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Press Release

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EC technology – and then what?

Technical publication

EC technology has catapulted efficiency to a completely new level. Is there still more to come? Or is the focus moving towards other potential that has lain unexploited in this technology until now? It seems there is no doubt that the way to cost-saving energy management is through energy monitoring.

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Lingen (Ems), March 2013 - EC technology, the technology of electronically commutated DC drives, is the drive concept for now and in the future, particularly at low output ranges and therefore in very many heating, air conditioning and ventilation applications. It was preceded by DC motor technology that has fewer losses due to its physical properties, combined with the rapidly developing miniaturisation and integration of electronic control and performance-based components. The question: "What is the next evolutionary step after EC technology?" A proven expert in the development of EC fan technology over the last 15 years answered this question some time ago: "The efficiency of EC systems is optimised to a limited extent. Other applications in higher electrical output ranges will come onto the market but their greatest potential will be in their communication capacity and the required networking of the components relevant for energy consumption."

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Fans will play a key role in heating, air conditioning and ventilation technology in terms of consumption, efficiency and functionality of total systems.

Efficiency technologies

The first step for an energy-saving building operational strategy is undoubtedly based on the selection of appropriate efficiency technologies, taking into account the building and the building concept. As low average temperatures are only often available on the producer's side with the demand for regenerative energies, the consumer side must be prepared for this.

In addition to classic low temperature systems, such as panel heating and cooling systems, fan-based systems are gaining increasing importance with their high achievable outputs with regard to the installation space required. A high level of efficiency and excellent controllability are required in order to guarantee the high demands of needs-based power control as well as sound emission limits. Decentralised systems are favoured over centralised systems for heating and cooling in many cases due to the comparatively low power consumption of the small fans. Decentralised components are the most efficient solution by far for heating and cooling, particularly with regard to the SPF values for fans required by the EnEV 2009. Low temperature systems, such as fan convectors and trench convectors for installation in floor, wall or ceilings areas are the ideal complement.

Separating ventilation and temperature regulation

The EnEV 2009 defines heat recovery for ventilation requirements. Looking at the achievable efficiency levels and the resulting pressure losses with highly efficient heat recovery heat exchangers, the majority of applications are centralised systems. A centralised ventilation unit with a highly effective heat recovery system only needs a small amount of supplementary temperature regulation to

prevent draughts due to supply air temperatures being too low. With good ventilation planning, ideally in conjunction with a decentralised heating or cooling unit, there is absolutely no need for any supplementary temperature regulation with a centralised ventilation unit. The mantra is "Separating ventilation and temperature regulation," with the use of waste heat from production or air conditioning systems proving increasingly popular. Whilst the connection of the waste heat is quick and easy to implement via hydraulic separators and buffers but is associated with high installation costs, direct integration, e.g. via direct evaporator heat exchangers is easier in engineering terms. However, the measurement and control system requirements for the safe integration of the refrigeration control functions into the room air conditioning measurement and control system are significantly harder to implement and require a high degree of coordination.

Adiabatic cooling systems are becoming more and more important

Classic refrigeration using compression refrigeration units is making substantial progress in terms of efficiency due to the rapid development in compressor technology. There are more and more modulating compressor applications that can provide infinitely variable modulating cooling outputs. DC technology is also making inroads here. The field of adiabatic cooling systems is gaining in importance alongside this classic technology and also take advantage of the physical of energy being removed from a carrier medium during the evaporation of water. In addition to popular classic cold, steam and warm humidifiers used in ventilation systems on the exhaust air side, there are now systems on the market in which evaporation takes place inside a heat exchanger. The immense size of the heat exchanger surface for the evaporation effect significantly increases the cooling output in relation to the installation space required.

Networking of technologies

All these technologies have only a limited effect if they are not incorporated into the air conditioning targets, specifications and the operating philosophy of the building. It is impossible to have a manual overview of these functions within the complexity of the individual systems. Automation is essential to integrate the individual efficiency systems

This brings us to the interface problems. Isolated manufacturers' solutions can provide for the automation of a small system with small- and perhaps also medium-sized projects. A higher-level automation and building management system is needed with larger projects, more diverse applications and more complex tasks. But as there are as many bus systems as there are manufacturers, this now becomes the next hurdle on the path to efficiency: A USB interface is needed (USB = Universal (!) serial bus) for technical building equipment components but a system like this is not envisaged at present. However, there are good options for defining a communication platform via manufacturer-independent and largely standard building management systems, such as Bacnet, KNX or LON, onto which the individual manufacturers' intelligent products can be connected. Special mention should be made of the RS485 protocol MOD-bus, which is gaining more and more acceptance in smaller applications due to its excellent cost-effectiveness and simple programming.

The next important step towards energy efficiency has been taken with the use of a small-, medium-sized or large BMS. As a result of all system data (data points) now being communicated in bus protocols, it is now also available for further higher-level processing. Building automation provides the infrastructure for a monitoring system.

Technical and energy monitoring

Fundamentally there are two distinct areas:

a) Technical monitoring

b) Energy monitoring

All the prerequisites have now been put in place for **technical monitoring**: The intelligent heating, air conditioning and ventilation units have recorded all operating and also all event and fault messages in particular via their integrated unit controllers. These can be used in the context of technical monitoring to be able to plan maintenance management proactively and just-in-time. Technical monitoring enables the timely and targeted coordination of operations in specific situations in the field of fault management. However this only leads to a limited reduction in energy consumption and energy costs.

It goes without saying that energy consumption values are relevant for **energy monitoring**. If the values of electricity, gas, heat or cold water are assigned higher relevance then they must be measured.

Measuring costs money. A certification procedure is generally carried out in accordance with DIN ISO 5001 to determine how detailed this breakdown needs to be and also includes a cost/benefit ratio for the details of the measurements. EC technology can again make a valuable contribution here. Its electronic drive units have internal factory-fitted electricity consumption monitoring to keep the motor within its power limits and issue advance warnings in the event of certain "symptoms." Therefore, operating and efficiency-relevant data points, such as the motor operating mode, operating hours and the electrical consumption of the machines in particular are available immediately as data points; practically a free of charge extra with the purchase of an EC fan!

Over and above an existing BMS system it is important to bring together the individual energy-relevant data on the existing infrastructures and networks, in particular with decentralised properties. In large companies this is normally done via an in-house network that brings together all operating data for an energy

benchmark via protected connections on the Energy Manager's control panel. It is possible that this structure cannot always be reproduced due to internal company IT guidelines. The solution is to be found in service providers that incorporate the recording, collection, transfer and bringing together of the necessary energy data points on external Cloud server systems. The operator has individual access with a customer-related allocation and prepared data. This way is generally the quickest and more favourable as the provision of the complete infrastructure and also the data management are outsourced.

Outlook for energy monitoring

Energy costs are increasing. The phasing out of nuclear energy and the rapidly escalating share of renewable energy in the overall energy mix are two key inflationary factors. Companies, in particular, must ensure that they reduce their energy consumption – and more importantly their energy costs to maintain a competitive edge in the long run. Energy management is therefore of outstanding importance – now and in the future.

Direct influence on energy cost efficiency

Companies have intensified their efforts in terms of increased energy efficiency in the past year. The energy price increases that have occurred could largely be offset with more efficient machines and appropriate technology. However, the absolute energy costs have only been slightly reduced. The ratio of electricity costs to turnover has scarcely improved. This may lead to the conclusion that companies would rather deal with the issue of energy on the consumer side and primarily implement individual technical measures that are generally linked to investment. However, there are a few measures that directly affect energy cost efficiency. One option would be to obtain a tax rebate. This could be applied for in the context of tax capping in accordance with §10 of the Electricity Tax Act (*StromStG*). Another possible measure is the use of EEG

apportionment reduction (*EEG = German Renewable Energies Act*). That applies in particular to companies whose energy consumption is to a great extent the result of production and value creation.

What can we conclude from this?

Sustainability is possible! EC technology, as a high efficiency technology, can be an important element in this large puzzle. However, the above-mentioned overview of this topic also shows how diverse and wide-ranging the technical and design task is, to meet and ideally exceed the statutory, environmental and economic requirements that are becoming even more restrictive by means of an integrated building concept. The ability to take a broader view is becoming more important than ever. A planning guide for energy monitoring of technical systems in buildings!

Kampmann GmbH

Medium-sized family-run company Kampmann GmbH is successful throughout the world with its wide range of technologically leading developments for heating, cooling and ventilation. It employs around 700 employees worldwide. Kampmann GmbH celebrated its 40th anniversary in 2012.

(1,802 words/12,066 characters)

Photo 1 *(1_KampmannISH_Energ_Mon.jpg)*

Combination of a centralised ventilation unit with decentralised units: Temperature regulation of the air is decentralised; ventilation and heat recovery are centralised.

Photo 2 *(2_KampmannISH_Energ_Mon.jpg)*

Plan view of the building automation system; assignment of field units

Photo 3 *(3_KampmannISH_Energ_Mon.jpg)*

Exploded view of an EC fan drive with integrated commutation electronics and a communication interface (communication interface not visible)

Photo 4 *(4_KampmannISH_Energ_Mon.jpg)*
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