

General Motor Knowledge
Part 37

The PSC Motor
(This is a rewrite of Part 3, October 1992)

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GMK37.wp5

A shaded pole motor has a main pole area with part of that area surrounded by a single turn of large size copper wire known as a shading coil. This coil is connected to itself or short circuited. The purpose of a shading coil is to cause a time delay, or phase shift, in the magnetic flux. It is this phase shift with the alternating current that sets-up the revolving field. The rotor tries to align with this revolving field.

If we call the portion of the pole surrounded by the shading coil the "auxiliary," the shading coil then becomes an auxiliary winding. The purpose of our auxiliary winding is to start the motor. We will call the remainder of the pole our "main." The winding around this main pole is the main winding.

Notice that the main winding of our shaded pole motor goes around both the main pole and the auxiliary pole. This winding provides the source of power for the auxiliary winding, in a shaded pole motor.

Now we will split our pole into two equal halves. Each half with the same size and shape. Each half with the same number of turns and wire size. One half we will call the "auxiliary" the other half we will call the "main." We will connect each of these windings to our AC power. We are not going to rely on the main winding to power the auxiliary.

What happened? Our rotor is not turning. Our main and auxiliary windings are producing their magnetic fields simultaneously. The field alternates, but it does not revolve. There is no phase shift.

A capacitor is an electronic device that will store an electrical charge. There is a lot that goes on but the result is, a capacitor in an AC circuit will cause a time shift between voltage and current. If we install a capacitor between the AC power and our auxiliary winding, it will cause the current in the auxiliary to lead (happen before) the current in the main. The magnetic field will appear first under the auxiliary, next under the main and so on from pole to pole. We have established the needed revolving field. Since the capacitor is left in the circuit, this type of motor is known as a Permanent Split Capacitor (PSC) motor.

The auxiliary of a shaded pole motor lags the main. The auxiliary of a PSC motor leads the main. The rotor turns the same direction in either motor. The PSC motor is more complicated to build, so why build a PSC motor? It is more efficient. It uses almost one half the electrical energy for the same output. The phase shift from the capacitor is smoother and more uniform than the shading coil and therefore the PSC motor is very noticeably quieter than the shaded pole motor. The PSC motor is a high efficiency alternative to the shaded pole motor.