



# Technology Overview

Presented to:



## Our Company

**NATCOM** is an industrial burner manufacturer, delivering high-efficiency, low-emissions combustion systems to customers throughout the world.

As part of the Cleaver-Brooks family of companies, we bring over 50 years of combustion experience and offer innovative burner technologies for a comprehensive range of applications.

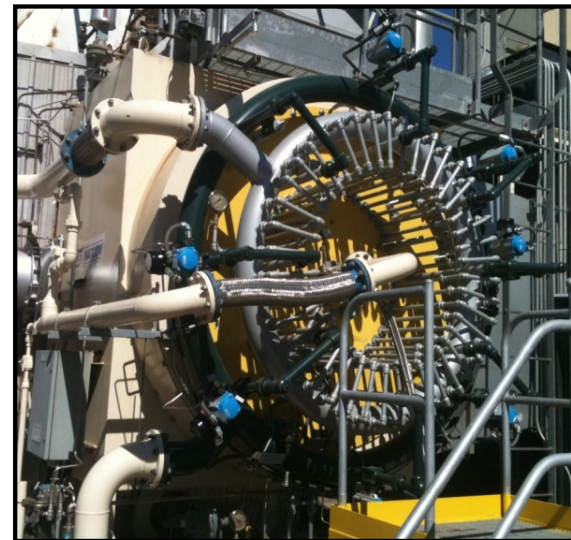
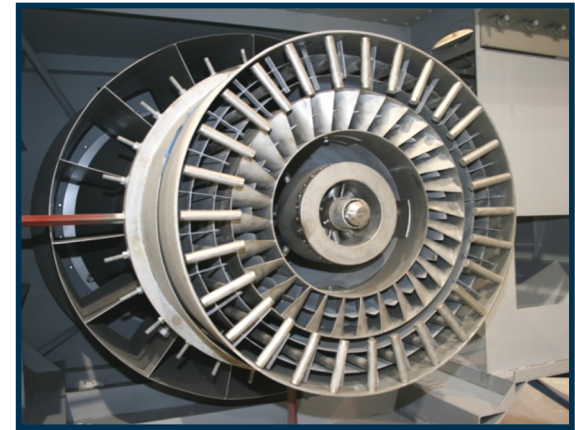




High Performance Burner Solutions

# Industrial Burner Systems

- Leading Technology
- Custom Solutions



# Applications

## Steam Generation:

- Industrial Watertube Boilers
- Utility and Field Erected Boilers
- OTSGs



## Duct Burners:

- HRSG for Cogeneration and Heat Recovery Applications

## Process :

- Refineries, Petro-Chemical, Pulp & Paper, Food and Beverage, Bio-Energy Industries



## Specialty Burners:

- For waste fuels, H<sub>2</sub>, digester gas, LFG-gas, refinery gas, low BTU gas
- Oil Atomizers: for heavy light-grade and waste oils
- Thermal oxidizer, gas heaters



Our Boiler and Burner Systems Group offers several service advantages for you to consider on your projects:

- **Single-Source Responsibility** – We maintain our leadership in the industrial market by offering innovative solutions and a true single-source responsibility to our customers.
- **Fully Integrated Boiler, Burners, Controls & Auxiliaries** – Providing maximum system flexibility, performance, safety and reliability in a "user-friendly" environment.
- **Project Management** –Your project will be assigned a Project Manager who will communicate with you and orchestrate the different phase of the project.
- **Engineering**–Expertize you can rely on to customize each system to your specific needs. Thermal, fluid dynamic, mechanical, process, instrumentation and controls, electrical, etc.



High Performance Burner Solutions

## 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

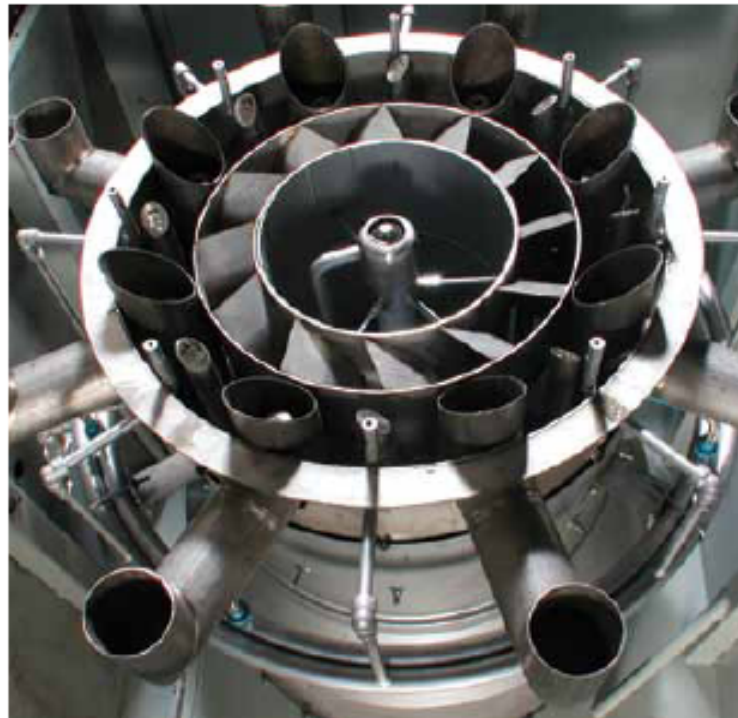
**Air flow meter** for strong control signal at high turndown

**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)



**Custom products  
built to your exact needs**

# Main Burner Features

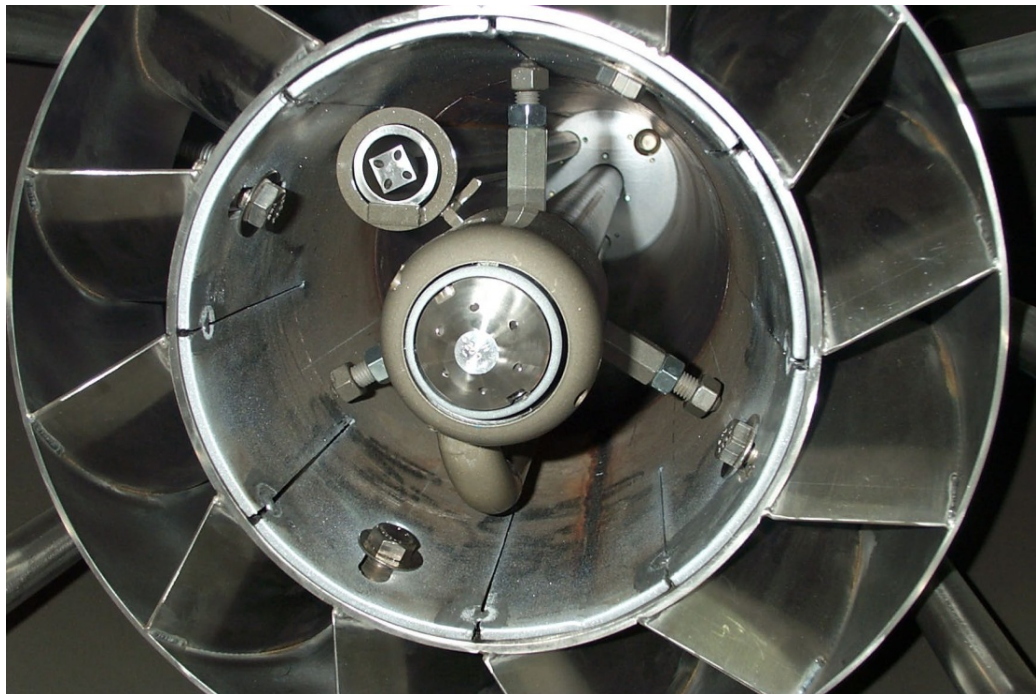
## Flexibility & Performance

- **Center Core Technology**
- **Online Adjustability for optimal performance and furnace fit.**
- **Stabilizing gas injector, hot stand-by**
- **Smooth and reliable light off**
- **Gaseous and liquid fuel firing**
- **< 7ppm NOx**
- **No refractory quarl**



## Three Air Zones

- **Center Core, low velocity for flame rooting and reliable ignition**
- **Swirler, flame shaping and homogeneity**
- **Axial, main flow within a small cross section**

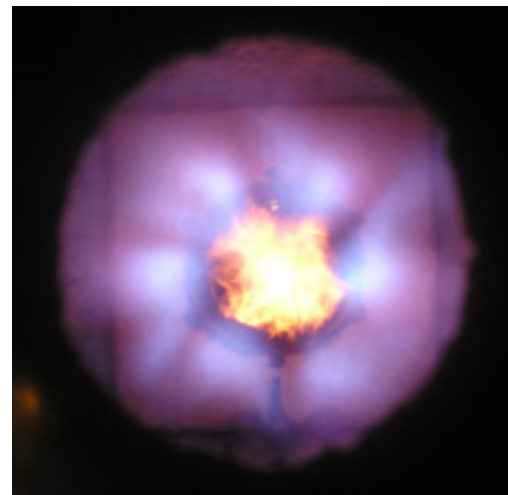




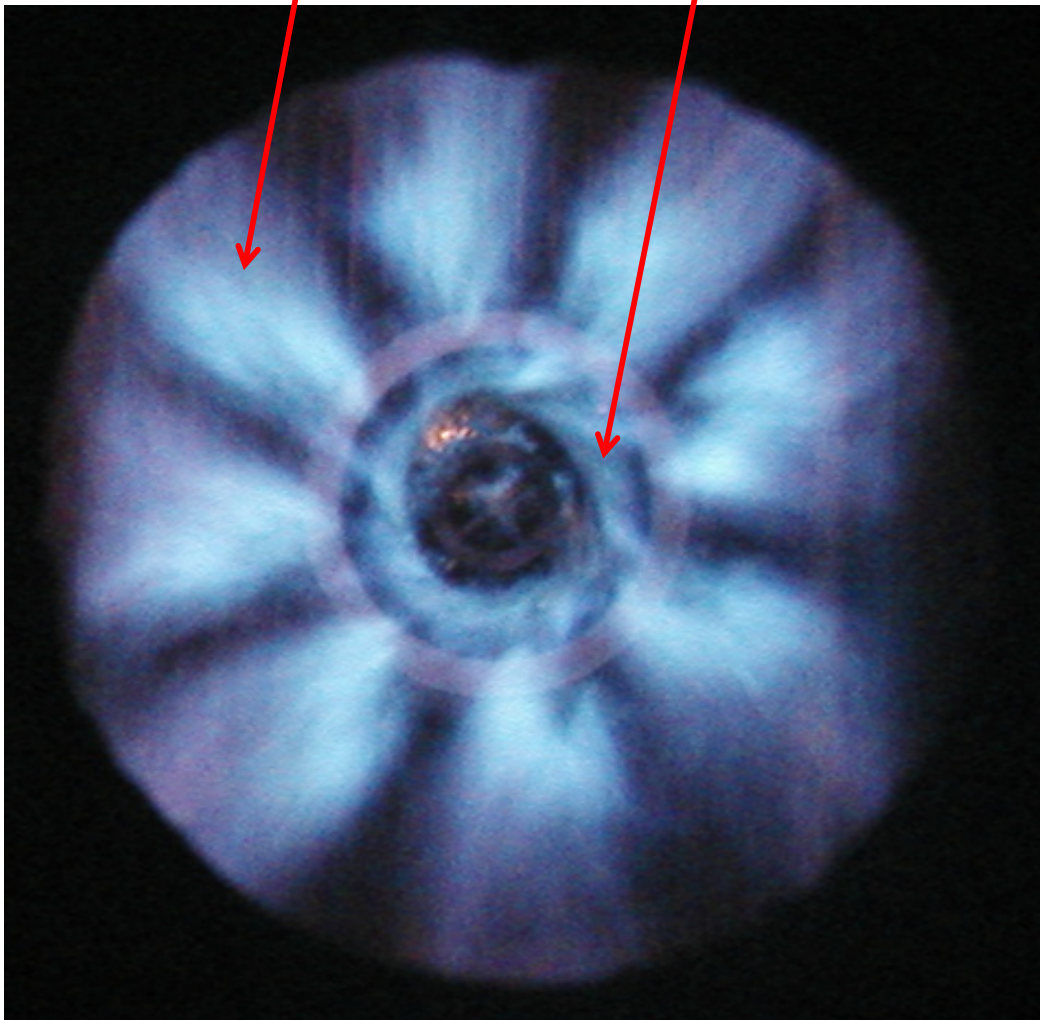
# Flames

Main flame petals

Annular stab-gas flame



Low fire



High fire







# 390 MMBTUH Low NOx Burners





# Refinery Gas

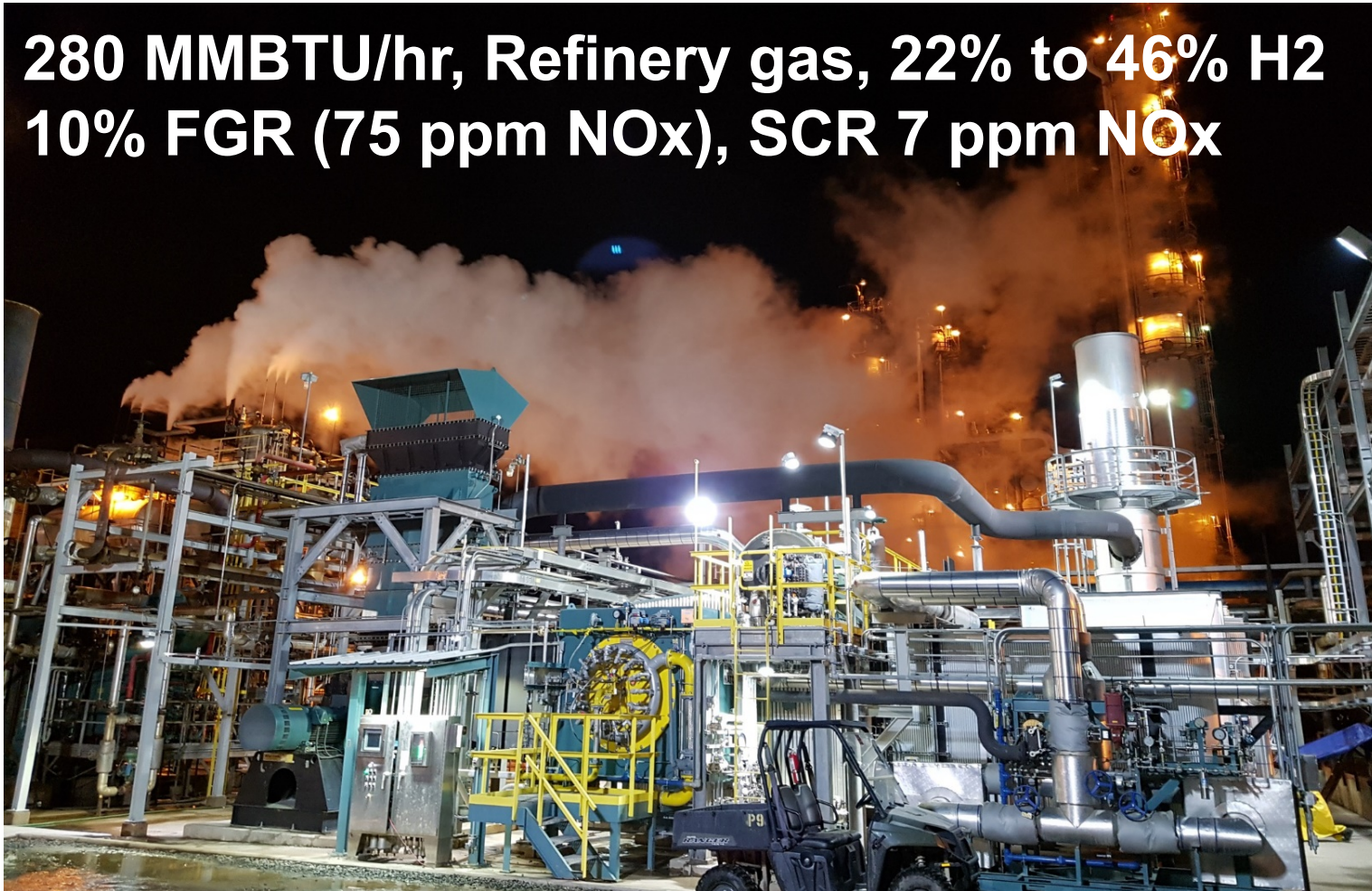


- **180 MMBTU/hr Refinery gas & natural gas burner**
- **Multiple fuel zones with online combustion adjustments**
- **25 ppm NOx FGR only**

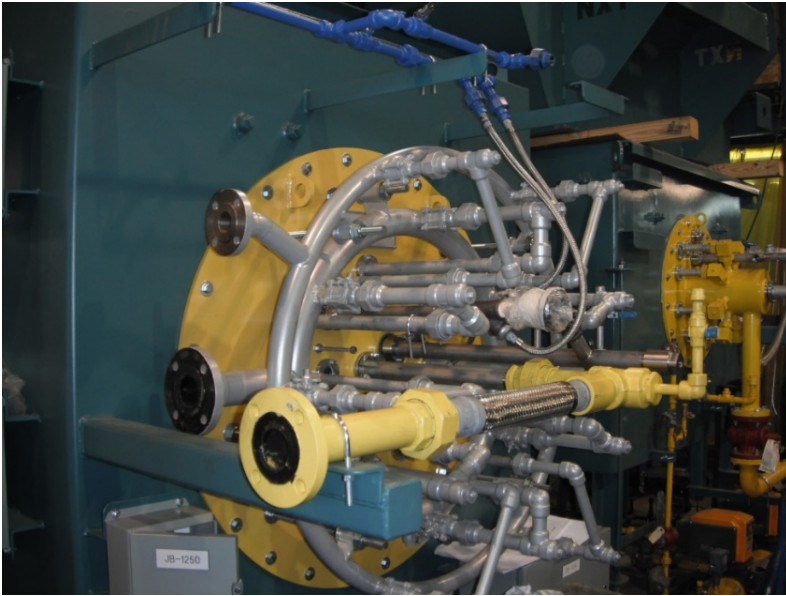


# Refinery Gas

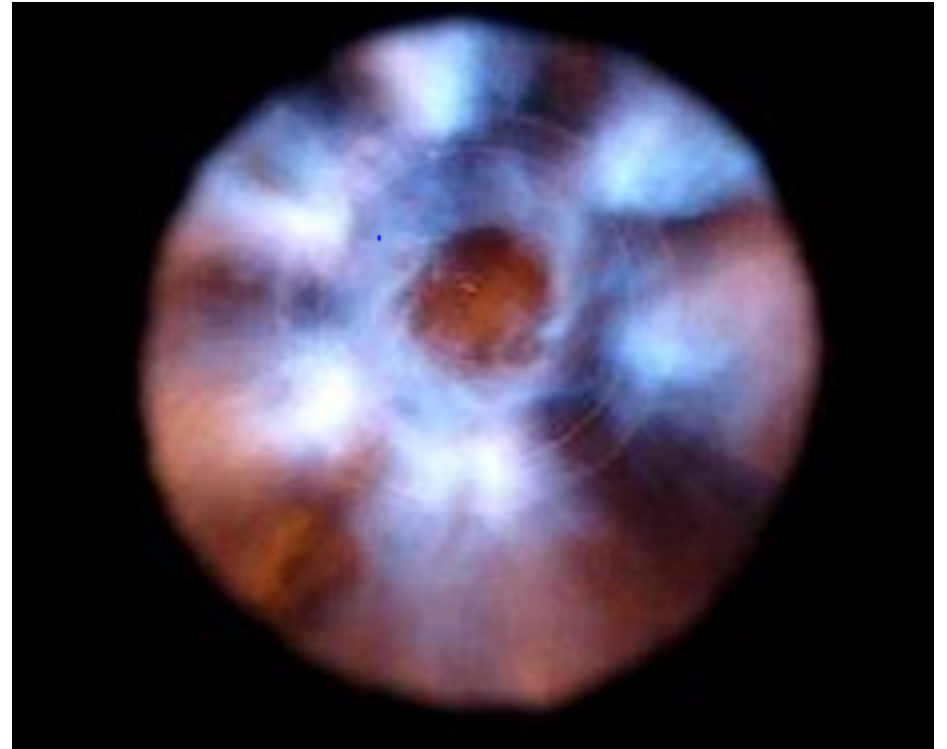
**280 MMBTU/hr, Refinery gas, 22% to 46% H<sub>2</sub>  
10% FGR (75 ppm NO<sub>x</sub>), SCR 7 ppm NO<sub>x</sub>**



# Refinery Gas



**60 MMBTU/hr, RG, NG  
Multi zone burner  
17 ppm NO<sub>x</sub>, FGR only.**



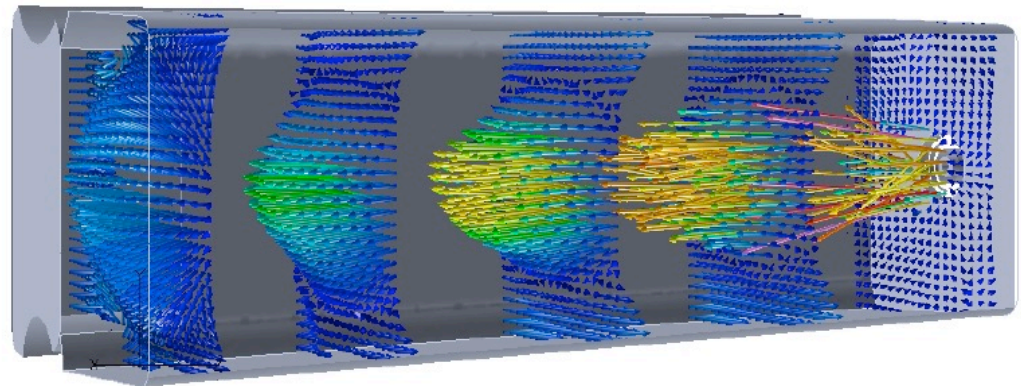


# Exxon Billings Plant, NG/RG 30 ppm

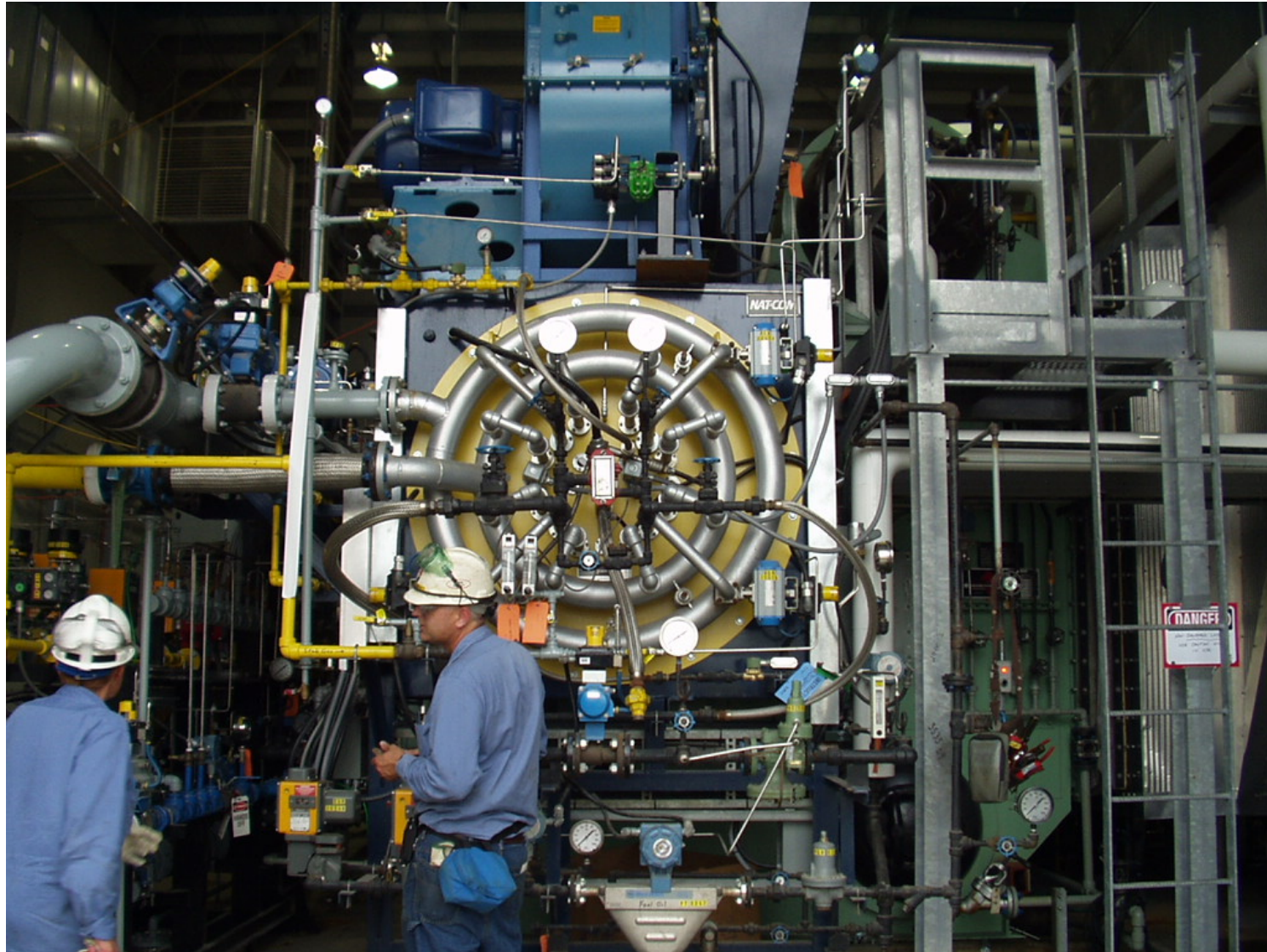


Numerical Simulation of a  
C-B Natcom Refinery Gas Fired Low-Nox Burner  
in a Nebraska NS-F-89 D-Type Boiler

C-B NATCOM project # 11400



# Process Fuel Applications



**NG, H<sub>2</sub> and #2 oil  
20:1 turndown on H<sub>2</sub> with 5 psig supply.**



# MULTIPLE BURNER APPLICATIONS



# Ultra-Low NOx, Unison Firing

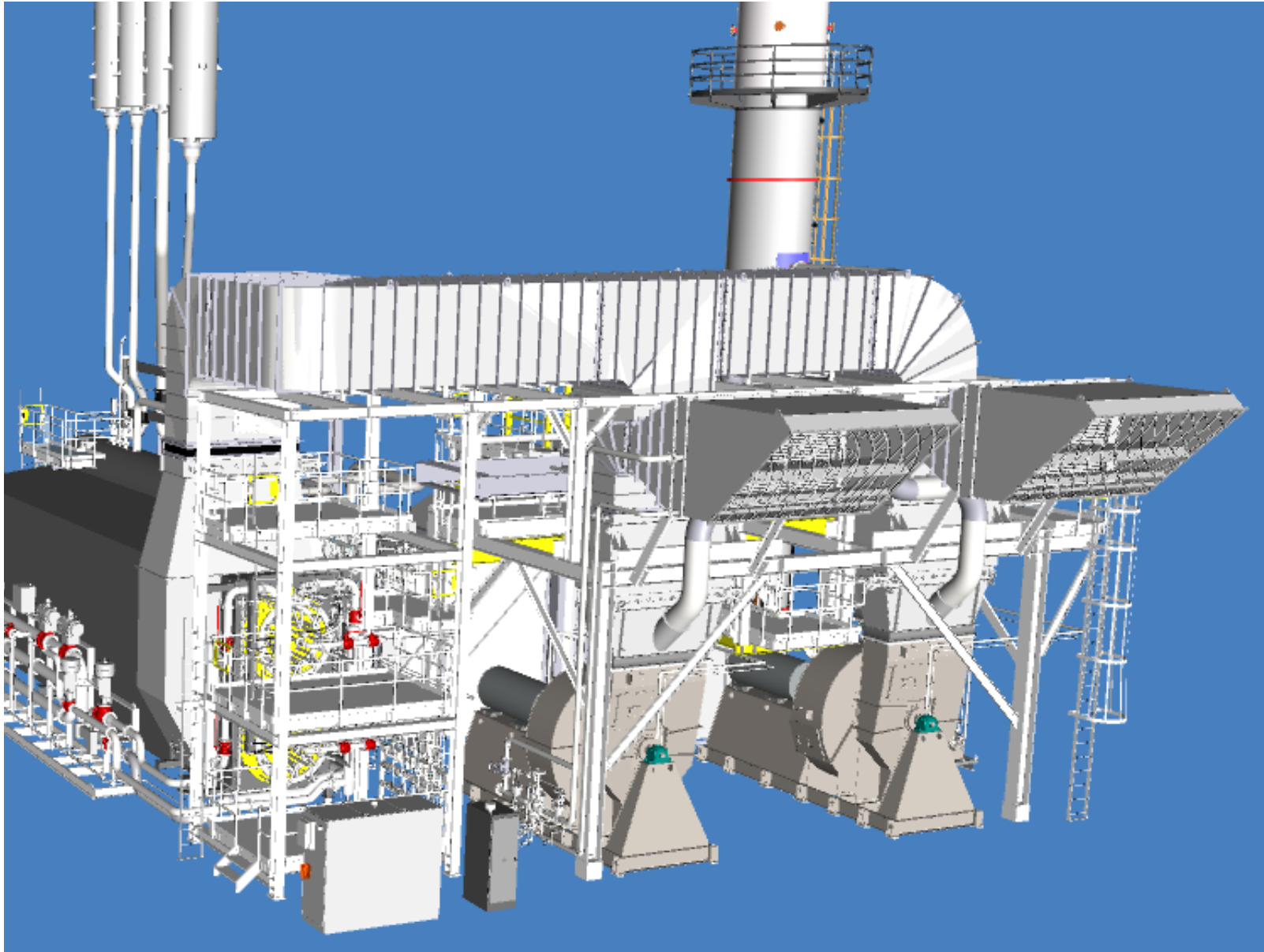


$\leq 9$  ppm NOx  
306 MMBTU/hr total  
800 hp FD fan  
D type, 225kpph, 600 psig,  
750F





# Unison Firing



LNG Plant, 434 MMBTU/hr NG/Off Gas, dual burner units **CleaverBrooks** 





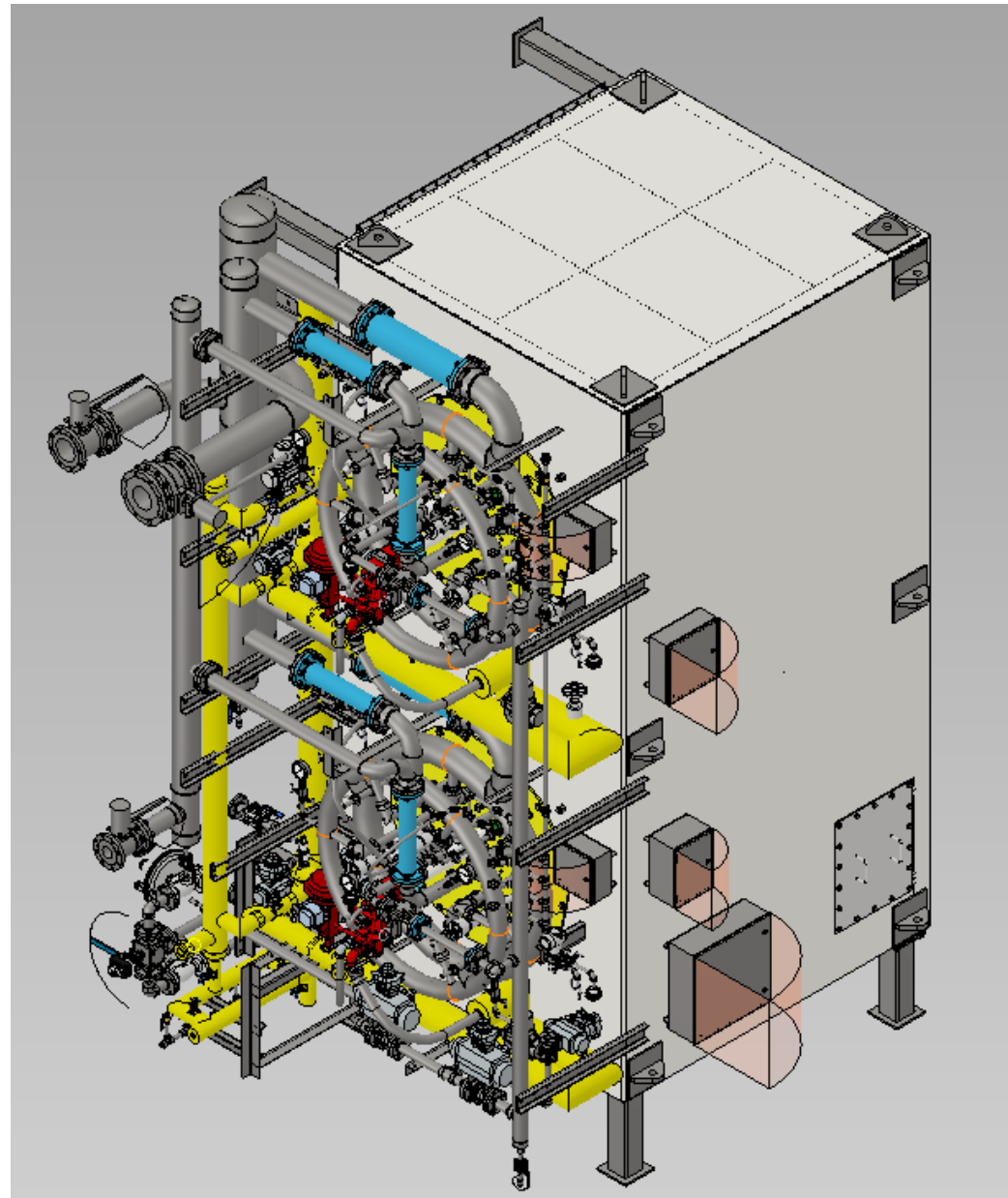
# Unison Firing

**391 MMBTU/hr**  
**NG, HCG (700BTU/SCF) &**  
**LCG (~0 BTU/SCF), no FGR**  
**Post SCR NOx 12.5ppm**



# Unison Firing

434 MMBTU/hr  
NG, RG & Heavy Oil  
Special low fire  
Independent firing for  
Oil gun maintenance





# MULTIPLE BURNER APPLICATION FOR FIELD ERECTED BOILERS



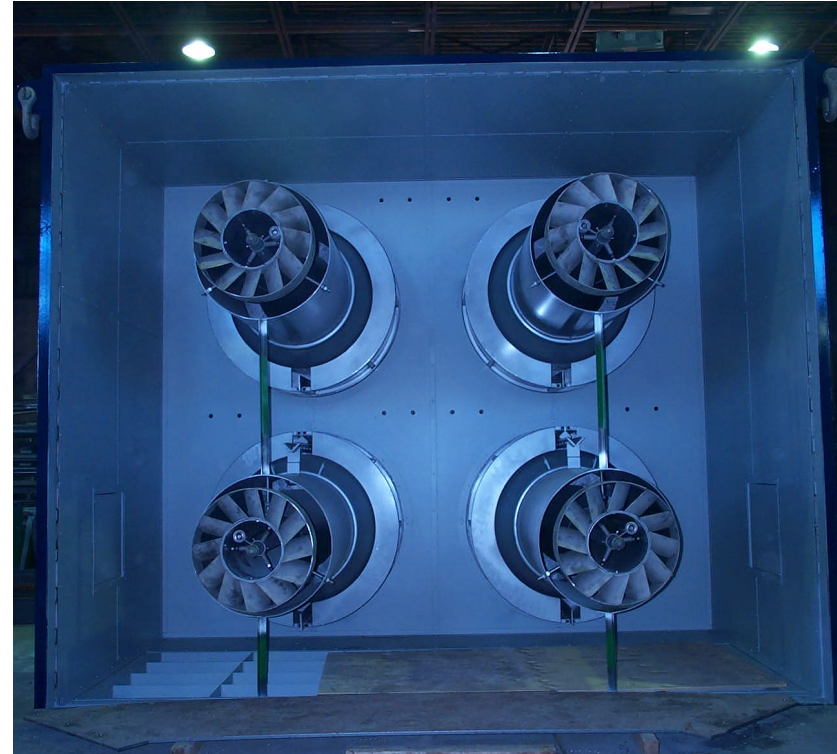
# MULTIPLE OIL-FIRED BURNERS



**Project: CFE, Mexico**

**18 burners consisting of retractable individual air slides, retractable oil lances and oil ignitors to burn extra heavy Mexican bunker oil.**





# ABITIBI CONSOLIDATED



**Fuel Trains**  
**3 FCVs, NG/OG,**  
**434 MMBTU/hr**



# Multi Burner Fuel Trains



**Tangential Firing, 8 Burners**





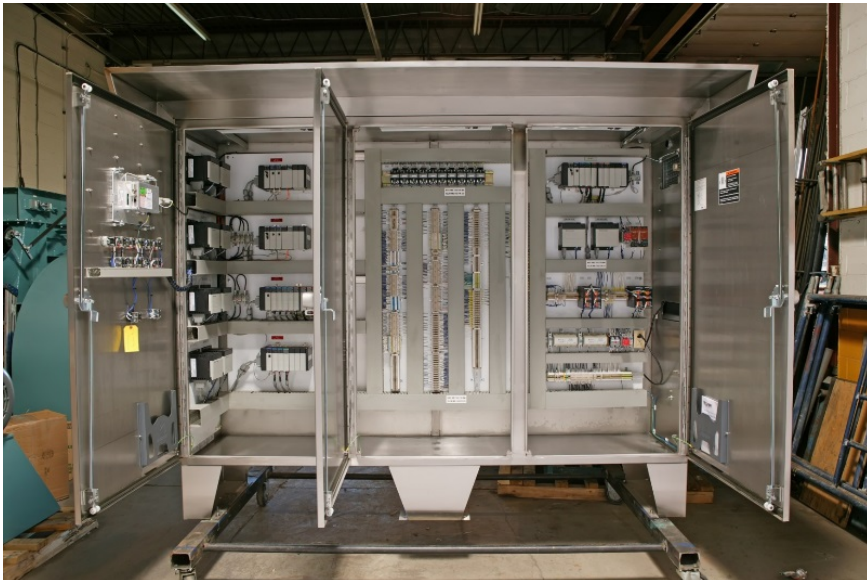
# Multi Burner Fuel Trains



**Front Fired, 8 Burners**

# Control Systems

## BMS, CCS, plant master and Balance of Plant systems



ControlLogix SIL2



Factory Acceptance Test

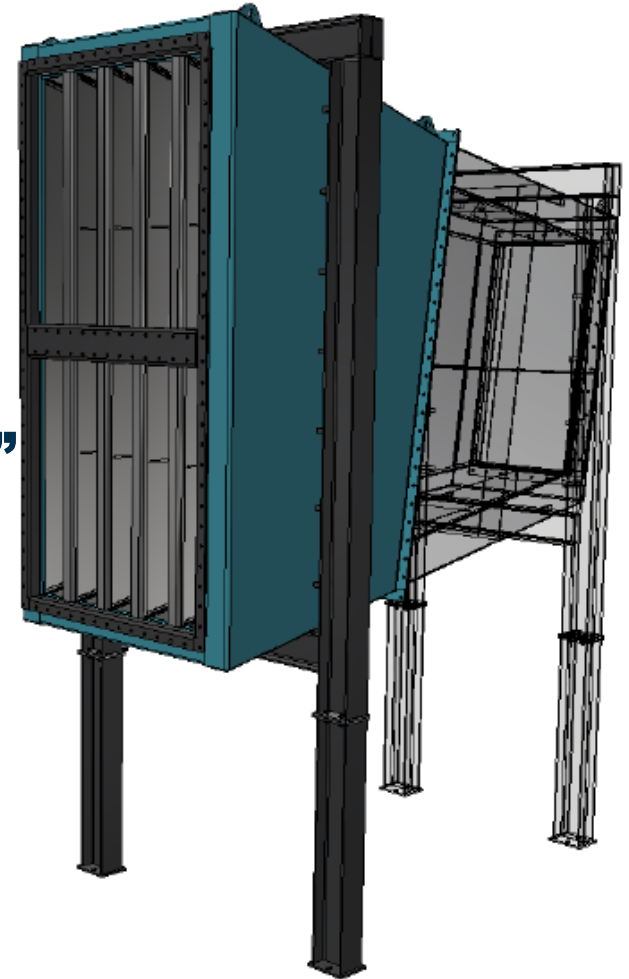


# In House Designs

- **Rain hood**
- **Flow Element/Silencer**
- **Inlet Damper**
- **Air and FGR Mixing Box**



**fan outlet “evase”  
and silencer**





# SCR Systems

# Modules or Elements?

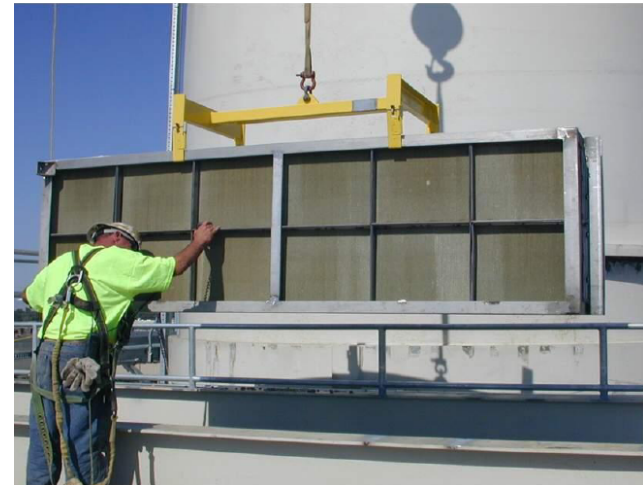


**Elements for hand installation**

**Sampling element**



**Modules for large applications.**

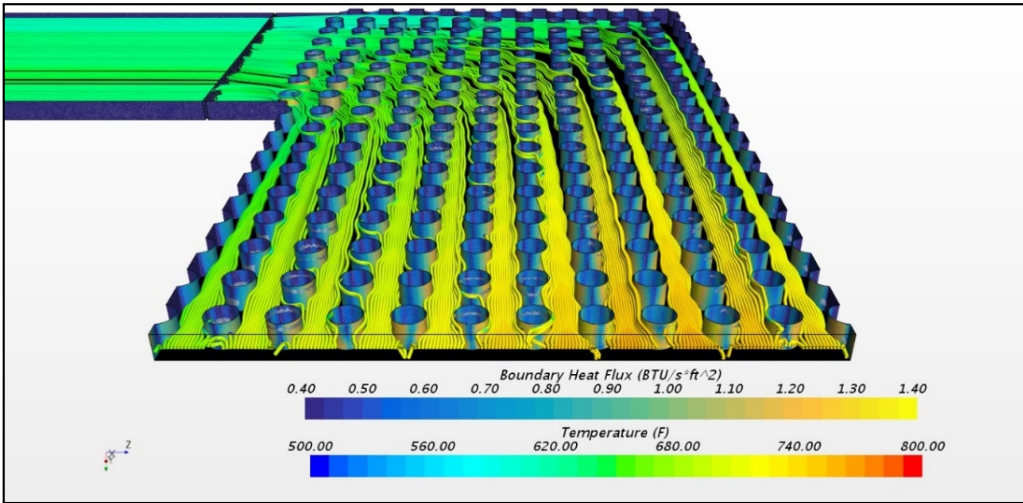
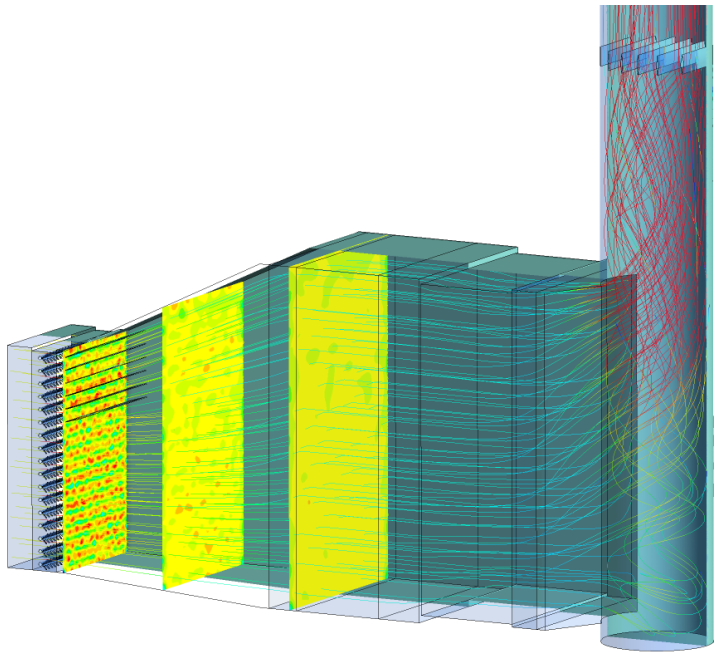
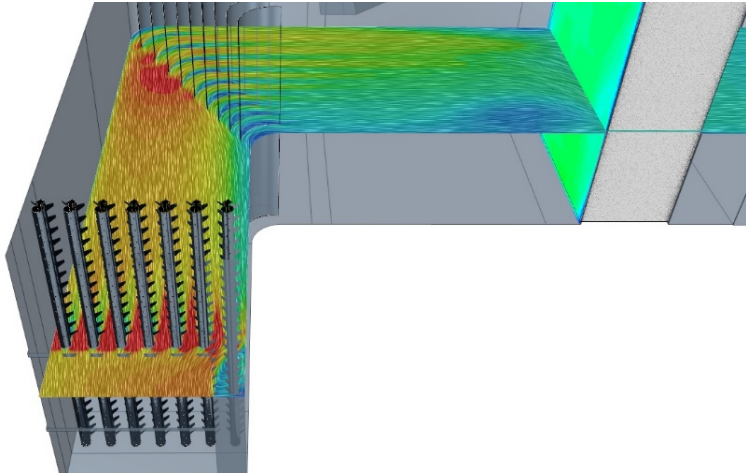
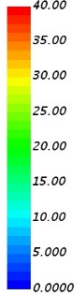




# CFD Assisted Design

STAR-CCM+

Velocity: Magnitude (ft/s)



# AFCU and Evaporators





# Ammonia Injection Grid

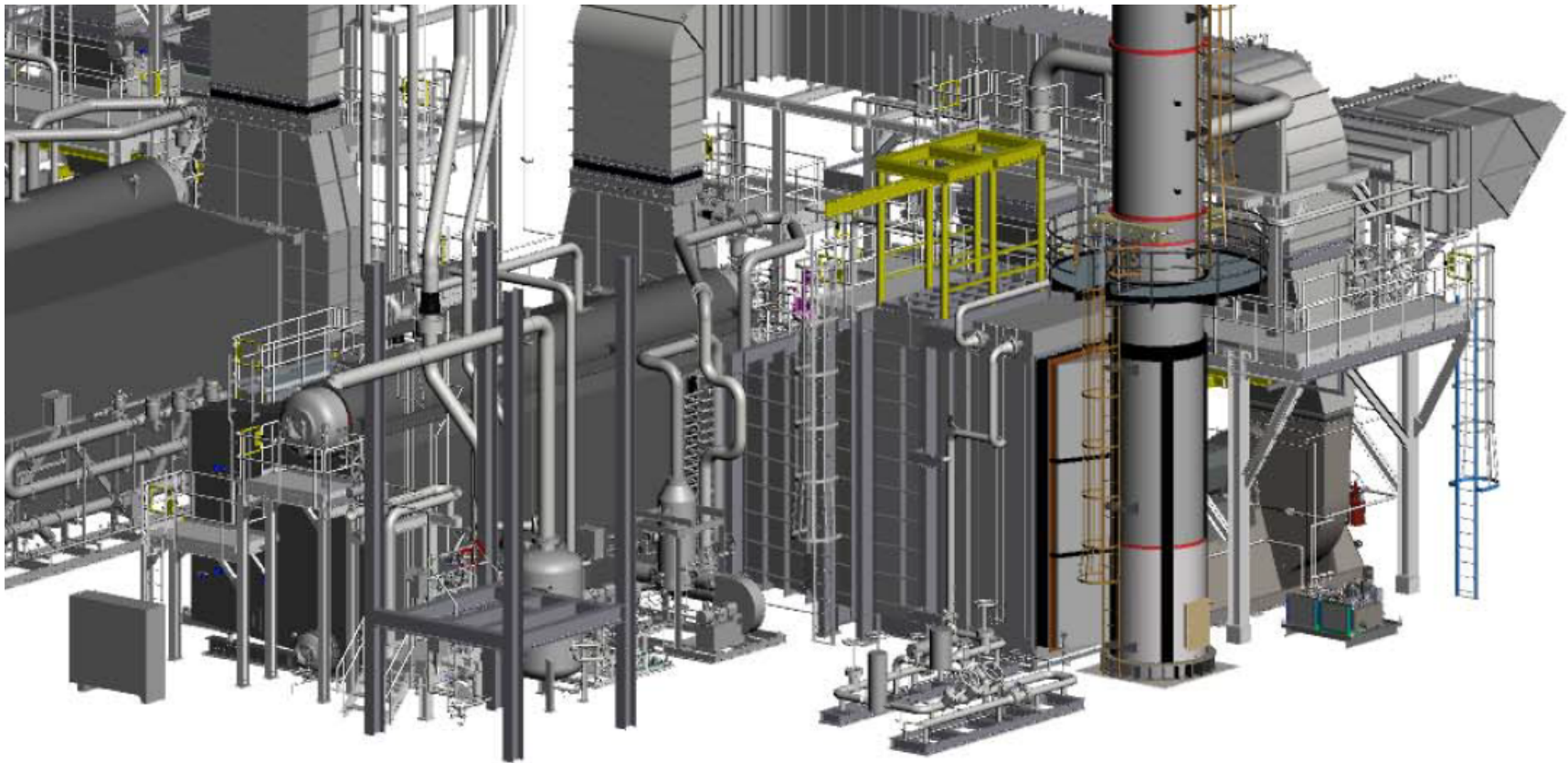


# Catalyst Reactor

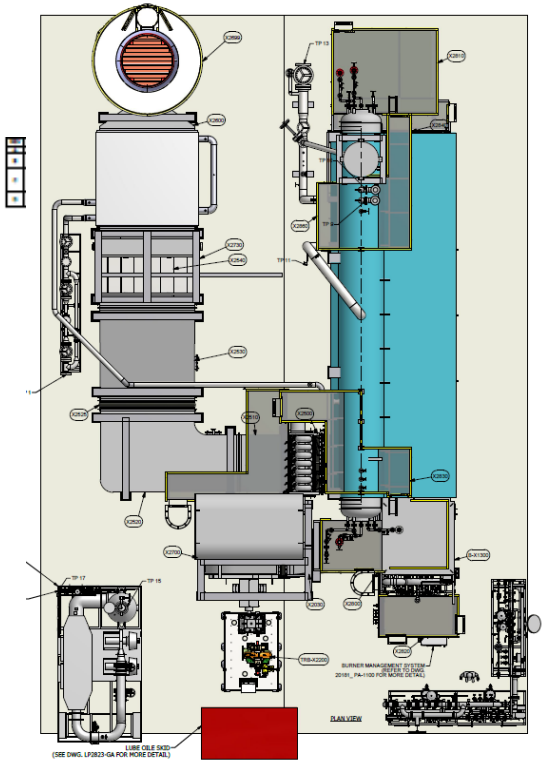
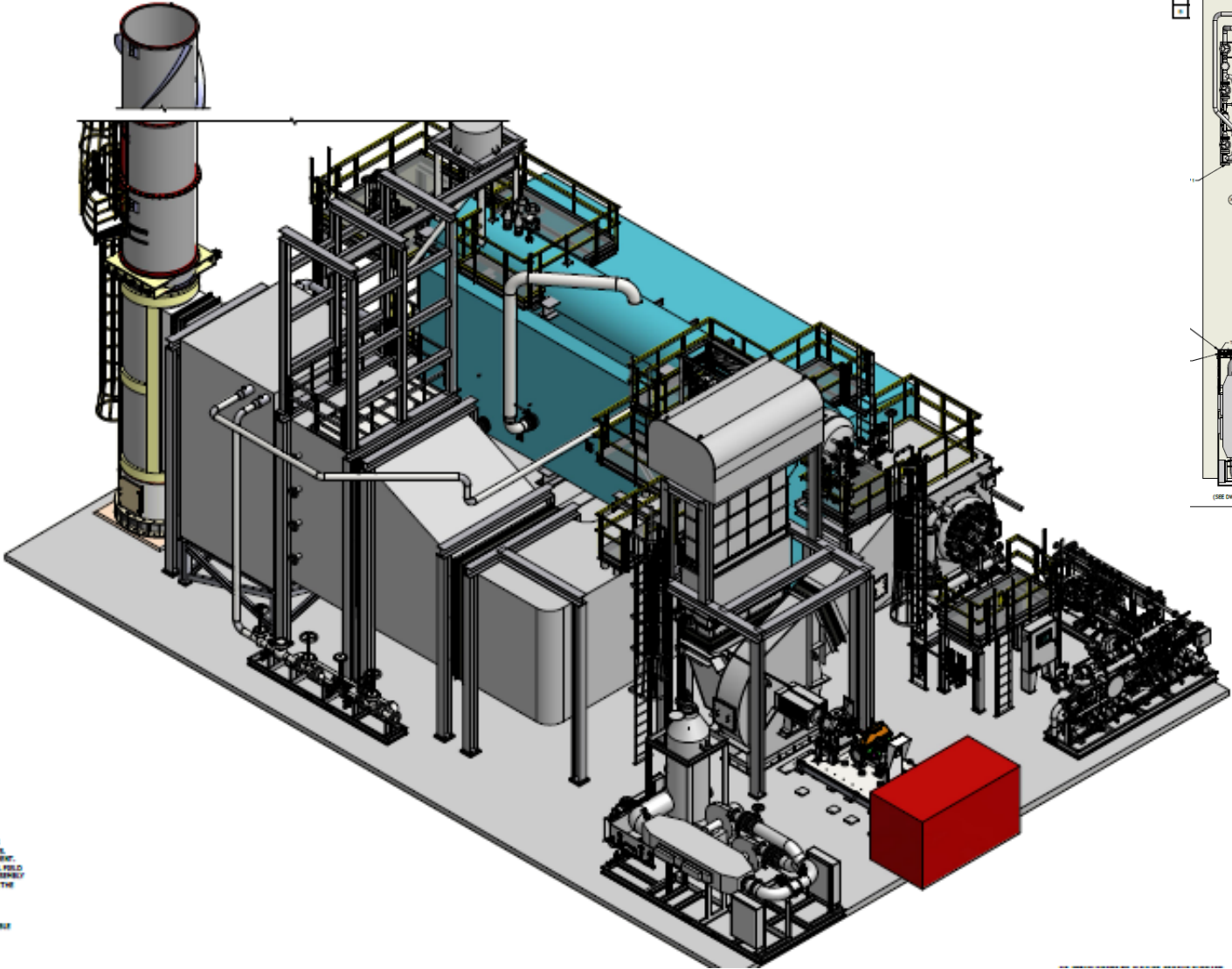




# Assembled SCR System



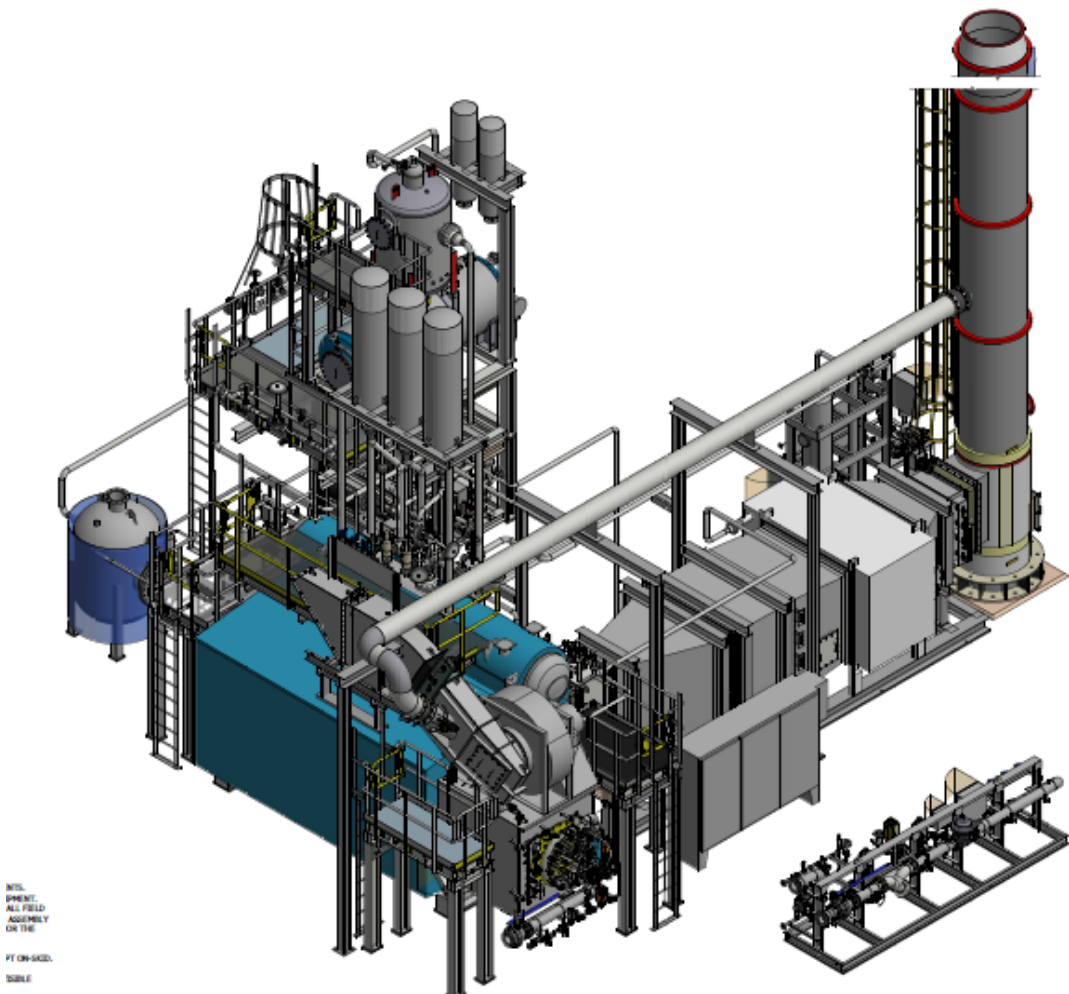
# Horizontal Arrangement 1



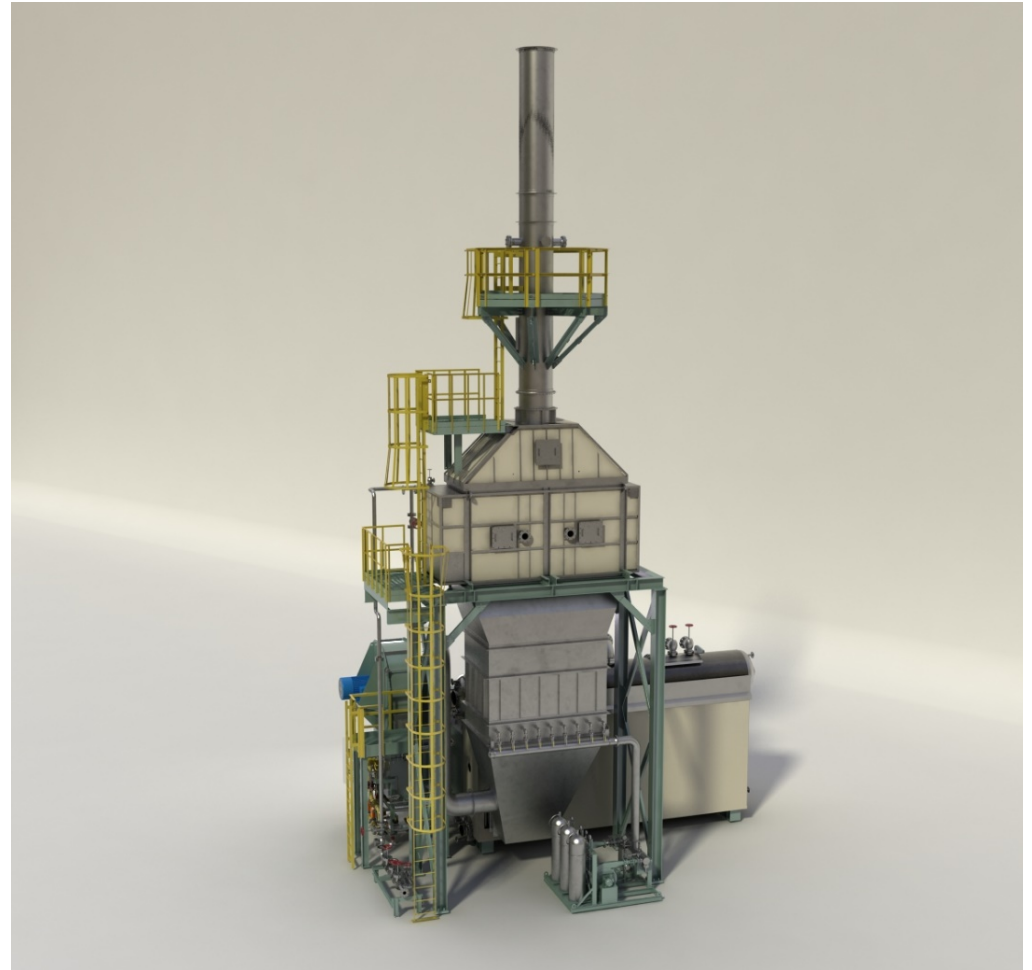
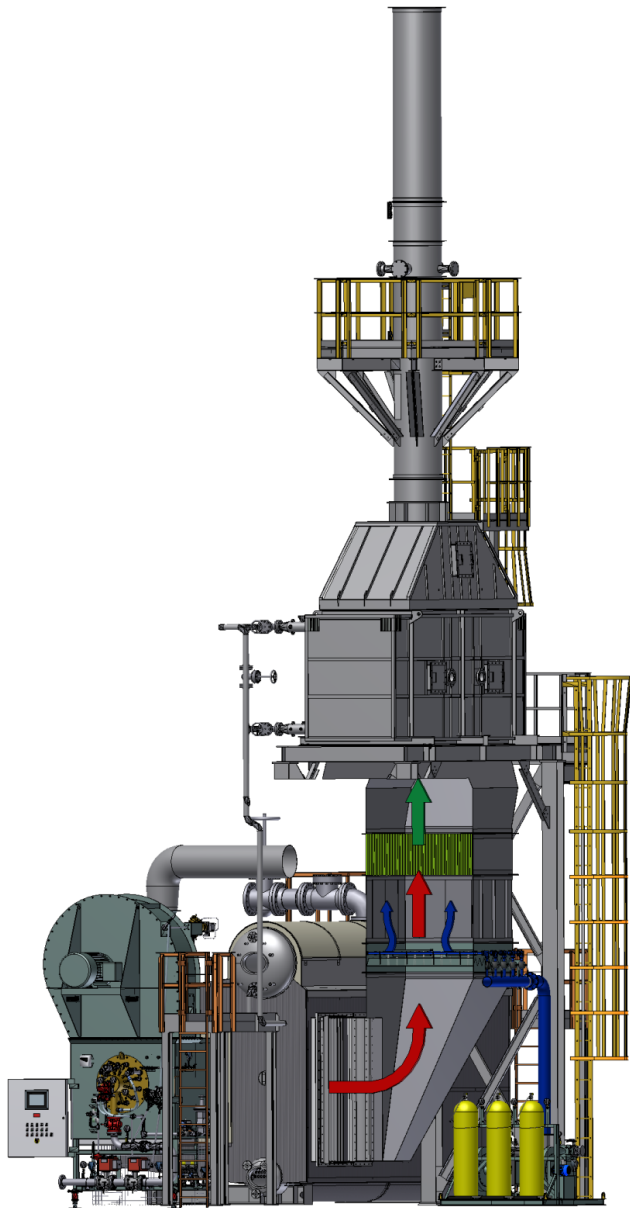
SEE DATA SHEET NOTE  
 SUPPLY & COMPONENTS  
 ASSEMBLY THIS EQUIPMENT.  
 IF THE LOCATION OF ALL WELD  
 TUBES TO DETAILS ASSEMBLY  
 AS BUILT ADVISE FOR THE  
 OUT PURPOSE.  
 SEE BY OTHER  
 REF TO A SAFE AND VISIBLE  
 POSITION  
 BY LOCAL



# Horizontal Arrangement 2



# Vertical Arrangement





Specifically  
engineered to optimize the  
performance of NATCOM  
burners and  
their boiler systems.

# Auxiliary EQUIPMENT



OIL ATOMIZERS



RETRACTABLE OIL GUN  
SYSTEMS



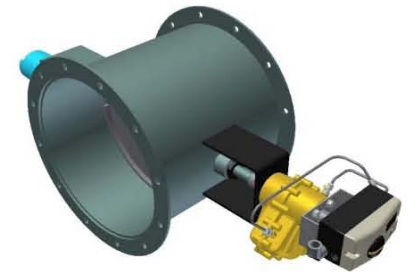
CAMLINK  
SYSTEMS



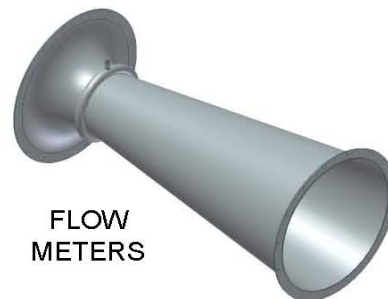
COUPLING BLOCKS WITH  
INTEGRATED ISOLATION  
PURGE VALVES



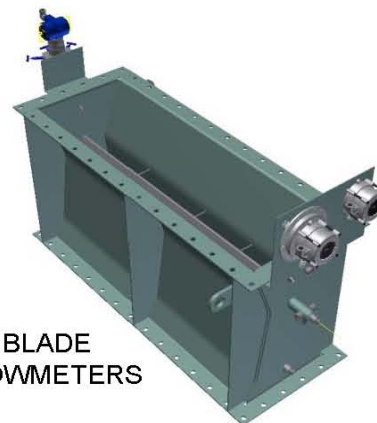
CLASS I,, II AND III  
IGNITERS - GAS OR OIL



DAMPERS



FLOW  
METERS



BLADE  
FLOWMETERS

