



200+ VARIABLE-SPEED CHILLERS DEPLOYED THROUGHOUT GSA

Focus on Variable-Speed Chillers

SUCCESSFUL M&V AND REGIONAL ADVOCACY SUPPORTS DEPLOYMENT

Even after the variable-speed magnetic bearing chiller (MBC or maglev) received a positive GPG testbed evaluation at the George Howard Jr. Federal Building in Pine Bluff, Arkansas, plant operators in the Greater Southwest Region remained hesitant to adopt the next-generation technology, says Tyler Harris, Branch Chief, Energy and Sustainability, Region 7. "Operators are often reluctant to embrace a new technology when they have a legacy technology that they know and trust," says Tyler. "The fact that the MBC chiller is nearly half the size of legacy chillers and requires new skills and training to operate efficiently might also have worked against adoption," he continues. Dana Ulanoff, an equipment specialist in Region 7, helped overcome skepticism by leading the charge for design and installation of the chiller in other facilities. Subsequent installations demonstrated even better results, and Region 7 has gone on to install nearly 70 MBC chillers; another 141 are deployed throughout GSA. The new chillers have realized significant savings—at the Federal courthouse in Lubbock, TX, for example, whole-building energy use dropped 15%; at the Lanham Federal Building in Fort Worth, TX, four chiller replacements, along with a cooling tower upgrade, realized whole-building savings of 48%. A subsequent 2017 GPG evaluation of the variable-speed screw chiller demonstrated performance comparable to the MBC chiller, providing GSA with another option for future deployment of variable-speed chillers.

Of course achieving energy savings has required a shift in chiller plant design and operation; variable-speed chiller plants maximize efficiency by running multiple chillers at partial load, rather than one chiller at maximum load. "Initially, we did have some head-pounding experiences," reports Tyler, "but with training and many lessons learned, operators are now eager to update all of their chillers to the variable-speed technology." Beyond energy savings, the region has also seen equipment cost savings. Because next-generation chillers can operate at low loads, some facilities have been able to eliminate smaller capacity "pony" chillers altogether. **GPG's assessment recommends end-of-life replacement of conventional chillers with next-generation chillers (the variable-speed magnetic bearing or the variable-speed screw chiller). Individual site characteristics will determine the most cost-effective chiller technology for a particular application.**

Variable-speed chillers are 35% more efficient than FEMP standards for water-cooled chillers. At partial loads, where chillers spend 80% of their time, they are particularly effective. As cooling loads decrease, efficiency increases.

"Swapping out chillers at end-of-life makes sense, but you can get maximum efficiency as well as help out your operations staff if you upgrade all of your chillers at the same time."

– Tyler Harris, Branch Chief
Energy and Sustainability, R7

BEST PRACTICES

For Chiller Selection & Operation

- Employ a mechanical engineer to do a thorough economic and technical analysis for all facets of the chiller plant design. Consider the control optimization system for chiller plants that GPG evaluated in September 2016 (GPG #028) in the chiller plant analysis.
- When replacing an old chiller, perform a heat gain/loss calculation to size the new chiller correctly.
- If the building spends most of the time at partial loads, prioritize the energy consumption rate (kW/ton) at part load. If a facility operates 24/7/365 with a fairly high and constant internal load, such as data centers often do, focus on a chiller's efficiency at maximum capacity.
- Centrifugal compressors, such as those in the magnetic bearing chiller, are custom designed to meet site-specific condenser water temperatures. For effective performance of MBC chillers, water temperature must be considered during design. The variable-speed screw compressor is a universal design.
- Look at both consumption and demand charges. If demand charges are high, thermal storage or some other method of load shifting might be a cost-effective part of a new chiller plant design.
- When choosing a chiller, consider whether or not the manufacturer operates in your locale. Some manufacturers might be able to provide better service because of having a stronger local presence.
- For maximum plant efficiency, run multiple chillers at partial load, rather than one chiller at maximum load.

RESOURCES

Learn More About Next-Generation Chillers

[009 Variable-Speed Magnetic Bearing Chiller Findings & Report from Pacific Northwest National Laboratory »](#)

[031 Variable-Speed Screw Chiller Findings & Report from Oak Ridge National Laboratory »](#)

[Webinar Recording: Next-Generation Chillers, 07.13.17 »](#)

[Webinar Presentation Slides »](#)

[Map of GSA Deployment of Magnetic Bearing Chillers »](#)

For more information about GSA's Proving Ground program or tested technologies: www.gsa.gov/gpg or contact Michael Hobson michael.hobson@gsa.gov



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