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Fog-Humidification Units Play Major Role in Facility's Cooling-System Improvements

Cut annual maintenance, energy costs by $250,000

In the Commonwealth of Virginia's Division of Consolidated Laboratory Services (DCLS) building in Richmond, gas-fired clean-steam humidifiers used to offset dry winter air were causing problems.

"The humidifiers kept breaking down," DCLS building manager Steve Crouch said. "The burners would quit, the boxes would get cracks in them—they just weren't working out."

Fog manifolds run independently to stage the amount of humidification supplied.

Al Torquato of Prime Air Products blamed the buildup of scale on the humidifiers' generators, which greatly reduced capacity.

Looking to reduce ongoing maintenance issues while substantially lowering energy costs, the DCLS turned to a fog-humidification system from Mee Industries Inc.

The MeeFog system includes three 7.5-hp pumps, each of which delivers 10.5 gal. of water per minute at 1,000 psi. Two of the pumps are enough to handle the load of the building's three air handlers; the third is for backup.

Each pump is controlled with manual/off/auto selector switches mounted on a programmable-logic-controller panel. The lead pump can be selected manually; if all three pumps are in "auto" mode, the pump with the fewest run-hours starts first. If flow rate exceeds a set point, a second pump comes online, and the speeds of the two pumps are equalized.

A 0-to-10-vdc signal from the building-automation system is used by the staging processor to determine which staging solenoids to energize for each air handler. As humidity demand changes, the processor recalculates valve configurations. Control parameters can be adjusted to tune the system by allowing minimal over- and undershooting of set points.

Water under high pressure travels through ¾-in. and ½-in. stainless-steel tubing into a fogging array, which is located inside of an air duct. Small nozzles emit a micro-fine spray of water to produce the desired level of humidity.

A reverse-osmosis (RO) water-softening system was installed to provide purified water for the fogging system.

"The MeeFog humidification system is not complicated, but it works great," Crouch said. "Engineers were even able to install the spray racks in the air handlers while they were running, so there was no interruption of our operations."

Prior to installation, Torquato compared the purchase, installation, maintenance, and operations costs of gas-fired steam humidifiers with those of the MeeFog system. Purchasing and installing the MeeFog system and supporting RO system turned out to be about 9 percent more expensive than simply replacing the gas-fired steam generators. Further, there was a $139,725 cost for demolition, retrofit, of air-handling-unit sections, electrical work, and piping changes. However, in the final analysis, these added costs were more than offset by $192,426 in annual energy savings. Additionally, the MeeFog system provided a bonus in the form of a $58,400 reduction in annual maintenance costs.

"We were always washing out the steam units, changing the elements, doing this and doing that," Crouch said. "There was a great deal of maintenance with the old ones."

With the MeeFog system, maintenance entails no more than changing the oil in the pumps, swapping out the water filters, and making sure softening salt does not make its way into the RO system.

Ultimately, the MeeFog system was shown to pay for itself within an eight-month period, with the DCLS saving $250,000 a year from that point forward.

"We are saving a tremendous amount of money because we are not burning gas through the old humidifiers," Crouch said. "Our gas bills came way down when we got rid of them."

Those gas savings come primarily during the dry winter months. But the MeeFog system also saves money during summer. Although the dew point is not such that it would automatically trigger the fogging system, Crouch manually runs the fogging units on hot days to take advantage of the cooling effect of the evaporating water.

"You have the evaporative-cooling effect of the fog across the air handlers and that takes some of the load off the chillers," Crouch said. "That works out very well for us."