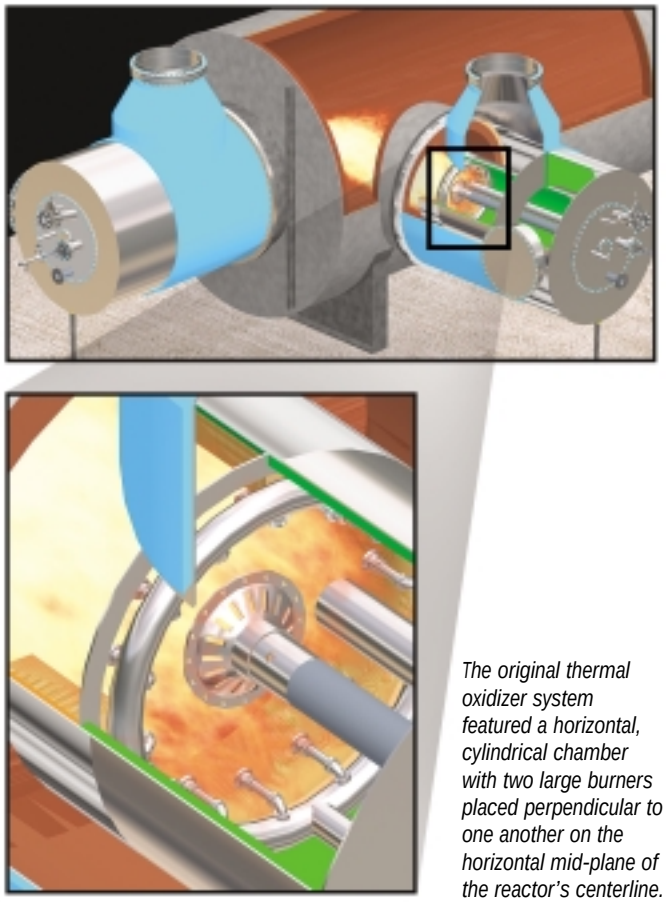
Case Study

3088

Custom Burner Design Installs in Record Time and Delivers Exceptional Emissions Reduction



The original thermal oxidizer system featured a horizontal, cylindrical chamber with two large burners placed perpendicular to one another on the horizontal mid-plane of the reactor's centerline.

The Situation

Engineers at an Alabama natural gas plant were faced with lowering the facility's total reduced sulfur (TRS) emissions to obtain a higher destruction removal efficiency (DRE). This was mandated in a consent decree from the Alabama Department of Environmental Management.

In October 2002, just three months before the state's compliance deadline, company personnel contacted John Zink Company, LLC engineers to analyze its thermal oxidizer system, which included two burners that were not meeting the sulfur plant's emission requirements. John Zink's engineers were asked to design a solution that would meet the company's DRE goal without requiring replacement of the entire thermal oxidizer vessel.

The delivery and installation schedules were crucial due to the approaching emissions compliance deadline and an upcoming scheduled shutdown at the plant in early December.

The Application

John Zink's engineers predicted the burners were no longer meeting the performance requirements because (1) the existing burners were damaged from age and/or previous upstream process upsets, or (2) process conditions had changed, reducing the tail gas flow and loading below the original design thereby altering the pressure drop and mixing characteristics of the system.

Upon inspection of the equipment, John Zink's engineers determined that the burners appeared to have sustained some damage. Flame patterns were not uniform and there were indications that the waste was not being properly mixed. Taking temperature readings along both sides and ends of the thermal oxidizer further supported this. The readings were not uniform for a given cross-section of the oxidizer, indicating that the internal flow and flames were not uniform. This indicated poor mixing within the unit.

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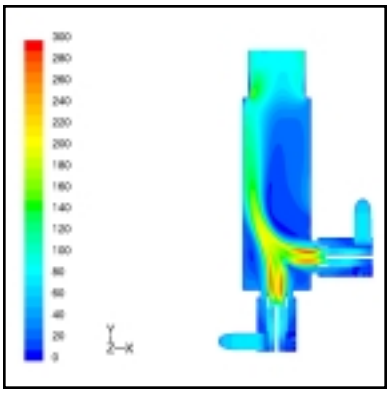
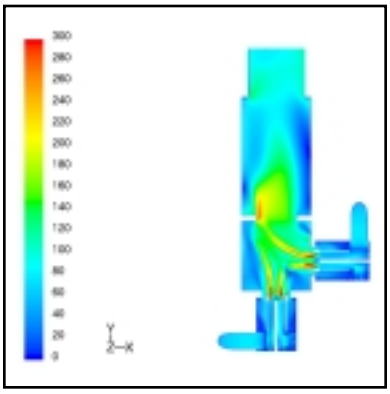


CFD modeling predicted the new burners would greatly improve the localized mixing, thus improving the overall destruction efficiency of the existing incinerator.



The mixing wall was predicted to improve the downstream uniformity of the resulting flow and temperature fields, and reduce the slip of acid gas from the side burner annulus.

The John Zink® Solution

John Zink's engineers proceeded with engineering design parallel to conducting Computational Fluid Dynamic (CFD) modeling. This tandem approach enabled them to deliver the new equipment almost one week before the scheduled shutdown.

The engineers used CFD modeling to analyze the system, identify the source of the performance problem, and design an optimal solution. They recommended replacing the original burners with new custom-built John Zink® burners, and installing a mixing wall inside the oxidizer chamber. They also conducted CFD modeling on the new burner design and mixing wall location to ensure the custom-burner solution would meet the plant's emissions-reduction goals upon initial startup.

The Result

The superior performance and reliable, cost-efficient operation of the John Zink® thermal oxidizer system provided the plant with a successful solution for economical, clean-air combustion.

- Exceeded the required DRE of TRS at maximum design conditions
- Optimized operation at lower temperatures
- Reduced fuel consumption by 750,000 scfd
- Increased profits from the sale of excess fuel
- Delivered equipment ahead of the fast-track schedule

John Zink thermal oxidizer systems are world-renowned for solving difficult emissions control projects with structural design challenges, hard-to-destroy wastes and complex project requirements.

For more information about thermal oxidizer systems and CFD modeling, contact the clean combustion experts at John Zink Company today.

AMERICAS	ASIA-PACIFIC	EUROPE
+1-918-234-1800 800-421-9242	+81-3-5435-8551	+352-518991

www.johnzink.com

11920 East Apache, Tulsa, OK 74116

Voice: +1-918-234-1800 • Fax: +1-918-234-2700

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