Carrier
United Technologies
turn to the experts

Aquazone™ Water Source Heat Pumps

Fan Motor Innovation

Carrier's commercial water source heat pumps (WSHP) offer a wide selection of fan motor options, from permanent split capacitor (PSC) motors and constant airflow electronically commutated motors (ECM). One our most popular options is the constant torque ECM motor, which is an ideal choice when both cost and efficiency matter.

How is a constant torque ECM different from a constant airflow ECM?

Constant torque ECMs are high efficiency, brushless DC motors similar to constant airflow ECMs but much less expensive. The constant torque ECM fan motors maintain constant torque, not constant airflow, as the system external static pressure (ESP) changes. Herein lies the main performance difference between the constant torque and constant airflow ECM. The actual amount that the airflow will vary with the constant torque ECM, however, is minimal.

Figure 1 shows how the airflow of a 3-ton WSHP changes as ESP increases for each of the 3 fan motors. At low ESP, all fan motors provide relatively the same amount of airflow. As the ESP increases above 0.5 inches of w.g., the airflow from the PSC and constant torque ECM fan motors decreases. However, the decrease of the airflow in the constant torque ECM is minimal. Even as the ESP increases up to almost 1 inch w.g., the constant torque ECM air volume is still near 90% of design volume. Thus, with a minimal airflow reduction as ESP increases and a lower first cost, the constant torque motor is a perfect middle tier fan motor option.

What motor is the right choice for my WSHP?

Determining exactly what motor is the correct choice depends upon the specific needs of the application. To help with this, Table 1 is provided below to compare each of the 3 motor types available.

A PSC motor provides an adequate solution where first cost is the main concern. When efficiency and longevity are important, ECM motors are the best choice. Constant airflow motors excel at maintaining an exact volume of air, but at high first cost. If both efficiency and cost are important, turn to the constant torque ECM.


EDUCATION


HEALTHCARE


HOSPITALITY


MIXED USE


OFFICES


RETAIL

Table 1: Comparing WSHP Fan Motors

	Efficiency	Speeds	Sound Level	First Cost	Availability		
					50PC High Efficiency Single-Stage WSHP	50PS Premium Efficiency Single-Stage WSHP	50PT Premium Efficiency Two-Stage WSHP
PSC	Low	3	Medium	Low	◆	◆	
Constant Torque ECM	HIgh	5	Low	Medium	◆	◆	◆
Constant Airflow ECM	HIgh	3	Low	High		◆	◆

CONTROL EFFICIENCY INNOVATION REBATE SAVINGS SOUND VERSATILITY

How quickly can an ECM payback?

Choosing either a constant torque or constant airflow ECM motor will help to reduce operating cost. While both types of ECM motors will have similar operating costs, constant torque ECM motors will have a lower purchase price, making it's payback period more attractive than constant airflow ECM motors. Depending on the location and application, constant torque ECM motors can pay for itself in as little as two years. For example, when modeling a school in Atlanta, New York, or Los Angeles using Carrier's 50PCH030 WSHP, the payback for the additional cost of a constant torque ECM over a PSC motor is as short as 2 years as can be seen in Table 2. Here, Carrier's *Building System Optimizer* software was used to model the building's energy costs.

Figure 1: Motor Performance Comparision

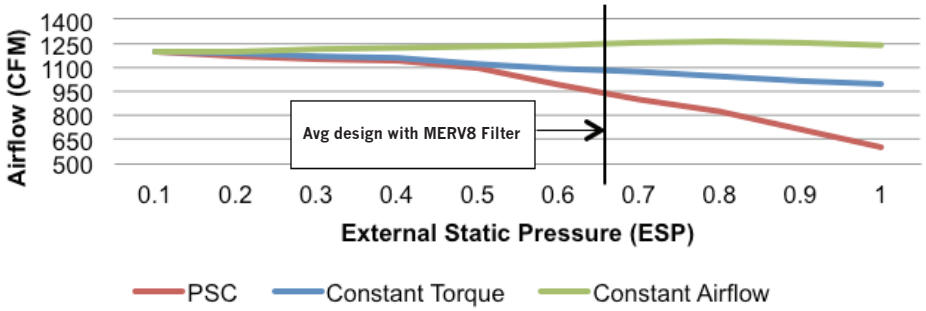

Table 2: Payback with the Constant Torque ECM Fan Motor Compared to the PSC Fan Motor

Location	Annual HVAC Energy Savings with ECM	Average Payback Period (years)*	Electricity Rate (kWh)
Los Angeles	6%	2	.13050
Atlanta	4%	2	.09870
New York City	4%	2	.15810

**Payback period based upon average price of a 208/230v -1 phase Constant Torque ECM on a Carrier 50PC WSHP compared to average price of a PSC Motor.*

Summary

Carrier's WSHP units offer a variety of fan motor options. When both efficiency and cost matter, the constant torque ECM is an ideal choice!

Aquazone™ Water Source Heat Pumps

50PC

50PS

50PT

Carrier
United Technologies
turn to the experts

www.carrier.com/commercial | 1.800.CARRIER

Cat. No. 04-811-70005