

CECO CCA



COMBUSTION AND DeNO_x SYSTEMS FOR INDUSTRIAL AND UTILITY BOILERS

CECO
ENVIRONMENTAL

CECO Environmental is your partner for equipment and environmental protection. Our team eliminates nitrogen oxide (NOx), carbon monoxide (CO) and volatile organic compounds (VOCs) 24 hours a day, 7 days a week, 365 days a year. We work with industry leaders in power generation, oil and gas and industrial manufacturing to reduce and eliminate air pollutants. We take pride in helping our customers solve complex challenges, providing a more efficient process that protects our shared environment.

OVER
150
YEAR
LEGACY

19
HERITAGE
BRANDS

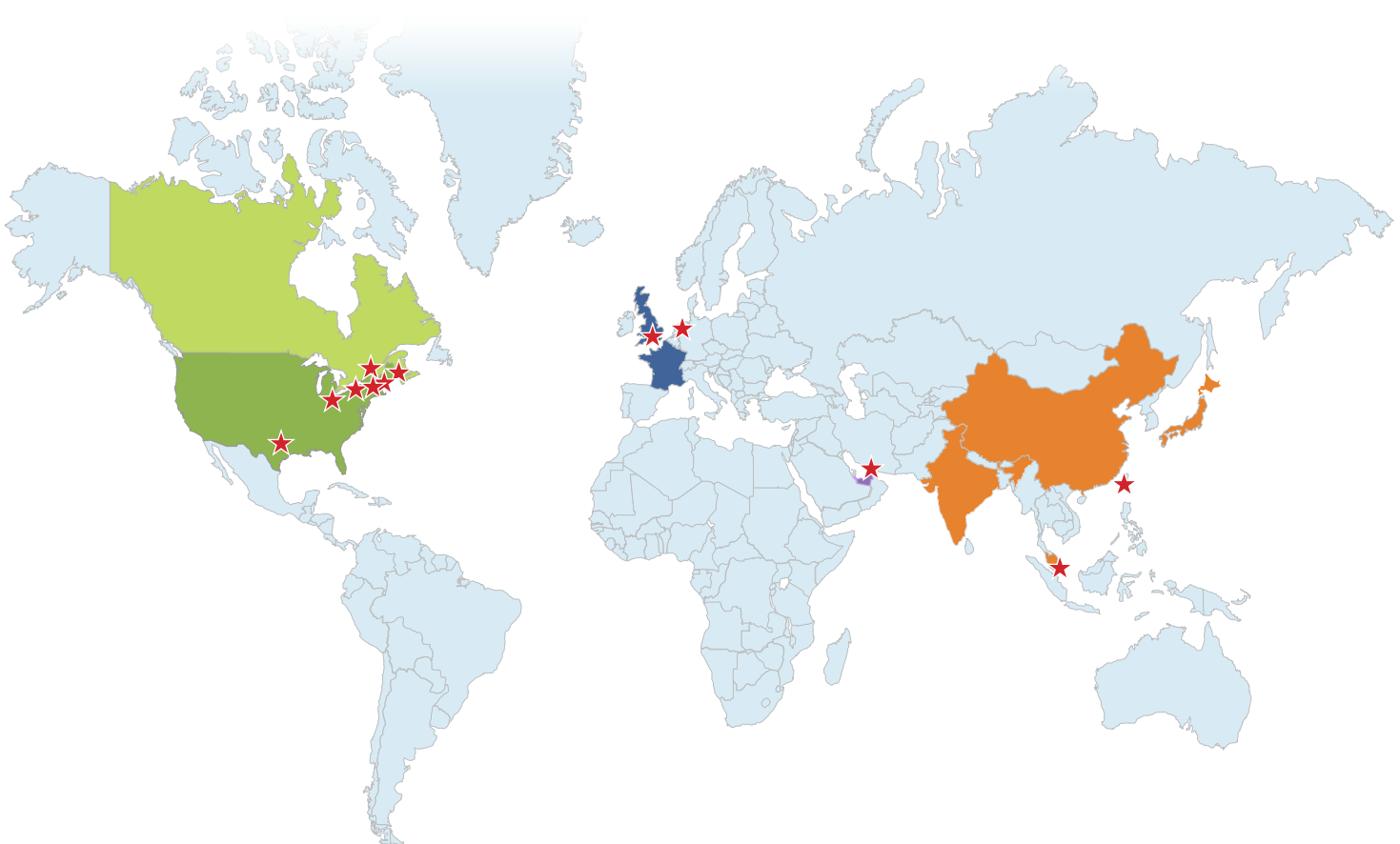
30+
INDUSTRIES
SERVED

28 CORE
TECHNOLOGIES

221
PRODUCTS
WORKING TO
IMPROVE THE WORLD

CECO CCA takes pride in providing premium, high-efficiency combustion and emissions control systems that boast unrivaled performance and impressively low emissions for its customers. CECO CCA's exclusive technologies reduce nitrogen oxide (NOx), particulate matter, unburned carbon and carbon monoxide emissions to safe, appropriate levels for facilities around the globe.

CECO Environmental leads a global suite of energy brands that increase plant efficiency. We manufacture an arsenal of technologies to enable equipment and environmental protection.

CECO Aarding**CECO Burgess-Aarding****CECO CCA****CECO Effox-Flextor****CECO Peerless**

CECO CCA designs turnkey solutions for the international utility and industrial power industry.

- Over 40 years of experience
- Thousands of successful installations and millions of hours of engineering excellence
- Expertise from concept through commissioning stages
- Experienced in technology, process engineering and turnkey solutions
- Worldwide delivery capability and vast network of local/regional/global partners
- Global presence, multi-cultural teams with localized approach to attain clean, safe, efficient and sustainable solutions within budget and schedule

CECO CCA COMBUSTION SYSTEMS

CECO CCA'S TECHNOLOGIES HAVE BEEN INSTALLED ON HUNDREDS OF STEAM GENERATORS WORLDWIDE RANGING IN SIZE FROM 10 MW (25,000 LB/HR STEAM GENERATION) TO 800 MW, AND ON THERMAL OXIDIZERS AND DRYERS.

CECO CCA Combustion Systems, founded in 1980, is a global industry leader in the engineering, design, development, testing, and manufacturing of high-efficiency, low-emission combustion and emissions systems for industrial and utility boilers. CCA Combustion Systems offers a unique combination of engineering expertise, on-site experience, and proprietary technology. Our experience and wide range of solutions will help you efficiently and reliably meet your operational and emissions.

Solutions suite:

- Low-NOx burners (LNB)
- Selective catalytic reduction (SCR) systems
- Selective non-catalytic reduction (SNCR) systems
- Overfire air (OFA)
- Flue gas recirculation (FGR)
- Combustion tempering (CT)
- Rich reagent injection (RRI)



COMBUSTION SYSTEMS FEATURING LOW-NO_x BURNERS (LNB)

CECO CCA low-NO_x burners (LNB) are configured to stabilize the combustion process and allow the unit to operate safely throughout the load range. CCA low-NO_x burners are engineered to provide stable combustion with high turndown, low NO_x and CO and ease of maintenance.

Benefits:

- Low total cost of ownership
- High-efficiency NO_x reduction of up to 50%
- Extends burner life
- Reduces fly ash carbon losses and LOI
- Lowers excess air levels and maintains the lowest possible emissions (at maximum and minimum loads)

Applications:

- Utility power boilers - wall-fired, T-fired
- Package boilers
- Recovery boilers - startup and auxilliary fuel burners
- Burner heat capacity - 25 MMBtu/hr to 300+ MMBtu/hr

Fuels:

- Any combustible gaseous or liquid fuel
- Natural gas, refinery gases, propane, hydrogen, landfill/digester gases
- Process-off gases and liquids
- Hazardous waste gases and liquids
- Heavy fuel oil
- Ultra heavy fuel oils (pitch/bitumen)
- Light fuel oils, kerosene
- Biomass (wood, nut shells, etc.)



Our combustion control technologies reduce nitrogen oxide (NO_x), particulate matter (PM), unburned carbon, and CO emissions at various types of combustion facilities, including **utility power plants, pulp and paper mills, chemical plants, oil refineries, ethanol plants and marine vessels.**



SELECTIVE CATALYTIC REDUCTION (SCR)

CECO CCA's patented Direct Injection SCR System is an innovative delivery, metering and injection system designed to reduce NOx and CO emissions using substantially less auxiliary load compared to a traditional SCR system.

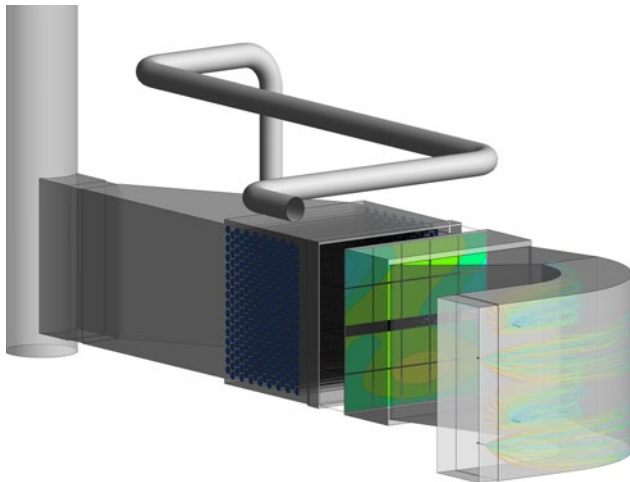
Our CCA brand TRIM-NOx® XL SCR injection module automatically injects a urea or ammonia-based reagent into the exhaust gas of a boiler, furnace, turbine or IC engine to reduce NOx emissions. Each module is engineered to optimize efficiency, performance and reliability while meeting stringent environmental standards.

Features:

- Eliminates the need for vaporization equipment such as fans and electric heaters
- CCA specializes in safer alternatives to ammonia (e.g. urea-based SCR)

Benefits:

- Efficient NOx and CO reduction of 95%+
- Reduces capital and operational costs by as much as 60%
- Less equipment means less maintenance costs and reduced down time



DIRECT REAGENT INJECTION SCR SYSTEM PACKAGE



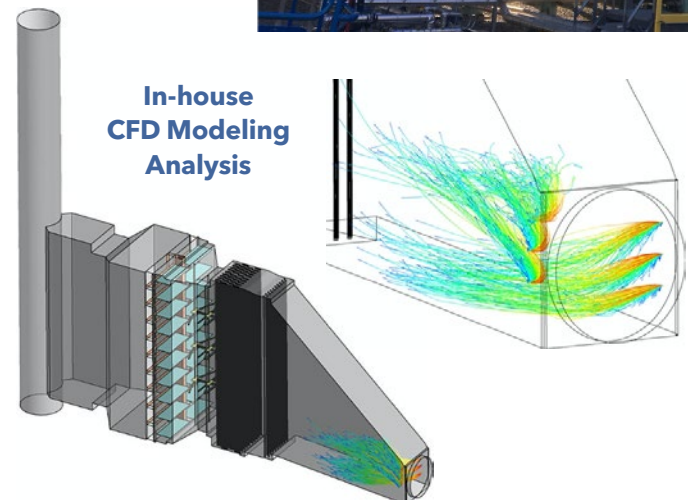
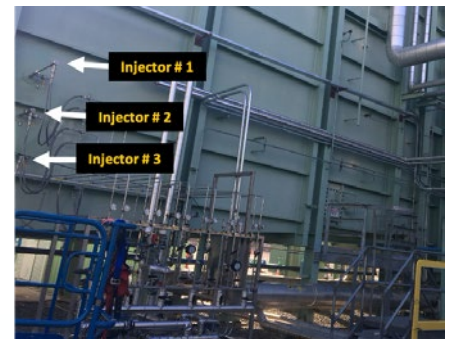
Modular Injection Skid



Ammonia/Urea Injector



Reagent Storage Tank



In-house CFD Modeling Analysis

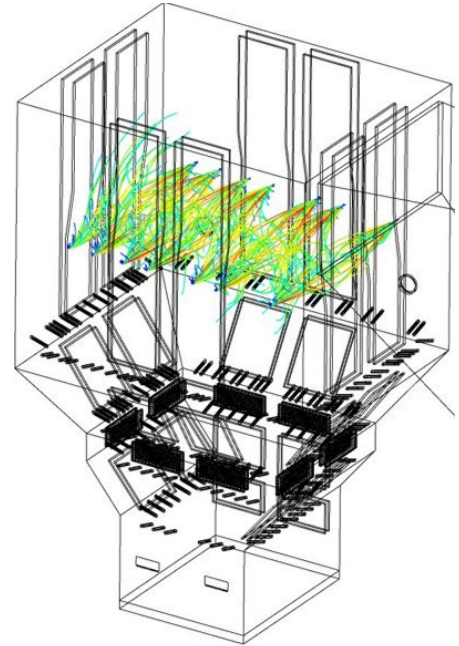
SELECTIVE NON-CATALYTIC REDUCTION (SNCR)

SNCR systems provide a low-cost technique to reduce NOx emissions by 30%-75% for boilers, furnaces and kilns.

The SNCR process involves injecting a reagent into the flue gas in the appropriate temperature window. The reagent reacts with NOx to form harmless nitrogen and water. The design, arrangement, and location of the reagent injectors are critical to the performance of the SNCR system. Our advanced technology utilizes variable droplet size control and automatic tilting injectors based on furnace temperature, to enhance the NOx reduction performance.

Benefits:

- Low total cost of ownership
- High-efficiency NOx removal, providing 30%-75% reduction
- Energy efficient
- Easy to retrofit with minimal downtime



SNCR SYSTEM PACKAGE

Features:

- Injection of urea or ammonia (mixed with air and water) into furnace section of field erected boilers
- NOx reduction reaction temperature window: 1,650-2,100 °F
- Optimum injector locations determined by CFD modeling of furnace and exhaust gas profiles
- CCA developed unique tilting injector design to improve efficiency and reduce equipment costs



Urea or Ammonia Pump Skid



SNCR Injectors



Injection Distribution Module



Reagent Storage Tank

ADVANCED ENGINEERING SOLUTIONS

EXPERT ON-SITE ENGINEERING AND TECHNICAL SUPPORT

CECO CCA is your expert in assessing, troubleshooting, testing and tuning your combustion and emissions control systems. CECO CCA's TWIC certified, experienced engineers can perform a wide range of services on utility boilers, industrial boilers, package boilers, turbines, HRSG's, recovery boilers, thermal oxidizers and auxiliary equipment.

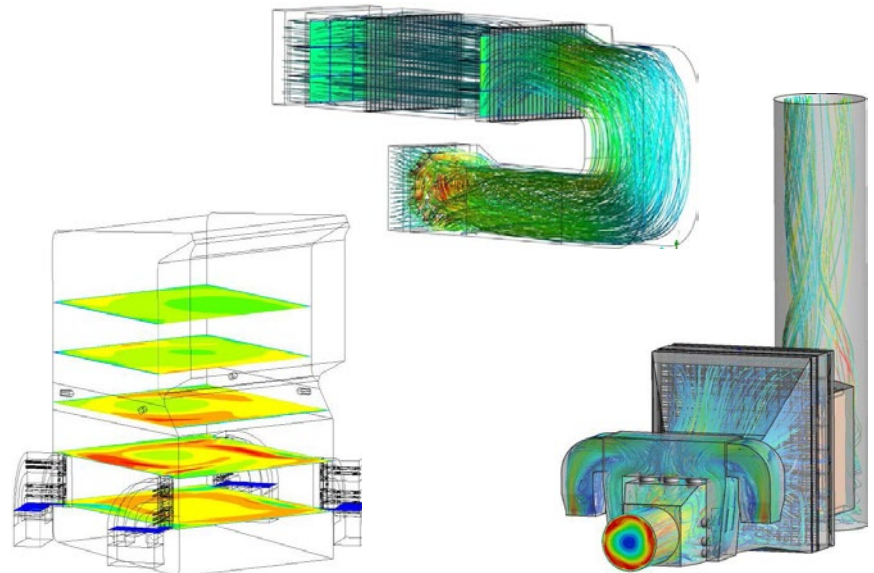
Services:

- CFD modeling and flow analysis
- Emission engineering and consulting
- Long-term service agreements
- On-site technical advisory engineers/technicians
- Operator training
- Combustion optimization services
- Parts
- PLC programming and support
- Systems support
- Engineering assessments
- Equipment upgrade ROI analysis



ON-SITE ENGINEERING SERVICES AND ASSESSMENTS

<p>MOBILE EMISSIONS TESTING TRAILERS</p>
<p>FUEL AND AIR BALANCING</p>
<p>FIELD TEST OPERATIONS ON ALL TEST COMBUSTION SYSTEMS</p>
<p>FURNACE TEMPERATURE AND EMISSIONS MAPPING</p>





The overall goal of an SCR or SNCR system is to reduce the NO_x generated by a combustion source, such as boilers, gas turbines, or engines. The SNCR process is a higher temperature process that does not require a catalyst, but is slightly less efficient. The SCR process uses a catalyst to reduce NO_x more efficiently at lower temperatures. Safety, availability, environment and cost are all factors when choosing a system that utilizes either aqueous ammonia, anhydrous ammonia or urea as a reagent.

CECO IS YOUR PARTNER FOR EQUIPMENT AND ENVIRONMENTAL PROTECTION.

CECO Environmental's suite of energy solutions, including our patented EDGE® Ammonia Injection Grid (AIG) and RASCR™ Vaporizer Skid, in conjunction with our dampers, silencing and combustion technology, will help you optimize your facility and avoid unnecessary maintenance costs and downtime.



CECO Aarding and CECO Burgess-Aarding

CECO Aarding and CECO Burgess-Aarding provide customized solutions based on a proven track record in design, engineering and manufacturing of gas turbine exhaust systems and acoustical systems. Both new systems are provided as well as upgrades and retrofits.



CECO Peerless

CECO Peerless is a global leader in compact, engineered, high-efficiency, processing, separation, and filtration equipment, primarily serving the oil and gas production, gas pipeline transportation and power generating industries around the world.



CECO Effox-Flextor

With over 5,000 installations globally, CECO Effox-Flextor is the global leader in the design and manufacture of dampers and expansion joints for use in flue gas and process air handling systems. Our team includes a highly skilled staff of engineers, designers, fabricators and field service personnel to ensure the performance of your product solution.

Products and solutions:

- Dampers
- De-NOx solutions
- Expansion joints
- Gas turbine exhaust systems
- Low-NOx burners (LNB)
- Selective catalytic reduction (SCR systems)
- Selective non-catalytic reduction (SNCR)
- Separation-filtration technologies