Motor and Drives

Over half of all electrical energy consumed in Ireland is used by electric motors. Improving the efficiency of electric motors and the equipment they drive can save energy, reduce operating costs, and improve productivity.

Energy efficiency should be a major consideration when you purchase or rewind a motor. The annual energy cost of running a motor is usually many times greater than its initial purchase price. If a 10kW motor is running all year round then it will use nearly €8,000 in energy costs in one year. Motors generally drive other mechanical systems such as pumps, fans and compressors. When it is required to reduce the output of these systems, it is common practice to increase the resistance in the outlet pipe or duct to achieve the desired effect. This is like reducing your car's speed by keeping the foot on the accelerator and at the same time applying the brake – not a very energy efficient outcome. A better alternative would be to reduce the motor's speed using a variable speed drive.

Motor efficiency is the ratio of mechanical power output to the electrical power input, usually expressed as a percentage. Considerable variation exists between the performance of standard and energy-efficient motors. Improved design, materials, and manufacturing techniques enable energy-efficient motors to accomplish more work per unit of electricity consumed. The typical increase in efficiency using a high efficiency motor is 3% or more.

Energy-efficient motors offer other benefits. Because they are constructed with improved manufacturing techniques and superior materials, energy efficient motors usually have higher service factors, longer insulation and bearing lives, lower waste heat output, and less vibration, all of which increase reliability. Most motor manufacturers offer longer warranties for their most efficient models.

Energy Saving Opportunities

Electric motors drive nearly all machinery in industry. Of course they are also found in commercial premises and business such as hotels. For any particular situation there is usually an energy efficiency solution that can be applied that is optimal for that situation. The main techniques are summarised below.

- Replace conventional motors with high efficiency motors where savings of 3% can be achieved.
- Use Variable Speed Drives to control the speed of existing motor driven applications. In pump and fan applications a reduction in speed of 50% will reduce the flow by 50% with a reduction in power input of 87.5%. The power/speed relationship is sometimes known as the power cubed law or as the square torque law and works for applications utilising centrifugal pumps and fans such as typically found in HVAC systems. Hence controlling flow by motor speed reduction means, that a relatively small speed change produces a large reduction in absorbed power.
- Motor Optimisers can be used to improve the efficiency of standard motors operating at reduced load. Typical savings of 1-2% can be achieved.
- New Build – Ensure all new motors are of high efficiency type.
- Continuously operated motors – retrofit high efficiency motors (HEM).
- Motors greater then 7kW operating less then 5,000 hours per year – install HEM rather then rewinding old motors (rewinding may reduce motor efficiency).
- For motors under 7kW it is normally cheaper to buy a new motor then rewinding an old one. Rewinding can reduce a motors efficiency by 1%.
- Small motors operating at less the 50% load – install motor optimisers.
- Large motors operate less then 80% load all the time – replace with HEM rated at 80% that of the replaced motor.
- Large motors operating at less then 50% load for more then 30% of the time – install motor optimiser.
- Motors on pumps and fans that are either oversized or are continuously modulated – consider installing variable speed drives.

Other energy savings techniques

- Can a timer be used on motor to ensure off when not required?
- Can the motor be switch off when idling. On larger motors will soft starts help to increase the allowable starts per hour?
- Is the transmission between the motor and the system driving efficiently? Can a flat belt driver be used to replace v-belt drives?
- Are the motor phase voltages balanced?
- Is the power factor correction working and sufficient?
- Can the motor be interlocked with key item to ensure it is off when not required?
- The use of good lubrication oil including synthetic oil have be shown to reduce overall motor transmission losses.

ESB Independent Energy has considerable expertise in the efficient utilisation of Motor and Drive Systems. If you require further information please contact your Customer Relationship Manager or ESBIE Head Office at 00 353 1 8628300.