



# NITROGEN BEARING WASTE

## Thermal Oxidizer



COMBUSTION AND ENVIRONMENTAL SOLUTIONS.  
PURE AND SIMPLE.®

BURNERS

FLARES

INCINERATORS

PARTS & SERVICE



# NITROGEN BEARING WASTE Thermal Oxidizer

## Opportunity NO<sub>x</sub>.

Zeeco is the world leader in ultra low-NO<sub>x</sub> combustion solutions. For decades, our engineers have custom designed Nitrogen Bearing Waste Thermal Oxidizers for petrochemical plants, petroleum refineries, carbon fiber manufacturers, and electronics companies. At this very moment, our combustion systems are eliminating hazardous waste and minimizing environmental emissions in all corners of the globe.

Nitrogen Bound Waste Thermal Oxidizers are incineration systems that treat gaseous and liquid wastes comprised of nitrogen bound compounds such as ammonia and cyanide. High-temperature incineration of nitrogen-bound wastes in an oxidizing (excess-air) environment produces unacceptable levels of nitrogen oxides (NO<sub>x</sub>).

To limit the formation of NO<sub>x</sub>, Zeeco employs a multi-stage low-NO<sub>x</sub> incineration process. Our propriety design sets the standard for low-NO<sub>x</sub> thermal oxidation systems.

## Tougher requirements, lasting solutions.

Our Combustion Research and Test Facility is considered one of the best on the planet, and was the first in the world to become ISO 9001-2000 certified. Our staff continually strives to stay ahead of rapidly changing environmental emission requirements, while exceeding our customers' expectations for quality and long-lasting performance.

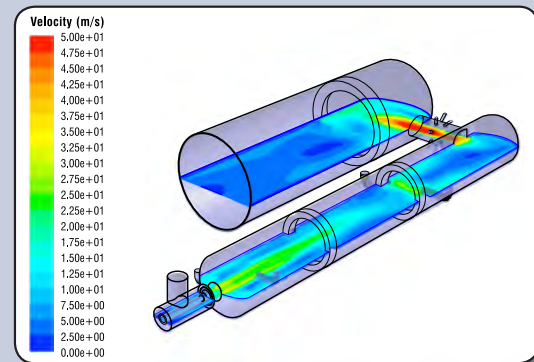
With 15 full-scale combustion test furnaces, Zeeco is capable of testing a wide variety of combustion systems under simulated field conditions. We have multiple liquid and gaseous fuels available to enable us to simulate virtually any specified fuel under specific process conditions. A multi-stream incineration system allows us to test the most complex situations in a controlled environment. Zeeco is also equipped to demonstrate a full range of burner and flare equipment, including process

burners, boiler burners, and all manner of flaring equipment including a wide variety of smokeless technologies.

## Computational Modeling

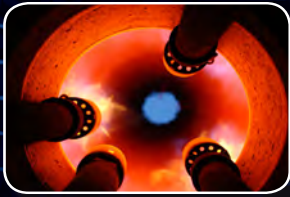
Zeeco combines advanced Computational Fluid Dynamics (CFD) capabilities with our extensive experience in the design, fabrication, and operation of combustion equipment to ensure optimal performance. By modeling our client's specific process conditions against the actual equipment design, CFD lets us predict what we cannot otherwise see or anticipate, rather than relying only on past experience and traditional design rules.

*ZEECO CFD Model*



*ZEECO Combustion Research and Test Facility*





*ZEECO GLSF Ultra-Low NOx  
Free-Jet Burner*



## **The Zeeco difference.**

Our only business is the combustion business. By concentrating on what we do best, Zeeco has grown into a worldwide leader in combustion solutions. We are a privately held company whose ownership stays highly involved in daily operations, with upper management comprised of the world's leading combustion experts.

When you call Zeeco, we answer. When you make a request, you get a quick, efficient response. We are lean and efficient, able to make decisions quickly, without bureaucracy and red tape. Our sales, engineering, and purchasing groups work hand-in-hand to deliver highly competitive quotes and heroic turnaround times. We stand ready and willing to travel anywhere in the world to discuss upcoming projects firsthand, and to ensure that every existing project runs seamlessly.

## **Choose Zeeco.**

Choose to work with our dedicated, flexible, and innovative team, and you won't be disappointed. Call or email us today to request a quote or to learn more about our proprietary combustion systems.

*ZEECO Nitrogen Bearing Waste Thermal Oxidizer*



*ZEECO facility on 250 acres (1 km<sup>2</sup>)*

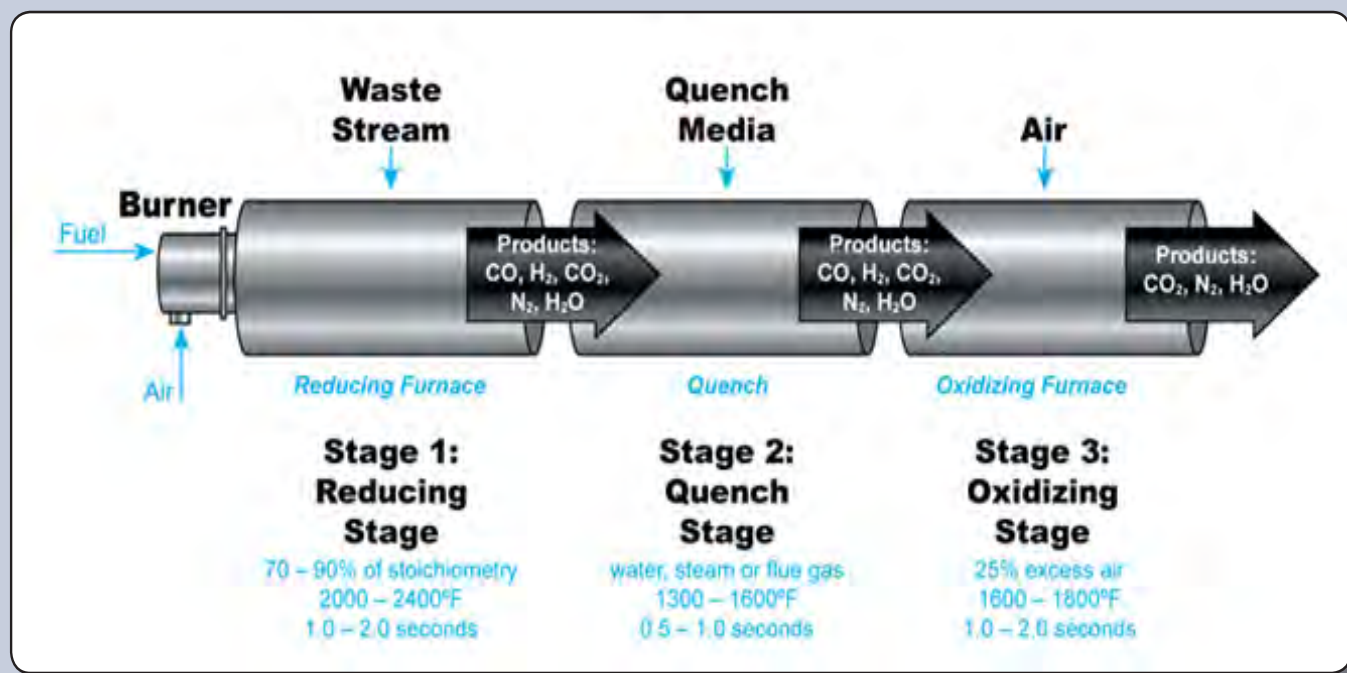






*Zeeco's automatic control and instrumentation systems assure equipment operations are conducted in a safe and controlled manner.*

*ZEECO's three-stage thermal oxidation process for Nitrogen Bound Waste*



### Stage One: Reduction Furnace

The first stage typically involves burning waste and fuel together in a reducing environment (e.g. with less than the stoichiometric requirement of oxygen) at a controlled temperature at or above 2000-2400°F (~1100-1300°C) and a residence time up to 2.0 seconds. This high temperature environment and sub-stoichiometric oxygen levels cause the compounds containing bound nitrogen to dissociate, eventually producing free nitrogen. Due to the supply of sub-stoichiometric oxygen, combustibles including carbon monoxide (CO<sub>2</sub>) and hydrogen (H<sub>2</sub>) exist in the Stage One effluent.

### Stage Two: Quench

The second stage cools the Stage One effluent to a lower temperature that ranges between the NO<sub>x</sub> formation threshold temperature and the auto-ignition temperature of the flue gas. The residence time in the second stage typically ranges from 0.5-1.0 seconds. An inert cooling medium, such as water, steam, or recycled flue gas, is introduced in this zone to achieve these temperatures, which typically range from 1300-1600°F (~700-870°C).

### Stage Three: Oxidation Furnace

The third stage oxidizes the combustibles in the now-quenched Stage Two effluent. The combustibles that are oxidized in stage three include CO<sub>2</sub>, H<sub>2</sub>, and any remaining hydrocarbons which cannot be released untreated into the atmosphere. In order to complete the combustion process, supplementary air is introduced to the cooled flue gas so that the remaining combustibles oxidize prior to atmospheric discharge. The operating temperature at this final stage is typically limited to 1800°F (~980°C) and residence time in this final stage is usually 1.0-2.0 seconds.



*ZEECO® high energy pilot burners are fully tested to ensure reliable long term operation in severe service, and can even be ignited and fired while completely submerged underwater.*



## Typical Performance

- NO<sub>x</sub> emissions for Nitrogen Bound Waste Streams <100 ppm (vd)
- Waste Destruction Efficiency (DRE) > 99.99% (available up to 99.9999%)

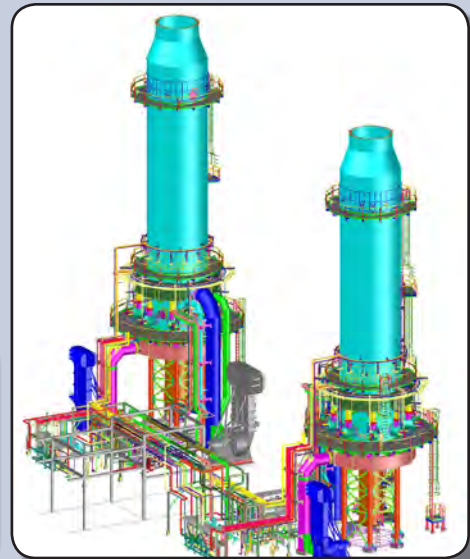
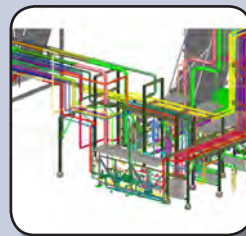
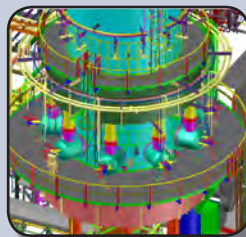
## Typical Applications

- Petrochemical applications involving Amines, Nitriles, etc.
- Ammonia and/or Cyanide Vapors
- Sulfur Recovery Units: Sour Water Stripper (SWS) Gas Overhead Streams
- Carbon fiber manufacturing LT/HT Off-Gas streams
- Electronics manufacturing vent streams

## Proprietary Design Features:

- Guaranteed predictable emissions performance
- Proper re-ignition in oxidizing stage
- Burner combustion air is efficiently separated from waste combustion air for optimal control
- Dependable process control and long-term reliability

### ZEECO Project Modeling







**BURNERS**



**FLARES**



**THERMAL OXIDIZERS**



**PARTS & SERVICE**



**COMBUSTION AND ENVIRONMENTAL SOLUTIONS.  
PURE AND SIMPLE.®**

**Zeeco Corporate Headquarters**  
22151 East 91st Street  
Broken Arrow, Oklahoma 74014 USA  
Phone: +1.918.258.8551 Fax: +1.918.251.5519  
E-mail: sales@zeeco.com

[zeeco.com](http://zeeco.com)



*CERTIFICATIONS APPLY TO ZEECO HEADQUARTERS.*

ZEECO® is a registered trademark of Zeeco, Inc. in the U.S.  
● ZEECO office, affiliate, sales, representative, or third party representative/licensee offices.  
© 2011 COPYRIGHT ZEECO, INC. ALL RIGHTS RESERVED

