

# Application Report

## Kemco Systems equips its Direct Contact Water Heaters with Eclipse Winnox Burners for lowest possible NOx and CO emissions.

Kemco Systems, of Clearwater, Florida, is an original equipment manufacturer (OEM) of direct contact water heaters for industry. The company designs fully integrated water heating systems to match the specific needs of a wide range of customers, including such high-profile firms as Ford Motor Company, Lee Apparel Company and Tyson Foods.

When a large business-to-business uniform rental company in Southern California sought to replace an outdated water heating system for its high-volume laundry, Kemco Systems was the supplier of choice. Since uniform laundering depends on the availability of consistently hot water, the company wanted the most efficient system available.

*Kemco's direct contact water heater provides instantaneous hot water generation within seconds after start-up.*



Intended for use in hot water-intensive processes, Kemco's direct contact water heating technology provides efficient fuel utilization. For Kemco customers, this adds up to efficient operation and fast payback on the equipment.

### Low NOx Required

One additional requirement was paramount. The laundry required a water heating system capable of holding NOx and CO emissions to a minimum to ensure compliance with standards established by the South Coast Air Quality Management District (SCAQMD), the most stringent emissions control agency in the nation.

To meet this objective, Kemco equipped its direct contact water heater with the Winnox 600, a low NOx direct-fired burner from Eclipse Combustion. According to Kemco president Carroll Gorrell, "Our customer wanted to keep NOx emissions to 20 ppm or less. The Eclipse Winnox 600 could help us meet that demand."

### Direct Contact vs. Boiler Systems

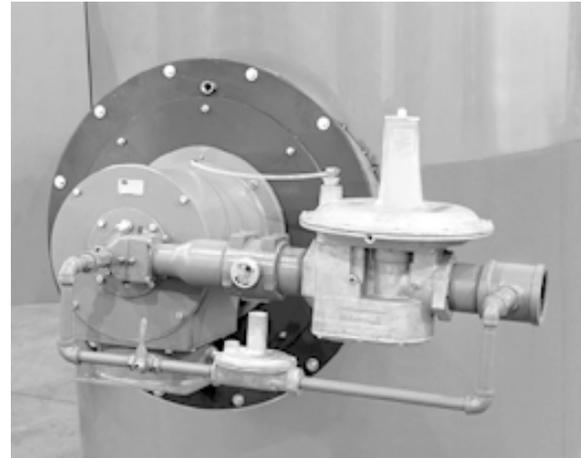
Kemco's patented direct contact water heaters are designed to replace the boiler systems typically

used in applications calling for large volumes of hot water. Boiler systems have an inherently inefficient principle of operation. They heat water under pressure, converting it to steam, then re-convert it back to water of the desired temperature.

Kemco's direct contact water heaters perform just as the name implies. In these heaters, a nozzle mounted atop a cylindrical, non-pressurized water vessel sprays water into the vessel, which cascades over a side-fired burner below. The water is heated as it falls through the flame. Because it is in direct contact, the water captures all of the flame's heat energy, resulting in instantaneous hot water generation within seconds after start-up, not hours, as is the case with boiler systems.

Kemco water heating systems have proven their effectiveness in many applications. They provide super-efficient water heating – up to 98 percent efficiency as compared to a boiler system's typical 75 percent efficiency. In addition to being easier to operate and maintain, the thermal efficiency of the direct contact heater is far superior. Boiler systems utilizing a 2500 to 3000 degree F. flame will discharge super-heated air (up to 350 degrees F.) into the atmosphere. With the same temperature flame, the direct contact water heater will discharge air at significantly lower temperatures – for example, 50 degree water inlet, 60 degree exhaust to atmosphere – so fuel economies are improved resulting in no wasted energy.

Of course, key to the performance and reliability of direct contact water heating is the quality, performance and reliability of the burner that heats the water – in this case, the Eclipse Winnox 600.



*The water heater's Eclipse Winnox burner gave the laundry the emission results they were looking for...NOx levels well below the required 20 ppm.*

### **The Winnox 600 Solution**

Simple and efficient, the Eclipse Winnox 600 low NOx air heating burner is designed specifically to meet today's stringent emissions mandates. Winnox burners incorporate direct-spark ignition and an air/gas regulator to fire efficiently at a controlled ratio over a wide gas turndown range (15:1).

The burner's patented nozzle design allows for intense mixing of air and fuel, resulting in extremely low NOx (less than 20 ppm in most applications), as well as low CO (literally no CO emissions during normal operation). Designed for multi-fuel operation, the burner will use natural gas, propane and butane with no nozzle change.

One design innovation in the Winnox Burner is its short flame, which is completely contained within the firing tube due to intense swirl generated by its patented nozzle. This feature enables the size of the combustion chamber to be reduced. For the laundry application, this space-saving advantage allowed Kemco to design a vessel with increased capacity yet smaller footprint.

## System Design and Implementation

Based on the industrial laundry's requirements, Kemco designed and built the water heating system in its own manufacturing facility. John Niu, Kemco's project engineer, reports that the off-site start-up went well. "Our initial test results for NOx and CO emissions were quite favorable," he says. "This preliminary set-up and fine-tuning of the system paved the way for rapid and trouble-free installation at the customer's California site." Niu notes that, in the final system configuration, the Winnox 600 burner was modified with a double-wall, water-cooled discharge sleeve.

According to Craig Swanson, sales representative for Thermal Equipment Systems, an Eclipse representative located in Tampa, Florida, Kemco's selection of the Winnox 600 made installation not only faster, but much easier. "In this type of equipment, burners often require installation of a flue gas recirculation system," he says. "And, it will usually take up to 30



*Winnox burners are typically packaged with blowers for ease of installation.*

hours to tweak and modify the system to meet the emission standards. The Eclipse Winnox eliminated the need for flue gas recirculation and required minimal time and labor to install."

## End User and OEM Results

With the system now up and running for several months, the uniform company's laundry operation enjoys a virtually limitless supply of 160 to 170-degree F. water for thorough and efficient cleaning of its rental uniforms. Because the system is simple to use and not pressurized, operators need not be licensed and no pressure vessel insurance is required.

Most important, the company's goal of reducing NOx and CO emissions has been realized. The results of the on-site testing are shown in Table A.

**Table A: WINNOX BURNER DATA**

Control Output	O <sub>2</sub> %	CO ppm	NOx ppm
25%	6.2	1	12
50%	6.3	5	8
75%	6.8	25	6
100%	6.4	29	8

For Kemco Systems, the Winnox Burner enables the company to offer the latest in low NOx burner technology for customers who require it. Its short flame design also enables the OEM to save on materials and decrease the overall footprint of its direct contact water heaters. In fact, according to president Gorrell, Kemco is evaluating the Winnox for possible inclusion in water heating systems designed for customers in the textile, concrete, automotive, pet food, and food service industries.

He concludes: "We design systems to meet customer requirements and challenges. For low NOx applications especially, the Eclipse Winnox complements our advanced direct contact water heating technology. Currently, we are installing two more systems – one for a commercial laundry, the other for a food service operation. Both will incorporate Winnox burners."

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