

In 1883, Nicola Tesla invented the first induction motor with rotating magnetic fields thus starting a second industrial revolution still evident today. The global market for electric motors is close to 100 billion U.S. dollars and is expected to grow to 141 billion by 2022 according to Sherry James of Grand View Research.

Now, 136-years later, unless there is some divine intervention, the Permanent Split Capacitor (PSC) motor that is barely able to convert a paltry 65% of its electrical input into mechanical work is on its way out. PSC motors suffer from asynchronous alignment, meaning the rotor constantly lags the magnetic field in the stator. This is known as slippage. A six pole PSC motor, for example, should turn at 1200 RPM but because of slippage it turns at 1075 rpm. This considerable amount of waste heat is the byproduct of slippage.

The Department of Energy (DOE) published a final rule regarding residential furnace fan energy ratings (FER) in July of 2014 mandating major manufacturers with sales over \$8 million be required to have FER-complaint furnaces in production by July 3, 2019.

**FER**, according to the DOE, is expressed in terms of watts per 1,000 cfm delivered, considering energy consumption in three different modes: heating, cooling and constant circulation. This requirement affects gas, oil and electric residential furnaces and according to the DOE is expected to provide \$9 billion in homeowner savings.

According to one furnace manufacturer, the fan in a 70,000 Btu/hour furnace consumes up to 1,000 kWh annually. These new standards will require a whopping 46 percent watt reduction over a typical PSC furnace, clearly showing the goal of this rule is to improve the energy efficiency of residential appliances.

Goodman/Amana furnace models \*MEC, \*MVC, \*MVM already have FER-complaint motors in them but the builder grade units \*MSS92 and \*MSS96 and most of the 80% units will have to be changed to FER-complaint Constant Torque Motors (CTM). These unit model numbers will change as follows:

The **GMSS92** will become the GMES92

The **GMSS96** will become the GMES96

The **GMS8** will become the GMES80

The **GMH8** will become the GMES80/ GMEC80

The **GME8** will become GMEC80

Many techs call the CTM motor introduced by Regal Beloit (now Genteq) in 2006 the "X-13" but X-13 is actually the Genteq brand name for the motor.

CTM motors utilize ECM technology but they are not variable-speed motors. Constant torque motors are basically upgraded, next generation PSC motors.

Some features of the CTM motor:

- The non-ramping CTM motor interface is simpler than that of an ECM
- receives analog 24-volt turn-on instructions to the appropriate motor speed tap by the furnace control board.
- reduces power consumption compared to a PSC motor
- has soft start capability
- provides multiple speed taps for various levels of torque for different applications.

What differentiates the CTM from PSC motors is their ability to deliver constant torque, i.e., rotational force or power output down a shaft. For example, if the ESP changes, then the motor program will maintain the amount of torque it was programmed for, which is not the same as constant airflow.

The CTM motor programming is optimized around providing a consistent rotational force. If the external static pressure changes due to a restricted filter, then the motor program will maintain its programmed torque although airflow will decrease, but not as drastically as the PSC motor under similar circumstances.

ECM motors are often said to be the solution to undersized ductwork, which is not the case with these constant volume motors. In a nutshell, an ECM motors doesn't adjust the static pressure if dampers are opening or closing, they adjust to static pressure changes by

adjusting motor torque up or down to maintain system airflow settings.

If you aren't up to speed on ECM and CTM motors or just want to learn more about them, then please join us for a **FREE seminar on the ECM and CTM blower motors in Goodman/Amana Furnaces** on June 11, 2019 from 5:30 pm to 7 pm at our 1 B Street, Derry, NH location.

FYI, after July 3, 2019, Distributors will be able to sell any non-FER-complaint furnaces they have in stock until they are gone and contractors can buy and install these units because the regulation relates specifically to production, not purchase & installation.

[Training Schedule and Registration Sheet HERE.](#)

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