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“Most clients give you the best information they have and a bit of conjecture,” advises Craig Harris, Project Manager for Hendrix Consulting Engineers in Round Rock, Texas. As an HVAC system designer, Harris tries to anticipate his clients’ needs based on the information they provide, but he often has to temper that information with his own knowledge and years of experience. Actual cooling loads seldom match design assumptions. But Harris has a simple solution to avoid the complications arising from AC system overcapacity — the APR Control from Rawal Devices, Inc.

THE PROBLEM: Oversized AC Systems Result in Poor Dehumidification

Typically, engineers design HVAC systems for maximum load conditions using a “design day” — a sunny, 95° F day with average relative humidity — and assuming maximum building occupancy. However, these conditions normally occur less than 2 weeks a year, so most systems have more capacity than needed.

For a cluster of buildings in the Austin area, chilled water systems or new rooftop VAV units would not have been a cost-effective investment because the tenant, a major computer manufacturer, was only leasing the buildings. Harris was in charge of renovating their rooftop HVAC systems, but the business’s loads kept changing. “I might be told that a room was going to house 75 high-heat-producing computers and 5 or 6 people,” he recalls, “and then later I’d find out that initially it was only going to house 3 computers and 1 person. The air conditioning system was able to keep the space cool, but the humidity was getting all out of whack.”

Load changes need not be this extreme to present a problem. Since most direct expansion (DX) systems lack the sophistication to run at less than full capacity, they cycle on and off, resulting in:

- Uncomfortably humid conditions. When the AC compressor shuts off, humidity levels increase and occupants feel uncomfortable even when temperatures are within the desired range.
- Excessive compressor cycling. This can lead to poor dehumidification, insufficient cooling, and other system failures.

When portions of a building are vacant, when the outside air is cool but muggy, or when occupants tinker with thermostats to compensate for the system’s shortcomings, problems are magnified.



THE SOLUTION: The APR Control

“Even with accurate specs, loads are always going to fluctuate,” says Harris. “But the APR Control provides flexibility. It allows an HVAC system to ‘track’ the load — to operate at the same capacity as the load.” While compressors pump only what they are rated for, the APR Control “de-rates” the evaporator coil for a reduced load. The APR Control:

- Automatically modulates capacity, matching it to changing load conditions
- Compensates for inaccurate design data or changes in load
- Improves humidity control
- Reduces system energy and repair costs
- Outperforms hot-gas bypass systems

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Harris has specified the APR Control for a variety of HVAC systems. “On single-stage equipment (usually 6-ton or less), the APR Control allows the compressor to follow the load all the way down to about 1.5 tons,” he explains. “If you put the device on the first stage compressor of a system with two; three; or four 5-ton stages, it can follow the load from 1 to 5 tons, 6 to 10 tons, 11 to 15 tons, etc.”

Harris has also seen the APR Control used successfully on split systems (air handler inside building, condensing unit outside) and/or built-up equipment. If conditions warrant, the APR Control can be easily added in the field.

As a result of new ASHRAE standards, most schools and many other buildings now have high make-up air requirements. “ASHRAE makes us bring in a lot of outside air,” notes Harris. “But on a cloudy-humid or rainy day with temperatures of 70° to 75° F, you’re bringing in moisture-laden air without adding to the sensible cooling load. By allowing it to run at partial capacity, the APR Control maintains the AC system in a dehumidifying mode without overcooling the space.”

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For more information, contact