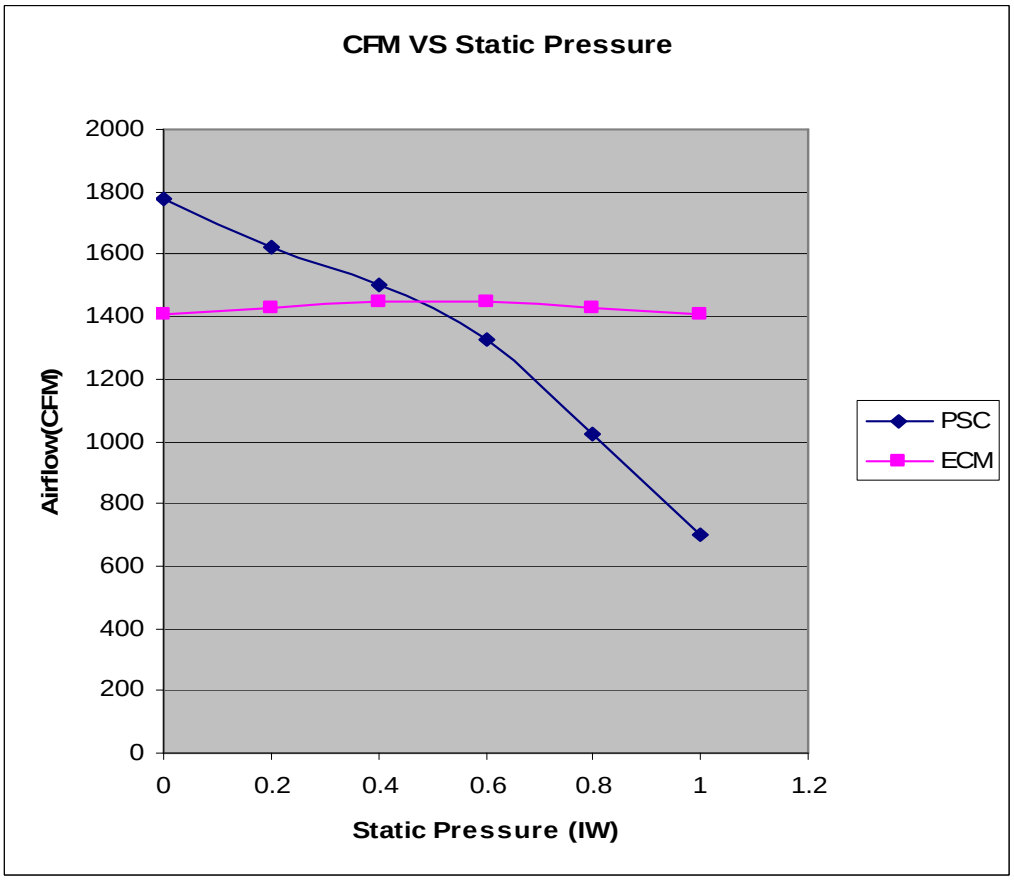
Heat Pump Air Handlers: Old School vs. New School

(Graphics courtesy of Proctor Engineering Group)

Until very recently, most residential heating and cooling equipment has used a blower with a permanent split capacitor (PSC) motor. The advantages of this motor are low cost and easily adaptability to a variety of blower wheels.

A PSC air handler will react to increasing back-pressure like a water pump. The more external static pressure placed on the air handler, the less air it moves. The blue line in the graphic shows a "3.5 ton" blower's performance over a wide range of external static pressure. At about 0.5 water column inches, the blower delivers 1400 CFM, or "3.5 tons" (assuming 400 CFM/ton). Out at 0.8 water column inches, the same blower only delivers about 1000 CFM (or about 2.5 tons).

Contrast this with the newer technology. The electrically commutated motor (ECM) is designed to deliver constant CFM over a wide range of back-pressure. It does this by increasing RPM as needed. The red line in the first graphic shows a "3.5 ton" ECM air handler's behavior up to around 1 water column inch. It delivers the CFM by greatly increasing RPM.



The higher RPMs come at a price. The actual amp draw (and therefore also the power (Watts) for the ECM increases by more than twofold. The PSC air handler

can't deliver its full 3.5 tons of air at the higher static pressure (it's not even close) but note its running Watts have fallen off considerably.

There are two important issues to remember for the ECM air handler. If it has to work against higher static pressure (here defined as over 0.8 water column inches), it will consume quite a bit more power. This means it will not operate at the manufacturer's claimed efficiency (since COP and HSPF include fan energy). More important, its life will be reduced. In some instances, Ecotope has noted ECMs lasting only a couple of years when operating at external static pressures of over 1 water column inch.