GPG FINDINGS **043**

NOVEMBER 2019

SOFTWARE-CONTROLLED SWITCHED RELUCTANCE MOTOR

OPPORTUNITY

Why is GSA interested in smart motors?

38% OF ELECTRICITY IS USED BY MOTORS IN U.S. COMMERCIAL BUILDINGS[1]

56% OF MOTORS ARE < 5 HP[2]

TECHNOLOGY

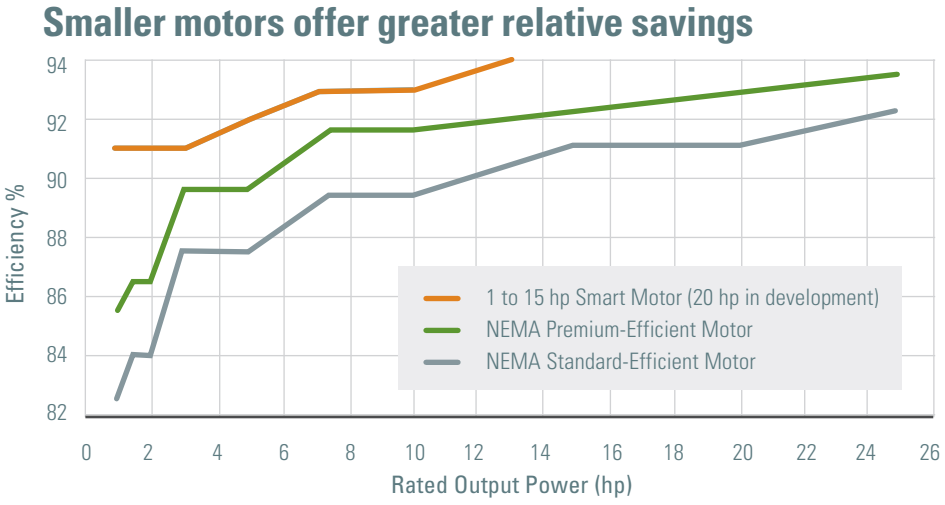
What are smart motors?

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 motors[4]

O&M
INSTALLATION COMPARABLE
Reduced maintenance. Drop-in motor replacement[5]

More Efficient and Less Expensive

When motors are replaced at end-of-life, payback is immediate[6]

	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

[1] *Energy-Efficiency Policy Opportunities for Electric Motor-Driven Systems*, International Energy Agency, Paul Waide and Conrad U. Brunner, 2011, p.11 [2] *Premium Efficiency Motor Selection and Application Guide*, U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, February 2014, p.1-5 [3] *Laboratory Evaluation and Field Demonstration of High Rotor Switched Reluctance Motor Technology*, Brian Fricke, Mahabir Bhandari (ORNL), October 2019, p.32 [4] *Evaluation 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 [5] NREL Report, June 2019, p.31 [6] NREL Report, June 2019, p.34

GSA

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