

VARIABLE-SPEED DIRECT-DRIVE SCREW CHILLER

OPPORTUNITY

What is the impact of improved chiller operations on GSA?

MOST LARGE COMMERCIAL BUILDINGS (> 100,000 FT²) USE WATER-COOLED CHILLERS

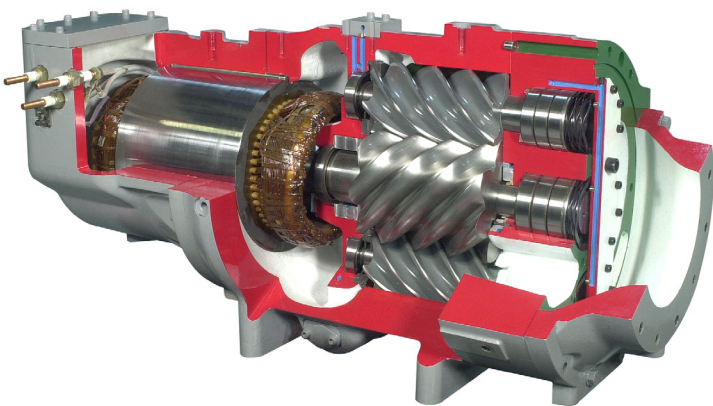
80% of GSA floor space is in large buildings¹

TECHNOLOGY

How does this Variable-Speed Screw (VSS) Chiller work?

CAPACITY CONTROLLED BY REGULATING MOTOR SPEED ALONE

three screw rotors and a variable-speed motor are the only moving parts; there are no unloaders²



M&V

Where did Measurement and Verification occur?

OAK RIDGE NATIONAL LABORATORY assessed a variable-speed direct-drive screw (VSS) chiller against a baseline variable-speed magnetic bearing chiller (MBC). The chillers were installed at the Sidney R. Yates Building in Washington, D.C. and connected to the same chilled water and condenser water loops, creating operating conditions as close to identical as possible within a real-world environment.

RESULTS

How did the Variable-Speed Screw Chiller perform in M&V at the test bed location?

HIGH EFFICIENCY
ENERGY PERFORMANCE COMPARED TO BASELINE MBC³

RANGE OF OPERATING CONDITIONS MET
Condenser water temperature ranged from 55°F to over 95°F⁴

QUIET PERFORMANCE
77-83 DECIBELS
For both VSS & MBC⁵

Average Energy Consumption at the Yates Building

VSS savings over baseline MBC could range from +24% to -4% due to field measurement uncertainty⁶

Combined Chillers/ Total Building % of full load	% of Full Year's Profile	VSS kW/ton (weighted)	MBC kW/ton (weighted)
20–30%	3.8%	0.020	0.021
30–40%	8.3%	0.044	0.049
40–50%	11.3%	0.062	0.070
50–60%	13.1%	0.075	0.086
60–70%	25.1%	0.154	0.176
70–80%	24.3%	0.163	0.183
80–90%	13.0%	0.097	0.106
90–100%	1.1%	0.009	0.010
		0.623	0.699

DEPLOYMENT

Where does M&V recommend deploying the Variable-Speed Screw Chiller?

CONSIDER VSS & MBC FOR END-OF-LIFE REPLACEMENT

Both chillers performed effectively and have rated energy consumption that is more than 35% better than FEMP standards for water-cooled chillers. Individual site characteristics will determine the most cost-effective chiller for the application.

¹Variable-Speed Screw Chiller, Sidney Yates Building, Washington, DC, Dan Howett (PE), Mark Adams (ORNL), George Ostrouchov PhD, revised August 2017, p.4 ²Image courtesy of Carrier, used with permission ³Variable-Speed Screw Chiller, Sidney Yates Building, Washington, DC, Dan Howett (PE), Mark Adams (ORNL), George Ostrouchov PhD, revised August 2017 p.3 ⁴Ibid, p.186 ⁵Ibid, p.25, 281 (as measured in a lab setting) ⁶Ibid, p.9