INDUSTRIAL COMBUSTION


# SBR-5

## ULTRA LOW-NOx BURNER

**Offer ultra low NOx, low CO emissions and up to 6:1 turndown on natural gas & propane**

$H_2$
HYDROGEN
BLEND READY

# Reducing Emissions While Increasing Environmental Responsibility

A smart choice for your sustainability efforts, the Cleaver-Brooks ProFire® SBR-5 series is ideal for applications where reliability and low emissions are required.

**The SBR-5 series burner utilizes advanced technology to:**

- Provide less than 5 ppm NOx emissions with flue gas recirculation (FGR) with natural gas. Less than 9ppm NOx on propane
- Achieve controlled combustion, leading to ultra low emissions with 3% $O_2$
- Offer ultra low NOx, low CO emissions and up to 6:1 turndown on natural gas and propane.
- Avoid the use of ammonia and selective catalytic reduction (SCR) to reduce the amount of hazardous material handling resulting in lower costs and space savings


Can be used with a hydrogen blend up to a maximum of 20% H2. Wobbe index to be within 10% of NG. Supply pressure and gas valve sizing to be selected accordingly. For more information on hydrogen options please connect with Industrial Combustion.

# SBR-5: Advanced Technology with Endless Possibilities

Whether you are installing a new system or upgrading an existing boiler, the SBR-5 burner supports your operational and sustainability goals. This versatile burner series is engineered for use with a variety of boiler types, including firetube and watertube. It burns natural gas from 8.4 to 42.0 MMBTU/hr and is capable of firing ultra-low-sulfur diesel as a backup fuel at NOx levels below 40 ppm.

## SBR-5 advantages:

- Ultra low NOx emissions of less than 5 ppm achieved with FGR
- 3% to 4% $O_2$ across a wide load range
- Maximum efficiency provided by standardized parallel positioning and variable speed drive
- Uniform flame for equal heat transfer allowed by premix fuel
- Easy-access air housing for internal components
- Silent operation with advanced combustion air fan wheel, variable speed drive and burner frame cover
- Induced FGR modulating valve
- Durable burner head provides safety and reliability with less maintenance
- Avoids use of ammonia and selective catalytic reduction (SCR)

**ULTRA LOW NOx**

**5 ppm**

or less achieved with FGR

# Retrofit Your Burner to Restore Boiler Efficiency

The burner is the true driver of fuel use and costs in a boiler. One smart upgrade a facility can make is to replace a legacy burner with a new burner that has a high turndown capability. Depending on a variety of factors unique to the boiler system, replacing an old burner can reduce fuel usage by 5-10%. In addition, replacing an older burner can lower your carbon footprint and NOx emissions.

## Evaluate your burner and controls for an upgrade if:

- Existing burners are cycling on/off frequently, wasting energy
- Burner or boiler controls are more than 10 years old
- Burner controls are not fully integrated with boiler loads
- Need to reduce emissions while maintaining efficiency
- Alternate fuels could provide energy savings and/or reduced emissions

## When replacing a burner:

- Match the flame shape and length to the furnace or combustion chamber for optimal performance
- Ensure that the burner's combustion characteristics integrate well with the boiler and its acoustic nature or frequency for smooth operation
- Select a burner constructed of heavy gauge materials that reduce unwanted high-frequency vibrations to minimize equipment wear

# Strategies to Reduce NOx Emissions

Many facilities today seek to reduce their NOx emissions as part of a sustainable initiative or to meet stricter regulations. There are several methods available to meet low NOx requirements, such as:

- Reduce the amount of oxygen available during the combustion process
- Burn low-nitrogen fuel oils
- Utilize flue gas recirculation (FGR)
- Employ stage combustion by alternating fuel-rich and fuel-lean zones
- Use premixed combustion techniques by premixing air and fuel

## Applications

- Process Steam
- Industrial Process
- Waste Heat Recovery
- Hospital and Healthcare
- Laundry and Dry Cleaning
- Refineries and Petrochemical

# Capacities and Ratings

The SBR-5 is designed to burn natural gas with variations of diesel as a backup fuel. If low NOx, #2 oil combustion is requested, ultra-low-sulfur diesel (ASTM 2D-S15) can be used.

## SBR-5

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Burner Size (BHP) | 200 | 250 | 300 | 350 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| Heat Input (MMBtu/hr) | 8.4 | 10.5 | 12.6 | 14.7 | 16.8 | 21.0 | 25.2 | 29.4 | 33.6 | 37.8 | 42.0 |
| Recommended Furnace Diameter (Inch) | 27 | 34 | 34 | 37 | 37 | 45 | 45 | 50 | 50 | 52 | 52 |
| Recommended Furnace Length (Inch) | 142 | 128 | 134 | 135 | 143 | 146 | 152 | 160 | 160 | 200 | 200 |
| Recommended Furnace Pressure @ 15% Excess Air and No FGR (inch wc) | 3.5 | 2.7 | 3.7 | 3.7 | 3.6 | 4.3 | 5.6 | 5.4 | 7.0 | 3.5 | 4.1 |
| Elevation (ft) | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 | 0~1500 |
| Ambient Temperature (°F) | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 | 60~100 |
| Gas Train Inlet Pressure (psig) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Oil and Atomizing Air Pressure at Burner Inlet (psig) | 40 | 50 | 50 | 50 | 50 | 60 | 60 | 60 | 100 | 100 | 100 |
| Fan Motor HP | 20 | 20 | 25 | 30 | 40 | 40 | 50 | 60 | 75 | 75 | 100 |
| Operating Excess $O_2$ (%, dry) | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 | 3.0~4.0 |
| FGR | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| NOx (ppm, @3% $O_2$) burning Natural Gas | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 | ≤ 5 |
| NOx (ppm, @3% $O_2$) burning ASTM 2D-S15 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 | ≤ 40 |
| CO (ppm, @3% $O_2$) burning Natural Gas and ULSD | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 | ≤ 100 |
| Turndown burning Natural Gas for gas only burner | Up to 4:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 | Up to 6:1 |
| Turndown burning Natural Gas for dual fuel burner | Up to 3:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 |
| Turndown Burning ULSD | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 | Up to 4:1 |
| Smoke # burning ULSD | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |

* Jet Style Burner - 200-400 BHP

* Fan Over Design - 500-1000 BHP

1) The information in this document is work in progress and subject to change without notice

2) The sulfur and nitrogen contents in ultra-low sulfur diesel (ULSD) are similar to ASTM 2D-S15 or better: < 15 ppm sulfur and < 20 ppm nitrogen in fuel by mass

3) The recommended furnance conditions are based on firetube boilers. Operating conditions and performance criteria may be different if furnance diameter and length are smaller than the recommended values. Consult manufactuer with specific conditions to verify applicability.

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