CASE STUDY

Lab Temperature and Humidity Swings Attributed to Sediment in Closed-Loop System

MSC was on an extended diagnostics assignment at a large research facility when it began experiencing frequent, transient temperature and humidity excursions that were triggering alarms on a near-daily basis. The issues were occurring in various areas of the system with no discernible pattern. The facilities manager reported that the overall reheat hot water temperature was maintaining 145°F, as per design. Tolerances were ± 1°F for temperature and ± 10% for RH.

Recording the Temperature and Humidity Data

Our first step was to deploy NIST-traceable temperature and humidity data loggers in several of the labs where excursions had occurred, and temperature data loggers were installed at the VAV boxes both before and after the reheat coils. Airflow was measured using a balancing hood and by traversing the duct system to determine CFM, velocity, and static pressure. To determine heat exchange rates, GPM across the reheat coils, which ranged from 3.0 GPM to as low as 0.9 GPM, was checked and verified.

The reported problems were observed by our technicians almost immediately, with temperatures swinging erratically across the coils by several degrees. Upon blowing down the coils, checking strainers, and evaluating logged data, it became evident that the closed-loop system contained excessive rust and sediment that was intermittently plugging the reheat hot water control valves and/or circuit balancing valves before moving on. The system would need to be purged of the rust and sediment to restore consistent flow and proper temperature and humidity control.

What Causes Rust and Sediment in a Closed-Loop System?

When black steel pipe is drained down and left unfilled for an extended period of time, rust can swiftly develop; this had been the case at the laboratory facility. The same can happen in pipes that contain air gaps and pockets due to failure to bleed the system after refilling. More common problems include lack of water treatment and poor preventive maintenance.

The Solution

MSC blew down the system twice a day for the next two weeks, concentrating particularly on low points. We removed and cleaned strainers, and refilled the system with clean water treated with a rust inhibitor. Next, we installed a temporary sediment filtration system across the main supply and return lines. Filter socks were changed every other day. After two weeks of continuous filtering and blowing down the system, the water tested almost 100% rust-free and laboratory temperature and humidity were consistently back under control.