ThermoTek Motors and Control

ECM

Electrically Commutated Motors (ECMs) use an internal microprocessor to control rotation. This allows a unit to achieve many operating speeds without stopping and changing out parts. This also allows a unit to slowly start and stop, increasing unit life. Interface control is accomplished either through a Visual Control Unit (VCU, turn dial system adjustments) or an Analog Control Unit (ACU, 0-10 V/4-20 mA system adjustments). ECM controllers are a form of DC control that are limited to inputs of single phase AC power. In an ECM, brushes and commutators are replaced by permanent magnets attached to the rotor. Motor windings are attached to the armature. ECMs offer extremely high efficiency at all speeds of operation.

Figure 1: VCU panel

Figure 2: ACU panel

PSC

Permanent Split Capacitor (PSC) motors use a capacitor to link the start up and running windings of the motor. This results in a low starting amperage load. Permanently linked windings also allows for instantaneous reversal of direction. These motors are available for single phase applications. To perform system adjustments a manual potentiometer is supplied with the unit. Only a single operating speed is available at any given time.

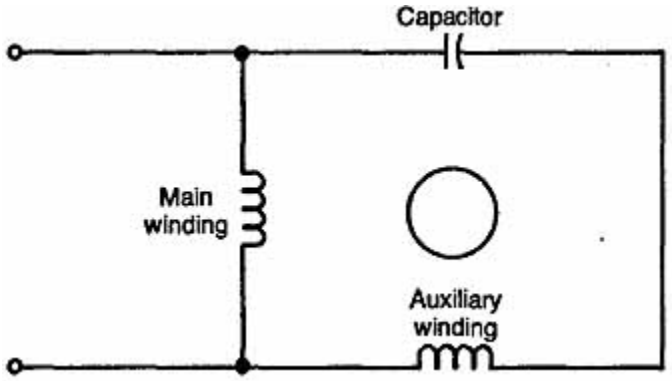

Figure 3: PSC motor wiring[1]

Images courtesy of 3:Industrial-electronics.com 4. Wikipedia.org 5:lselectric.com 6: clrwtr.com

Three phase induction motor (inverter duty)

Rather than use mechanical means to overcome starting resistance, three phase induction motors use three offset electrical phases to start. As such, this type of motor is limited to three phase applications. Inverter duty motors can be used with or without a VFD. Changing operating speed requires new belts, sheaves, and other hardware. Therefore, only a single speed is available at any given time (unless a VFD is used).

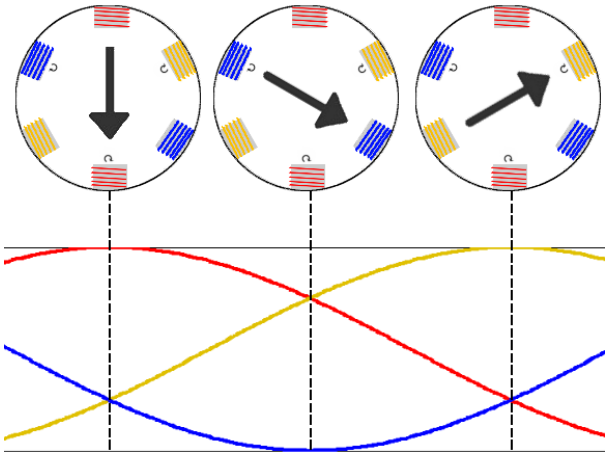

Figure 4: Offset phases allow self-starting[2]

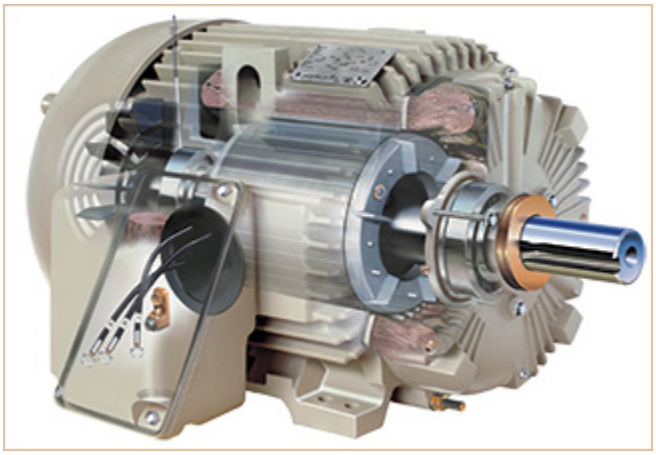

Figure 5: Induction motor cutaway[3]

VFD

Variable Frequency Drive (VFD) controllers are a form of AC control. VFDs are able to function with both single and three phase power, depending on model. In contrast to the ECM, a VFD unit is an independent component from the motor. In a VFD controlled motor the input voltage and frequency are manipulated to create different speeds. This allows a unit to achieve many operating speeds without stopping and changing out parts. Further benefits include soft start capabilities and enhanced motor protection.

Figure 6: AC Tech VFD[4]

Motor Control Selection

ECM
First choice when available (single phase only). Cost increases as units get larger.

PSC
Value engineering choice (single phase only). Single speed applications only.

VFD
Good choice when ECM is not available. Allows speed control for three phase induction motors. Note that a VFD and three phase induction motor pairing can be used with both single and three phase input power. If using single phase input power, special sizing considerations will need to be taken into account.

Three phase induction
Value engineering choice (three phase only). Single speed applications only. Without VFD for speed control this motor will only operate in an on-off fashion. Note that a VFD can be used to create three phase power from single phase input on site, given appropriate sizing.