



## RESOURCE-EFFICIENT AND ENVIRONMENTALLY SOUND SOLUTIONS IN

# Motion

Building on more than 130 years of experience, ABB's Motion Business Area provides leading technologies that enable our customers to increase their energy efficiency, improve their safety and reliability, and maintain precise control of their processes. Like ABB's other Business Areas, we are proud to provide solutions that contribute to the ongoing energy transition and deliver major reductions in emissions and environmental impacts. Our Business Area offers the world's leading portfolio of industrial electric motors and the variable-speed drives that ensure they perform at optimum efficiency. Connecting products with our digital solutions and services further optimizes performance, system efficiency and energy savings.

We believe the environmental potential of our products and services has not yet been fully appreciated. An estimated 45 percent of the world's electricity is used to power electric motors in buildings and industrial applications. Electric motors have been in use for 150 years, and they have steadily improved over time. Yet for the past decade, they have undergone a renewed period of technological advancement. The latest wave of improvements has opened the door to significant reduction of the carbon footprint of industrial electric motors. An expanding range of highly energy-efficient electric motors and variable-speed drives that can be used to run them will underlie much of the ongoing effort to meet the goals of the Paris climate Agreement.

### **Reducing emissions through more efficient motors**

While motors of all sizes have been embedded in great quantities into nearly every built environment, the majority of electric power consumed by motors is used by mid-sized motors. Many of these are larger than necessary for the applications at hand and are often run at full speed, even when that extra power is not needed. Roughly 75 percent of the industrial motors in operation are used to run pumps, fans and compressors, a variety of machinery that is ripe for major efficiency improvements. At ABB Motion, we equip our customers with innovative, practical and highly efficient solutions that are both smart and optimized for their intended applications. We continue to push the limits of technology, searching for innovations that will take our solutions to the next level.

In 2020, we launched the ultra-premium ABB IE5 SynRM, a synchronous reluctance motor that offers the performance advantages of permanent magnet technology with the simplicity and service-friendliness of an induction motor. SynRM motors do not use magnets or rare earth materials. Instead, they achieve a maximized reluctance torque from a simple but robust rotor design. Researchers estimate that replacing 80 percent of world's installed motors with IE5 ultra-premium-efficiency motors like SynRM would save



160 terawatt-hours of energy per year, equivalent to more than the annual power consumption of Poland. Recognized by the World Economic Forum as a sustainable energy innovation in a 2020 special report, SynRM motors offer up to 50 percent lower energy losses and significantly lower energy consumption in comparison with commonly used IE2 induction motors. SynRM motors are controlled by variable-speed drives, further maximizing their energy savings.

## CASE STUDY

### ABB IE5 SynRM motor receives Efficient Solution Label



In 2020, our IE5 SynRM (synchronous reluctance) electric motor received the Solar Impulse Foundation's Efficient Solution Label, in recognition of its ability to reduce energy use and CO<sub>2</sub> emissions. The labelling process involves a strict assessment by independent experts and lies at the heart of an initiative to build a portfolio of 1,000 labelled solutions that will be promoted to governments and businesses worldwide, with the aim of accelerating the transition to a sustainable, carbon-free economy. SynRM technology is based on an advanced rotor design with precise variable-speed drive control.

Offering the performance advantages of permanent magnet motors combined with the simplicity of an induction motor platform, SynRM technology does not use magnets or rare earth materials, deploying an environmentally friendly design that also simplifies servicing. Installing just one ultra-premium efficiency IE5 SynRM motor to replace an IE3 motor can reduce CO<sub>2</sub> emissions by as much as 22,000 kilograms per year for an application rated at 315 kilowatts – the equivalent of taking nine fossil-fuel-powered cars off the road. Another benefit of the IE5 SynRM motor is lower operating temperatures than induction motors, which extends the service life of bearings and windings, resulting in better overall reliability. SynRM motors also help improve the working environment with their lower noise levels.



## Achieving greater efficiencies with variable-speed drives

While there are significant efficiency gains to be achieved from upgrading a motor, still greater energy savings are possible when a high-efficiency motor is used in combination with a variable-speed drive.

Variable-speed drives make substantial contributions to the efficient operation of many electric motors, but their role often goes underappreciated. Drives control the speed and torque of a motor to optimize its operation. In this way, the motors run only as fast as is required by the underlying load, leading to significant electricity savings. The highest-impact case of this is seen in pump, fan and compressor applications, which can be found across all industries and in buildings. Adding an ABB drive to an existing motor system without a drive can reduce electricity use by roughly 25 percent.

Ultra-low harmonic drives are a special class of drives manufactured by ABB featuring state-of-the-art technology that mitigates harmful disturbances in electrical networks. Harmonic pollution is a serious, often neglected problem that can cause electrical interference and make equipment connected to the circuit behave erratically, akin to the rogue waves that sometimes swamp boats at sea in a storm. Harmonics can trip circuit breakers, blow fuses and cause capacitor failures. The effects also include overheating, which wastes energy and shortens equipment life. Our ultra-low harmonic drives reduce harmonic content by up to 97 percent, resulting in energy savings and improved performance.

All of ABB's motors and drives are designed to maximize reparability, serviceability and modularity. ABB Motion offers a wide variety of extensions, upgrades and retrofits to lengthen the service life of the equipment.

## Leveraging digitalization to optimize operations

Another technological development that is poised to improve the efficiency of the world's electric motors can be found in digitalization and connectivity – the “industrial Internet of things.” Using wirelessly connected sensors, many of ABB Motion's motors and drives deploy cloud-based condition monitoring solutions to optimize performance and predict maintenance needs.

In 2020, ABB Motion entered a collaboration to modernize the motors of Swedish company Svenska Cellulosa AB (SCA), including the installation of ABB Ability™ Smart Sensors on electric motors in one of its facilities. In this two-year pilot project to reduce energy consumption and increase the efficiency and reliability of the company's paper and pulp production line, old motors have been locally recycled and replaced with more energy-efficient models and new drive systems. This circular collaboration includes Stena Recycling, which entered a local agreement with ABB Sweden in November 2019 to develop a process where all material fractions (iron, copper and aluminum) in electric motors can be recycled and reused in new products.



We offer a suite of advanced digital solutions using smart sensors that help make factory operations more efficient, predictable and safe. The ABB Ability™ Digital Powertrain consolidates sensor and drive data with cloud-based analysis of all components in an industrial system. By assessing the data from variable-speed drives, motors, pumps, bearings and other components, it generates deep data insights that help customers optimize processes and performance, realizing efficiency gains and energy savings.

Our digital solutions also play a key role in a pilot project to create Switzerland's first digital hydropower plant. In partnership with Hewlett Packard Enterprise, ABB worked with Axpo, Switzerland's largest producer of renewable energy, to help realize their Hydro 4.0 initiative. Together, we installed ABB Ability™ Smart Sensors on their motors to capture valuable maintenance and performance data from the plant's equipment. The ABB Ability™ Condition Monitoring digital solution enables Axpo to deploy condition monitoring across the plant, so engineers can identify anomalies, anticipate maintenance needs, and gain real-time insights into operations. The solution results in much more efficient maintenance without incurring any additional risk of unpredicted failure. This increased efficiency allows Axpo to provide sustainable power for its customers at lower cost and with greater reliability.

## Lessons learned

Over the past seven years, we have learned that maintaining a strategic approach to sustainability is fundamental to securing the commitment of senior management, which in turn is critical to making progress on major initiatives. This ensures that we focus on areas where we can have the greatest impact. As the market leader in energy efficient motors and drives technology, we understand that we must also lead by example in our own operations. We have set highly ambitious targets and will maximize the use of our own products, solutions and expertise to achieve them.

We have also learned that cross-functional collaboration is fundamental to the success of sustainability initiatives. For example, the Motion green electricity initiative was made possible only through effective collaboration with ABB's Supply Chain Management, Sustainability, Operations and Real Estate functions. From this solid foundation, we will continue to make a strong, sustained push to raise awareness at all levels. Our goal is to make sustainability a source of pride for employees and a lever in attracting new talent. During the stakeholder engagement process that accompanied the development of ABB's 2030 sustainability strategy, we were pleased by the positive response from our stakeholders, especially customers. It's clear that we all have a critical role to play to contribute to a low-carbon society.

Our role, as ABB Motion, is to provide the most energy efficient products and services to our customers, and to always innovate for more. But we also need to work together with academia, public decision makers, NGOs, customers and partners to change the way society uses electricity. By joining forces, we can make the world more energy efficient.