EXPERT TIP #2

How to optimize HVACR efficiency with the right motor/drive technologies?

Many types of electric motors are currently available for use in commercial HVAC+R applications and new products are being constantly introduced into the market. But how to select the motor/drive combination that best fits your needs? And does new technology always mean greater levels of efficiency?

The selection of motors used in HVAC systems is often determined by cost rather than efficiency. In order to comply with new efficiency mandates, new motor technologies have been developed to provide higher levels of performance.

Induction motors, often deemed to be the more inefficient solution, are widely appreciated because of their availability across the world, the healthy stock levels and its proven technology. However, standard induction motors are not particularly well suited for low-speed operations as their efficiency drops with the reduction in speed. At some point induction motors will simply not offer sufficient efficiency anymore for the HVAC application.

Permanent magnet motors combine the high speed accuracy of synchronous technology with the robust design of induction motors. On the other hand, the use of rare-earth elements (REEs) is usually quite expensive and the motors’ strong magnetic rotor field can make servicing more difficult. The concept of synchronous reluctance motors has also been around for a long time, but the potential of these kind of motors with regard to efficiency has not yet been fully explored.

HVAC manufacturers are striving for systems that provide for high productivity levels and use only the energy that is really needed. This can be achieved by the application of variable speed drives (VSDs), which run the motor based on the processes current demands. It is imperative that VSDs work seamlessly with higher efficiency motors. New drives provide a software function that optimizes the magnetization of the motor automatically to the optimal value and control the energy consumption by following the set point of the system. Certain drives also have a built-in capability to run as stand-alone controllers, meaning running speeds can be optimized in order to keep the process value stable without external controllers.

It is important to remember that the drive is only one part of an HVAC system. The drive must be carefully integrated into the operating environment to achieve maximum efficiency. For this purpose, the application and communication capability of the drive is all-important. The drive must support native BACnet MS/TP and BACnet IP integration in buildings and the systems housed in
them. This enables the drive to obtain a reference or set point, i.e. the necessary operating speed for the motor.

Further, the combination of the fan, the motor and the drive has to be considered. All devices should be selected with efficiency in mind. One major advantage of ABB HVAC drives is the compatibility with any motor. The worst-case scenario when opting for inflexible systems is that the whole HVAC package has to be replaced. HVAC specialists must adopt a component-wise approach in order to achieve optimal system efficiency. For example, drive and motor packages from ABB offer pre-measured and guaranteed efficiency levels providing optimized solutions.

The IE4 efficiency class is currently the major achievement on the HVAC market, and drive manufacturers such as ABB are already setting their sights on offering IE5 and IE6 solutions in the future. Designing for efficiency is never an easy task. The design often becomes more complex when greater efficiency is the goal, as the efficiency of a fan, motor or speed control can rarely be predicted before being applied to an AHU or other complex HVAC system. This will require the services of an experienced partner who is able to provide all the HVAC knowledge required to ensure an informed decision is made.

You can learn more about ABB drive and motor solutions for HVAC on our webpage.