products cover almost all related fields, including natural gas, various industrial exhaust gases and other special fuels, including PSA exhaust gas, hydrogen, carbon black exhaust gas, Lanthan exhaust gas, biogas, calcium carbide gas, blast furnace and coke oven gas, as well as liquid fuels, as well as a variety of fuel mixed combustion.

BONUS burners are divided into two types according to the calorific value: high calorific value and low calorific value burners. For the characteristics of low calorific value, low pressure and unstable combustion of fuel, personalized special designs are carried out, including targeted design and production of industrial fuel burners with complex and variable fuel components.

Type test tests conducted by China's Special Inspection Institute show that the minimum nitrogen oxide of natural gas and hydrogen burners can be less than 30mg/Nm3.

- **Product features**

BONUS's products are tailored and finely crafted, and their quality and performance generally have the following characteristics:

Combustion simulation design, better match between flame and furnace;
Stable combustion design, adapt to the stable combustion of various calorific value fuels;
Air and gas vortex design, uniform mixing, full combustion, low noise and shockproof;
Designed with advanced ultra-low nitrogen technology, it is suitable for ordinary boilers to ultra-high temperature and ultra-high pressure and can achieve low nitrogen emissions.
BONUS burner Special design to reduce the impact of high air hot wind temperature on emissions;
Different structures and materials are selected according to different fuel characteristics, which are suitable for long-term use in extreme conditions.

Technical introduction

- **technological development**

Bonus has a team of highly skilled engineers, designers, and technicians dedicated to continuous product development. Through our 3D modeling, CFD simulations, and research conducted in our testing facilities, we optimize product stability, efficiency, and performance—including achieving low nitrogen emission targets.
Through personalized precision design, the quality and performance of BONUS's products reach a new height, ensuring that they meet the contractual specifications agreed with customers.

The NOx emission below 30mg/Nm^3 burner is the result of BONUS's in-depth research, designed

to ensure higher safety and stability under working conditions for natural gas and hydrogen boilers. It features simple management, full automation, robust structure with long-term reliability, customized design matching boilers, smaller space requirements, higher efficiency, and lower emissions.

BONUS specializes in low-nitrogen combustion equipment, serving as an economical and high-quality provider of combustion solutions. By integrating combustion expertise with practical experience, the company conducts in-depth technical development to become a qualified supplier capable of fulfilling diverse demands in the field of combustion technology.

● technological superiority

Based on the absorption of world advanced technology, the project products are innovatively developed and have independent intellectual property rights. The main technical advantages include:

1. Ultra-low nitrogen emission performance on the basis of stable combustion

The ultra-low emission performance of BONUS products is achieved through long-term operation under different working conditions, ensuring stable performance, safety, and vibration-free operation without compromising boiler system efficiency or reducing power consumption. Through customized design solutions, the company ensures perfect burner-to-boiler compatibility with appropriately sized flames, maximizes thermal efficiency of furnace heating surfaces, and enables stable combustion even under low oxygen conditions.

The BONUS burner employs multi-stage air distribution, multi-stage fuel input, and a dual-combustion system. In the concentrated combustion zone near the burner, reduced air supply and increased fuel consumption minimize NOx formation while generating substantial CO to reduce nitrogen oxides. Meanwhile, supplementary air in the dilute combustion zone ensures complete fuel combustion for optimal efficiency. Utilizing proprietary staged jet combustion technology, BONUS creates an internal circulation within the furnace, maximizing chamber utilization and further reducing NOx emissions.

BONUS's low nitrogen burner couples the core technologies of staged combustion, Rich-Lean combustion, super mixing, central stabilization and flue gas internal circulation. If supplemented with flue gas recirculation(FGR) or overfire air(OFA) technology, the nitrogen oxide emission of the boiler can be guaranteed to be less than or equal to 30mg/Nm3.

The company's latest Tri-B non-outside smoke low nitrogen technology has no smoke gas recirculation, stable, no additional energy consumption, and no condensation corrosion problems.

2. Combustion stability and reliability

BONUS products always put combustion stability and reliability in the first place. When we study ultra-low nitrogen performance, we pay full attention to and deeply study how to avoid or overcome the possible instability caused by it. The details are as follows:

1) In a given furnace chamber, the burner structure must be designed to effectively reduce pollutant emissions while being fully compatible with and perfectly matched to the furnace's structural configuration and temperature. By leveraging on-site boiler data and relevant parameters, the product utilizes customized simulation design technology to achieve optimal burner perfect integration with existing boilers. This ensures flame movement avoids furnace wall erosion,

maintains combustion in an optimal state, reduces vibration, and minimizes noise levels.
2) BONUS combustion technology is an important guarantee to ensure the operation quality of the burner. The BONUS burner makes the gas and combustion air mix and burn uniformly in the whole furnace space, avoiding local high temperature and local oxygen deficiency, and ensuring the stability of combustion.
3) The burner is designed with special flame stabilization to ensure that the system can maintain stable combustion state near the burner under the condition of low oxygen content in negative oxygen, when the Rich-Lean combustion technology is used; and it is suitable for stable combustion under the condition of flue gas recirculation technology.
4) The burner can change the gas distribution, flame shape and combustion condition through parameter configuration and flexible adjustment of fuel gun to ensure better combustion effect.
5) The burner adopts low back pressure technology to reduce the power of the fan, which is not only energy-saving but also enhances the stability of combustion.

3. Product adaptability and compatibility to working conditions
The BONUS burner has a large capacity and adopts one furnace and one type, personalized customization and simulation design technology, so that the burner can better match with the original boiler, the combustion flame is suitable for the size of the furnace, and the combustion and emissions meet the requirements of better operation.
Through CFD software simulation, BONUS calculates the velocity and temperature of the fluid as well as the concentration of each substance. During the analysis, the geometric shape or boundary conditions of the system can be changed, and different flow patterns can be set to obtain the optimal parameters.

4. Burner quality and reliability
1) Principle of scientific combustion design
Through simulation and scientific flow field design, BONUS controls the flame shape and temperature to avoid damage to equipment due to high combustion temperature. Generally, the flame is about 150mm away from the burner throat; the high-temperature combustion section is 300mm away from the burner at low load, and 1500mm away from the burner at full load.
The important combustion parts, such as burner fuel spray gun and swirl, are in the high-speed swirling and direct air, which plays a cooling role for boiler heat radiation, so it is suitable for long-term and reliable operation.
BONUS's many core technologies ensure that the boiler and burner can run stably for a long time under different loads and working conditions, which also ensures that the burner does not have the possibility of major abnormal damage to the burner, thus greatly increasing the service life of the burner.
2) Ensure product manufacturing and material quality
The company strictly follows the ISO9001 quality management system, and strictly manages and monitors the production materials, welding and other manufacturing processes and factory inspection. The main combustion components such as burner cyclone and gas spray gun are made of stainless steel heat-resistant material to ensure the high life of the burner.

- **core technology**

Ultra-ignition-resistant technology; enhanced internal pre-mixing technology; staged combustion technology; Rich-Lean combustion technology; M-X technology; Tri-B non-exhaust low nitrogen technology; flue gas external circulation technology; combustion technology with overfire air.
Combined with the above technical means, the product can achieve enhanced and stable combustion, reduce the peak temperature of combustion flame, reduce the excess air coefficient of combustion, and reduce the emission of NOx and CO.

Main technical principles:
1. The ultra-stable combustion technology is to set a stable low-speed zone in the center of the burner to make gas and air fully mixed, so that high temperature smoke reflux, which helps the burner to maintain the continuous combustion state of the central flame, so as to strengthen the stable combustion state of the entire combustion flame.
2. Strengthening internal mixing technology refers to strengthening the mixing technology of gas and combustion air, which is to reverse spray the high-pressure and high-speed gas flow and mix with high intensity swirl air before combustion, so that the combustion in the furnace is more complete and uniform, reduce the excess air coefficient and nitrogen oxides, and enhance the stability of combustion.
3. Rich-Lean combustion technology, that is, air and gas fuel are divided into multiple levels of transportation, and the fuel in each level is given an appropriate amount of combustion air, so as to control the chemical equivalent ratio of combustion in each combustion area, reduce the peak temperature of combustion flame, closer to the average temperature, and thus reduce the generation of thermal nitrogen oxides.
4. The lean-burn technology refers to maintaining a lower air supply than required in the burner's central zone, creating a lean combustion area that reduces nitrogen oxide formation. This is achieved through decomposition of NOx by reducing agents like CO produced during lean combustion. Meanwhile, the burner annular zone utilizes excess air mixed with fuel to form an oxygen-rich combustion zone, ensuring complete fuel combustion, optimizing efficiency, and minimizing emissions of combustible components such as CO in flue gas.
5. M-X technology, that is, multi-stage air distribution and multi-fuel input, generates internal circulation in the combustion area, maximizes the use of combustion chamber space, ensures combustion efficiency, and reduces nitrogen oxide emissions.
6. Tri-B non-outside smoke follows the low nitrogen technology for smokeless gas recirculation, strengthens the internal circulation of smoke in the furnace, and reduces the oxygen content of air and the calorific value of gas by triple Venturi air suction technology. The fuel is divided into sections and layers, and the stratified combustion with central oxygen deficiency, middle oxygen enrichment and external oxygen deficiency is set;

Furthermore, addressing practical challenges in similar products such as vibration, noise reduction, energy efficiency, corrosion resistance, and low-nitrogen emission requirements caused by combustion technology, the burner utilizes 3D modeling and CFD simulation techniques. These include flame velocity and temperature simulations, along with emission indicator modeling. Through continuous model refinement, structural improvements are ultimately implemented in the product design. Market testing has demonstrated that this product achieves low nitrogen emissions

while ensuring stable, safe, and energy-efficient operation, while enabling fully automatic performance across all working conditions.

According to the different characteristics of the project, flue gas external circulation technology and combustion air Overfire Air technology are adopted.

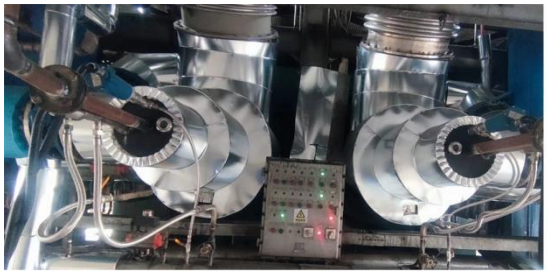
1. Flue gas external circulation technology:

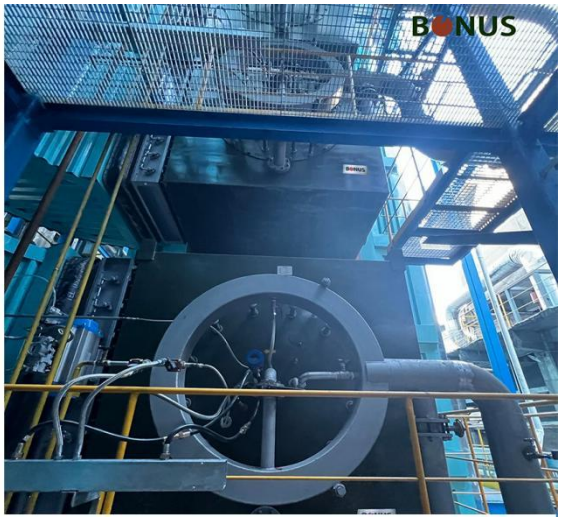
The exhaust gas is extracted from the tail of the boiler flue, mixed with fresh combustion air, and enters the burner to burn the fuel. The purpose is to use the reducing gas substances in the flue gas to decompose nitrogen oxides, reduce the oxygen concentration and reduce the generation of NOX.

2. Overfire Air Combustion technology

The integrated air staging technology for boilers involves dividing the total air volume into primary and secondary air streams. The primary air stream, after being partially diverted for combustion, enables low-oxygen combustion before the burner to effectively suppress nitrogen oxide emissions. Meanwhile, a secondary air inlet is strategically positioned at the rear of the furnace along the flue gas flow direction. This configuration ensures complete combustion of residual fuel, thereby optimizing overall combustion efficiency and achieving temperature stratification for nitrogen oxide reduction.

typical case





1. Ultra-low nitrogen project for industrial tail gas in petrochemical enterprises

In the petrochemical industry, industrial processes generate dry gas, tail gas, or exhaust gases that typically contain hydrogen and nitrogen compounds. The fuel composition and calorific value vary significantly across different production phases and operating conditions. Some processes involve blending multiple calorific fuels, while others experience substantial pressure fluctuations. These conditions often lead to unstable combustion and make nitrogen oxide emissions particularly challenging to control.

BONUS has successfully addressed challenges and overcome technical hurdles in specific boiler projects for enterprises such as petrochemical and steel industries through product design optimization and technological implementation. All projects have met their intended objectives. These boilers are configured with single or multiple burners, enabling flexible operation of single fuel types or multi-fuel blends in any proportion.

BONUS Based on the advanced combustion theory and technology, the model is preliminarily established according to the characteristics and composition range of these fuels, and the CFD simulation technology is used to simulate the flow field distribution, velocity, temperature and emission, so as to carry out targeted design.

1. First, address combustion stability by enhancing the structure of the flame stabilization system and nozzle design to accommodate fuel variations and complex multi-fuel blending scenarios. For multiple burners, we adopt a unified design approach that considers different combustion zones within the unit. The individual burners are positioned strategically to minimize interference between them during operation, thereby reducing operational fluctuations caused by mutual disturbances.

Second, ensure that nitrogen oxide emissions meet the requirements

Based on the core technologies of theBONUS low-NOx burner, namely fuel-richfuel-lean combustion, staged combustioninternalflue gas recirculation,internapremixing,and M-X,and supplemented bvtechniques such as overfire air(OFA) andexternal flue gas recirculation (FGR),thesystem is designed for effective nitrogeroxides reduction.BONUS employs customized design simulations tailored to complex fuel characteristics like hydrogen, refining experimental data until meeting performance and emission standards. For multi-burner configurations, it addresses potential temperature spikes caused by flame overlap that could otherwise increase NOx emissions.

The relevant typical cases are as follows:

1. Environmental protection energy in Xinjiang; 130t/h boiler with 4 burners; analytical gas, raw gas

2. A chemical plant in Xinjiang; 6 burners for a 130t/h boiler; calcium carbide tail gas

3. A chemical plant in Inner Mongolia; 35t/h boiler with dual fuel burners; natural gas/ water gas

4. A chemical plant in Chongqing; 15t/h boiler with three fuel burners; exhaust/gas/natural gas

5. A coal chemical plant in Shaanxi province; 220t/h with 6 burners; Lantian tail gas

6. An enterprise in Guizhou; 8 burners are configured for a 360t/h boiler; fuel coking oven gas/hydrogen-rich gas

7. Enterprise in Kunming, Yunnan province; 130t/h with 4 burners; phosphorus tail gas

8. Chemical plant in Jiayuguan; 40t/h with 2 dual-fuel burners; carbon black tail gas/coking oven gas

9. Chemical plant in Jiangxi; 15t/h configuration with single dual-fuel burner; natural gas/hydrogen

10. Chemical plant in Sichuan; 35t/h with 3 burners; HCN tail gas, natural gas, formaldehyde tail gas

11. Project in Taiwan; 65t/h boiler with 4 dual-fuel burners; natural gas and hydrogen

12. Project in Indonesia; 50 t/h configuration with dual-fuel burners; natural gas and hydrogen

13. Project in Kazakhstan; 6 dual-fuel burners for 160 t/h boilers; natural gas and ferroalloy tail gas

2. Ultra-low nitrogen burner case

Natural gas and hydrogen boilers equipped with single or multiple BONUS's ultra-low nitrogen burners can achieve NOx emissions below 30mg/Nm³. BONUS's burners are custom-designed through 3D modeling and CFD simulations based on operational data from boilers and fuel systems. This ensures optimal burner compatibility with boiler environments, stable combustion, flame protection against furnace walls, vibration reduction, and compliance with ultra-low nitrogen oxide standards. Below are case studies demonstrating NOx levels <30mg/Nm³:

1. A 60t/h burner is configured for a property owner in Guangdong

2. A Sinopec enterprise has two burners for a 75t/h gas boiler

3. A paper industry in Guangdong has 3 burners with a capacity of 240t/h

4. A chemical plant in Jinxi 75t/h with a single burner

5. A silicon industry in Qinghai province 50t/h and 20t/h configuration of a single burner