



**TODAY'S THERMAL OXIDIZER SOLUTIONS  
TO MEET TOMORROW'S CHALLENGES**

**Thermal Oxidizer Systems**

**Catalytic Oxidizer Systems**



# Callidus, experts in Thermal Oxidizers

## Wide Range of Applications

Callidus Technologies by Honeywell is an industry leader in environmental and combustion technology. We have provided incinerators for a wide variety of gas and liquid wastes including inorganic particulate, various acids and hard-to-burn organic compounds. Our experience extends to development and implementation of Thermal Oxidizer systems for Fume, Tail Gas, Halogenated Waste, Bound Nitrogen, Catalytic Oxidizers and Downfired Incinerators including units with ratings of over 400 MM BTU/hr.

All Callidus products - Burners, Flares, Selective Catalytic Reduction systems and Thermal Oxidizers - are engineered and designed by combustion experts who have years of experience and are focused on customer satisfaction and emission compliance.

Dedication to our customers is proven by the performance of our thermal oxidizer group. The engineers in this group are second to none in oxidizer experience

and technical capabilities. We have been involved in the successful design, fabrication, and startup of hundreds of thermal oxidizers worldwide.

Callidus will provide the best possible solution to your thermal oxidizer requirements.

## We Pride Ourselves On Quality

Our manufacturing facility employs the highest standards in the industry. Like many companies, our manufacturing techniques use state-of-the-art equipment; but, what truly sets Callidus apart is our people. We take great care to ensure that highly trained individuals are used in performing our special requirements. Ongoing and regularly scheduled training through our research and development group assures that a high level of quality is maintained.

Callidus quality assurance personnel thoroughly inspect each assembly prior to shipment, thus reducing installation time. Callidus fabrication and manufacturing is certified ISO 9001:2008 in the USA and China.

## Callidus Leads The Way With Engineering Excellence

Callidus focuses on meeting each customer's individual requirements, resulting in a custom-designed solution for every project. In fact, on average, each engineer has 15 years experience designing thermal oxidizers.

## Advanced Manufacturing and Fabrication Capabilities

Upgrading our manufacturing and fabrication facilities is an ongoing process at Callidus. Our fabrication facilities employ the latest manufacturing practices and equipment.

As a global leader in the thermal oxidizer market, much of our fabrication occurs in strategic locations around the world while proprietary items are fabricated in our own facilities. This approach makes good economic sense, and provides our customers the best value for their combustion system.



8 MM BTU/hr brominated waste



Soil remediation



Closed loop gasification system for wood products plant

### Fume Thermal Oxidizer

Callidus Fume Thermal Oxidizers thermally treat organic fumes in air or inert gas streams at temperatures between 1400°F and 1600°F. Destruction efficiencies typically range from 99 to 99.99 percent.

#### Fume Thermal Oxidizer

##### Typical Equipment

- Low emissions burner
- Ceramic fiber refractory
- Forced draft operation
- Heat recovery equipment
- Burner management system
- Stack

##### Typical Waste Streams

- VOC streams
- Process vents
- Pharmaceutical vents
- Dryer exhausts

##### Typical Installation

- 5 to 100 MM BTU/hr burner
- 1 second residence time
- 1500°F operating temperature



22 MM BTU/hr tail gas unit

### Catalytic Oxidizers

Callidus Catalytic Oxidizers can be used in cases where the organic level is low and the fume stream is free from dust or substances potentially poisonous to the catalyst. Catalytic oxidation is generally carried out at 550°F to 850°F and requires substantially less fuel than thermal systems.

Destruction efficiencies greater than 99.99 percent may be required for some organic wastes. This is achieved by operating the oxidizer at a higher temperature with minimal auxiliary fuel. Waste heat boilers or hot oil heaters can be used downstream to recover heat for other plant operations.



9.5 MM BTU/hr fume incinerator



15 MM BTU/hr fume incinerator

### Tail Gas Thermal Oxidizer

Tail Gas from Sulfur Recovery Units contains a variety of sulfur compounds, which are destroyed in a Callidus Tail Gas Thermal Oxidizer. Typical oxidizing temperatures vary from 1200°F to 1500°F, with residence times of 0.6 to 1.0 second. System designs for both natural or forced draft are available.

Generally, regulations require H<sub>2</sub>S in the flue gas to be 10 ppmv or less; but in certain cases, levels as low as 2 ppmv can be achieved.

#### Tail Gas Thermal Oxidizer

##### Typical Equipment

- Low emissions burner
- Castable or brick refractory
- Natural draft/forced draft
- Heat recovery (optional)
- Stack

##### Typical Waste Streams

- Sulfur plant tail gas
- Carbon black tail gas

##### Typical Installation

- Refineries
- Natural Gas Processing Plants
- 20 to 150 MM BTU/hr burner
- 1 second residence time
- 1200°F-1500°F operating temperature



20 MM BTU/hr sulfur plant tail gas incinerator

### Downfired Thermal Oxidizer Systems

Thermal destruction of aqueous or organic waste streams containing inorganic or organic alkali metal salts requires that the thermal oxidizer be downfired to prevent accumulation of molten salts in the oxidizer furnace. Because molten salts tend to destroy refractory, the Callidus design minimizes salt contact with refractory lining which improves refractory life.

Particulates entrained in the flue gas are removed by either a wet or dry flue gas clean up system depending on the required emissions rate. In the Callidus wet system, salt or ash-laden flue gas from the oxidizer first enters the quench system located directly below the thermal oxidizer. Here the hot gas is quenched to its adiabatic saturation temperature by water injection or by a Callidus high efficiency submerged quench system (patent pending).

Then, the saturated flue gas flows through a wet venturi scrubber and/or WESP (Wet Electrostatic Precipitator) before being sent to a packed column scrubber, if required, or vented to the atmosphere through a stack.

In the Callidus dry system design, flue gas from the oxidizer is typically cooled by air and/or water injection before being sent to a baghouse or an electrostatic precipitator for particulate removal.

Destruction efficiencies greater than 99.99 percent are routinely achieved for most organic waste components at temperatures of approximately 1800°F. Particle matter emission rates may vary from as low as 0.005 to 0.08 grains/DSCF, depending on the particle removal equipment selected to meet the customer's requirements.

### Downfired Thermal Oxidizer

#### Typical Equipment

- Low emission burner
- Low porosity brick refractory
- Forced draft
- Adiabatic quench
- Particulate removal

#### Typical Waste Stream

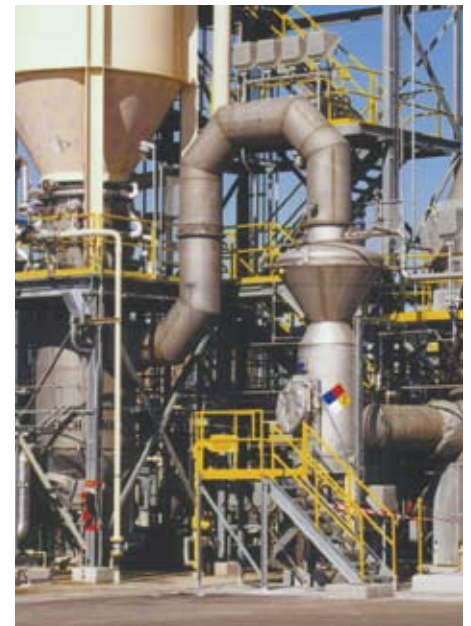
- Ethylene plant blowdown
- Caustic waste streams

#### Typical Installation

- Chemical plant
- 20 to 80 MM BTU/hr burner
- 2.0 seconds residence time
- 1650°F-1800°F operating temperature



deNOxizer/tail gas unit



35 MM BTU/hr downfired system

## Halogenated Waste Thermal Oxidizer Systems

Callidus has extensive experience in halogenated organic waste oxidation. The most common halogen is chlorine. Thermal oxidation of chlorinated hydrocarbons produces hydrogen chloride gas (HCl) and some free chlorine, which must be removed. The quantity of HCl in the flue gas determines whether a single or two-stage HCl removal system is used. Either an HCl absorber or a caustic scrubber is used when a small quantity of HCl is present. A two-stage system is often used to reduce caustic usage when the flue gas contains a significantly large quantity of HCl.

Callidus Halogenated Waste Thermal Oxidizer Systems are capable of destruction efficiencies up to 99.99 percent. Operating temperatures can range from 1500°F to

2200°F with residence times of 1.0 to 2.0 seconds depending on the destruction efficiency required.



Halogenated Waste Thermal Oxidizer

## Halogenated Waste Thermal Oxidizer

### Typical Equipment

- Medium intensity burner
- Forced draft
- High alumina brick refractory
- Heat recovery equipment
- HCl recovery/scrubber

### Typical Waste Stream

- PVC plant vents
- VCM waste liquids
- Pharmaceutical vents
- Bromine liquid wastes

### Typical Installation

- Chemical plant
- 10 to 50 MM BTU/hr burner
- 2.0 seconds residence time
- 1800°F operating temperature



80 MM BTU/hr low NO<sub>x</sub> system

# Callidus Technologies offers the best in design

## Low NO<sub>x</sub> deNO<sub>x</sub>izer Systems

Thermal oxidation of nitrogen-bearing wastes require a specialized combustion approach. Single-stage combustion of these wastes can produce NO<sub>x</sub> emissions in excess of those allowed by most regulatory agencies. To maintain NO<sub>x</sub> emissions within acceptable limits, Callidus uses a three-stage combustion process to destroy these wastes.

The waste is burned in the first stage under substoichiometric, or reducing conditions. The high temperatures and lack of oxygen in the first stage cause the nitrogen-bearing compounds to form elemental nitrogen rather than NO<sub>x</sub>.

In the second stage, flue gas from the first stage is cooled to approximately 1400°F by injection of water, steam, or cooled recycled flue gas.

The combustion process is completed in stage three where the flue gas is oxidized at a temperature of 1700°F to 2000°F with excess oxygen present. NO<sub>x</sub> in the final flue gas typically ranges from 80 to 200 ppm, depending on the waste composition. A destruction efficiency of 99.99 percent can be achieved for most compounds.

## Low NO<sub>x</sub> Thermal Oxidizer

### Typical Equipment

- High intensity burner
- Brick lined furnace
- Forced draft
- Heat recovery equipment
- 3-stage process

### Typical Waste Streams

- Ammonia vents
- Acrylonitrile vents
- Nitrogen bound organic wastes

### Representative Installation

- Petrochemical plant in India
- 10 to 60 MM BTU/hr
- 2.0 seconds residence time
- 2200°F/1600°F operating temperatures



Three stage combustion system at Callidus research facility



Downfired oxidizer in Callidus research facility

# gn, quality, performance and delivery.

## **At Callidus Technologies We Exceed the Expected**

At Callidus, quality assurance and customer satisfaction are our top priorities. Each step of a project is reviewed to meet or exceed our customers' requirements and standards. Where applicable, equipment is pre-assembled and tested. Fabrication is accomplished either in-house or by certified, experienced suppliers. Our rigorous quality inspection program is evidenced by our ISO 9001:2008 certification.

## **Unequaled Research and Development**

Our industrial scale Thermal Oxidizer R&D Facility is fully instrumented and utilizes process control and data logging systems. The facility is devoted to research and development of new products, new combustion processes, improvement of existing equipment processes, and problem-solving efforts. The center also serves as a research facility for regulatory agencies as well as private clients.

The Thermal Oxidizer R&D Facility currently consists of two major combustion systems: a vertical, downfired salt type unit with complete wet quench system, and a three-stage, low NO<sub>x</sub> horizontal Callidus deNO<sub>x</sub> system. Both units are designed to be easily reconfigured to allow numerous process configurations. The computer control system and its leading edge data acquisition system also enhance the capabilities of the test facility. A separate pad, complete with stack, utility hook-ups, and flue gas sampling equipment, is also available for equipment checkout and specialty combustion testing for our customers.

Our R&D facility investment and capabilities, along with our dedication to quality and continually improved incinerator school, underscores Callidus' commitment to being the leader in the worldwide environmental and combustion industry. We don't just follow the standards - we set them.



Reducing furnace burner at Callidus' research facility

## Test Facility

The Callidus test facility is in continual use for combustion technology research and development as well as customer witnessed demonstrations. Our array of test systems allows us to closely match actual field operating conditions, providing results which will more accurately predict actual measured performance.



Callidus 82,000 sq. ft. manufacturing and fabrication facility in USA



Callidus headquarters - Tulsa, Oklahoma. USA

## ISO 9001:2008 Certification



USA Certification

China Certification

## Global Coverage

Callidus reaches the global market through our headquarters located in Tulsa, Oklahoma, USA, regional direct sales offices in Shanghai, China; Brussels, Belgium; Mumbai, India and Sao Paulo, Brazil and with independent sales representation around the world.

Meeting our customers' expectations and setting the standards for the combustion industry have always been our company goals. Each burner, flare, thermal oxidizer and catalyst system we design and manufacture is built with those goals in mind.

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