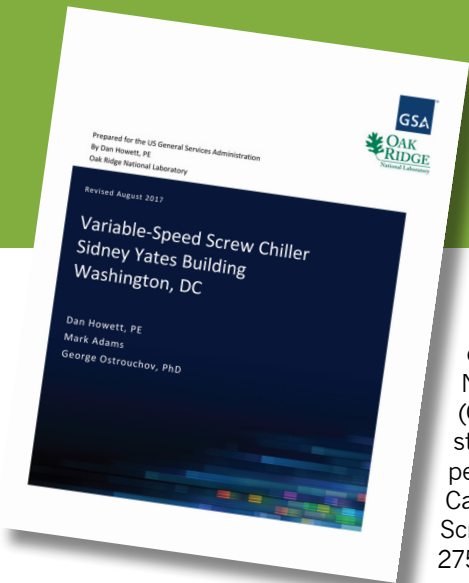


GSA PROVING GROUND VARIABLE-SPEED SCREW CHILLER STUDY EXECUTIVE SUMMARY

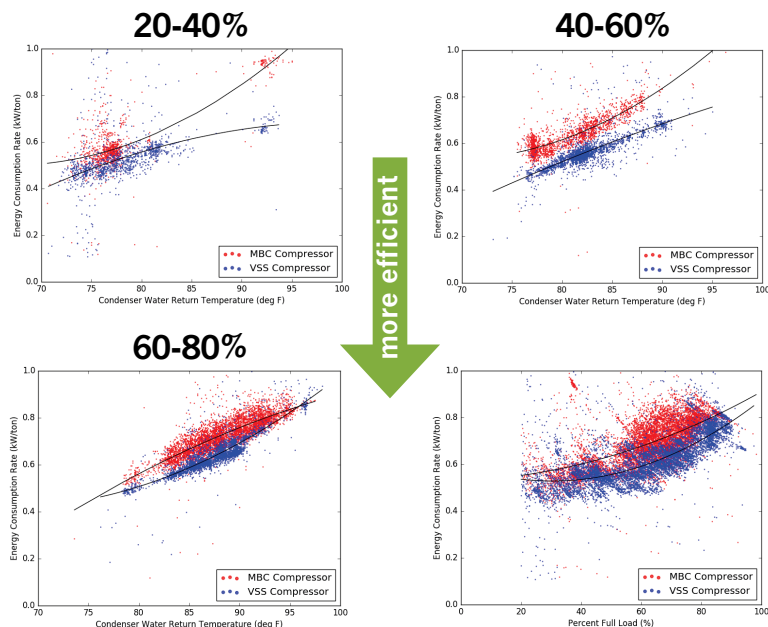


The U.S. General Services Administration commissioned Oak Ridge National Laboratory (ORNL) to perform a study comparing field performance of a 275 ton Carrier Variable-Speed Screw (VSS) chiller with a 275 ton magnetic bearing centrifugal compressor (MBC) chiller installed side-

by-side at the Sidney Yates Building in Washington, DC. Data was collected during 2015 & 2016 cooling season with final report date of August 2017 which included additional peer review by the National Renewable Energy Laboratory (NREL).

OPERATING EFFICIENCY

- VSS was on average 11% more efficient than MBC
- VSS more efficient over a wide range of loads
- VSS and MBC had a similar IPLV rating, but measured efficiency was significantly better for VSS



■ MBC Chiller ■ VSS Chiller

*"This analysis corroborates, by means separate from that used in the original report, the original report's finding. That is, that at the Sidney Yates Building, on average, the VSS chiller used less electricity than the MBC chiller."*¹

¹ Full report p. xviii.

² 4 page summary "Versatility under Different Operating Conditions". Full report p. 21.

³ Full report p. viii. ⁴ GPG Infographic

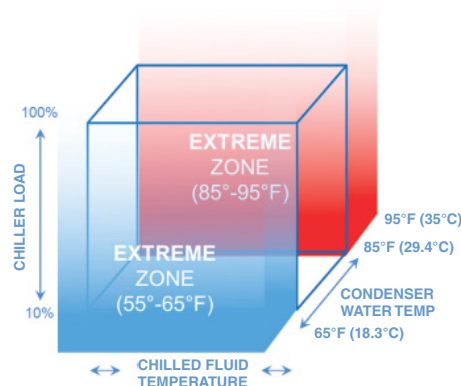
For more information and links to the GSA publication, visit carrier.com/proof

The GSA study referenced herein does not constitute a product endorsement, recommendation, or preference by the U.S. Government or any agency thereof, or the Pacific Northwest National Laboratory/Oak Ridge National Laboratory.

WIDE OPERATING RANGE

- VSS started and operated with 55°F (12.8°C) condenser water (eg. spring start-up or water side economizer switchover)
- VSS maintained operation with 95°F (35°C) condenser water (eg. extreme weather, tower failure, condenser scaling)
- Especially valuable for critical application such as data centers, high security facilities or facilities that must operate 24/7/365²
- The study referred to the VSS as a "universal compressor" type design

*"The VSS compressor was able to operate under conditions not normally found in the DC climate zone, handling swings in entering condenser water temperatures from 55°F in spring to over 95°F in peak summer."*²



PRICE

- VSS more than 30% lower cost than MBC
- "All documentation supports the installed MBC chiller as legitimately representative of what a typical engineering and procurement process would deliver for this application and, therefore, a credible baseline."*³

SOUND

- Comparable for both machines
- "Quiet performance: 77-83 decibels for both VSS & MBC."*⁴

DEPLOYMENT RECOMMENDATION

VSS chiller provides energy efficiency ratings that are more than 35% below Federal Energy Management Program (FEMP) minimum standards. At demonstration site, it delivered 11% lower energy consumption than MBC technology. It should be considered for deployment across a broad variety of applications and climate zones for new or end of life replacements.



Turn to the experts