



Terry Farthing is technical marketing consultant for Advanced Air Ltd

Turning efficiency on its side

Where do you begin to make energy saving with a building's secondary fans? **Terry Farthing** takes a look at a new fan coil unit claimed to be the most efficient in the world

We all know that carbon emissions and hence energy efficiency is a critical factor in the design of buildings and their associated services.

Anything that saves energy is going to create a saving in running costs but all too often the initial investment is high and therefore the payback period is long and frequently over ten years. But what if a new fan coil unit was developed that saves an enormous amount of carbon emissions and the payback period was less than one year?

With fan coils the minimum fresh air requirement is supplied by the main air handling plant and secondary fans in the fan coil unit mix this with return air to provide a constant volume at temperatures that will provide comfort conditions within the occupied space. These secondary fans distinguish the fan coil from chilled beams and it is these secondary fans where energy savings need to be made.

Specific fan power

Specific fan power, SFP, is a measure of the efficiency of the secondary fans and is measured in watts per litre/second. In the 2006 building regulations an acceptable SFP of 0.8W/l/s is provided which means for every 1l/s delivered by the fan coil the actual secondary fan could consume 0.8W. The new 2010 building regulations are likely to reduce the SFP to 0.6W/l/s.

Advanced Air has developed a unique range of fan coil units known as the EPIC with SFP down to 0.15 which could make it the most energy-efficient unit in the world.

As will be seen from the image the actual fan has been turned on its side and there is only a single motor compared to the three to five fans used on more conventional units. The fan motor termed ECM uses the latest EC technology which is basically an electronically commutated motor with much higher efficiencies than the normal AC motors. Figure 1 gives a direct comparison of the EPIC SFP with the other fan coil options.

In the past the AC fan deck within

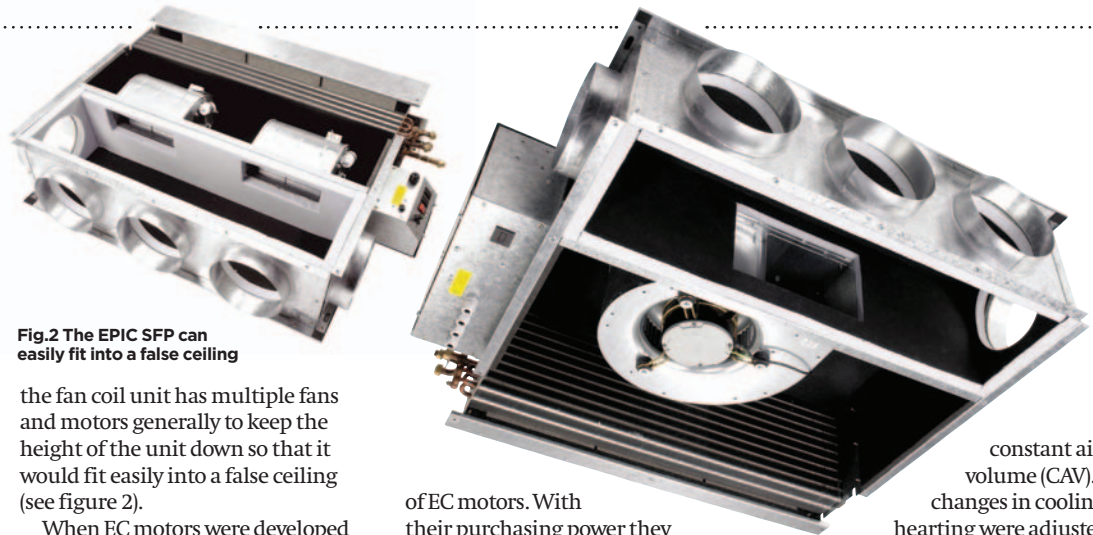


Fig.2 The EPIC SFP can easily fit into a false ceiling

the fan coil unit has multiple fans and motors generally to keep the height of the unit down so that it would fit easily into a false ceiling (see figure 2).

When EC motors were developed for fan coils the manufacturer of the motor made a small "one size" motor which was then assembled into the fan deck. For some period of time there has only been one European manufacturer of EC fan coil decks

of EC motors. With their purchasing power they encouraged motor manufacturers to produce larger EC fan coil motors of 250W compared to the European model which was only 75W. The "clever engineering" was to turn the fan through 90° and lay it on its

constant air volume (CAV). Any changes in cooling or heating were adjusted by the water valve, i.e. varying the water volume. However with the fans running at full speed all of the time this is a needless waste of energy. By varying the air volume, significant reductions in energy can be achieved and typical values for a wide range of constant and VAV fan coils is shown in the energy comparison graph figure 3.

Fig.1 Comparison of the EPIC SFP with other fan coil options

Motor Type	Air Volume l/sec	Motor Power Watts	SFP w/l/s
ECM - EPIC Advanced Air	170	34	0.2
EC - Conventional Fan Coil	170	55	0.32
AC - Conventional Fan Coil	170	103	0.61
AC - External Rotor Motor	170	123	0.72

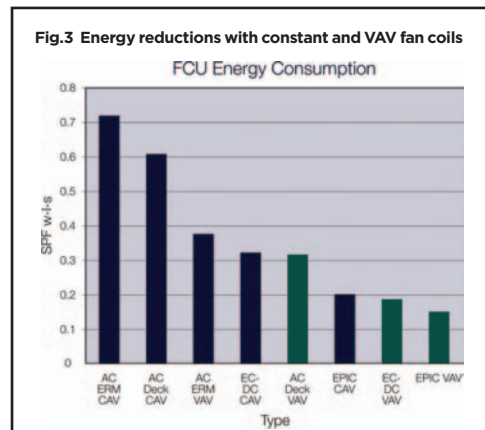
and both the price levels and design have not changed significantly.

Advanced Air, with their US parent company, Nailor Industries, were able to develop difference sources

side or, more correctly, horizontally mounted. In addition, Advanced Air designed the scroll and impeller and assembled these with the ECM motor so that the complete fan

characteristics matched the requirements of the fan coil. By designing and manufacturing their own fan deck as opposed to utilising an "off the shelf" solution, they were able to achieve much better efficiencies.

So how did Advanced Air achieve an SFP of 0.15? For the last 40 years virtually all fan coils have been constant fan speed and consequently



Simple control philosophy

The control philosophy is relatively simple. At maximum cooling the fan is running at 100 per cent with the water valve fully open. As the cooling load reduces the fan air volume is reduced down to a minimum of 60 per cent & if necessary the water flow rate is lowered to maintain off coil temperatures. If the cooling load reduces further the water valve is progressively closed until the dead band is reached. In other words the fan air volume is reduced first followed by a progressive reduction in the water cooling volume.

On heating the early morning boost has maximum air volume and heating. On the heating cycle the air volume is kept constant to ensure there is no stratification within the room. The heating requirement is usually a short period just before the building is occupied and therefore does not significantly impact on the carbon emissions. ●

ENQUIRY No. 136
www.advancedair.co.uk