POWER PRODUCTS

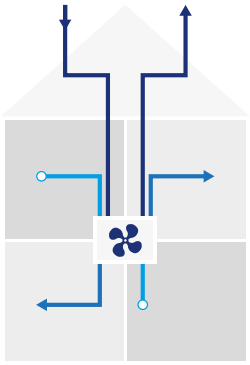
MVHR Makes Sense

MVHR systems are becoming increasingly necessary as we near the Zero Carbon goals for dwellings by 2016, "Mike Farrer" of Stadium Power highlights the need for the highest possible efficiency MVHR power sources to perform over a wide operating window

Mike Farrer
Engineering Director - Stadium Power
mike.farrer@stadiumpower.co.uk

In general, legislation exists for good reason, in any industry. In the building industry legislation provides regulatory requirements that deliver a safer and increasingly more sustainable end-product. The drive towards sustainability isn't restricted to the building industry, of course; it now touches and influences every industry and permeates the entire supply chain.

Legislation also drives innovation; out of necessity, manufacturers who are obliged to comply with legislation must continuously strive for ways to differentiate their product or service, in what can be viewed as an increasingly homogeneous landscape. However, invariably legislation and regulation exists to protect consumers from the 'worst-case scenario'; imposing upper limitations that allow significant room for improvement. And it is here where real innovation can shine through.



Sustainability and 'going green' is a case in point. While opinions will always conflict, it's a fact that the decision from global governments to adopt 'greener' and more sustainable practices now spans design, manufacturing, distribution, and end-of-life across practically every industry at some level. The use of harmful chemicals and base materials in now highly restricted in the electronics industry, for example, while European Directives now dictate how manufacturers must also make provision for the disposal of such products.

In the building industry the focus is less on end-of-life and more on its preservation; specifically, buildings constructed today are expected to be in use for many decades and so it is their impact on the environment over their 'working life' that is now coming under closer scrutiny.

MVHR makes sense

With a target of making all new homes Zero Carbon by 2016, an important aspect of new builds is their efficiency in heating and/or cooling. Modern homes must now comply with legislation that requires them to be air tight, maximising their ability to lower heating costs through insulation and efficient windows/doors. Targets propose a roadmap of waypoints in improving insulation and heating systems, leading to the eventual Zero Carbon goal.

This isn't happening in isolation, of course; other aspects of legislation also dictate the restricted use or cessation of harmful components in building materials, coupled with a reduction in the contribution to CO2 emissions. On the face of it, an airtight building that neither harbours or vents harmful materials, or contributes any CO2 to the environment would provide the ideal solution. However, this presents its own problems, specifically in dealing with the affects of stale air and condensation. The solution to this is to vent stale air to the outside and replace it with fresh air. However, while not harmful to the environment, it is clearly wasteful in terms of the heat lost by venting warm and replacing it with cooler albeit fresher air.

Mechanical Ventilation and Heat Recovery (MVHR) helps overcome this problem, by recovering the heat from the warmer internal air and using it to heat the fresh air from outside, before it is introduced in to the property. MVHR systems are relatively simple but provide an important part of the Zero Carbon building.

In order to preserve the overall goal of reducing emissions, the performance of an MVHR system is also subject to inspection. Specifically, their performance can be submitted in accordance to the Standard Assessment Procedure Appendix Q, which makes performance data for installations of specific equipment available to energy performance assessors. It uses tests and methodologies that integrate within the applicable SAP calculation version.

This data contributes to the overall energy performance of a dwelling and is becoming increasing relevant as the Zero Carbon objectives of 2016 draw closer. There are now a number of MVHR equipment manufacturers and equipment listed on the Appendix Q website, allowing specifiers to select the most appropriate solution for their needs.

Driving Efficiency

The performance of an MVHR installation is dependent on number of parameters, some of which are installation-dependent — such as using rigid or flexible ducting — and some which are determined purely by the equipment and components used, like the kind of fans employed, their power supplies and control systems.

Predominantly, the components that make up the electronic subsystems are developed and assembled by a range of manufacturers, such as those listed in the database of performance data maintained by SAP (www.sap-appendixq.org).

This database of performance data describes key aspects of an MVHR system's operational parameters measured using SAP's own criteria. These include (and are largely defined by) the power needed to (re)circulate a given volume of air based on the number of (wet) rooms in the dwelling. By example, the tested airflow for a kitchen is 13 Litres/second and for wet rooms (bathrooms, for example) it's 8L/s.

The SAP Appendix Q specification measure this airflow in terms of electrical energy, or Watts. The result is a figure measured in Watts/Litre/second, referred to as the Specific Fan Power (SFP). The current specification calls for fairly modest SFP figures; <1.5 W/L/s and heat recovery efficiency > 70% . Already the database of performance data lists equipment/manufacturers that achieve much better figures. The challenge these manufacturers face, however, is improving these already impressive performance figures under the variable airflow rates required by SAP Appendix Q; something that is almost entirely dependent on the fan type used. Inevitably the requirements will get tougher.

Powering MVHR

Fans are, generally speaking, relatively cheap. However, their cost is directly related to their efficiency, which in turn is dependent on their operating method. The cheapest and simplest fans run directly from an AC mains source but they are also the least efficient. Electronically Commutated Fans (EC-DC or ECM fans) take the AC mains source and convert it to a high voltage DC (direct current) which delivers a more efficient use of the power source, but significantly increases cost. Low voltage DC fans use a power supply to convert the AC mains voltage to a low voltage to operate the fan. These can be more efficient and cost effective.

However, the low power and low flow rate requirements of Appendix Q can have a negative impact on the efficiency of Electrically Commuted Fans, which are normally designed to run most efficiently over a given flow rate range.

The problem is actually in how the fan converts the power into mechanical movement ; as ever, cost is a factor so the power conversion stage is normally designed to be efficient over a limited window of operation. With MVHR systems, the performance of the fan is largely dependent on the prevailing conditions, number of (wet) rooms and even seasonal climate.

As a result, the most efficient MVHR systems — those that can deliver low power consumption and high efficiency (<1.5W/L/s and >70% heat recovery) over a wide operating window — need a more efficient and typically bespoke power conversion stage. In response to this growing need power supply manufacturers such as Stadium Power are now developing power supplies that meet these exacting requirements.

Given that a typical dwelling may have one kitchen and between 1 and, say, five wet rooms, and each of these rooms may have variable ventilation needs (perhaps controlled by external sensors such as humidity, temperature or occupancy), the load on the power supply could vary between 25% and 100%. For this reason, Stadium Power has designed a range of MVHR PSUs to deliver greater than 90% efficiency at 25, 50, 75 and 100% load, achieving >87% between 10 and 100% loads. Stadium Power now offers five variants in a range developed specifically for MVHR applications; delivering between 75W and 120W @ 24V DC with a 'flat' efficiency of >90% between 25 to 100% load.

Conclusion

MVHR systems are becoming increasingly necessary as we near the Zero Carbon goals for dwellings by 2016. However, looking at system efficiency requires MVHR manufacturers to consider the environmental and financial impact of the variable power requirements such systems exhibit. In order to not only comply with the requirements of SAP Appendix Q but to also differentiate themselves amongst the competition, MVHR manufacturers should look closely at the PSU sub-components and strive to provide the highest possible efficiency over a wide operating window; parameters many ECM fans aren't designed to deliver.

Though designing in high efficiency power supplies designed specifically to help meet SAP Appendix Q will enable MVHR manufacturers to deliver the right solution in the face of mounting demand and competition.

T: +44(0)1379 644233
E: sales@stadiumpower.co.uk
www.stadiumpower.co.uk

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