

Next-generation of high efficiency motors now available for potentially explosive environments

Petteri Hyytiäinen, Chemicals Global Industry Segment Manager, ABB, explains how the chemical industry can ensure safety and boost energy efficiency by deploying motors that offer up to 40% lower energy losses compared to commonly used IE3 motors.

The chemical sector is the second-largest consumer of industrial energy and the third-largest direct emitter of CO₂. Given the climate crisis, improving the energy efficiency in chemical production processes is now imperative.

Motors are at the beating heart of chemical production, powering critical applications from pumps and fans to compressors. These motor-driven systems claim most of the industry's energy, making them a logical starting point for energy efficiency improvements. Right on schedule and up to the task is the new IE5 Increased Safety SynRM motor developed to deliver energy savings and lower emissions.

NEXT-LEVEL EFFICIENCY

Electrical equipment efficiency is rated from IE1 (lowest) to IE4 (highest). And due to the latest Ecodesign regulation, as of July 2023, new motor installations and upgrades in Europe will require a minimum of IE4 for motors rated between 75 and 200 kW.

But these regulations don't address older motors already in use, leading many chemical production facilities to continue to waste energy with inefficient IE2 or IE1 motors. So, there is an immediate gain to be had by upgrading motors. ABB's IE5 synchronous reluctance (SynRM) motors deliver more efficiency, with up to 40% lower energy losses compared to IE3 motors. Furthermore, a SynRM motor must be paired with a variable speed drive to function correctly. That means a SynRM motor comes as part of a package that automatically brings the energy efficiency advantages of using a drive.

UPGRADING DELIVERS HUGE ENERGY SAVINGS

To show what's possible, the world's largest nitrogen-based complex fertilizer producer turned to ABB to boost the energy efficiency of its production facility in Porsgrunn, Norway. The upgrade project will ultimately yield annual energy savings of 32–40 GWh and cut CO₂ emissions by 12–19 kt — equivalent to the emissions produced by nearly 14,000 standard cars.

The first project phase involved the replacement of around 1,000 old low-voltage electric motors with IE3 motors, 75% of which also had drives added. The second, ongoing phase will replace an additional 2,500 motors with IE5 SynRM ultra-premium efficiency motors. Nearly 70% of these motors are fitted to pump and fan applications, proving significant energy-saving potential.

SAFETY FIRST

It is vital to use motor-drive packages with ATEX certification for applications in explosive atmospheres. But until now, a suitable SynRM motor has not been available. The arrival of SynRM Increased Safety motors now offers chemical manufacturers the most energy-efficient motor and drive technology available.

ABB is the first manufacturer to provide ATEX and IECEx certified SynRM motors suitable for explosive atmospheres. SynRM Increased Safety motors provide ultra-premium efficiency, increased reliability and reduced maintenance thanks to lower running temperatures, longer lifetime and fast return on investment. The motors produce lower CO₂ emissions and are sustainably manufactured, containing no rare earth elements.

COST-EFFECTIVE INSTALLATION

The motors can also help in specifying a more cost-effective installation. For example, in Zone 1, the cooler running design could allow the use of an increased safety motor, replacing the traditional flameproof motor with a special enclosure. In Zone 2, the improved loadability of SynRM motors, which enables more power to be delivered from the same size as an induction motor, is important. This could allow a smaller, and therefore lower-cost, motor to fulfil the same duty.

SynRM motors offer a seamless upgrade option for companies looking to modernize their assets. Because they are the same size as induction motors, replacement is straightforward and requires minimal process disruption. The motors are also compatible with ABB Ability™ Digital Powertrain, allowing remote monitoring of electrical motor-driven processes.

UNTAPPED ENERGY SAVINGS

Reducing energy consumption also lowers the total cost of ownership (TCO) over a motor's lifecycle. While less efficient motors might have lower upfront costs, TCO analysis shows that around 97% of a SynRM motor's TCO stems from electricity usage throughout its service life, with maintenance comprising just 1% and CapEx 2%.

OPPORTUNITY AWAITS

In the energy-intensive chemical sector, rising demand necessitates rapid energy efficiency solutions. The technology exists and is available right now to turn the tables on climate emergency. All that remains is to use it.

Learn more about the energy efficiency possibilities within the chemical sector in our whitepaper. <https://bit.ly/3Ezj6qh>

