

HVAC/R ENGINEERING profile



Condenser tube scale build-up on centrifugal chillers at the New Orleans Airport Hilton was cured with the ED2000 - a totally non-invasive electronic anti-tube fouling system from YORK International Corp.

Chiller Condenser Water Treatment, Cajun Style

YORK® ED2000 Electronic Anti-fouling System Cures Hilton's Scaling Blues

NEW ORLEANS — New Orleans is a hot bed for cool jazz, hot and spicy food, good times and old-fashioned Cajun-style Southern hospitality that is second to none. When one conjures up images of the “Crescent City,” however, hard water and chiller tube scaling are the last things that come to mind.

But, condenser tube scale build-up on centrifugal chillers at the New Orleans Airport Hilton did create major operating problems ranging from undesirable compressor surge to rising wastewater and chemical treatment expenses.

The Hilton's facility engineers opted to cure their scale blues, enhance chiller efficiency, and lower operating and maintenance costs with the ED2000 — a totally non-invasive electronic anti-tube fouling system from YORK® International.

SCALE NEVER SLEEPS IN THE “BIG EASY”

The New Orleans Airport Hilton opened in 1989, and since its debut, scale-related troubles have been increasingly problematic.

Originally, the hotel's cooling plant was comprised of three centrifugal chillers rated at 135, 185 and 235 tons. The condenser water loop was conditioned using a magnetic water treatment device to prevent scale and chemical treatment was used for biological control.

As cooling tower water was warmed in the chillers' condensers, dissolved mineral ions precipitated out of the water and adhered to condenser tube walls. Over time, soft deposits formed and eventually turned into hard scale. This unwanted accumulation decreased the effective heat transfer surface and restricted water flow.

The old magnetic system proved to be an ineffective scale-controlling deterrent. What's more, this system's failure to alleviate scale formation in the condenser tubes resulted in higher-than-design condenser pressures, which created other operating concerns.

“High condenser pressure increases the chiller's energy consumption and if the pressure increases enough, it will force the compressor into surge. A surge condition limits a chiller's ability to produce cooling and, if left unchecked, can lead to significant compressor mechanical failures,” commented Ned Hebert, zone service manager at the YORK Saint Rose, LA, office.

Chiller tube fouling can also increase chiller energy consumption. For example, with a fouling factor of 0.003 (0.036-inch scale thickness), the additional energy cost per year for a 500-ton chiller is \$25,300.

“Energy use was rising and maintenance and water treatment costs were going up, as well.

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The New Orleans Airport Hilton's investment in YORK's ED2000 electronic anti-scaling system paid large dividends in improved guest comfort, enhanced cooling system reliability and lowered energy and operating costs.

The magnetic system just wasn't working and we had to do something to protect our investment for Hilton and its guests," declared Glenn Ziegler, the hotel's chief engineer.

ENTER ED2000

Ziegler acted quickly and dealt a severe and swift blow to the slowly creeping mineral deposits. In April, 1998, York International technicians installed ED2000 units on each of the condenser water supply lines to the three chillers; ED2000 coils were also added to the cooling towers' make-up water supply inlet piping.

Once scaling occurs, traditional removal methods may shorten tube life, resulting in expensive, premature tube replacement. The ED2000 system's unique electronic process prevents scale fouling, which eliminates the need for caustic and abrasive cleaners.

Unlike the less effective magnetic system it replaced, the ED2000 system is based on well-documented and patented technology. ED2000 technology prevents scale fouling by inducing dissolved mineral ions to precipitate into larger insoluble crystals, which pass through the condenser without adhering to the tube walls. This process is called solenoid-induced molecular agitation (SIMA™). The insoluble crystals settle at the bottom of the cooling tower sump where they are flushed from the system during blow-down.

"With ED2000 water management, you eliminate the hassles of cleaning tubes with acid, steel brushes, and abrasives. You also save the wear and tear on tubes caused by these cleaning methods," Ziegler offered as one of the system's many benefits.

ED2000 system is easily installed, because no welding or other invasive procedures are used: the hardware includes an electronic control box attached to a pre-wrapped solenoid coil enclosed in a weather-resistant enclosure. The solenoid coil is externally (non-invasively) fitted to the condenser inlet pipe; this installation process takes about 20 minutes. As a result, there is no downtime and no threat to system integrity.

A FLAWLESS PERFORMANCE

With almost two years in operation, the ED2000 electronic descaling system has performed flawlessly, exceeding expectations.

The condenser water loop continued to be treated by a combination of the ED2000 system for scale control and chemical treatment for biological control. About 10 months after the anti-fouling devices were installed, condenser heads were removed from the three chillers. When the tubes were inspected, no evidence of scale was detected.

"By removing the condenser heads, we confirmed beyond a shadow of a doubt that the ED2000 system was effectively preventing scale build-up on the condenser tubes," Hebert affirmed.

In December 1999, a post-installation water chemistry analysis that was performed by an independent laboratory supported the physical results.

The tests showed a significant increase in the amount of calcium ions precipitating out of the tower water. When compared to the raw make-up water, which was determined to have respective calcium and chloride levels of 84 and 134 parts per million (ppm), the tower water showed chloride and calcium readings of 500 and 400 ppm.

Less calcium in the tower water created a proportional increase in chloride concentration, allowing increased concentration cycles from 3.4 to 5.8, saving up to \$3,157 per year in water expenses.

All in all, cleaner condenser tubes are predicted to have reduced chiller energy usage by about \$7,303 per year by improving the chillers' efficiency from about .80 to .75 kW/ton.

"Even if these symptoms aren't evident yet, if you are in a hard-water area like us, scale is likely to be lurking in your tube bundles. Installing the ED2000 system was a convenient and cost-effective way to avoid future problems, keep costs in check and maintain the plant's overall efficiency," the chief engineer concluded.

