



FLEXIBILITY UNDER A WIDE RANGE OF OPERATING CONDITIONS

Focus on Variable-Speed Direct-Drive Screw Chillers

INCREASED EFFICIENCY, QUIET PERFORMANCE, REDUCED MAINTENANCE

In 2015, the Sidney R. Yates Building in Washington, D.C. installed two next-generation chillers—a variable-speed direct-drive screw (VSS) chiller and a magnetic bearing (maglev) chiller—as part of a chiller plant renovation. Oak Ridge National Laboratory assessed the two chillers side-by-side and found that the VSS chiller was 11% more efficient than the maglev chiller and was able to operate under a wider range of condenser water temperatures. “Four years later, both chillers are operating without a hitch,” says Glenn Stewart, the chief engineer in the National Capital Region. Stewart has found that both chillers have similar maintenance needs. “Maintenance for the VSS is much simpler than it is with old screw chillers,” he continues. “Staff test the oil once a year but have not had to change it yet.” Carrier, the manufacturer of the VSS chiller, estimates that oil changes are needed only once every 10 years. Also, the VSS chiller offers an additional benefit at the Yates building, where the cooling tower sump is 25-feet beneath the ground and has no heater. Because the VSS is able to handle such a wide range of operating conditions, Stewart is able to turn the VSS on during shoulder seasons when temperatures are unseasonably warm. “It’s tough to know what the weather is going to do,” says Stewart. “You can have three-weeks of a cooling trend and then you have a hot day and need to be able to turn the chiller on. The VSS chiller allows us to do that. We’ve been able to handle swings in condenser water temperature from 55°F in the spring to over 95°F in the summer.”

Stewart has found both the VSS and the maglev to be great chillers. “Now, which is the best chiller for you will depend on your situation,” he observes. “You’ll have to take into consideration temperature and the efficiency of the chiller at different loads.” To date, GSA has installed 7 VSS and 234 maglev chillers and recommends next-generation chillers for all end-of-life chiller replacements.

The VSS offers another option for next-generation chillers. At the Yates building, it was found to be more efficient and less expensive than a magnetic bearing chiller.

“This is nothing like the old screw chiller. I ran a screw chiller at the national airport years ago that would actually shake the whole building when it turned on. Now, even with a low ceiling, you can have a conversation standing next to our chillers. They’re that quiet.”

– Glenn Stewart, Chief Engineer, National Capital Region (R-11)

Variable-Speed Direct-Drive Screw Chiller—Sidney R. Yates Federal Building, Washington, DC

- At the testbed, the VSS was 11% more efficient than the maglev; statistical margin of error was +24% to -4% savings. (Rated energy consumption for both the VSS and the maglev is 35% more efficient than a code-compliant chiller.)
- 65% less expensive than the comparable maglev at the testbed
- Wide range of operating conditions met; condenser water temperature from 55°F to 95°F
- Quiet Performance—77 to 83 decibels for both VSS and maglev
- VSS or maglev recommended for all end-of-life chiller replacements

RESOURCES

Learn More About Variable-Speed Direct-Drive Screw Chillers

[GPG Findings 031 & Report by Oak Ridge National Laboratory »](#)

[Webinar Recording, 01.18.18 »](#)

[Webinar Presentation Slides »](#)

For more information about GSA's Proving Ground program and the technologies it evaluates: contact Michael Hobson michael.hobson@gsa.gov or go to www.gsa.gov/gpg



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