# Synchronous savings

**Synchronous motors offer the potential for significant energy savings in high power, heavy load applications. Brian Tinham talks to Marek Lukaszczyk about the pros and cons**

Synchronous motors are increasingly being seen as the motor of choice for high-power, heavy-load applications. This is due in part to their ability to reduce electrical energy costs by improving energy efficiency – not least as a result of correcting for power factor on the motor power supply. Because of the size and nature of applications where synchronous motors are typically used, the energy savings achieved can be considerable – often resulting in fast payback, despite the increased up-front cost, and leading to worthwhile additional opex savings thereafter.

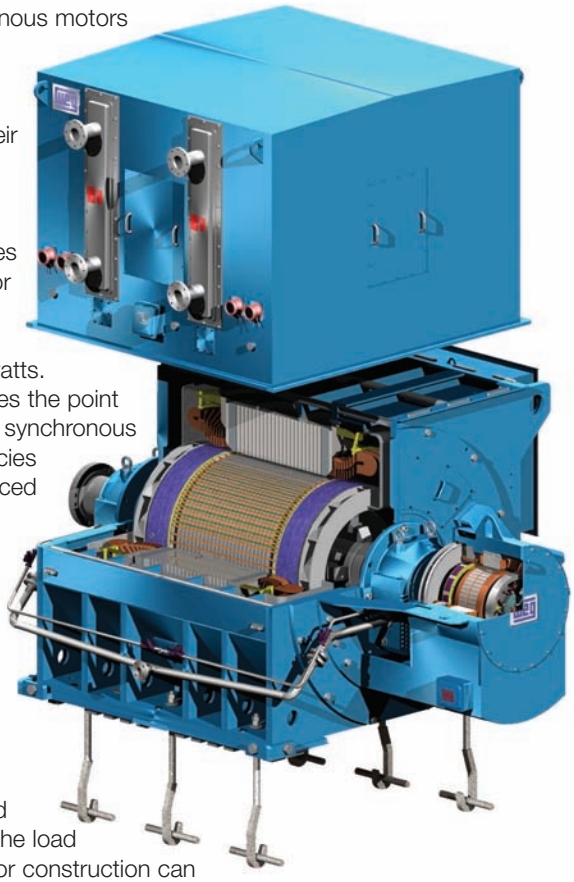
But there is another reason for their growing popularity: synchronous motors also deliver high torque and constant speed under varying load conditions. And for applications requiring high torque, breakdown torque with synchronous motors can be as much as five times higher than rated. Again, these attributes lead to lower operating costs, as well as reduced maintenance implications – on top of potentially better and more practical motion control than is easily achievable with alternative approaches.

## Smaller, but better

Hence their adoption in applications ranging from crushers, mills and conveyor belts for mining and quarry operations, to fans, pumps and compressors in steel plants, and chippers and de-barkers in wood processing. And it's a similar story with pulp and paper extruders, sewage system pumps, and large compressors and fans in chemical and petrochemical applications, and water injection pumps on floating oil platforms.

Looking at the detail, compared with dc motors, synchronous motors offer greater efficiency, reduced size and higher output rating. That makes them particularly attractive for high performance applications. Why? Because, as Marek Lukaszczyk, European marketing manager with Weg Electric Motors, explains, motors with lower torque values can often be applied. "This brings a reduction in motor starting current – resulting in fewer problems with the electrical system during starting – together with a reduction of mechanical stresses from the motor windings."

But although it's a similar story with induction motors – with synchronous motors scoring, in terms of efficiency and speed accuracy – design complexity is not in their favour. Lukaszczyk concedes that the simpler design of induction motors makes them less expensive for a given power level, certainly at power outputs up to 10 kilowatts. However, he also makes the point that, above this figure, synchronous motors' higher efficiencies deliver noticeably reduced operating costs.



And he adds that synchronous motors can improve stability in variable speed drive applications.

"Synchronous motors are recommended for applications with high torque and wide speed range. Depending on the load and environment, motor construction can be with, or without, brushes. These motors are suitable for any speed range, right down to zero, maintaining stability independent of load variation – which is critical on equipment such as laminators and plastic extruders." PE

## Brushed or brushless

Synchronous motors require a dc power supply for the field (rotor) winding, which is achieved through a brushless rotating exciter on brushless units, or via a static exciter for brushed motors.

Weg synchronous motors, supplied with static exciters, are fitted with slip rings and brushes. These allow current powering of the rotor poles, using slipping contacts. Dc power for the poles is derived from an ac/dc converter and static controller.

Meanwhile, synchronous motors with brushless excitation are fitted with a rotating exciter, normally installed on the rear of the motor and with either dc or ac power supply on the stator. Brushless synchronous motors offer reduced maintenance costs, simply because inspection and cleaning of brushes and slip rings is eliminated.