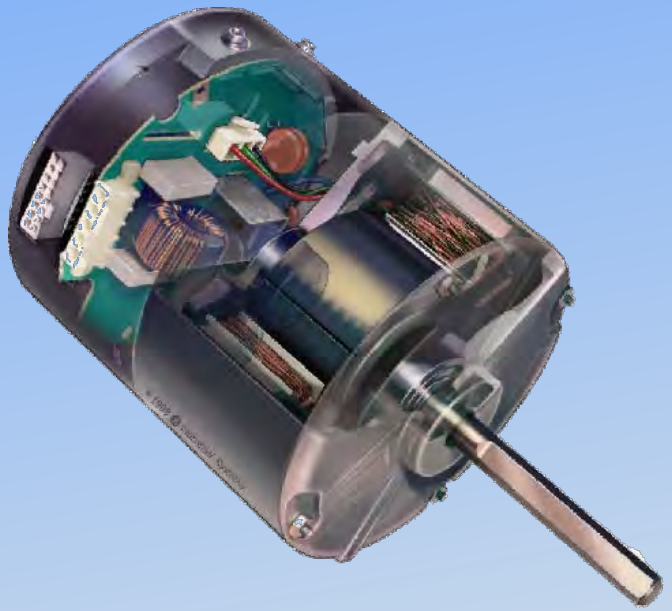
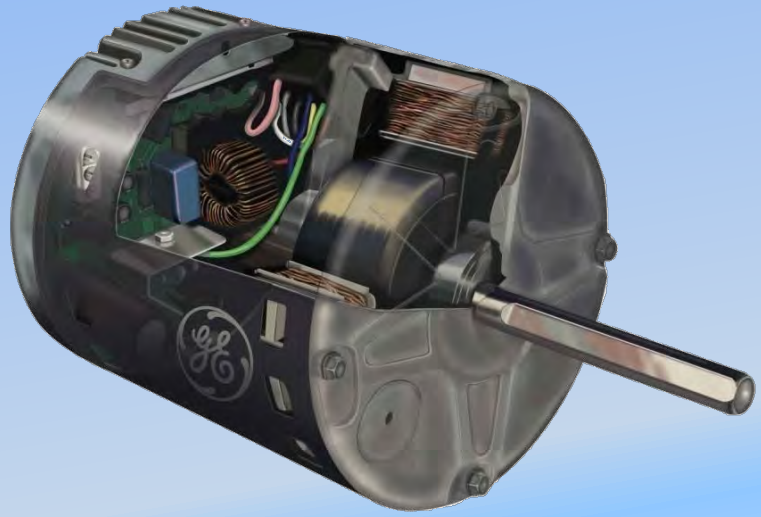
Achieve Up To 200% Greater Efficiency And Better Air Flow Performance With GE ECM Technology



GE ECM 2.3



ECM X13™

PWA Engineering, LLC

What's an ECM?

The highest efficiency motor there is! … essentially a DC Motor

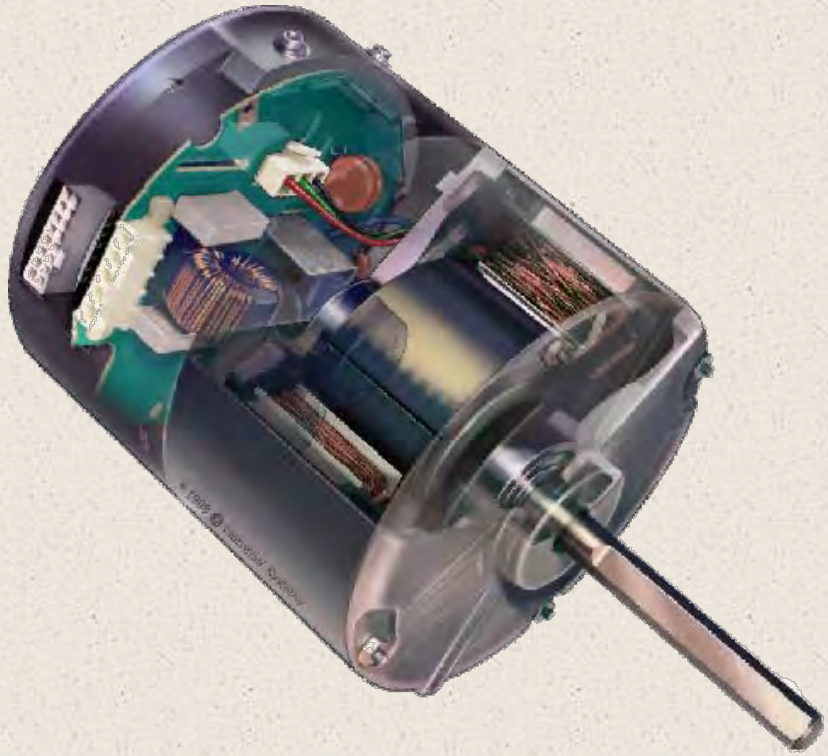
- Without mechanical Brushes and Commutator—motor is electronically commutated

Permanent Magnet Rotor

- Rotor losses are nearly zero

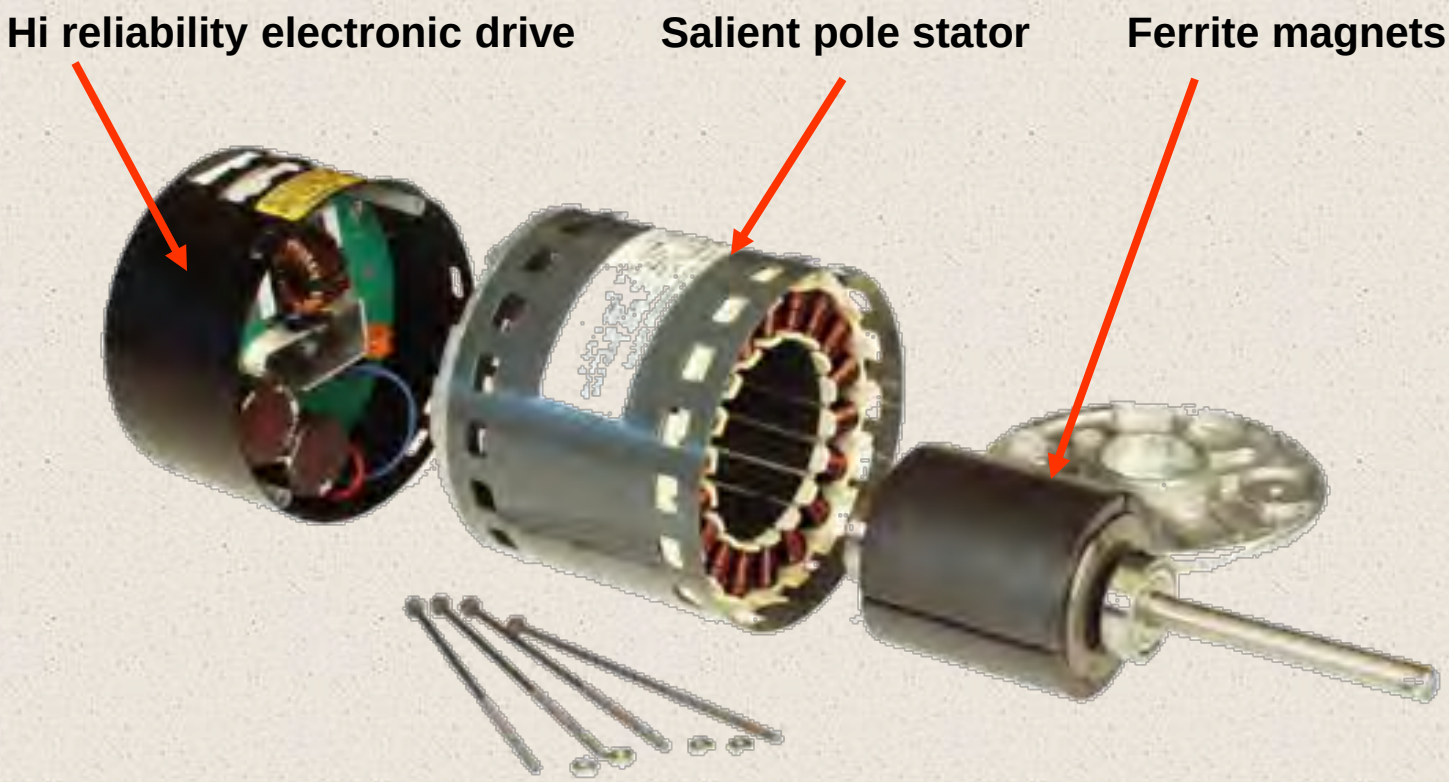
Motor has 3 windings and is powered from a single AC source

- The "Electronic Inverter"
  - Speed and torque controlled



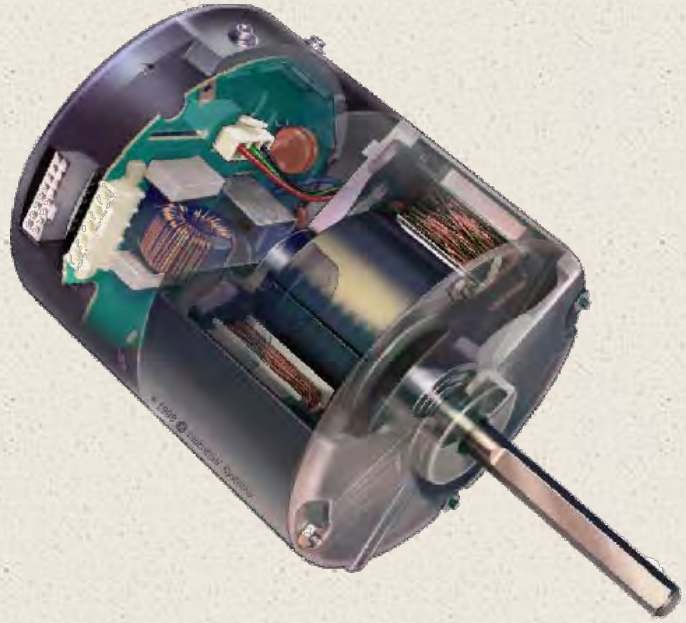
The ECM Motor

Simple construction minimizes the cost of the technology and takes advantage of the efficiency of DC motors



GE ECM 2.3

The GE ECM 2.3 motors offers many possibilities for integrating new capabilities into your products. Their wide speed range, high efficiency and programmability give them a virtually unlimited range of performance characteristics. All in one highly reliable, field-proven, convenient package that allows you to imagine possibilities that no conventional induction motor or competing variable-speed technology can provide.



ECM 2.3

Create Better Products

With features unavailable with conventional induction motors, the ECM motor gives product designers and engineers an extremely versatile tool for improving HVAC- system performance and differentiating products. Here are some examples of the system benefits made possible by the ECM motor: better humidity control, constant airflow, lower set-up and inventory costs, quieter operation, and better indoor-air quality.

Programmable Controls

Just one motor can optimize your system performance and minimize your inventory. Programming options for the ECM 2.3 include: rotation direction, start/ stop ramp rates, on/off blower delays and many other functions—all stored in the motor's microprocessor. Even its speed and torque characteristics can be customized to meet specific performance requirements. As a result, programmability means lower inventory because one motor can serve many applications.

PWA Engineering, LLC

ECM 2.3

Constant Airflow

The most important programmable feature is GE's patented sensorless, constant-airflow technology that allows the ECM 2.3 to maintain a programmed level of airflow over a wide range of external static pressure in an air-distribution system. It even holds airflow constant under less-than-optimum duct configurations and other conditions that produce high or varying static pressure. It does so by automatically adjusting its speed and torque to deliver the airflow you program into it. Constant airflow capability is critical to providing the greatest performance and comfort.

Resilient Electronics

Line transients from lightning strikes or corrupt utility power can cause damage or a temporary interruption of power to any electrical appliance. The ECM 2.3 Series comes standard with robust electronics that allow the motor to operate trouble-free in the event of power irregularities without spark gap. In addition, short power-line interruptions or under-voltage conditions do not affect the operation of the ECM 2.3.

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ECM 2.3

Easy Installation and Service

The ECM 2.3 is designed to be easy to install, troubleshoot and service. There is no need to go to the motor for set up. In fact, there are no dip switches or adjustment terminals on the ECM 2.3. The system manufacturer can locate all connections required for set up in any convenient location. When it comes to service, the 2.3 is designed so its electronic controller can be replaced without removing the motor from the blower mounting which greatly reduces service time and cost.

Moisture-Resistant Design

The ECM 2.3 addresses the most common problem today in forced-air systems—moisture. GE encapsulates the motor's sensitive controls in potting material to prevent water from reaching its electronic components. In fact, the ECM 2.3 stands up to more than 600 hours of ASTM-B117 salt-spray testing.

Ultra-High Efficiency

At full load the ECM 2.3 is 20% more efficient than a standard induction motor. In addition, its permanent-magnet, DC design, absence of rotor losses and high power factor allow it to maintain its high efficiency over a wide speed range

PWA Engineering, LLC

ECM 2.3

Wide Range of Applications

The ECM motor has given product designers and engineers a tool for greatly expanding the capability of air-moving applications. Here are a number of current applications: single-stage, two-stage and variable-capacity furnaces; air handlers; energy-recovery ventilators; powered filter units; unit ventilators; heat pump systems; rooftop exhaust fans; and commercial fan-powered terminal units.

Proven Technology

Since 1985, ECM technology has been providing product designers and engineers an extremely versatile tool for improving HVAC-system performance. Now some 20 years later, ECM technology is becoming a standard product in residential and non-residential buildings. In fact, the 2005 California Building Energy Efficiency Standards now mandates that ECM technology be used in series terminal units for commercial and industrial buildings.

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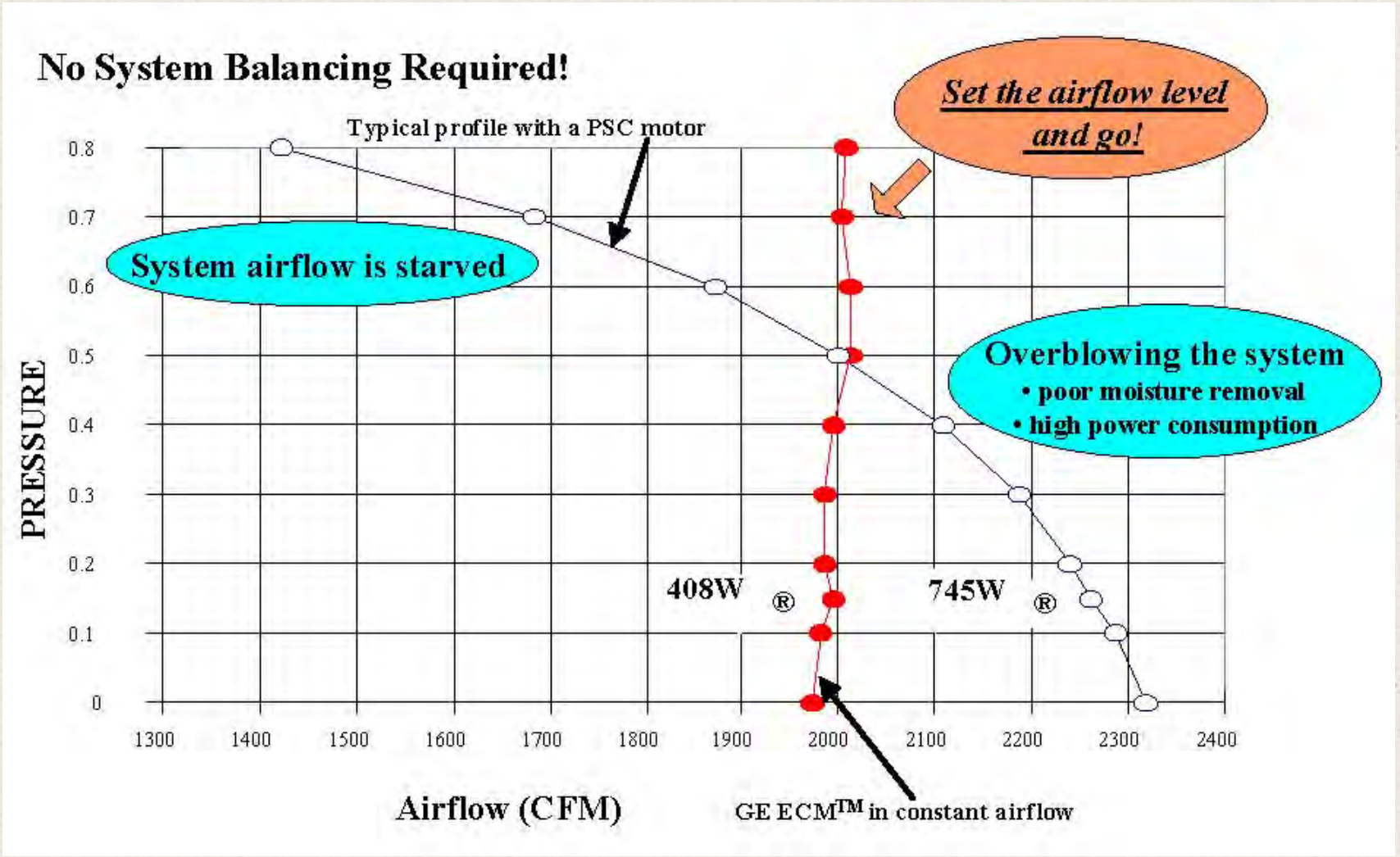
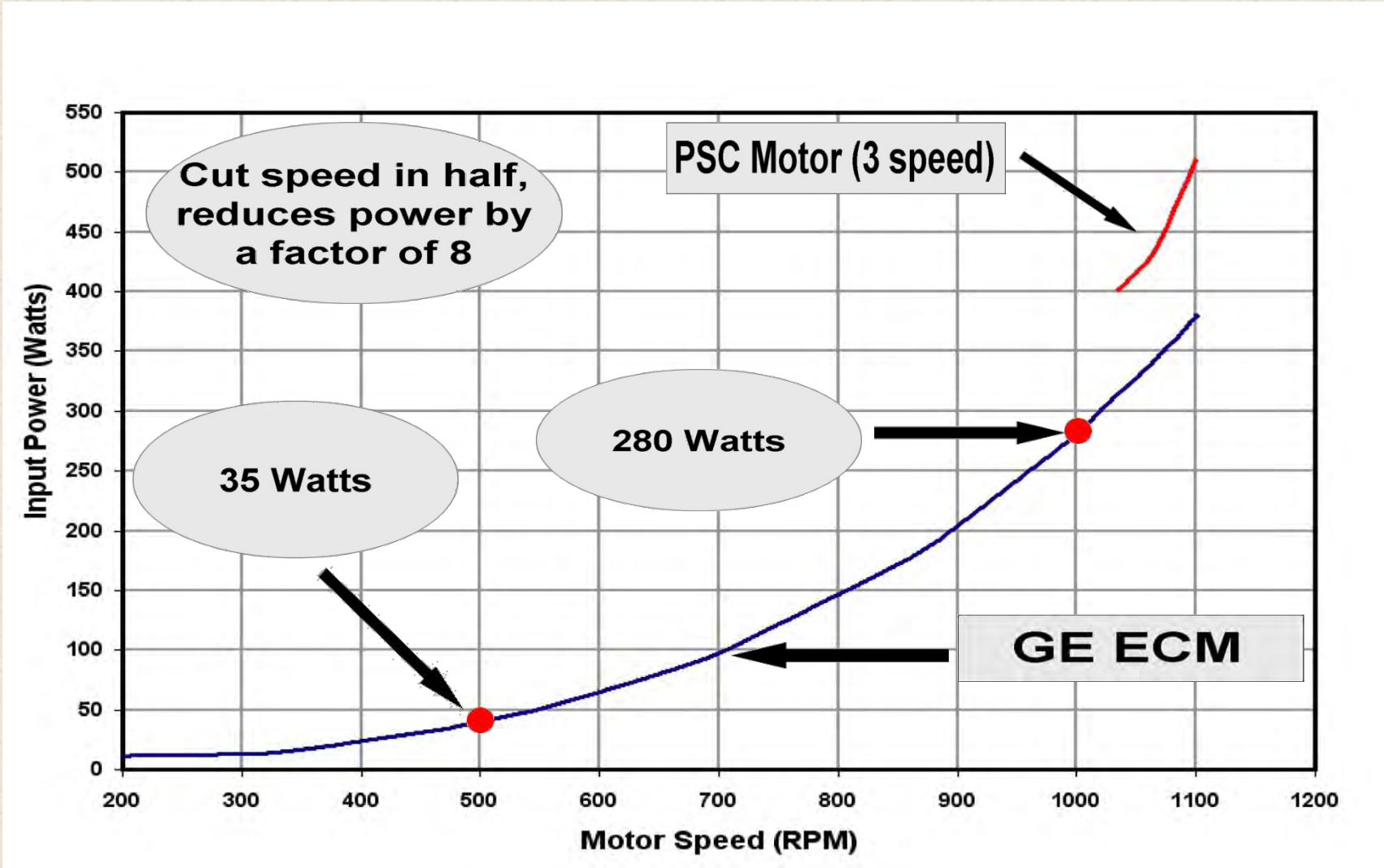
Feature Benefit Comparison for ECM 2.3 and PSC Motors

Feature	PSC	ECM 2.3
Input Voltages	120 or 240	120/240 or 277
Power Connection	Relay	Constant
Control Signals	High voltage	24VAC / PWM / DSI
Settings	2 to 5	Variable
Airflow Control	Speed	Constant
Speed Range	800- 1100	200-1300
Off Delay - Slew	with external timer	programmable
On Delay - Slews	with external timer	programmable
Output channel	none	programmable
Bearings	SB or BB	BB

Airflow Characteristics of An ECM 2.3 versus a PSC Motor



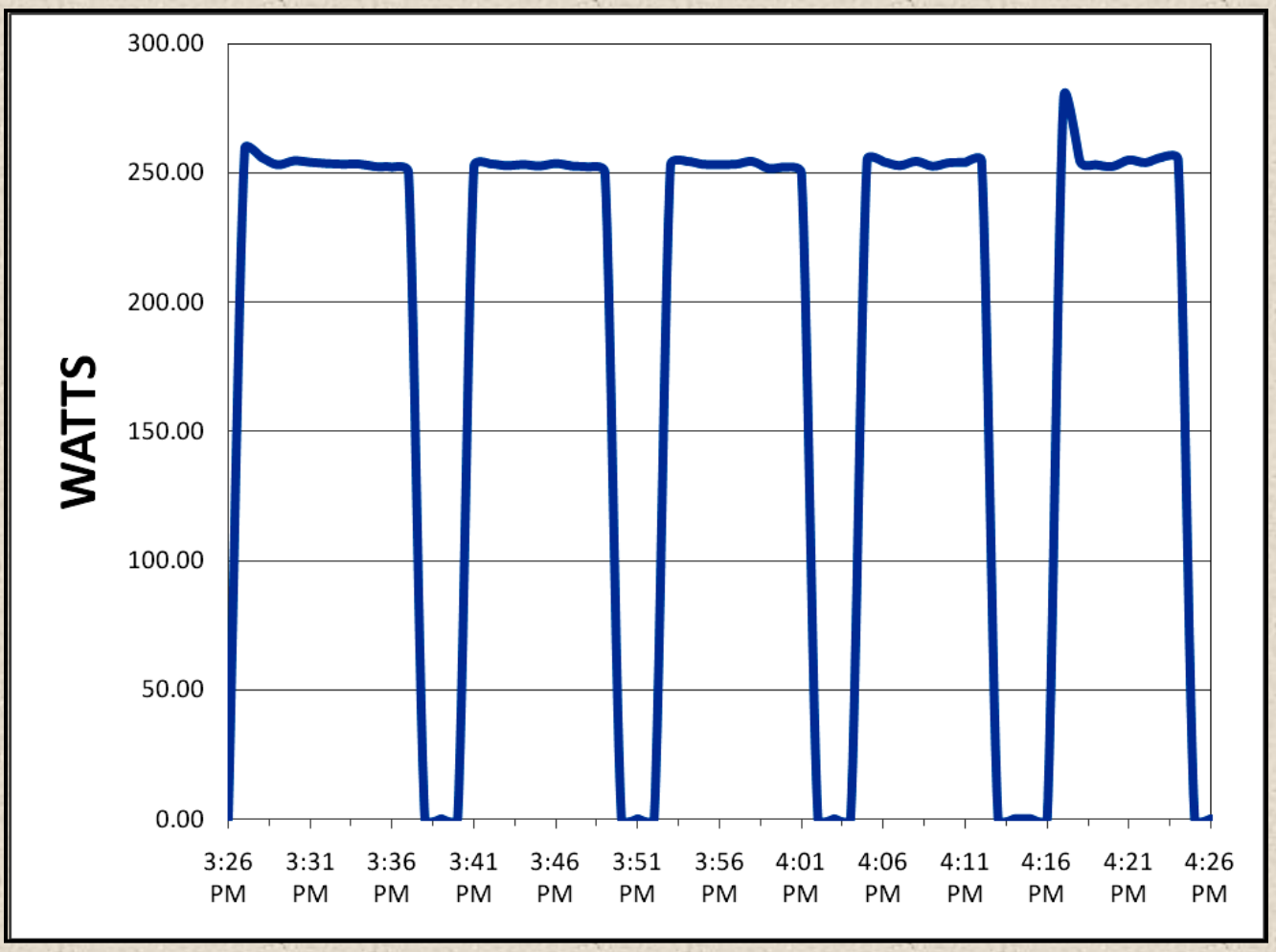
Power Consumption of An ECM 2.3 versus a PSC Motor



Energy Consumption Study for a Permanently Split Compactor Blower Motor versus an ECM 2.3 Contained In a Water Source Heat Pump

The existing 1/5 HP PSC motor was operating at 700 RPM and consumed an average of 256 Watts.

PSC Real Power Consumption at 1-Minute Intervals for a Period of One-Hour



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Energy Consumption Study for a Permanently Split Compactor Blower Motor versus an ECM 2.3 Contained In a Water Source Heat Pump

The existing 1/5 HP PSC motor was replaced with a 1/3 HP ECM that was also programmed to operate at 700 RPM. The ECM replacement showed an average power consumption of **121 Watts**, which is **52%** less energy consumption versus the PSC motor.

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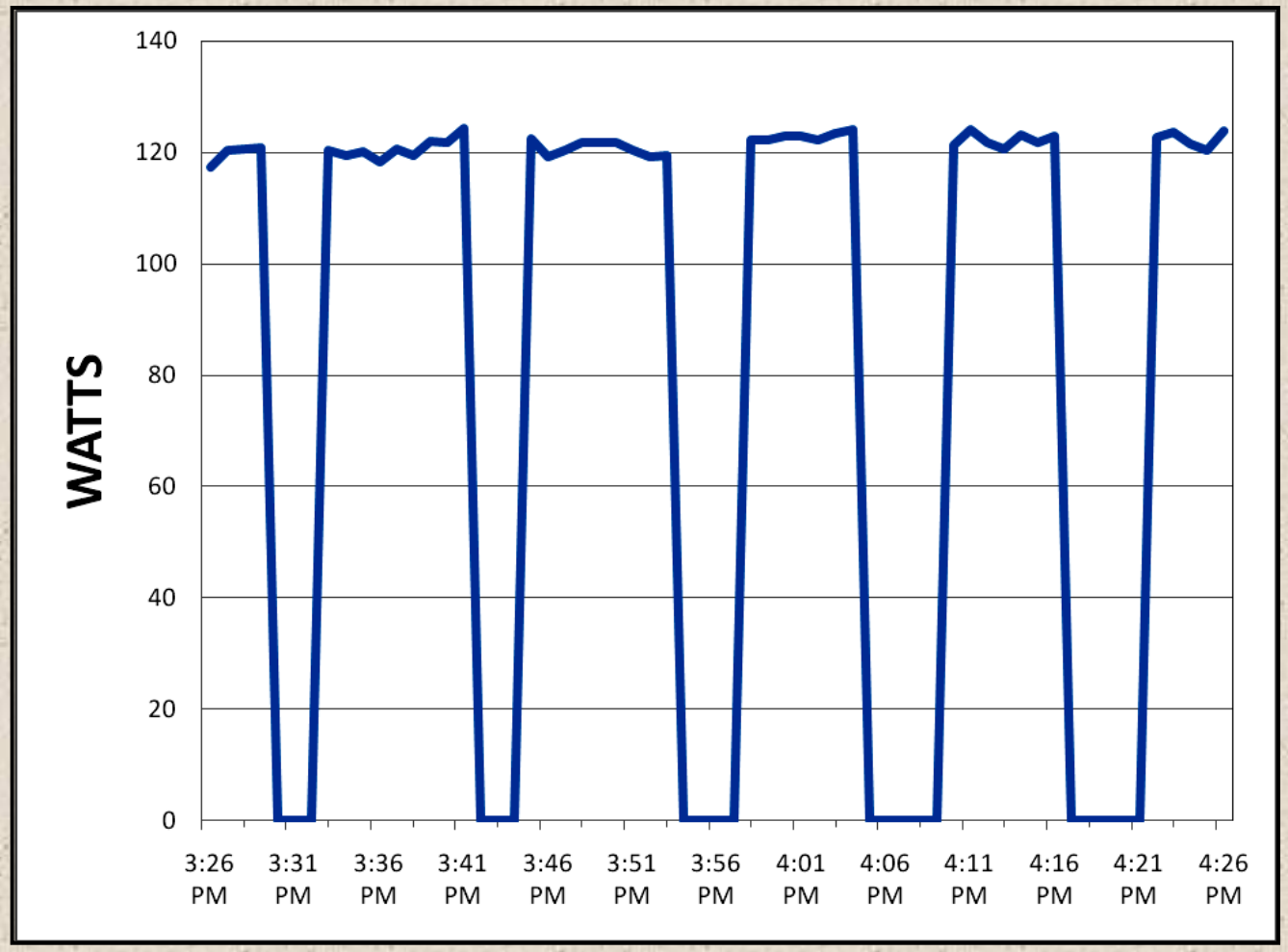
ECM Real Power Consumption at 1-Minute Intervals for a Period of One-Hour



Program the ECM 2.3 for Variable Speed and Achieve Greater Efficiency and Moisture Control

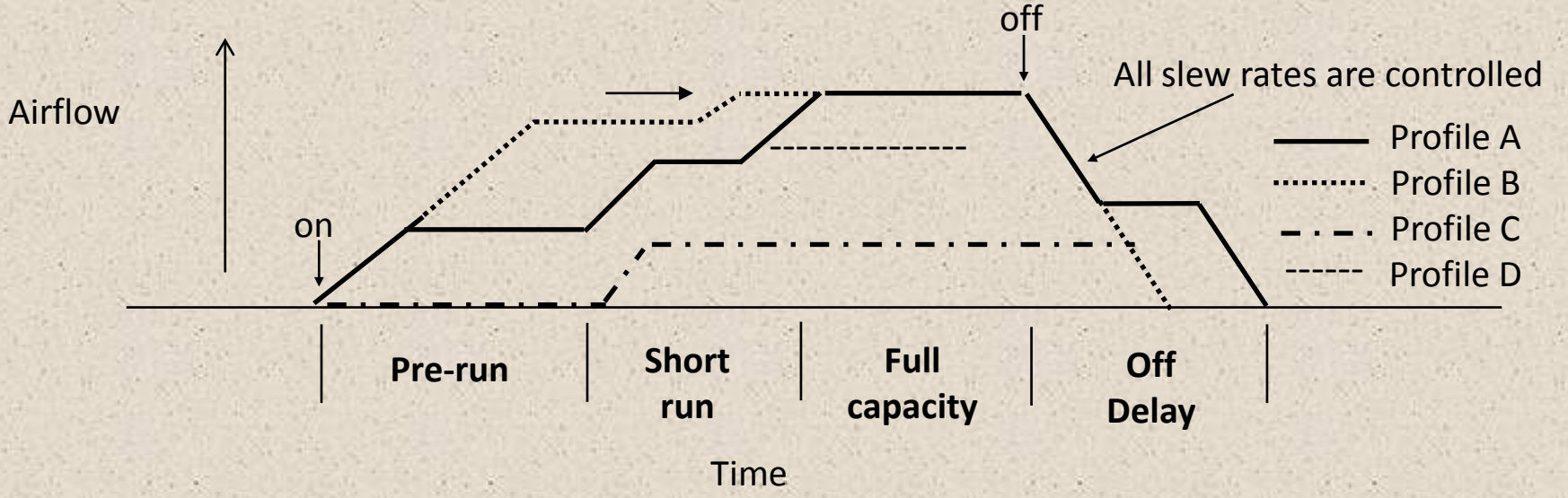
Benefits for Heating

- Profiles apply lower airflow until heat exchanger is up to operating temperature.
- Off Delay extracts energy stored in the heat exchanger after system turn off.

Benefits for Cooling

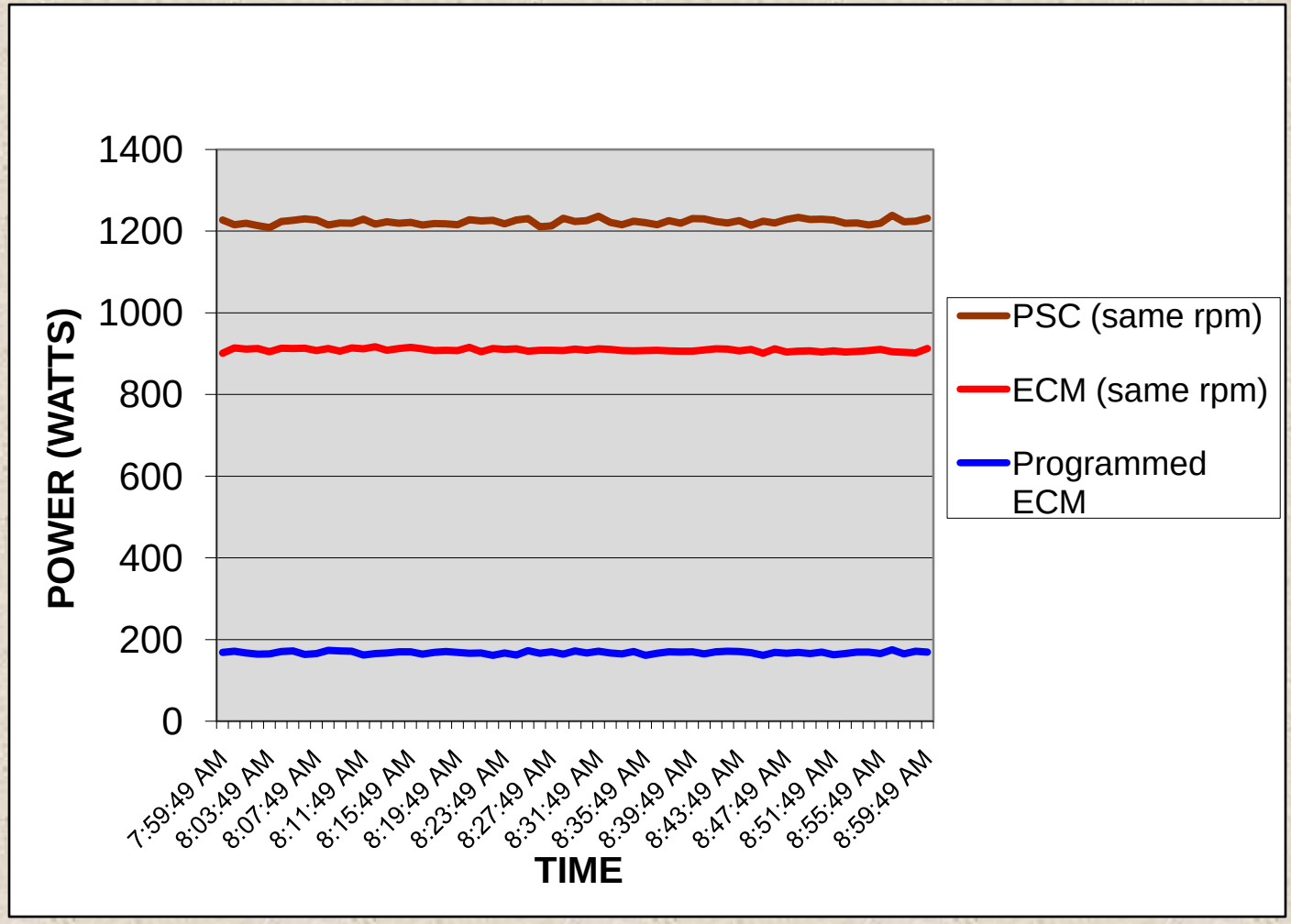
- Lower levels of airflow help moisture removal.
- Off Delay extracts energy stored in the heat exchanger after system turn off.

Typical Heating / Cooling Cycle



One Thermostat Cycle

Energy Consumption Study for PSC Motors versus ECM 2.3 Motors In Four Series VAV Boxes



Test results proved that the ECM motor ran 25% more efficient than the PSC motor when operated at the same revolutions per minute (RPM). Energy reduction was further increased to 86% when we utilized the unique programmability of the ECM motor and reduced the operating speed to 500 RPM.

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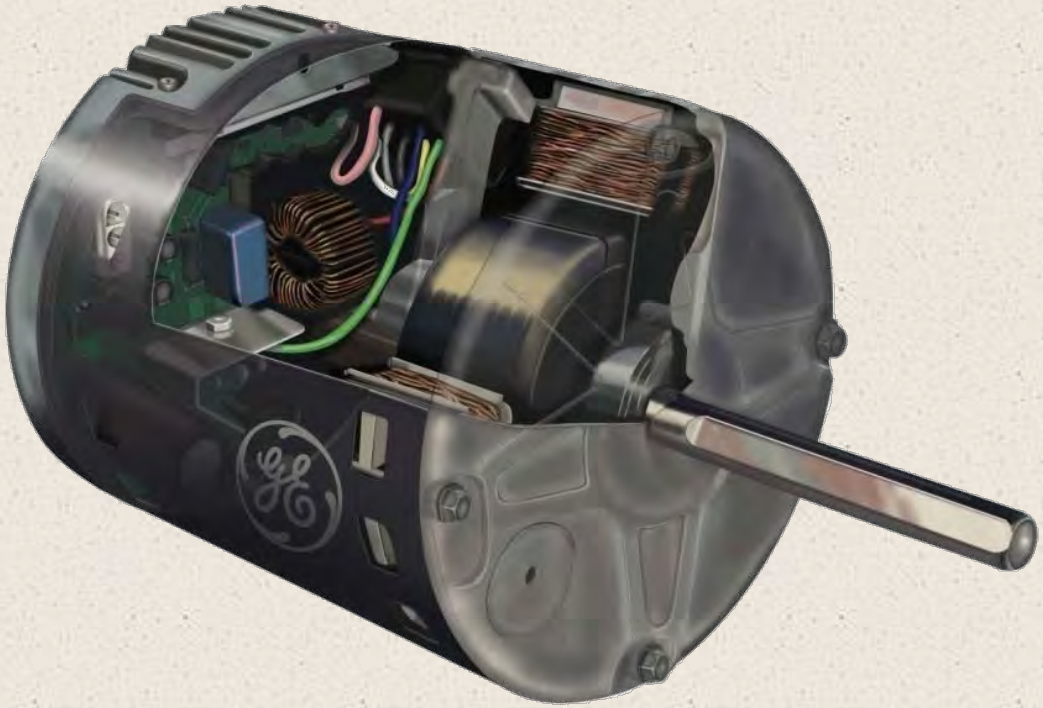
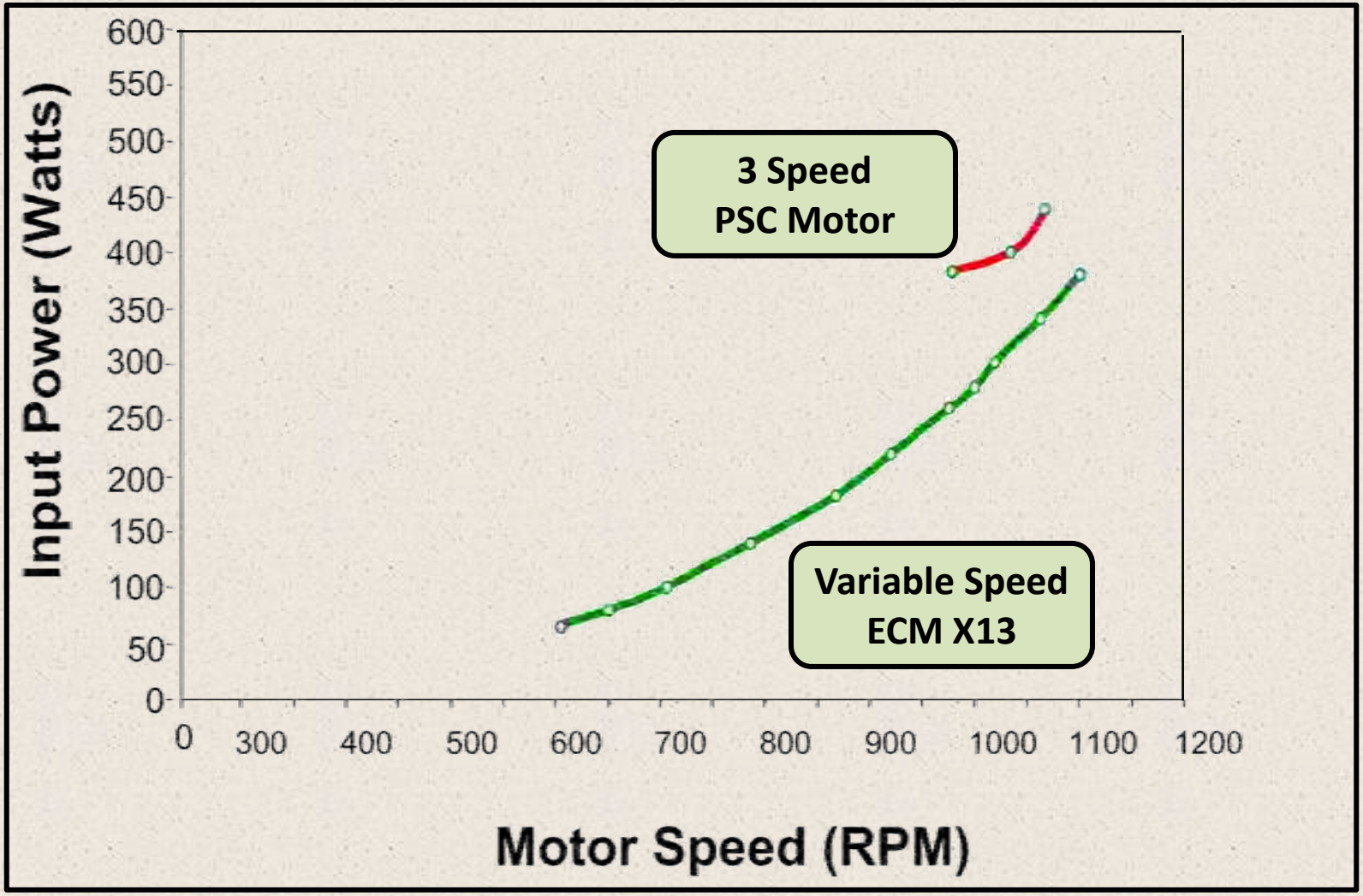
ECM X13™

Is essentially the same motor as the ultra-efficient ECM 2.3 becuase it is built with the same permanent-magnet, three phase, brushless DC design. The only difference is that the ECM X13 does not have the ability to be fully programmed. Instead, the ECM X13 utilizes 5 discrete programmable taps to determine operating speeds. The limited program capability provides users the option for a less sophicticated and expensive motor for applications only requirng descrete operating speeds.



Power Consumption of An ECM X13™ versus a PSC Motor



Please contact PWA Engineering, LLC for additional information.

PWA Engineering, LLC

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