



SCR SYSTEMS FOR THE POWER
AND PROCESS INDUSTRIES

Selective Catalytic Reduction and Catalytic Oxidation

Reducing NO_x and CO levels for simple-cycle systems, heat recovery steam generators, package boilers, and thermal oxidizers.

Callidus Technologies by Honeywell delivers technically superior emission control products and services to the power, petrochemical, and refining industries. Our Selective Catalytic Reduction (SCR) products utilize state of the art CFD modeling, engineering, and fabrication techniques. We offer total solutions for the power industry: SCR, CEMS, DARS and DCS. We also offer equipment for new and retrofit applications such as: duct burners, ammonia vaporization skids and ammonia injection grids. International fabrication and service capabilities meet your needs around the world.

Selective Catalytic Reduction (SCR) technology overview:

Callidus Technologies by Honeywell understands all aspects of SCR processes including: turbine exhaust gas conditioning, ammonia vaporization, ammonia injection and mixing, catalyst selection, acoustic attenuation and related process control integration. Callidus Technologies draws upon vast experience in mechanical, electrical, chemical, process, structural and project engineering as well as computational fluid dynamic (CFD) modeling and other technical disciplines to design custom solutions that exceed customer requirements.

Catalytic Oxidation for:

- Simple-cycle Systems
- Retrofit Catalyst Systems
- Thermal Oxidizers

In Addition to Catalyst Systems, Callidus Technologies Offers:

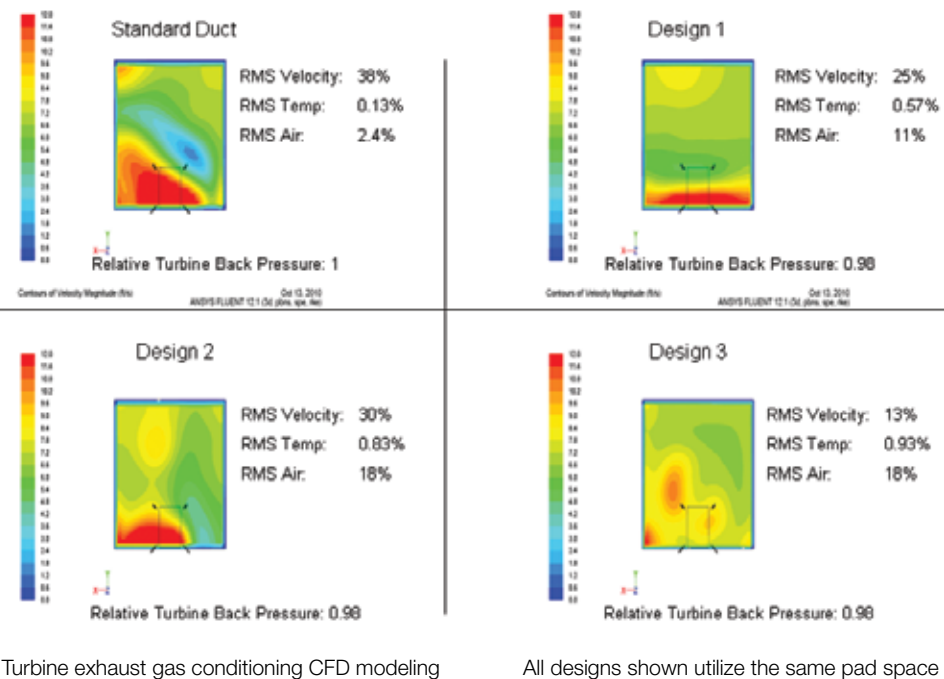
- Ultra-low NO_x Burners
- Flares and Flare Systems
- Thermal Oxidizer Systems
- Vapor Control Systems
- Field Services and Parts
- CFD Modeling
- Training and Schools

Turbine Exhaust Gas Conditioning:

Providing leading edge SCR performance begins with understanding turbine exhaust emissions. We recognize that different turbines provide different exhaust profiles, and that these individual turbine profiles are also subject to change based on various operating conditions. Our design philosophy is to create SCR systems which

accommodate a wide variety of exhaust profile inputs and operating conditions. Our experience in CFD modeling combined with Six Sigma evaluation methods allows us to create turbine independent designs that modify turbine exhaust profiles to achieve:

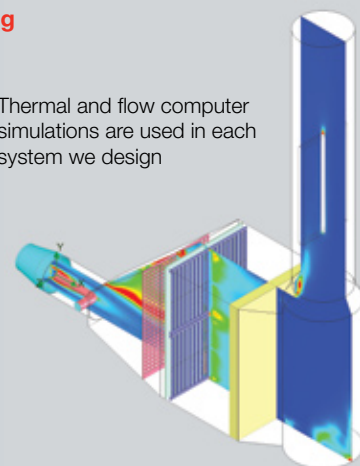
- Even flow distribution
- Even velocity distribution
- Even temperature distribution



Computational Fluid Dynamic (CFD) Modeling

- Dedicated In-house CFD since 1993
- Over 32 man years of modeling experience
- Over 500 models created
- Currently modeling 16 to 25 per year
- Currently have access to over 300 CPU cores
- Allows for more complex models
- Reduced run-time, faster turn-around
- 4 different solver technologies available
- Primarily use Ansys/Fluent

Thermal and flow computer simulations are used in each system we design



Ammonia Vaporization:

Callidus uses a proprietary method that utilizes turbine exhaust to provide the heat required to vaporize the aqueous ammonia.

- Allows for fast startup (< 10 minutes)
- Reduces parasitic load of conventional electric heat vaporizing systems
- Reduces oxidation of ammonia to NO_x during vaporization

Ammonia Injection Grid (AIG):

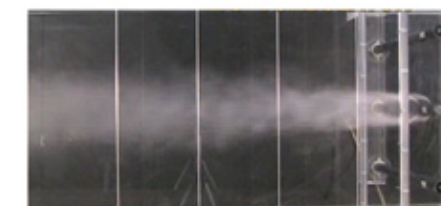
Our experience in flow and mixing for industrial combustion processes is unparalleled. Our field proven patent pending ammonia injection grid (AIG) technology provides superior mixing and distribution of ammonia in SCR applications. Our High Performance Mixing (HPM) technology can:

- Improve NO_x Reduction
- Reduce Ammonia Slip
- Extend Catalyst Life

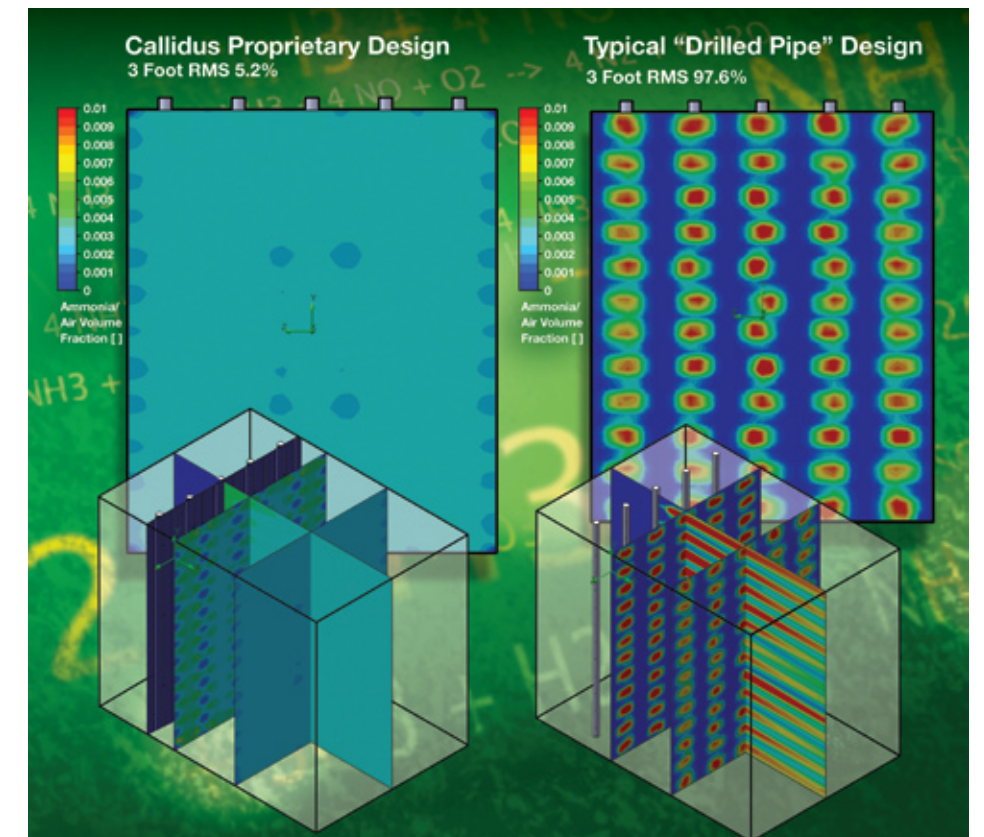
Callidus HPM Design



Compared to Typical "Drilled Pipe"



Cold flow modeling of ammonia injection grid High Performance Mixing technology



Callidus proprietary ammonia injection grid (AIG) design produces 5.2% RMS at 3 feet

Acoustic Attenuation Technology:

Callidus is evaluating a proprietary sound attenuation technology that reduces break-out noise without the need to increase wall panel thickness resulting in:

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

Modular Design Features:

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

- 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, Callidus Technologies offers broad capabilities to integrate SCR controls with:

- Plant DCS and turbine controls
- CEMS equipment
- DARS reporting software



Callidus headquarters - Tulsa, Oklahoma. USA

Global Coverage

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.

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Advanced Manufacturing and Fabrication Capabilities

Our fabrication facilities employ the latest manufacturing practices and equipment. As a global leader in the combustion technology market, much of our fabrication occurs in strategic locations around the world. This approach makes good economic sense, and provides our customers the best value for their combustion system.



Callidus Fabrication Facility in China



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

Quality In Everything We Do

Our manufacturing facility demonstrates the highest quality standards in the industry. In some cases, many of our internal quality assurance programs require higher performance standards than some industry certifications. Callidus fabrication and manufacturing are certified ISO 9001:2008 in USA and China.

ISO 9001:2008 Certification



USA Certification

China Certification

At Callidus, quality assurance is everyone's job. Every step of the project is consistently reviewed to ensure that we live up to the expectations of the customer.

R&D Test Facility

The Callidus, 290 acre, R&D 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.

