



**Thermal and Catalytic
Oxidizer Systems**

Meet the Thermal Oxidizer Experts

Wide Range of Applications

Honeywell UOP Callidus is an industry leader in environmental 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 more than 400 MM BTU/hr.

All of our 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.

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 us apart is our people. We take great care to ensure that highly trained individuals perform our special requirements. Ongoing and regularly scheduled training through our research and development group assures that a high level of quality is maintained.

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



8 MM BTU/hr brominated waste



35 MM BTU/hr downfired system

Leading the Way With Engineering Excellence

Honeywell UOP Callidus focuses on meeting each customer's individual requirements, resulting in a custom-designed solution for every project. 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, and our 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 you the best value for your combustion system.

Fume Thermal Oxidizers

Honeywell UOP Callidus Fume Thermal Oxidizer 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.

Catalytic Oxidizers

Our 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.

Tail Gas Thermal Oxidizers

Tail Gas from Sulfur Recovery Units contains a variety of sulfur compounds, which are destroyed in our 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 H₂S in the flue gas to be 10 ppmv or less; but in certain cases, levels as low as 2 ppmv can be achieved.



15 MM BTU/hr fume incinerator

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

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



22 MM BTU/hr tail gas unit



9.5 MM BTU/hr fume incinerator



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, our 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 our 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 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 unit

Downfired Thermal Oxidizer

Typical Equipment	Typical Waste Stream	Typical Installation
<ul style="list-style-type: none"> Low emission burner Low porosity brick refractory Forced draft Adiabatic quench Particulate removal 	<ul style="list-style-type: none"> Ethylene plant blowdown Caustic waste streams 	<ul style="list-style-type: none"> Chemical plant 20 to 80 MM BTU/hr burner 2.0 seconds residence time 1650° F-1800° F operating temperature



deNOx oxidizer/tail gas unit

Halogenated Waste Thermal Oxidizer Systems

We have 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.

Honeywell UOP 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

Typical Equipment	Typical Waste Stream	Typical Installation
<ul style="list-style-type: none"> Medium intensity burner Forced draft High alumina brick refractory Heat recovery equipment HCl recovery/scrubber 	<ul style="list-style-type: none"> PVC plant vents VCM waste liquids Pharmaceutical vents Bromine liquid wastes 	<ul style="list-style-type: none"> Chemical plant 10 to 50 MM BTU/hr burner 2.0 seconds residence time 1800° F operating temperature



Halogenated Waste Thermal Oxidizer



80 MM BTU/hr low NO_x system

The Best in Design, Quality, Performance and Delivery

Low NOx deNOxider Systems

Thermal oxidation of nitrogen-bearing wastes require a specialized combustion approach. Single-stage combustion of these wastes can produce NOx emissions in excess of those allowed by most regulatory agencies. To maintain NOx emissions within acceptable limits, Honeywell UOP 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 NOx.

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. NOx 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.



Three stage combustion system at Honeywell UOP Callidus research facility

Low NOx Thermal Oxidizer

Typical Equipment

- High intensity burner
- Brick lined furnace
- Forced draft
- Heat recovery equipment
- Three 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



Downfired oxidizer in Honeywell UOP Callidus research facility

We Exceed the Expectations

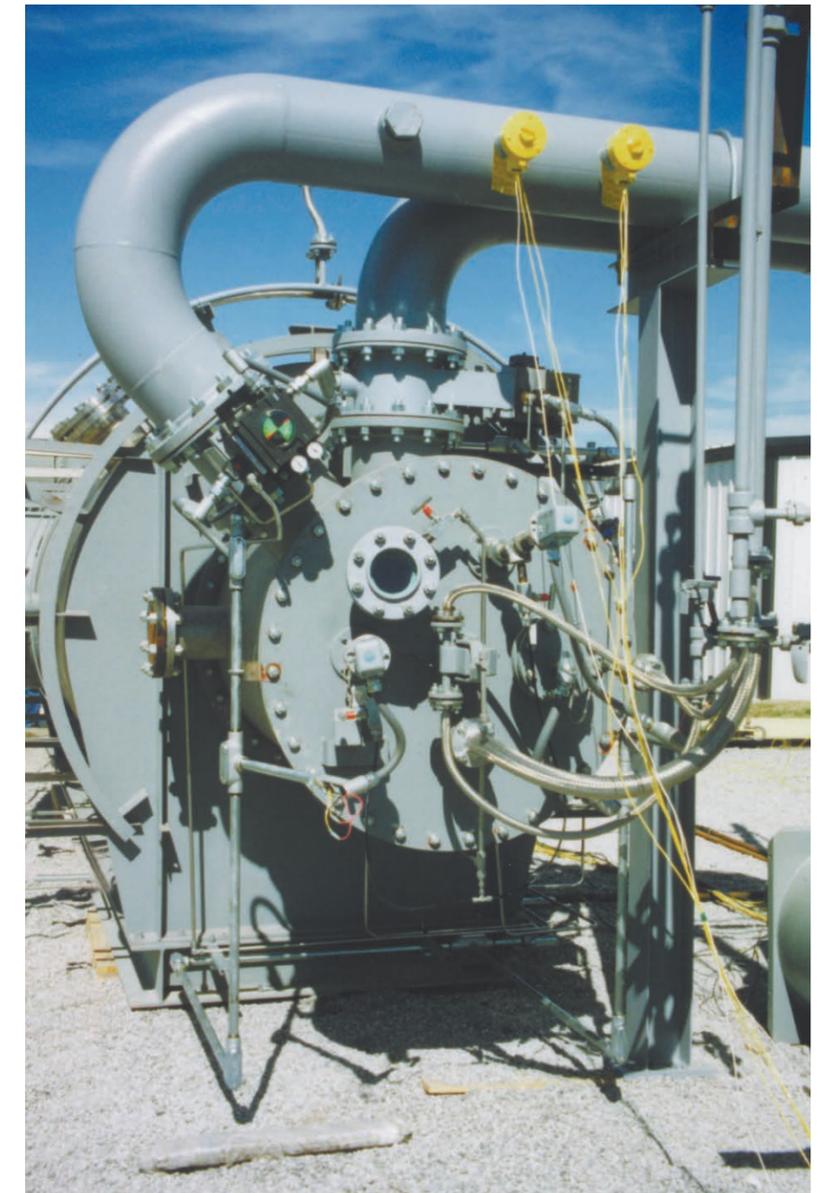
Quality assurance and customer satisfaction are our top priorities. Each step of a project is reviewed to meet or exceed our customers' requirements and standards. Where applicable, equipment is pre-assembled and tested. Fabrication is accomplished either in-house or by certified, experienced, and our rigorous quality inspection program is evident 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 NOx horizontal deNOxider 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 improving training options, underscore our commitment to being the leader in the worldwide environmental and combustion industry.



Reducing furnace burner at our research facility



Honeywell UOP Callidus headquarters - Tulsa, Oklahoma. USA



Honeywell UOP Callidus combustion test facility - China



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

Global Coverage

Honeywell UOP Callidus reaches the global market through our headquarters located in Tulsa, Oklahoma, USA, with regional direct sales offices and independent sales representation around the world. Meeting our customers' expectations and setting the standards for the combustion industry have always been our goals. Each burner, flare, thermal oxidizer and catalyst system we design and manufacture is built with those goals in mind.

Test Facility

Honeywell UOP Callidus' test facilities in the U.S. and China are used for combustion technology research and development, as well as for customer demonstrations. Our array of test systems allow us to closely match actual field operating conditions, providing results that will more accurately predict actual measured performance.

In Addition to Oxidizer Systems, Honeywell UOP Callidus Offers:

- Ultra-low NO_x burners
- Flares, flare systems and flare gas recovery systems
- Thermal oxidizer systems
- Field services and parts
- CFD Modeling
- Training and schools

ISO 9001:2008 Certification



USA Certification



China Certification

High-Performance Combustion Solutions
Service – Parts – Installation

Contact us—we're here to help.

CallidusHelp@Honeywell.com

For more information

For more information, please visit www.callidus.com to find a local sales representative

Corporate Headquarters Callidus Technologies

7130 South Lewis Ave.
Suite 335
Tulsa, Oklahoma. 74136
Tel: +1-918-496-7599
www.callidus.com



UOP7326-7
March 2016
Printed in U.S.A.
© 2016 UOP LLC. All rights reserved.

