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Controller for Rooftop A/C Units Cuts Store's Utility Bill 15 Percent

By MIKE RANDAZZO

ALIQUIPPA, Pa.- A demand-limiting controller applied to rooftop air conditioning units at Hills Department Store here has cut the building's average utility bill by 15 percent.

The \$20,000 project, completed in August 1994 at the 50,000-square-foot retail facility, included the addition of a stand-alone demand-limiting controller manufactured by K-MAC Inc., Pittsburgh. The device was installed to monitor energy consumption and coordinate air conditioning equipment run times in order to minimize demand charges that typically account for a large portion of the store's utility expenses.

A year's worth of bills confirm that the device saved \$20,728 in electricity costs as a result of an average peak load reduction of about 39 kilowatts (kw) a month. The store's annual consumption fell by 298,056 kilowatt hours (kwh).

The peak demand reduction, which accounted for \$9,163 of the savings, was calculated based on avoided monthly charges of \$19.58 per kw. The remaining \$11,565 in savings came from avoiding energy charges of 3.88 cents per kwh.

"Our electric bills are typically 40-50 percent a result of demand charges, not actual kilowatt hour energy consumption," explained Terry Holt, Hills' energy manager. "We felt that demand control could have the biggest impact on our

electricity billing and on our bottom line."

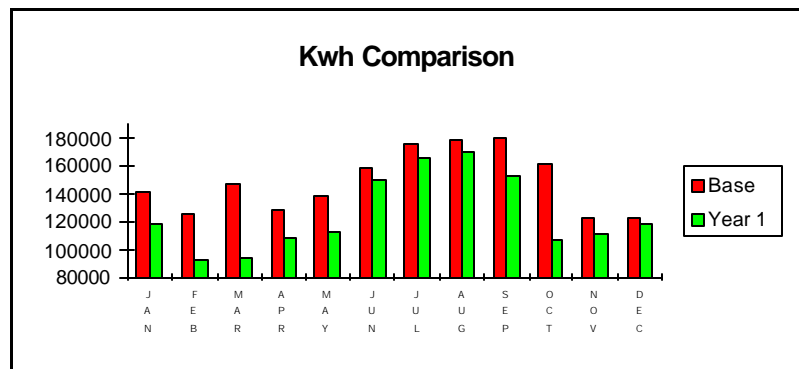
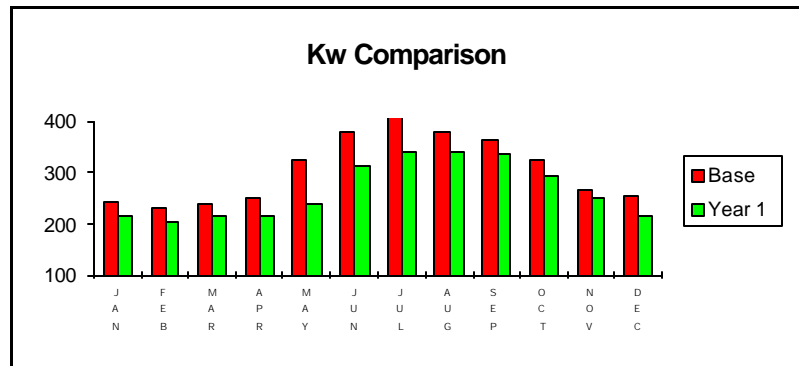
Savings are partially offset by about \$2,000 in annual monitoring charges paid to K-MAC, but the project yielded a payback in 12.8 months.

Mounted in-line with the facility's main distribution panel, the Phase III model controller, voltage, and current sensors supervise the operation of 13 rooftop air handlers. Each unit is equipped with two compressors that provide a 200-ton cooling effect. The units, which also supply natural gas heating, are made by Lennox International Inc., Dallas, and York International Corp., York, Pa.

The demand limiter's architecture includes 26 control points that are hard wired from the controller to a relay that supplies the 24-volt connection of each unit's thermostat. The control strategy is divided into seven zones with most points located toward the center of the store. The air conditioning systems account for approximately 200 kw of demand.

"The device measures true power the same way the utility measures it," explained Paul Vogel, K-MAC's president. "It takes into consideration the power factor, phase angles, and low and high voltages."

The phase III monitor is synchronized to the utility's meter and measures demand every 15



minutes. While demand may exceed the preset limit during the majority of the metering event, during the last three minutes of the measuring window the controller compares actual load to the prescribed value. It maintains an even peak profile by briefly turning off zones when necessary. At EUN press time, Hills was using 320 kw as its demand set-point. However, this value can be changed on a daily basis if needed, Vogel said.

The store's business starts to pick up at about 2:00 P.M. and peaks around 4:00 to 5:00 P.M., he explained, adding that during promotional events, the peak could occur later in the evening.

Vogel told EUN that a demand-limiting installation is essentially a two-phase process. First comes the actual installation, and operations survey, and fine-tuning process. The second phase focuses on the interactive control functions to ensure optimum savings and occupant comfort, he observed.

"Each location is different and has its own personality," he continued. "Demand is all over the place in that store. There has to be a study of site's operating strategy before you install a device like this. One of our key reasons for the success is that we understand how the business works and we stay with the business."

The current zoning strategy

reflects this philosophy. By selecting the centrally located air conditioning units as the first to be shut down, patrons entering the facility and loading dock workers are the least affected during load shedding, Vogel contended.

As part of the annual service agreement, assumptions based on historical weather data are part of the monthly peak load calibration procedure, he added. The controller can store up to 33 days of weather information. Periodically, data is downloaded to inform demand decisions.

"We will watch the weather," Vogel reiterated. "Even in the first week of the month, if they hit a peak and it cools down, we will go back in and set the controller to maintain the comfort and provide additional savings."

Based on the success of the project at this store, Holt said there are plans for similar installations at two all-electric facilities in Penn Hills and Carnegie next year.

"High demand peaks due to abnormal weather swings are prevalent for heating as well as cooling in Pittsburgh and other Northeastern cities," Holt maintained. "Too often, a high monthly demand is set due to unseasonable weather patterns. Just one abnormally warm day in February or cold day in May can have the negative impact on a monthly utility bill-- high demand

charges."

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