Honeywell UOP | Callidus Catalyst Systems

Catalyst Systems
for Industrial
Applications

Complete Solutions to Reduce NO_x and CO Levels

Reduce NOx and CO Levels for New and Retrofit Industrial Applications

Honeywell UOP Callidus offers total emission control systems for new or retrofit applications, anywhere in the world. From Selective Catalytic Reduction (SCR) systems to Computational Fluid Dynamic (CFD) modeling and our patented ammonia injection and mixing technology, our state-of-the-art technology and designs offer industry leading efficiencies and help minimize your capital and operating expenses. Our total package solution includes process gas conditioning, emission reduction, and post process gas heat recovery. We also provide system installation startup and support for those who desire an end-to-end solution.

Reduce NOx and CO from a range of sources with SCR

Our deep process knowledge of SCR means you gain an industry leading solution for reducing NOx and CO, but you also gain peace of mind. From process gas conditioning to ammonia vaporization and catalyst selection, you can rest assured that our experts understand all aspects of SCR processes to help you make the best decisions for your facility. Our experience in mechanical, electrical, chemical, process, structural and project engineering, as well as CFD modeling, helps us deliver a custom solution to meet your requirements and exceed your expectations.

SCR is available for a range of applications:

- Heater applications
- Chemical applications
- Retrofit Catalyst Systems
- Thermal Oxidizers

Total NO_X Control

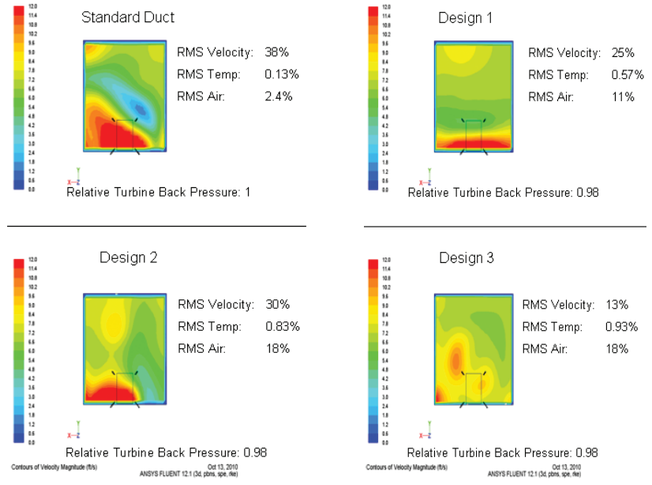
Honeywell UOP Callidus can provide both combustion and post combustion systems in combination to address your total NO_X control. We are your one stop shop for burner and thermal oxidizer technology, combined with catalyst technology.

Process Gas Conditioning CFD Modeling

Providing leading edge SCR performance begins with understanding the process exhaust emissions. We recognize that different processes generate different exhaust conditions, and that these process emissions are also subject to change based on various operating parameters.

Our design philosophy is to create catalyst systems that accommodate a variety of inputs and operating parameters. Our experience in CFD modeling combined with Six Sigma evaluation methods allows us to create robust designs that condition the variable process inputs to achieve:

- Even flow distribution
- Even velocity distribution
- Even temperature distribution



All designs shown utilize the same pad space.
Thermal and flow computer simulations are used in each system we design.

Computational Fluid Dynamic (CFD) Modeling

- Dedicated, in house CFD modeling since 1993
- More than 32 years of combined CFD modeling experience
- More than 500 simulations of actual fielded equipment
- 1048 Core Cluster offers:
  - More accurate models
  - Reduced run-time, faster turn-around
  - Four different Solver technologies
- Intelligent meshing
- Validation against industrial scale data from our world-class test and R&D facility

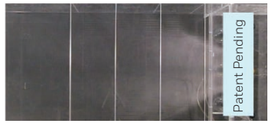
Superior mixing and distribution of ammonia in SCR applications

Honeywell UOP Callidus' experience in flow and mixing for industrial combustion processes is unparalleled. Our field-proven patented ammonia injection grid (AIG) technology provides superior mixing and distribution of ammonia in SCR applications. Our High Performance Mixing (HPM) technology can:

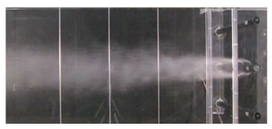
- Improve NO_X reduction
- Reduce ammonia slip
- Extend catalyst life

Reagent injection is tailored to meet the specific application. Some application configurations provide an opportunity to directly inject the reagent into the existing process ducting, while other applications utilize a separate skid mounted vaporizer to prepare the reagent to be injected into the process using carrier air and ammonia injection grid. Let us evaluate your system design to select the most reliable and cost-effective injection options.

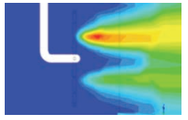
Honeywell UOP Callidus HPM Design



Our proprietary ammonia injection grid (AIG) design produces 5.2% RMS at three feet



Cold flow modeling of ammonia injection grid High Performance Mixing technology



High performance AIG, direct injection of anhydrous ammonia, direct vaporization of aqueous ammonia.

Catalyst Reagent:

Honeywell UOP Callidus can provide several reagent options for use in NOx reduction including:

- Aqueous ammonia
- Anhydrous ammonia
- Urea

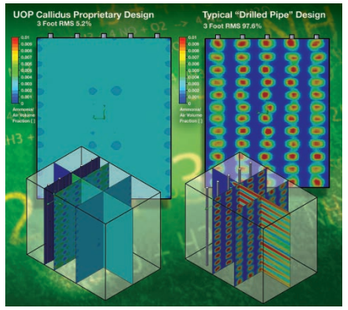
Process Pre-and Post-Conditioning:

- Process stream heating (gas fired, electric, steam)
- Process stream filtration (cyclone, fabrid filter house)
- Process heat recovery (air-to-air heat exchanger, economizer, boiler)

Acoustic Attenuation Technology:

When required we can provide sound attenuation technology that reduces break-out noise resulting in:

- Equipment weight savings (reduced shipping weight, reduced foundation loading)
- Reduction of downstream stack baffles
- Lower pressure drop than conventional baffle designs



Honeywell UOP Callidus' proprietary ammonia injection grid (AIG) design produces 5.2% RMS at three feet cold flow modeling of ammonia injection grid High Performance Mixing technology

Modular Design Delivers More Value:

Honeywell UOP Callidus leverages our global experience in field assembly to provide efficient modular designs that reduce overall project costs. Our modular design with bolted flange connections:

- Reduces shipping costs
- Reduces assembly time in the field
- Reduces field welding
- Utilizes lower cost field labor

Control Integration:

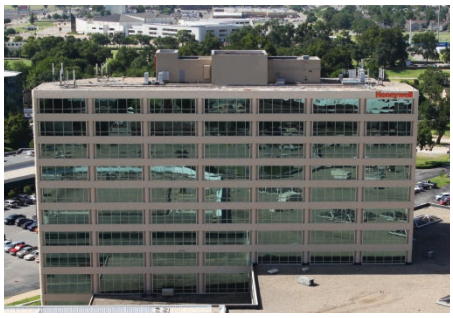
Complete integration of the SCR controls with other plant systems can provide improved visibility to plant operators. As a member of the Honeywell family, we offer broad capabilities to integrate SCR controls with:

- Plant DCS
- CEMS equipment
- DARS reporting software

Reactor Design

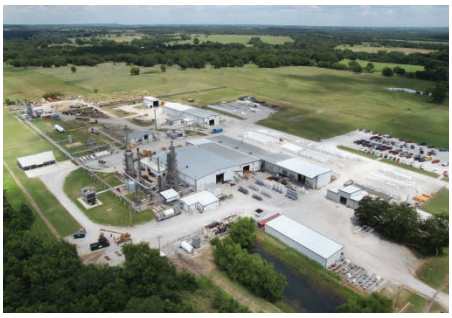
We design single and multiple stage reactors to address your specific combination of input concentration and required destruction efficiency.

- Single stage < = 95% destruction efficiency
- Multi stage > 95% destruction efficiency
- Temperature ranges from 450°F to 1050°F
- Low to high particulate



Honeywell UOP Callidus headquarters - Tulsa, Oklahoma. USA

Honeywell UOP Callidus' R&D and Test Center in China



Honeywell UOP Callidus' R&D and Test Center in China

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 Catalyst 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

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