

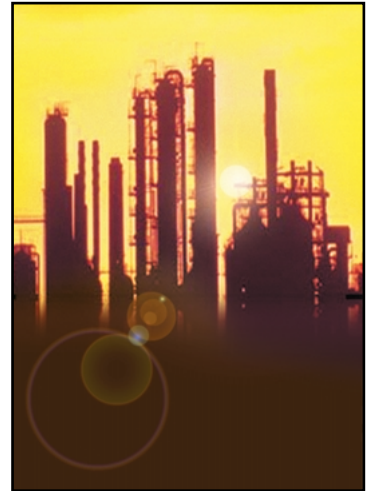
Who in the World is Clearing the Air About Ultra-Low Emissions?

Ask some of the largest names in global industry, and they'll tell you John Zink®. For more than 70 years, Zink® has developed proven combustion solutions that are as environmentally focused as they are economically driven. Now, we've set a whole new standard in clean combustion with intelligent fired equipment, breakthrough technologies and practical innovation. *But that's just part of the story.*

Today, John Zink Company is all about creating long-term value by helping our customers optimize every inch of their combustion systems.

Remarkably clean, remarkably efficient. Remarkable value.

John Zink. Now, that's smart thinking.



THE CHALLENGE:

Equilon Enterprises' Bakersfield Refinery needed to reduce NOx emissions to less than 30 ppm in the refinery's hydrogen reformer, which was fired by 320 burners supplied by another company. John Zink Company was selected to develop and implement a cost-effective solution for reducing NOx to meet compliance of <30 ppm and optimizing total burner performance.

THE APPLICATION:

The heater is a very large, single cell, steam methane reformer with 320 radiant wall burners fueled with refinery fuel gas. This particular type of furnace operates under extreme temperatures, commonly above 2,000° F. Heat release per burner was 750,000 Btu/hr. The engineers at John Zink Company retrofitted the burners with the furnace online so that no production would be lost during the retrofit.

THE ZINK SOLUTION:

Tenacious problem solving has become a Zink hallmark over the years, and the Equilon Bakersfield project proved to be no exception. John Zink Company was commissioned to meet several ambitious objectives that relied on expertise in next-generation radiant wall burner technology. After completing a comprehensive evaluation of the heater, Zink engineers developed a prototype radiant wall burner to meet the challenging specifications and goals of this project. The engineers were confident this burner would meet the <30 ppm regulation the project required.



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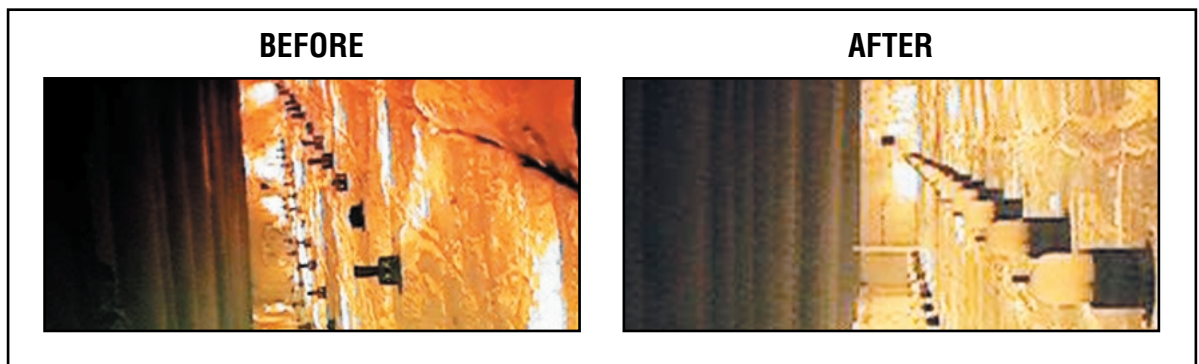
Prototype single-burner testing at the Zink test facility was successfully completed resulting in well under the 30 ppm requirement. The burners were installed in the field, with the heater in service, and without lost production due to furnace shutdown.

Initial tests at the site, however, were unsuccessful, leading John Zink Company to enter a novel phase of problem solving. A test furnace at Zink's International Research and Development Test Center was modified to simulate the field configuration with a 14-burner array. Zink's test furnace is the only one of its kind in the world and provided the configuration needed to duplicate the same NOx emissions experienced at the plant site. Initial tests quickly pinpointed flame interaction as the source for higher NOx, which led the engineers to successfully develop the LPM-308WC ultra low-NOx burner featuring Zink's signature COOLmix™ technology. This time, the burner performed to expectation.

John Zink's LeanPreMix series of burners is designed to achieve ultra low-NOx performance using a combination of proprietary "flameless staged fuel" methods and a sequenced ultra-lean premix process. The lean premix primary flame realizes enhanced performance with the primary fuel, and the unique fuel staging method ensures that the fuel mixes with sufficient furnace gases to minimize secondary NOx generation.

THE ZINK RESULTS:

- The LPM-308WC burners featuring COOLmix technology performed to expectations. Average NOx emissions were 25.7 ppm, corrected to 3% O₂.
- Zink's one-of-a-kind test furnace duplicated the field environment and provided the springboard to develop a proven solution for this project's unique conditions.
- Installation utilized the existing burner tiles and required no heater modifications.
- Retrofit was performed online with the heater in service and no lost production.
- Refinery saved millions of dollars as Equilon would have had to shut down the hydrogen reformer if the project did not succeed.



We're engineering value for global industry.



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