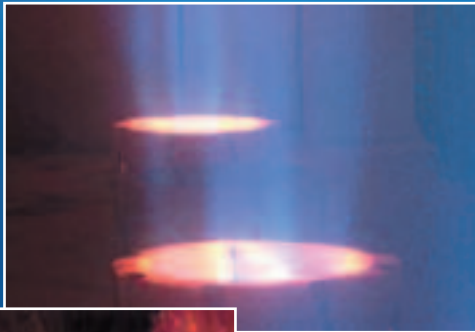


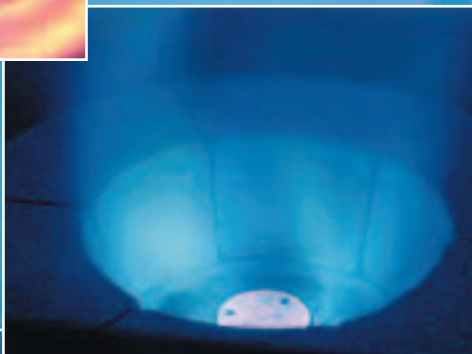
# CALLIDUS TECHNOLOGIES



ROUND  
FLAME  
CUB 8-W



CUBF-4W



ADVANCED ULTRABLUE™  
TECHNOLOGY

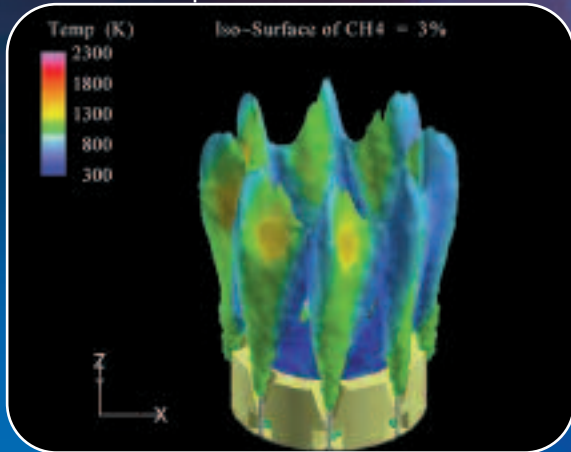
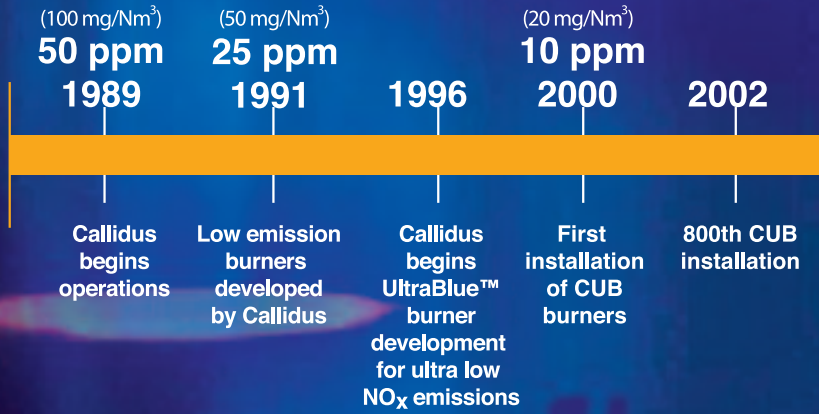
*UltraBlue™ Burner*

*Meeting the Challenge, Setting the Standards*



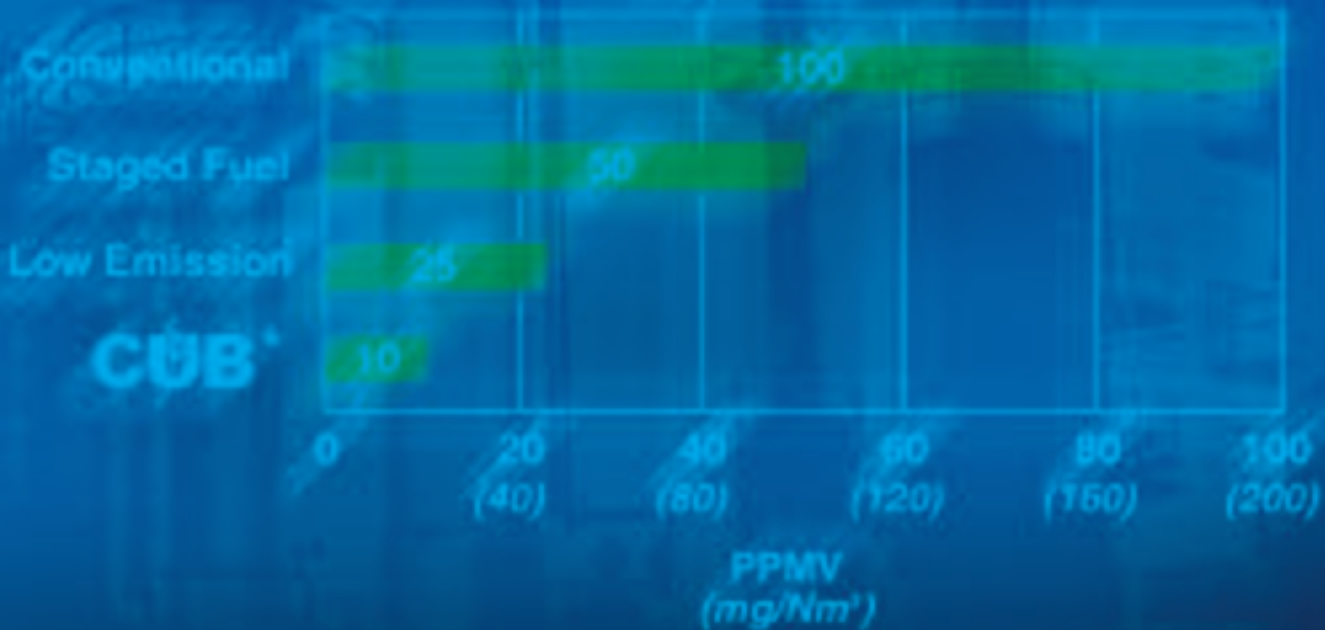
CALLIDUS  
TECHNOLOGIES, L.L.C.  
The Environmental & Combustion Experts.

## NO<sub>x</sub> Reduction



Advanced Combustion Modeling

## NO<sub>x</sub> Levels



\* The Callidus UltraBlue™ burner was the first process heater burner to achieve <10ppm (20mg/Nm<sup>3</sup>) NO<sub>x</sub>.

# To Meet Ultra low NO<sub>x</sub> emissions - Turn To [Callidus Technologies] And Our Proven UltraBlue™ burners

Innovation and technology have established Callidus among the world leaders in ultra low NO<sub>x</sub> burner development. The Callidus burner group has been on the leading edge of burner design for more than a decade. Working in conjunction with our customers, Callidus has developed the Callidus UltraBlue™ (CUB) burner, the first process heater burner to achieve < 10ppm (20mg/Nm<sup>3</sup>)\* NO<sub>x</sub>.

With hundreds of installations in operation today, the broad acceptance of the CUB burner has made it the ultra low NO<sub>x</sub> burner of choice for many of the industry's leading companies.

## CUB Capabilities and Performance

- Less than 10ppm (20mg/Nm<sup>3</sup>) NO<sub>x</sub> achieved in the field with optimum fuel composition and furnace temperatures
- NO<sub>x</sub> levels between 10-20ppm (20-40mg/Nm<sup>3</sup>) are typical results in hundreds of CUB burners currently in service
- Eliminates or reduces the need for expensive post-combustion equipment
- Burner is totally self-contained; no external flue gas recirculation or steam injection necessary
- Burner heat releases from 2 to 30MMBtu/hr (0.5 to 7.6 Gcal/hr) with high capacities under development
- Turndown of at least 3:1
- Flame length approximately 1.25'/MMBtu (1.6m/Gcal) fired
- Natural and forced draft operation
- Ambient and preheated air
- Round and flat flame designs

## CUB Applications

- Process Heaters for Refining and Petro-Chemical Industries
- Reforming Furnaces
- Cracking Furnaces
- Coking Furnaces

## Meeting NO<sub>x</sub> Regulations with the [Callidus UltraBlue™ Retrofit Kit]

NO<sub>x</sub> regulations are becoming more stringent each year. To meet the new regulations, Callidus has developed a cost effective upgrade for existing heaters and furnaces. The UltraBlue™ retrofit kit (CUBR) is designed to retrofit existing Callidus low emission (LE) burners in service by reducing NO<sub>x</sub> emissions up to 50%. The CUBR Kit can be easily installed during a scheduled routine or major shutdown and requires no special equipment or heavy machinery.

### CUBR Kit includes:

- Tile assembly
- Burner tip/riser assembly
- Updated general arrangement drawings
- Easy to understand change-out procedures
- On-site technical assistance available on request

## Computational Fluid [Dynamic Modeling]

Our in-house Computational Fluid Dynamics (CFD) capabilities were used to create a three-dimensional model showing various CUB designs under different firing conditions. This information and real world experience combined with Fluent® software helped solve the thermodynamic equations required to create a burner with less than 10-ppm (20mg/Nm<sup>3</sup>) NO<sub>x</sub>. Our CFD models are also used to help assure that our customers' CUB retrofit projects meet their performance expectations. CFD can effectively predict the system efficiencies, reducing production time and avoiding potential installation problems.

## Callidus, Meeting The Challenge - Setting The Standards

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

\* Measurements shown in italics are metric conversions.

## **[Global Installation] and Field Service**

Callidus installation and field service teams provide first class service to our customers. Familiarity and experience with Callidus UltraBlue™ burners enable us to provide enhanced product management, efficient turn-a-rounds, start-up assistance and turn-key installations with a high level of quality control.

### **Callidus Advantages:**

- Turnkey installation of CUB burners:
  - Demolition of existing equipment
  - Field modifications
  - Floor/wall panel replacements
  - Fuel piping modifications
- Single point responsibility
- Detailed assessment of existing situations
- Project reporting
- Quality control



*Callidus research, development and manufacturing facility*

## **Continuing [Research and Development]**

The CUB is a prime example of Callidus leadership in environmental and combustion technology development at our world class R&D facility. The facility includes furnaces dedicated to burner innovation, testing and customer demonstrations.

### **Our test facility features:**

- 7 water cooled furnaces vertical cylindrical, box and horizontal heaters
- Custom designed ethylene service testing
- Multiple observation points
- Heat flux profile measurement ports
- Fully instrumented for remote gathering of live test data

## **[Manufacturing]**

Each step of our manufacturing process is consistently reviewed to ensure the highest quality control standards are met and to make sure that our customers expectations are achieved. Callidus CUB Burners are produced at our manufacturing and fabrication facility in Beggs, Oklahoma, USA. Callidus fabrication and manufacturing process are certified ISO 9002

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