CleaverBrooks®

NATCOM BURNER SOLUTIONS

Advanced burner technology for stringent emissions requirements

THE BENCHMARK OF THE INDUSTRY

Our Technological Edge

HyperMix™ technology for ultra-low NOx and CO with compact flame to fit large packaged units

On-line adjustability and possible removal of individual gas injectors

Multi-fuels applications including natural gas, refinery gas, landfill gas (LFG) and other processed waste gases, light to heavy fuel oils, and liquid waste streams

Air flow meter for strong control signal at high turndown

No refractory burner throat

Unmatched flame stability with Center-Core technology

100% reliable ignition

NOx levels less than 30 ppm – No Flue Gas Recirculation (FGR)

Ultra-low NOx levels less than 7 ppm – FGR

Ultra-low excess air/high efficiency

High turndown ratio: 40 to 1 on gas/ 10 to 1 on oil

Custom products built to your exact needs

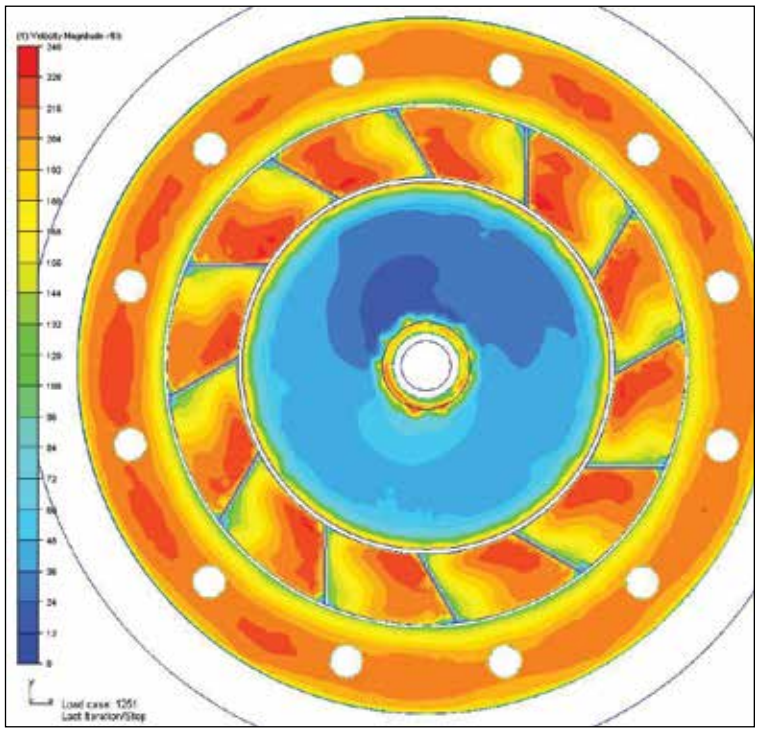
Every NATCOM burner is custom built to exacting specifications to meet each application and furnace configuration, ensuring seamless integration, and unmatched fit and finish.

Center-Core Technology

Our Center-Core technology provides ultra-stable load following and remarkably reliable turndown performance. Tuning and maintenance can be completed online, including an adjustable fuel injection system. NATCOM burners are found worldwide on a variety of industrial and utility boiler installations with capabilities ranging from 20 to over 1,000 MMBTU/hr.

Unsurpassed engineering and testing

Our advanced, in-house Computational Fluid Dynamics (CFD) modeling is the key to our revolutionary HyperMix™ burner technology. Matching burner flame and furnace aerodynamics optimizes efficiency and lowers emissions without costly field tests. Simulations in a virtual environment provide calculations for fuel and air distribution in any furnace configuration. Our HyperMix™ technology provides ultra-low NOx, ultra-low CO, and minimal particulate matter (PM).



CFD model of burner flow

Single supplier to provide the industry's best service

With more than 75 years of combustion experience in industrial applications, our Engineering Services include:

- Power plant engineering audits
- CFD analysis
- System retrofitting studies
- Turnkey installation supervision
- Local product and service support anywhere in the world

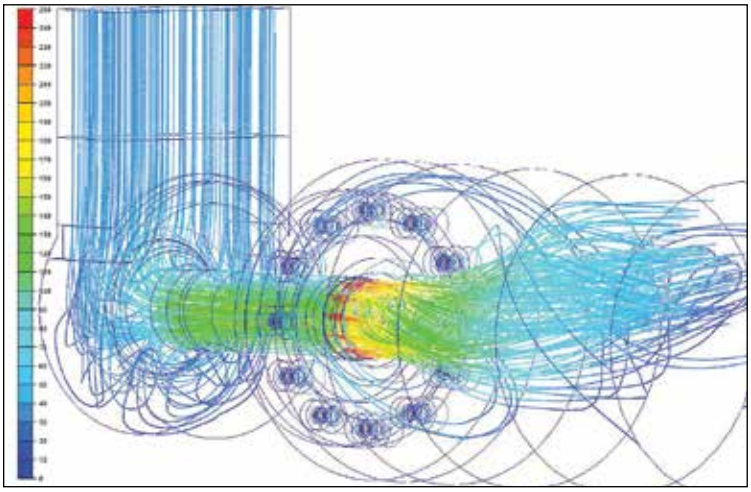
Our factory-trained Field Technicians provide reliable, timely start-up and commissioning services for all retrofit projects.

NATCOM is the global leader in single-source custom burner experience.

Industries and Markets

- Petrochemical and refineries
- Institutions
- Metal industries
- Food processing
- Pulp/paper mills
- Utilities
- Distilleries/breweries
- Automotive manufacturers


NATCOM



Specialty Burners Systems

The custom approach to burner design extends to the NATCOM specialty product line for thermal processing. We offer the perfect burner solution for industrial drying, air heating, and thermal oxidizing processes.

These custom systems feature cutting-edge design, engineering, system modeling, and testing to ensure the highest performance and lowest emissions in your thermal processing application.

Air Heater Features:

- Lower NOx emissions
- Lower excess air
- Improved efficiency
- Reduced equipment footprint
- Greater flexibility to meet new challenges

Utility Burners

Years of experience and expertise allow NATCOM to meet the rigorous standards of the utility industry. Our proven Utility Burner systems provide solutions for new emissions requirements, fuel conversions, and retrofit upgrades.

NATCOM uses in-house, proprietary combustion modeling to design and fabricate burners that ensure low emissions and safe and reliable operations for years of dependable service.

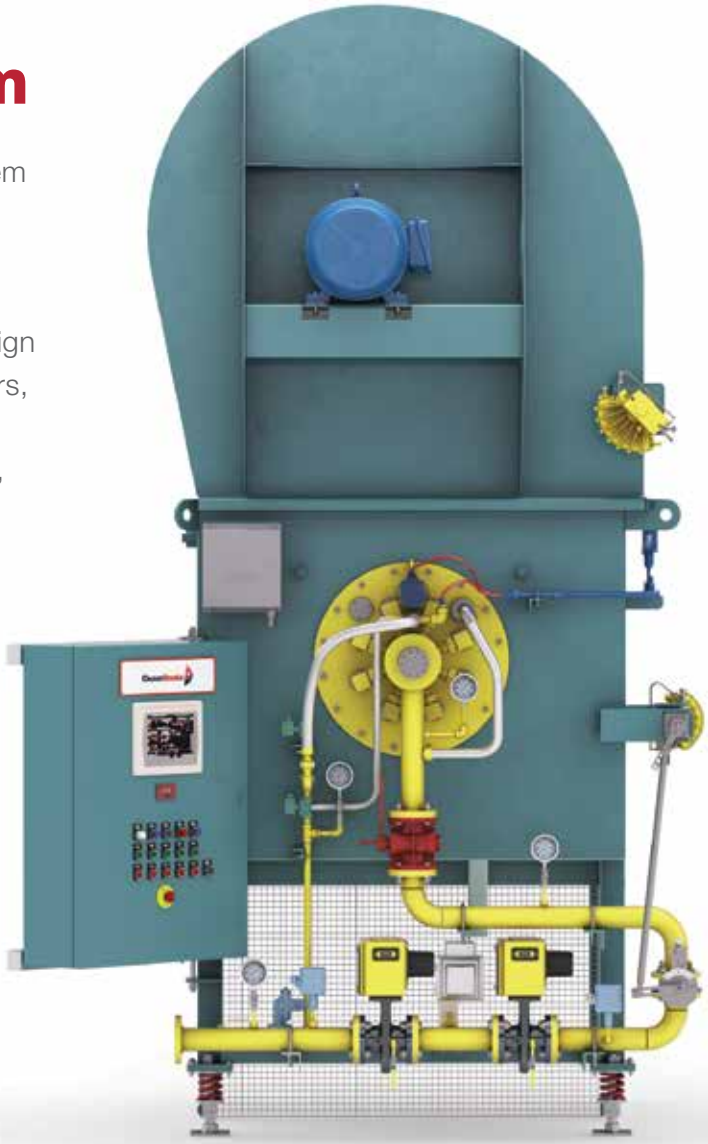
Features:

- Ultra-low-NOx, CO, volatile organic compounds (VOC), and PM emissions
- Reliable air shutter and oil atomizer retraction mechanisms
- Stable and dependable ignition systems
- Low-maintenance design

The NXT Burner System

NATCOM's NXT burner is a unique packaged burner system for new boilers and retrofit markets. Single burner up to 300 MBTU.

These burners are equipped with advanced NATCOM design features, including adjustable gas injectors, Class-III igniters, atomizers with coupling block valves, industrial-grade pneumatic actuators, and 4-20mA positioners. In addition, our NXT product line meets all NFPA and CSA guidelines and standards.



Windbox-Mounted Fan:

- Heavy-duty fan construction to reduce noise and prolong equipment life
- Windbox-mounted control panel with swing-away capability for shipment clearance
- Custom control system in single-point, parallel, or fully metered configuration
- Precise, rugged CAMLINK™ system for single-point positioning, high turndown, and excess O_2 control
- Easy access, windbox-mounted fuel trains built per ASME B31.3
- Compact arrangement with integrated air flow element and silencer

Large-Capacity Burner with integrated Hawk controls:

- Stand-alone burner and windbox arrangements
- Air-handling equipment package
- Rack-mounted fuel trains
- Totally integrated, Hawk 6000 control system with advanced BMS and CCS packages

Custom Control Systems

Maximize efficiency at the touch of a button

NATCOM manufactures control systems for any combustion application. Regardless of the level of complexity of your system, we will provide state-of-the-art hardware and programming for safe, reliable, and efficient operation with a user-friendly interface. Our control systems meet the latest NFPA, CSA, CE, TUV, and GOST international codes and standards.

Hawk 6000
freestanding option

Available Features:

- Burner Management System (BMS)
- Combustion Control System (CCS)
- Plant Master panel
- Balance of Plant controls
- Supervisory Control and Data Acquisition (SCADA)
- Auxiliaries
- Factory Acceptance Test (FAT) and Site Acceptance Test (SAT)
- Fuel transfer, simultaneous firing, preferred fuel strategies
- Solid state, loop controller, PLC and DCS platforms

Duct Burners

We are the only duct burner supplier to offer a complete system with an innovative duct burner solution for the cogeneration and combined cycle markets.

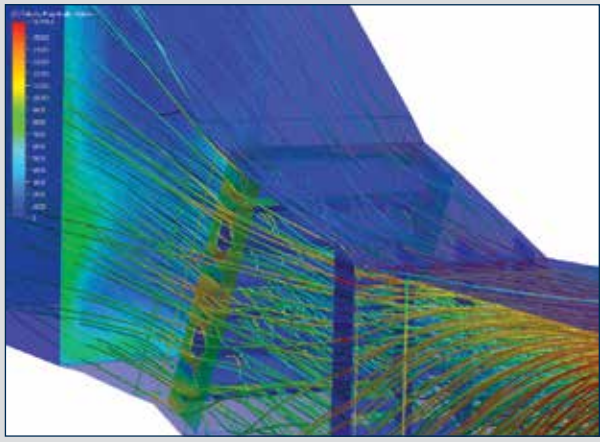
NATCOM's proven duct burner technology ensures the lowest levels of NOx, CO, VOC, and PM emissions available, even in the most challenging service conditions.

Our innovative flame stabilizer system with a two-zone fuel manifold generates uniform combustion and even heat distribution to fit any heat recovery steam generator (HRSG) configuration.

NATCOM's in-house simulation experience allows accurate and complete modeling of the turbine exhaust flow, distribution grid, combustion, heat recovery system, and selective catalytic reduction (SCR) performance.

Features:

- Self-supporting, high-temperature stainless assembly eliminates common "element sagging" issues
- An exclusive Retro™ fuel injection system enhances turbine exhaust gas (TEG) and fuel mixing for optimal flame control
- Flame stabilizing system (with TEG staged cooling zones) assures reliable, low-emissions performance and extended burner life
- Complete CFD analysis, design, and fabrication of TEG flow correction devices, including distribution grids, turning vanes, and anti-swirl systems



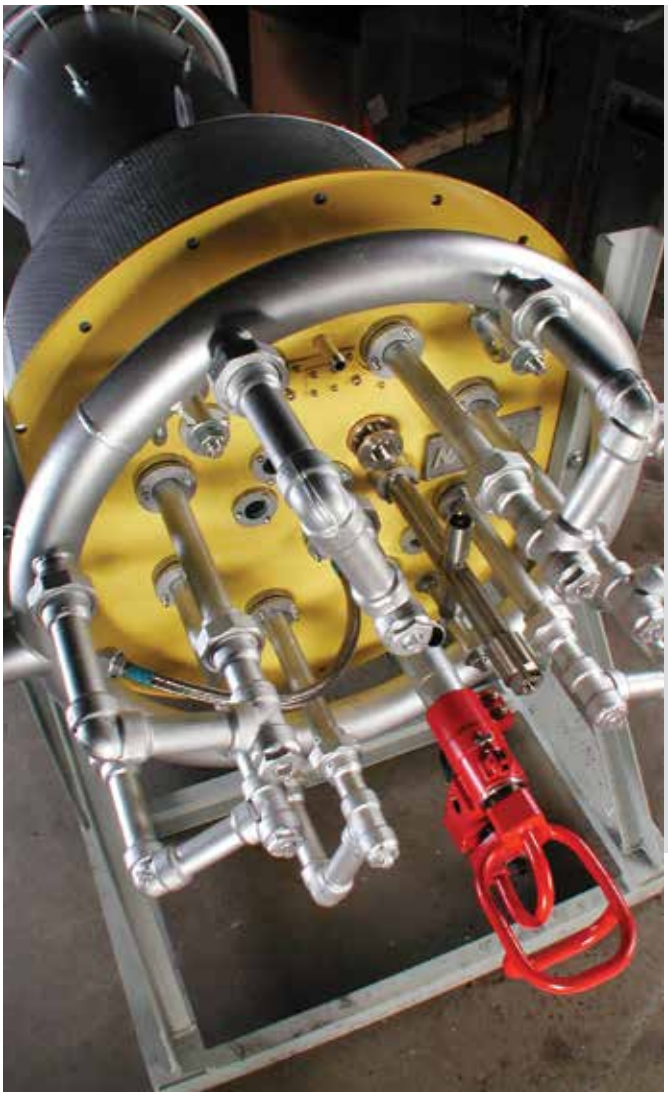
CFD model of duct burner

Burner Retrofits

Retrofitting is simple with burner systems from NATCOM. As a single-source provider, we guarantee a trouble-free retrofit process from start to finish.

Our experienced engineers oversee each project and work closely with NATCOM's global customer support team to ensure a successful outcome. Our services include complete project documentation, on-site supervision, field installation, start-up, and commissioning, as well as operator training to guarantee system performance.

Whether a burner solution to comply with new emissions standards, addition of an alternative fuel source, or replacement of an obsolete burner system, NATCOM's high-efficiency, ultra-low-emissions systems are an ideal choice.



Retrofit Applications:

- Oil and gas retrofit burners for:
  - Industrial Watertube Boilers
  - Field-Erected Boilers
  - Utility Boilers
  - Thermal Processing Systems
  - HRSG Retrofit
- Other retrofit options:
  - Control Systems
  - Fuel Trains
  - SCR

Fuel Trains

NATCOM offers pre-assembled piping systems for a wide range of gaseous and liquid fuel applications. We provide fuel trains that precisely and repeatedly meter the fuel flow to your specific burner application. Our design team has in-depth experience with diverse fuel compositions, fuel supply conditions, and burner arrangements.

Features:

- NFPA 85, FM, CSA B149.3, ASME B31.1 or B31.3
- Safety Integrity Level (SIL) and hazardous locations designs
- Refinery gas, hydrogen, landfill, digester gas, tail gas, or other alternative fuels
- Stainless steel piping
- Moisture removal management
- Windbox- or rack-mounted fuel trains
- Pressure-reducing stations
- Main and zone trains for multiple burner applications
- Gaseous fuel mixing station and knockout tanks

Selective Catalytic Reduction (SCR)

SCR is a proven technology to further reduce NOx emissions on boilers and HRSG systems of up to 95%. Integration of a NATCOM burner and SCR will provide operational flexibility, highest efficiency, and lowest emissions for any boiler design. NATCOM has the expertise and experience to meet your needs.

1 Controls

A single integrated system that controls the boiler, burner, and SCR. Control the entire system from one simple-to-use HMI.

2 Boiler

With a complete, single-source Cleaver-Brooks boiler system, we can choose the right boiler to optimize the system that best meets your application. An SCR system can be paired with any new or existing firetube, industrial watertube, or heat recovery steam generator.

3 Ammonia metering and dilution skid

Three types of ammonia systems available:
- Anhydrous Ammonia (NH_3)
- Aqueous Ammonia (NH_3+H_2O)
- Urea $(NH_2)_2CO$

4 Ammonia injection grid and flow conditioning devices

Boiler outlet transition redesigned for best distribution. AIG strategically located to inject ammonia into the flue gas stream.

5 Catalyst reactor

Ammonia mixes with flue gas in reactor, resulting in a uniform distribution to optimize catalyst performance. For each application, the catalyst bed geometry is optimized. The highest quality corrugated catalyst is used with vanadium, titanium, or tungsten oxides as active agents.

6 Heat recovery

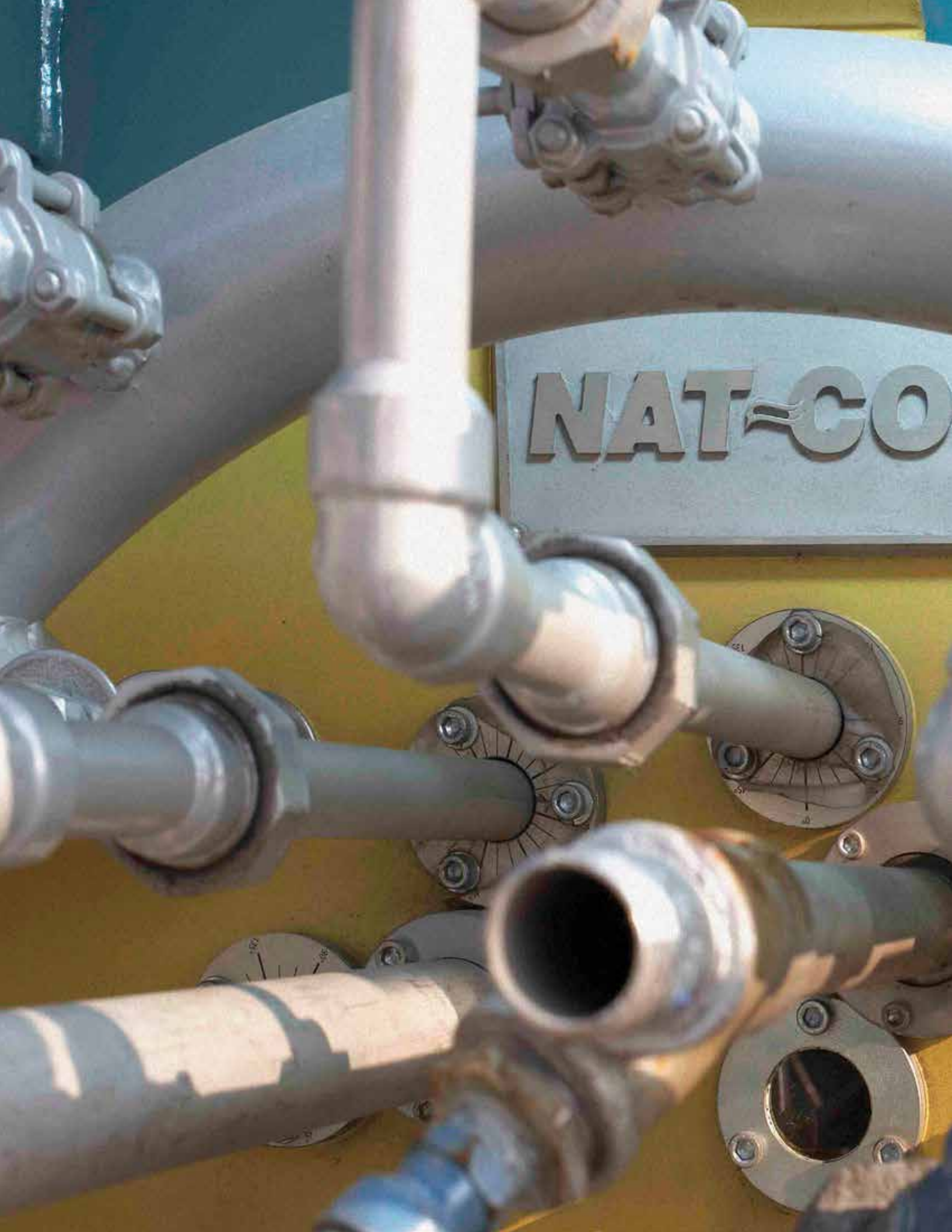
A custom heat recovery system allows flue gas temperatures to be optimized, resulting in the most effective reduction of NOx emissions. Recovering the waste heat of the flue gas with an economizer increases the efficiency of the boiler.

7 Structure, platforms, ladders, and piping

Complete engineering of all ancillary walkways, structures, etc., is included in our comprehensive integration.

8 Exhaust systems

An exhaust system designed specifically for your system, with both installation-ready and freestanding stacks available.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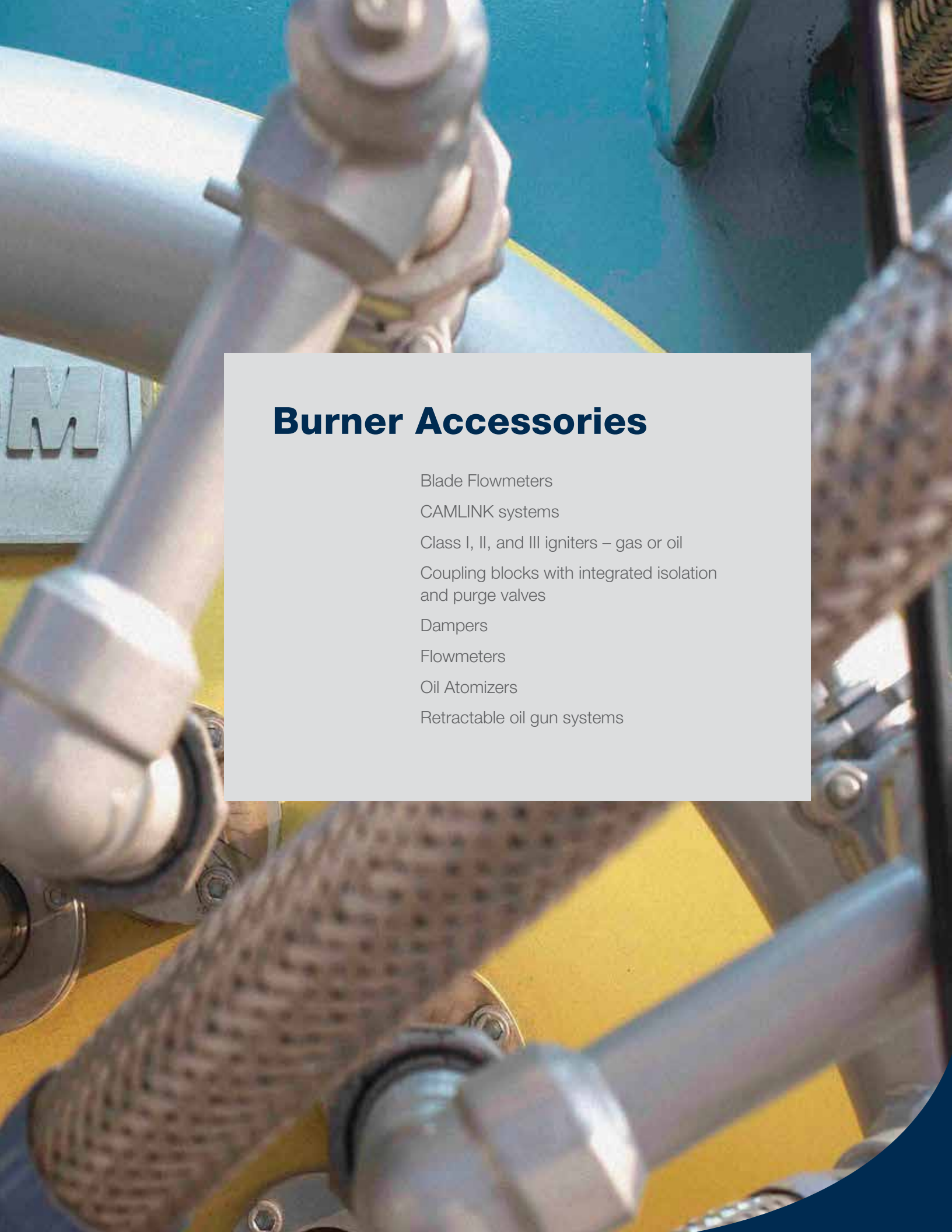


Burner Accessories

Blade Flowmeters

CAMLINK systems

Class I, II, and III igniters – gas or oil

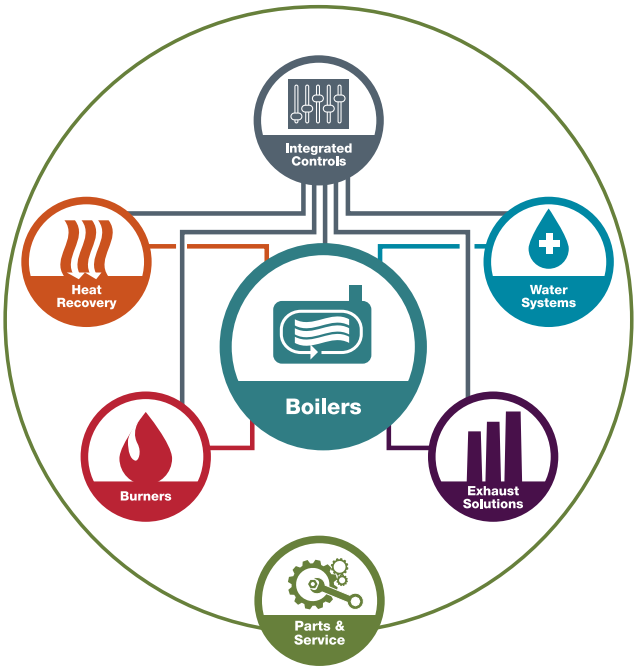
Coupling blocks with integrated isolation and purge valves

Dampers

Flowmeters

Oil Atomizers

Retractable oil gun systems



Total integration doesn't stop with the burner.

Only Cleaver-Brooks offers complete boiler systems, from fuel inlet to stack outlet, that are completely designed, engineered, manufactured, integrated, and serviced by one company. That integration starts with the burner, and Cleaver-Brooks has been perfecting this integral element of the boiler system through innovation and expert engineering for more than 80 years.

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