



Q-Sync Motors Boost the Efficiency of Commercial Refrigeration Evaporator Fans

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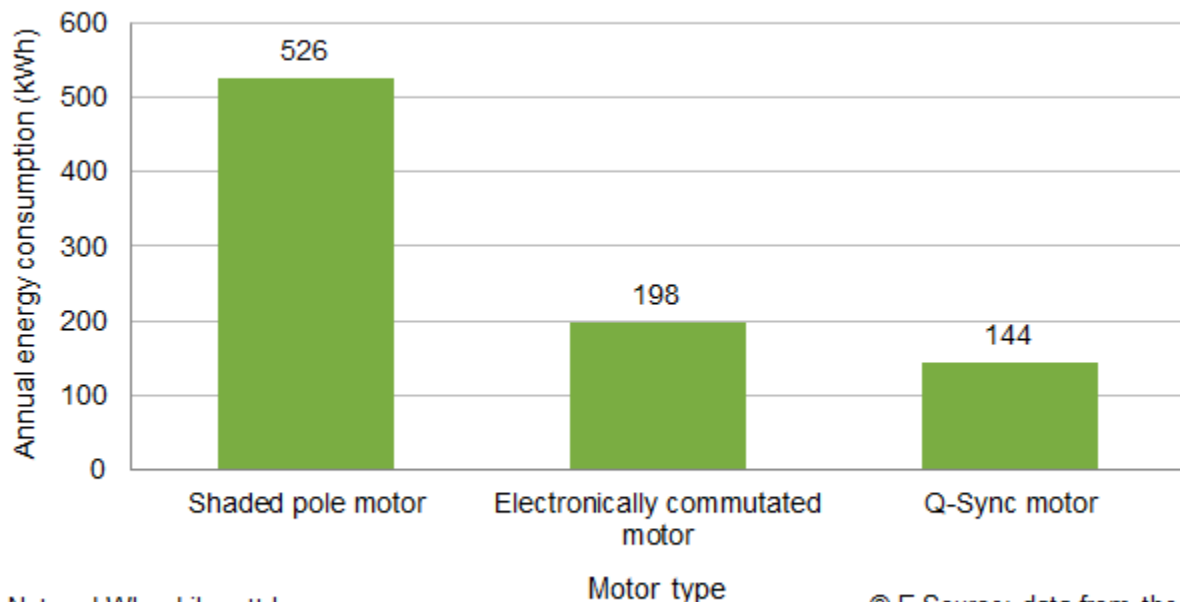
Commercial refrigeration display cases consume large amounts of energy. According to a report prepared by Navigant Consulting, [Energy Savings Potential and R&D Opportunities for Commercial Refrigeration](#) (PDF), the display cases' evaporator fan motors in particular can account for about 15 percent of a supermarket's total energy costs. To help reduce these costs, QM Power introduced the Q-Sync motor, which offers efficiencies even greater than today's best-in-class permanent magnet electronically commutated (EC) motors, which are common in refrigeration equipment. In the September 2015 report [Q-Sync Motors in Commercial Refrigeration: Preliminary Test Results and Projected Benefits](#) (PDF), researchers at the Oak Ridge National Laboratory (ORNL) documented the savings identified during a field demonstration of Q-Sync motors.

The two types of motors most commonly found in evaporator fans are shaded-pole motors (SPMs) and EC motors. According to the ORNL researchers, SPMs are used in roughly 65 percent of evaporator fan applications, and they currently dominate the market because of their simple construction and low first cost. However, SPMs only exhibit an average operational efficiency of 20 percent. EC motors, while more expensive, are gaining popularity because they offer an average operational efficiency of 53 percent. EC motors also run cooler and typically have a longer operating life, making them a cost-effective alternative to SPMs.

In many ways, the Q-Sync motor is similar in construction to the EC motor: Both use permanent magnets to generate a magnetic field. The two motors differ in their electronic controls to induce motor shaft rotation, though. The EC motor's control circuit is active and consumes power at all times while the motor is running. In designing the Q-Sync motor, then, QM Power targeted the EC motor's continuous power draw in the control circuit as an opportunity to save energy and increase operational efficiency. The company designed a more-intelligent control circuit for the Q-Sync motor that monitors the motor speed. Once a steady-state motor speed is reached, the control circuit disconnects from the power supply. Because the control circuit is de-energized during steady-state operations, the motor consumes less energy, making it about 20 percent more efficient than a typical EC motor. In addition, the power factor of the Q-Sync motor is 0.94, as opposed to 0.61 in EC motors. ORNL researchers documented that the Q-Sync motors out-performed the EC motors in energy consumption (**Figure 1**).

FIGURE 1: Annual energy consumption of three evaporative fan motors

In a field study, researchers at the Oak Ridge National Laboratory found the annual energy consumption of Q-Sync motors to be even lower than electronically commutated motors. With equipment and installation costs similar to other motor types, Q-Sync motors should be a good choice for prescriptive incentive programs.



Notes: kWh = kilowatt-hours.
Annual energy consumption is calculated assuming 8,760 hours of operation.

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Researchers further estimated that, in the US, replacing all evaporator fan motors in refrigeration display cases and beverage vending machines with the Q-Sync motors would save 68 percent of the total energy consumed by these refrigeration devices, which translates to about \$516 million in energy savings. As an added benefit, the Q-Sync motor's high power factor would contribute to improved operations for utilities. Q-Sync motors are comparable in cost to EC motors and are manufactured with the same form factor as the original equipment motor to facilitate drop-in installation, making them an ideal choice for retrofit applications. QM Power estimates that the cost to replace an existing motor with a Q-Sync motor is approximately \$100.

While the ORNL researchers evaluated the energy savings of the Q-Sync motors for evaporator fans in refrigerated display cases, the motors could also be designed for use in both evaporator and condenser fans in domestic refrigeration, walk-in freezers, and commercial and residential heating applications. We will continue to follow this technology as the various applications are tested.