

SOFTWARE-CONTROLLED SWITCHED RELUCTANCE MOTOR

OPPORTUNITY

Why is GSA interested in smart motors?

38% OF ELECTRICITY IS USED BY MOTORS IN U.S. COMMERCIAL BUILDINGS¹

56% OF MOTORS ARE < 5 HP²

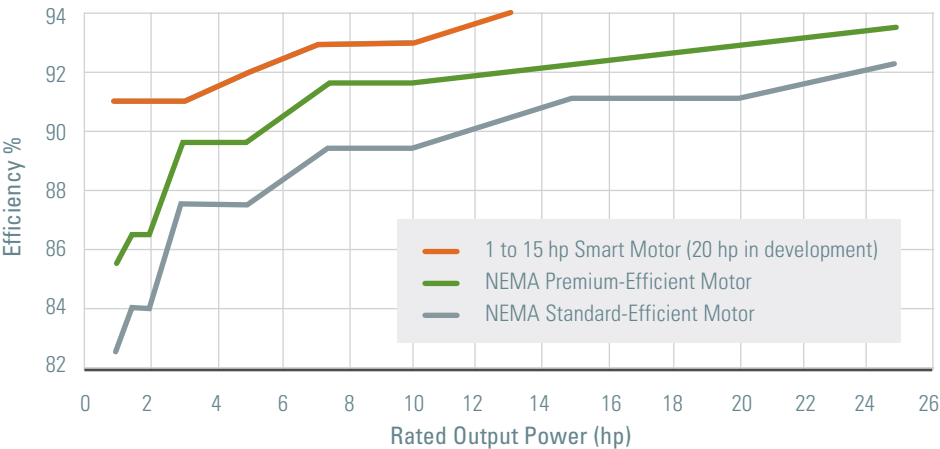
TECHNOLOGY

What are smart motors?

SOFTWARE-CONTROLLED SWITCHED RELUCTANCE MOTOR WITH VARIABLE-FREQUENCY DRIVE (VFD) REAL-TIME CLOUD-BASED MONITORING AND CONTROL*

*Subject to evaluation and approval by GSA-IT Security

Smaller motors offer greater relative savings



M&V

Where did Measurement and Verification occur?

OAK RIDGE NATIONAL LABORATORY (ORNL) assessed a 10 hp smart motor on a chilled water pump application at the Land Port of Entry (LPOE) in San Ysidro, California. A concurrent National Renewable Energy Laboratory (NREL) assessment of a 1.5 hp motor took place on condenser fans in a refrigeration system at a Walmart in Lakeside, Colorado. Technology was provided by Turntide Technologies, formerly Software Motor Company.

RESULTS

How did the 10 hp smart motor perform in M&V?

MORE EFFICIENT UNDER ALL CIRCUMSTANCES
4% savings compared to a NEMA premium-efficient motor + VFD.³

71% ENERGY SAVINGS
Compared to a constant-speed motor. Estimated retrofit payback < 3 years for constant-speed fan motors⁴

O&M INSTALLATION COMPARABLE
Reduced maintenance. Drop-in motor replacement⁵

More Efficient and Less Expensive

When motors are replaced at end-of-life, payback is immediate⁶

	Premium Motor + VFD	Smart Motor (End-of-Life)
10 hp motor cost (\$)*	\$4,375	\$2,430
Installation (\$)**	\$948	No additional cost
Motor electricity use (kWh/yr)	31,700 kWh	30,400 kWh
Motor electricity @ GSA avg. \$0.11/kWh (\$/yr)	\$3,516	\$3,371
Simple payback (yrs)		Immediate

*Premium motor (\$1,756) and VFD (\$2,619) cost provided by San Ysidro LPOE. Smart motor cost provided by manufacturer; does not include volume discounts. **Labor cost provided by San Ysidro LPOE: 12 hours @ \$79/hr. Pump installation requires laser alignment of pump and motor. Fan installation takes 2-4 hours.

DEPLOYMENT

When does the study recommend deploying smart motors?

END-OF-LIFE REPLACEMENT

Also, consider retrofitting constant-speed fan motors

¹Energy-Efficiency Policy Opportunities for Electric Motor-Driven Systems, International Energy Agency, Paul Waide and Conrad U. Brunner, 2011, p.11 ²Premium Efficiency Motor Selection and Application Guide, U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, February 2014, p.1-5 ³Laboratory Evaluation and Field Demonstration of High Rotor Switched Reluctance Motor Technology, Brian Fricke, Mahabir Bhandari (ORNL), October 2019, p.32 ⁴Evaluation of High Rotor Pole Switched Reluctance Motors to Control Condenser Fans in a Commercial Refrigeration System, Grant Wheeler, Michael Deru (NREL), June 2019, p.18 ⁵NREL Report, June 2019, p.31 ⁶NREL Report, June 2019, p.34