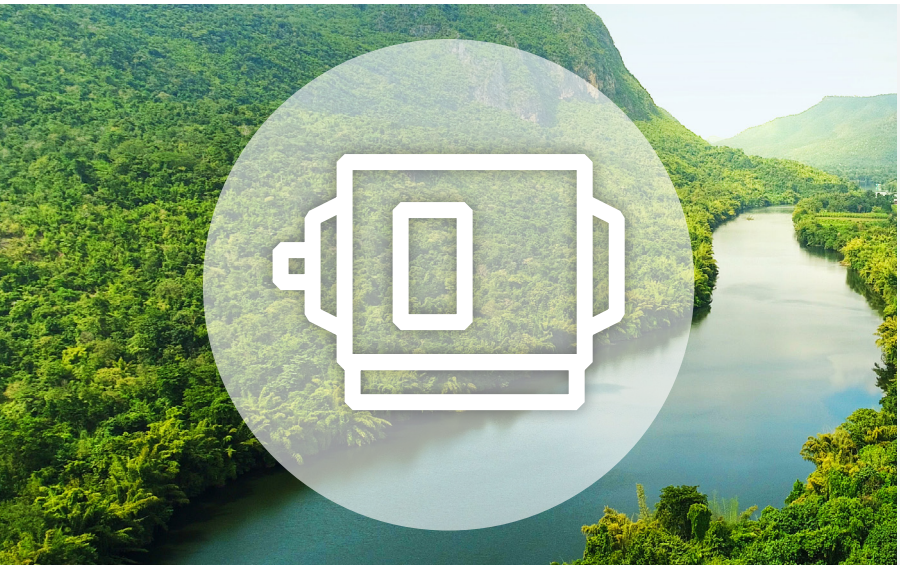
CASE NOTE

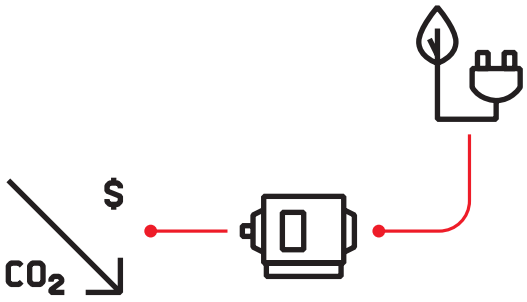
Top Industrial Efficiency (TIE): The best available energy efficient solutions lead value creation

Key enabler of a low carbon future, leading performance to create value for customers



- **Electric motors consume 45% of all the power generated in the world.**
- **Energy efficiency is set to make the biggest contribution to emissions reductions under the Paris Agreement.**
- **ABB's TIE initiative aims to make the highest possible efficiencies optionally available for large motors and generators.**

Significant potential for energy savings
It is estimated that by 2050, the global population will rise to 9.7 billion from 7.7 billion in 2019. The global economy is expected to more than double in size over the same period. Urbanization, automation, and the rise of living standards will significantly increase demand for energy. At the same time, there is already today an urgent need to cut CO_2 emissions to counter climate change.



To make the necessary changes, all stakeholders need to work together, using all their creativity and determination. We need to use the solutions we already have and continue to innovate for more. We need to invest in areas that help mitigate climate change and we need governments to guide our actions with regulation and incentives.

This is exactly what energy efficiency is all about. It's about bringing together all stakeholders to innovate and act for a more energy efficient, regenerative, adaptive world. Together, we can make a real difference if that's how we decide to use our know-how and power.

The number of large motors and generators installed every year is relatively low, but their power ratings are so high that even a small increase in efficiency can cut losses by tens of kilowatts per machine. Given that they typically run for more than 8,000 hours per year, a small increase in efficiency can mean huge energy savings.

Making the highest possible efficiency optionally available
ABB has launched the Top Industrial Efficiency (TIE) initiative to ensure that optional solutions offering the highest efficiency are always available. These higher efficiency solutions will still fulfill all the same requirements as the base offering, and they will not compromise on reliability or use unproven technology.

There are many ways to secure higher efficiency, with the most common being to utilize higher quality materials, sometimes in greater quantities, or in alternative configurations. Higher quality and/or more material will of course increase the purchase price, but the resulting higher efficiency should typically result in a payback period of less than two years, depending on electricity prices.

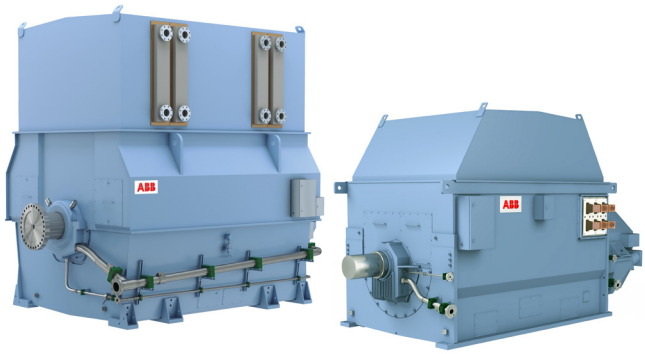
Use of higher efficiency TIE products will lead to a net reduction in emissions in all cases, even when motors are operated on 100% emission-free energy. This is because today's Life Cycle Assessments (LCAs) of electricity systems take into consideration the costs of manufacturing and maintaining the infrastructure.

A small increase in efficiency produces big savings
A real-world case shows the scale of energy savings and emissions reductions that are possible. A synchronous motor rated at 19 MW and built to operate a compressor had a base design efficiency of 98.53%. It proved possible to improve this to 98.75%, which meant that 42 kW of losses were eliminated.

Assuming the motor operates 8,000 hours per year, the efficiency improvement saves 336 MWh of electricity annually. If electricity costs 10 cents per kWh, the annual saving is USD 33,600. The price difference between the base design and higher efficiency TIE option is approximately USD 41,000, which gives a payback period of less than 15 months.
If the price of electricity is 20 cents/kWh, payback only takes a little more than seven months.

An open invitation to raise efficiency
Energy efficiency is crucial for the future of the planet, and ABB is firmly committed to working towards higher efficiencies. Therefore we are not making TIE an exclusive ABB concept – it can be used by anyone.

In ABB's portfolio TIE is currently available for 4- and 6-pole synchronous motors and generators, and more products will follow. The average efficiency improvement for these products could be as much as 0.2% (from 98.3% to 98.5%), if the TIE option were utilized in the vast majority of manufactured units.



A synchronous motor rated at
19 MW
and built to operate a compressor had a base design efficiency of
98.53%

TIE

The TIE motor rated at
19 MW
and built to operate a compressor had a base design efficiency of
98.75%

Losses eliminated
41.8 kW

Assuming the motor operates
8,000 hours per year,
the efficiency improvement saves
334.4 MWh
of electricity annually.

Electricity cost $0.10/kWh	
• Annual saving	**$33,440**
• Payback period	**14.7 months**
Electricity cost $0.20/kWh	
• Annual saving	**$66,880**
• Payback period	**7.4 months**

160,000 kg
CO_2 savings/year

For more information, please contact your local ABB representative or visit
new.abb.com/motors-generators

9AAU000000000032 REV A EN 18.1.2023