

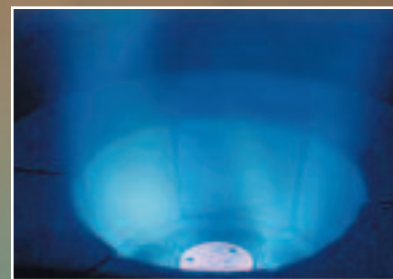
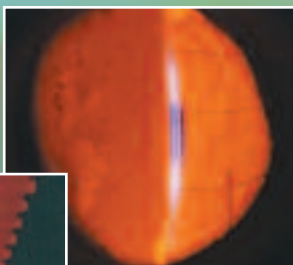
# CALLIDUS

# CALLIDUS TECHNOLOGIES

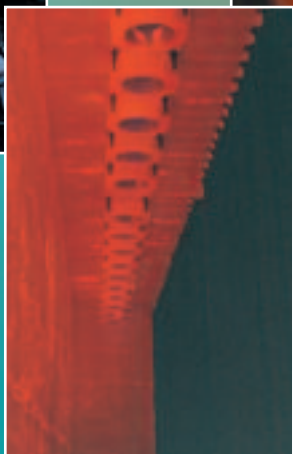
ETHYLENE TEST FURNACE



RADIANT WALL BURNER



ULTRA LOW NO<sub>x</sub>  
ULTRA BLUE™ BURNER



DOWNFIRED LOW NO<sub>x</sub>



FLAT FLAME LOW NO<sub>x</sub>

*Callidus Burners*

*Industry Leader*

*Compliance Driven*

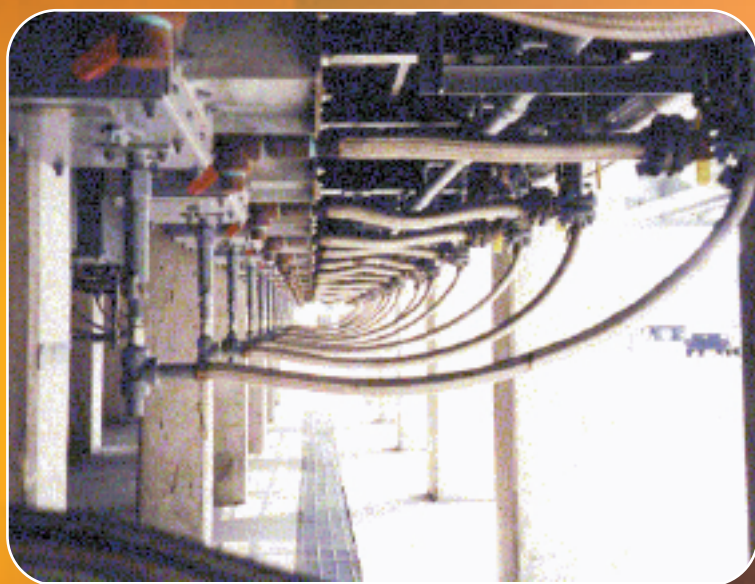
*Certification Assured*



CALLIDUS  
TECHNOLOGIES, L.L.C.  
The Environmental & Combustion Experts.



*Ethylene technology test furnace*



*U.S. coker furnace installation*

# Callidus Has A Burner To Match Your Application

Callidus Technologies L.L.C. has established itself as a world leader in burner technology. Over the years we have repeatedly broken new ground with innovative new products to meet our customers' requirements. Callidus was the first to break the 10 PPM NO<sub>x</sub> barrier, using natural gas, with our patented Ultra Low NO<sub>x</sub> burner. Now our new ULTRA BLUE™ burner achieves less than 10 PPM NO<sub>x</sub> on a wide range of fuels.

We offer a full range of process heater burners, speciality fired burner equipment, and burner related services for the petroleum and chemical refining industry.

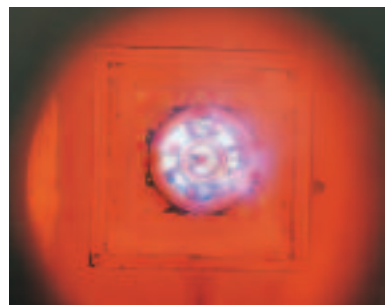
## We Pride Ourselves On [Quality]

Our manufacturing facility employs the highest quality standards in the industry. Callidus quality assurance personnel thoroughly inspect each assembly prior to shipment, reducing field installation time. Callidus fabrication and manufacturing is certified to ISO 9002 standards.

Our burner projects require state-of-the-art equipment. However, our biggest strength is our people. Everyone is highly trained for his specialized task. Ongoing training is regularly scheduled to assure that the high level of quality is maintained from one project to the next.



*Up-Fired Ultra Low NO<sub>x</sub> Burner*



*Horizontally Fired Ultra Low NO<sub>x</sub> Burner*

## Callidus Leads The Way With Engineering [Excellence]

Callidus is committed to providing the highest quality engineered products and services to the combustion industry. We focus on providing a custom designed solution for every project, based on each customer's individual requirements.

### Our Products and Services Include:

- Conventional, Low NO<sub>x</sub>, and Ultra Low NO<sub>x</sub> process heater burners
- Burners designed for new heater and retrofit applications
- Direct fired air heaters
- Thermal reaction furnaces and inline heaters for sulfur recovery systems
- Operator training services
- Burner maintenance/tune-up services
- Combustion optimization services

### Our Installation Services:

- Turnkey installation of Callidus burners, including demolition of existing equipment, field modifications, floor/wall panel replacements, and fuel piping modification
- Single point of responsibility
- Detailed assessment of existing structures to avoid costly changes and delays

**At Callidus We Don't Just Follow The Standards - We Set The Standards**

• Burners • Flares • Vapor Control Systems • Rotary Kilns • Thermal Oxidizers

## *Burners For Refinery [Process] Heaters*

Refinery process heaters come in an infinite array of shapes, sizes, and orientations. While most heaters fall into a typical design category, no two heaters are identical, so every heater's burner needs are somewhat unique.

Callidus Technologies offers a comprehensive range of burners for every imaginable combination of fired heater design and stack emissions requirement:

- Premix, Conventional, Low NO<sub>x</sub>, Ultra Low NO<sub>x</sub>, and ULTRA BLUE technologies
- Natural draft, forced draft, induced draft applications
- Ambient or preheated combustion air
- Low noise restrictions, including stringent European requirements
- Individual air plenums, or mounting in a common air plenum
- Wide range of fuel gas compositions
- High and low Btu gases
- Single or multiple fuel streams

## *Burners For [Reforming] Furnaces*

Callidus has supplied thousands of burners for reformers in hydrogen, ammonia and methanol service for every major heater manufacturer including down-fired, up-fired, side-fired and terrace wall configurations. Our designs include the following features:

- Single-piece high-strength tile for down-firing applications
- Conventional, Low NO<sub>x</sub>, and Ultra Low NO<sub>x</sub> designs
- The lowest-NO<sub>x</sub> technology currently on the market for down-fired heaters
- Single or multiple gases, including low-pressure, low Btu offgases
- Extensive experience with air distribution modeling for preheated air ductwork

- Designs which minimize down-firing flame buoyancy and mis-alignment of flame
- Approved Haldor-Topsoe burner supplier

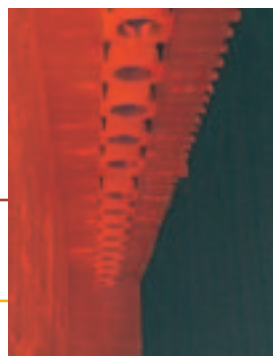
## *Burners For [Cracking] Furnaces*

Cracking furnaces subject burners to the most abusive firing environment of all process heaters. The intense heat present in these furnaces can lead to the eventual destruction of the burners if they are not properly designed; Ultra Low NO<sub>x</sub> burners are the most vulnerable.

Our cracking furnace burner design incorporates numerous mechanical and technological features which help it out-perform our competitors' burners in this harsh environment.

### **Design Features Include:**

- Conventional, Low NO<sub>x</sub>, and Ultra Low NO<sub>x</sub> technologies
- Custom designs for hearth, balcony, and radiant wall positions
- "Unitized" burner/tile construction where specified for ease of field installation
- Gas tip/riser anti-plugging/anti-coking design
- Burner tile throat design which eliminates presence of metallic parts which can fail in the intense heat
- Superior turndown performance (up to 10:1 with all gas tips firing)
- Uniform flame pattern for even heat profile on furnace wall and even heat transfer to process tubes
- Jackshaft air control linkages for precise combustion air flow trim



*Downfiring Ultra Low NO<sub>x</sub> Burners in Hydrogen Reformer*



Radiant Wall Burner  
in Side-Fired Cracking  
Furnace

## Cracking Furnaces

### Typical Equipment

- Hearth or radiant wall burners
- Conventional, Low NO<sub>x</sub>, Ultra Low NO<sub>x</sub>
- Wide range of fuel gases
- High turndown
- Even heat flux profile
- Low maintenance

### Typical Models

- LE-CFSG-W flat flame hearth burners
- LE-CARW radiant wall burners

### Representative Installation

- Ethylene unit on gulf coast
- Floor level LE-CFSG-W hearth burners
- Multiple levels of LE-CARW wall burners
- 0.060 #/MM Btu LHV NO<sub>x</sub> requirement
- Methane/hydrogen fuel

## Process Heaters

### Typical Equipment

- Round flame or flat flame
- Noise-reducing windbox
- Continuous pilot
- Single gas connection
- Multiple position high-efficiency damper

### Typical Models

- CUB-W ULTRA BLUE
- LE-CSG-W Ultra Low NO<sub>x</sub>
- CSG-W Staged Fuel Low NO<sub>x</sub>
- CRG-W Conventional

### Representative Installation

- West coast crude furnace
- LE-CSG-W Ultra Low NO<sub>x</sub> burners
- 1600°F firebox
- 15% excess air
- Ambient air
- Refinery fuel gas
- 0.033 #/MM Btu HHV NO<sub>x</sub>

## Reforming Furnaces

### Typical Equipment

- Downfiring burners
- Round flame
- Fuel gas + PSA off-gas
- 1850°F firebox
- Ambient air
- 0.040 #/MM Btu NO<sub>x</sub>

### Typical Models

- LE-CSG-WDF-PSA for non-mixed Gases
- CFRG-WDF for mixed PSA + fuel gases
- LE-CARW for radiant wall

### Representative Installation

- Hydrogen plant in upper midwest
- Forty-two (42) LE-CSG-WDF-PSA down-firing ULN burners
- Separate fuel & PSA gas connections
- Ambient air



## Burner Test Facility

### Equipment

- Seven test furnaces
- Up-firing
- Down-firing
- Horizontal-firing
- Radiant wall
- Fuel blending system
- Completely automated data acquisition
- Air-preheat system
- Experienced engineering staff
- Highly-trained test technicians
- Complete test facility machine shop staff

## Coking Furnaces

### Typical Equipment

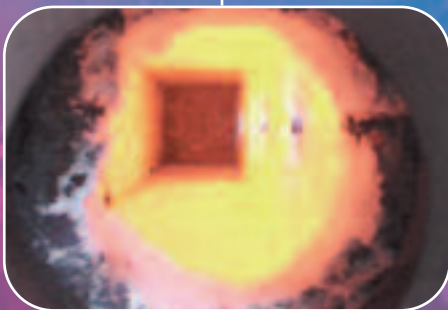
- Flat flame burners firing along wall
- Noise-reducing windbox
- High turndown
- Even heat flux profile
- High-efficiency damper

### Typical Models

- LE-CFSG-W Ultra Low NO<sub>x</sub>
- CFSG-W Staged Fuel Low NO<sub>x</sub>
- CFRG-W Conventional

### Representative Installation

- New coker in Ohio
- 144 Ultra Low NO<sub>x</sub> burners
- Ambient air
- Refinery fuel gas
- 1600°F firebox
- 0.040 #/MM Btu NO<sub>x</sub>



*Multiple radiant wall burners firing in unison in Ethylene test furnace.*

## *Burners For [Coking] Furnaces*

Like cracking furnaces, coking furnace efficiency is closely tied to the burners' ability to deliver a uniform heat flux pattern to the wall, and then to the process tubes. Our coker and cracking furnace burners share many of the same design features:

- Conventional, Low NO<sub>x</sub>, and Ultra Low NO<sub>x</sub> technologies
- Gas tip/riser anti-plugging/anti-coking design
- Burner tile throat design which eliminates presence of metallic parts which can fail in the intense heat
- Superior turndown performance (up to 10:1 with all gas tips firing)
- Uniform flame pattern for even heat profile on furnace wall and even heat transfer to process tubes
- Jackshaft air control linkages for precise combustion air flow trim

## *[Sulfur] Plant Equipment*

- Thermal reaction furnaces
- Inline mixers/burners
- Acid gas burners
- LMV burners



*Reaction furnace with acid gas burner ready for shipment*

## *[Burner] Test Facility*

Our burner testing facility is in continual use for burner technology research and design and customer witnessed demonstrations. Burner test results are only as reliable and accurate as the simulation; our array of test furnaces allows us to closely match our customers' actual field operating conditions, providing results which will accurately predict the measured performance of the same burners once installed in customers' heaters.

Our testing facility south of Tulsa, Oklahoma features the following:

- Seven water-cooled fired heaters
- Vertical cylindrical heaters, box heaters, horizontal heaters
- Specialty heaters for use when firing radiant wall burners
- Customer-designed Ethylene service testing heater with 45' tall radiant section, ability to fire multiple burners at multiple levels in unison
- Ample platforms and sight ports to observe burner flame pattern from multiple vantage points
- Flux measurement ports to allow optimization of heat flux profile
- Heaters fully-instrumented for remote gathering and compiling of live test parameters
- Each heater equipped with a video camera to allow taping of burner testing inside heater for internal and customer use

*Callidus Technologies Offers  
[The Best] In Design, Quality,  
Performance And Delivery*

## *[Unequaled] Research And Development*

Our industrial scale research center is a fully instrumented and computerized facility totally devoted to research and development of new products, new combustion processes, and problem solving applications. Our R&D center also serves as a test center for regulatory agencies as well as private clients. The test center has the capability to fully test and provide reports on all types of burner configurations. The Callidus test facility investment underscores our commitment to being the leader in the combustion industry.

## *[Advanced] Manufacturing And Fabrication Capabilities*

Upgrading our manufacturing and fabrication operation is an ongoing process at Callidus Technologies. Our current facility occupies over 30,000 sq. ft. consisting of the latest manufacturing techniques and equipment. As a world player in the combustion equipment market, some of our fabrication takes place around the world in strategic locations. Proprietary items are fabricated at our U.S. facility. This "satellite" approach makes good economic sense assuring that the customer gets the absolute best equipment for their installation.

At Callidus, quality assurance is everyone's job. Every step of the project is consistently reviewed to make sure that we live up to the expectations of our customers. Where applicable, each piece of equipment is pre-assembled and tested to assure performance. All machining and fabrication of critical components are accomplished in-house or by trusted experienced suppliers. Our rigorous quality inspection program is underscored by our ISO9002 certification.



*Burner research facility*

*Callidus Technologies, L.L.C. - best in design, quality, performance and delivery*



### **USA, Corporate Headquarters;**

7130 South Lewis, Suite 335 • Tulsa\*, OK 74136

Phone: +1 918 496 7599

E-mail: [burner@callidus.com](mailto:burner@callidus.com)

Fax: +1 918 488 9450

Web: [www.callidus.com](http://www.callidus.com)

### **London, UK:**

Phone: +44 14 8327 0360

Fax: +44 14 8327 0361

### **Mumbai, India:**

Phone: +91 22 2582 2639

Fax: +91 22 2582 3345

### **Shanghai, China:**

Phone: +86 21 6875 7533

Fax: +86 21 6875 7560

