



Making district energy sustainable through employing sustainable components in the system

Poster #24

Enabling a low-carbon society

Technologies for our customers and society



Making the case for energy efficiency



The global population is expected to rise **from 7.7 billion** in 2019 to **9.7 billion** in 2050¹



The global economy is expected to **double** over the same period



Urbanization, and the rise of living standards will increase the **demand for energy**



The demand for the drive systems powered by **electric motors will grow**



Critical processes can't stop, but need to be energy efficient to **reduce CO₂ emissions**



With **high-efficiency motors and variable speed drives** we can do just that



The critical role of motors

45% of the world's electricity is used to power electric motors in building and industrial applications

It has been estimated that, if all the more than **300 million industrial electric** motor-driven systems currently in operation were replaced with optimized, high-efficiency equipment, global electricity consumption could be reduced by up to 10 percent



Why adding a drive matters



It is estimated that **just under 1 in 4** of the world's industrial motors are equipped with a drive



That figure is expected to only increase by **3%** over the next five years



While not every motor can use a drive, experts suggest that roughly **50%** of industrial motors would benefit from being paired with one



When added to the existing motor of a pump, fan or compressor, a variable speed drive can typically reduce power consumption by **25%**



District energy

Role of drives and motors

Drives

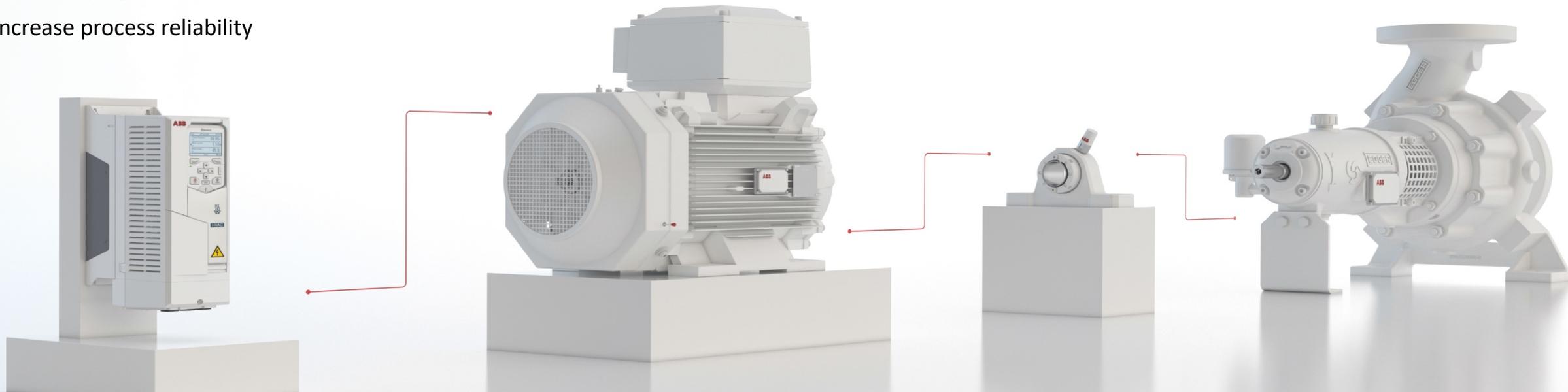
- Control motor speed
- save 20 to 60% energy in pumps, compressors and fans
- reduce mechanical and electrical stress
- decrease project investment costs
- increase process reliability

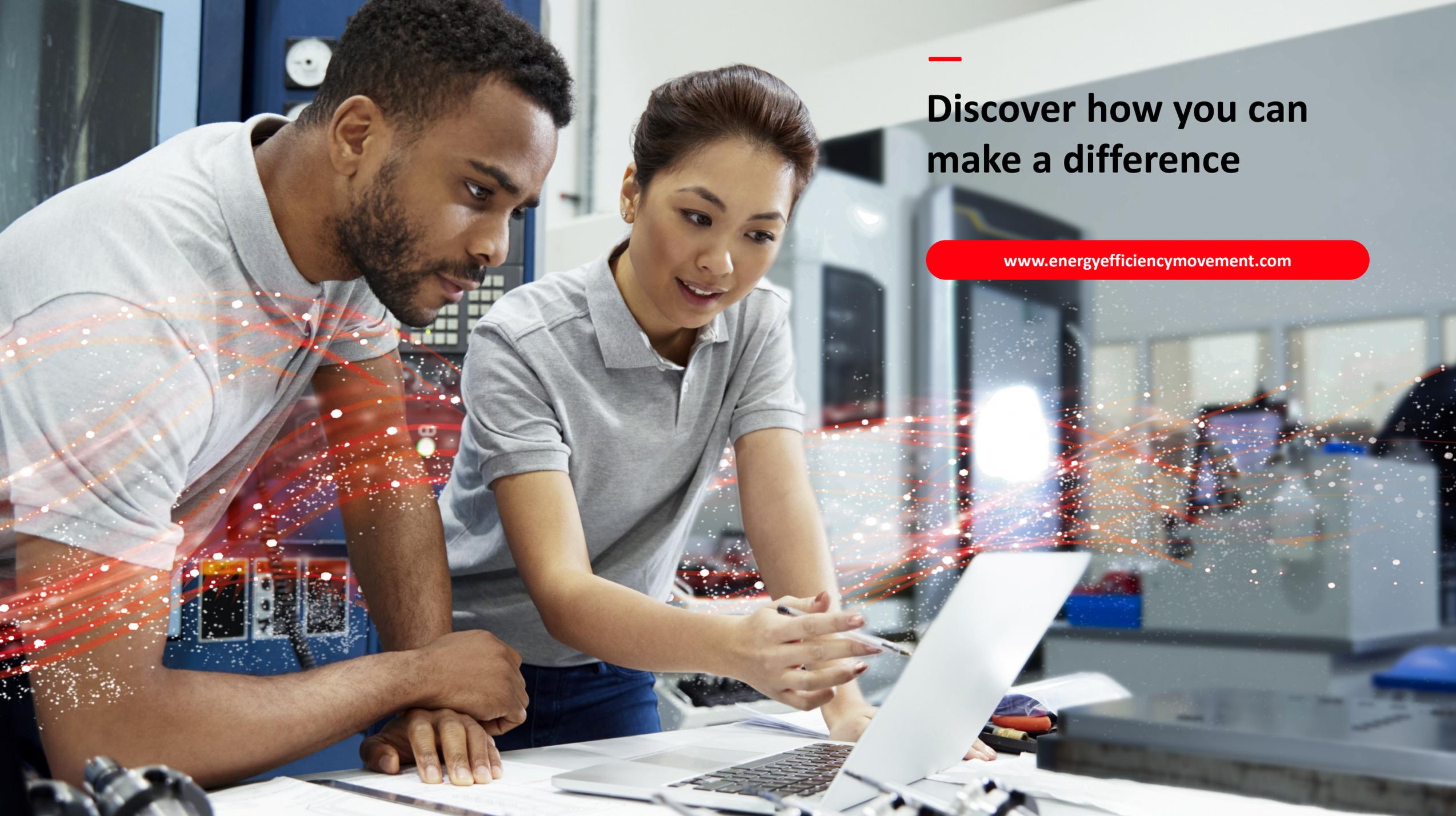
Motors

- rotate district energy applications
- up to 30% improved part load efficiency and 40% less losses vs. IE3 motors with ABB IE5 SynRMs

District energy applications

- Include pumps, fans, compressors





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**Discover how you can
make a difference**

www.energyefficiencymovement.com

Building the case for sustainability in District Energy



90% of all buildings will still be around in 2050



Buildings account for 45% of green house gas emissions in major cities.



70% of all buildings were built before current energy codes



HVACR consumes about 50% of the energy in commercial buildings



IE5 motors offer up to 30% reduced energy losses in comparison to IE3 motors



Variable speed saves up to 60% energy in HVACR applications



What can we do?

Our commitment

- Improving energy efficiency of District Energy systems, while protecting the power supply
- Supporting building resilience and safety with dedicated features
- Ensuring the lowest total carbon footprint from cradle to grave

How can we help you achieve sustainability targets?

- Improving part load efficiency for lowest energy use with optimized drive and motor packages
- Saving on electrical system sizing in new installations and simplifying retrofit with ULH drives in existing installations with no oversizing of established electrical systems
- Digital services enabling predictive maintenance instead of replacement and checkups on demand (no maintenance team regular traveling to locations)



We set new standards in sustainability

Almaza mall in Egypt uses ABB's ULH drives for HVAC

01.

Why?

To save energy in HVAC while making power network more efficient and reliable

02.

What?

ULH drives for HVAC with reduced harmonics content

03.

Benefits?

- Up to 60% energy savings in HVAC
- No reactive power in the electrical network meaning more efficient network
- Reduced power network equipment size meaning wise material usage
- Space savings as ULH drives have harmonics mitigation built-in



LV and MV AC drives for district energy segment

Low Voltage Drives



Low Voltage HVAC & Water

- 0.75 to 500 kW at 230 to 690 V output
- Diode or active front end (ultra-low harmonic)
- Protection classes from IP00 to IP55
- Full functional safety
- HVAC control SW

Industrial

- 0.55 to 5 200 kW at 230 to 690 V output
- Diode or active front end (ultra-low harmonic)
- Optional regen front end for 4Q operation
- Full functional safety
- Best in class motor control, high performance

Medium Voltage Drives



Medium Voltage

- 200 to 6 300 kW at 3.3 to 11kV output
- Low harmonics with high-pulse integrated transformers
- Compact design with network and motor friendly topology
- All-compatible user interface
- All essential features are built-in

Medium Voltage

- 315 to 5 000 kW at 2.3 to 4.16 kV output
- Easy integration with built-in transformer and output sine filter
- Low harmonics with 12 or 24 pulse rectifier
- Small footprint
- High reliability due to proven fuseless design
- Protection from dangerous electric arcs

Medium Voltage

- 250 to 3 700 kW at 4.0 to 6.9 kV output
- Installation flexibility, using external or built-in transformers
- 12 pulse rectifier or optional active front end for 4Q operation
- Small footprint
- High reliability
- Highest personal safety

Medium Voltage

- 2 000 to 36 000 kW (higher on request) at 6.0 to 13.8 kV output
- Installation flexibility, using external or integrated transformers
- 36-pulse diode rectifier
- Small footprint
- High reliability
- Highest personal safety

LV AC motors

Efficiency and reliability for the harshest conditions

Process performance induction motors



Reliable, versatile and easy to use

- Output 0.37–1000 kW
- IE2, IE3 and IE4 efficiency class
- Tailored according to specific customer needs
- Globally compliant with all regions
- Robustness for continuous process industries like district energy and heavy-duty applications like compressors

Synchronous reluctance motors



Sustainable

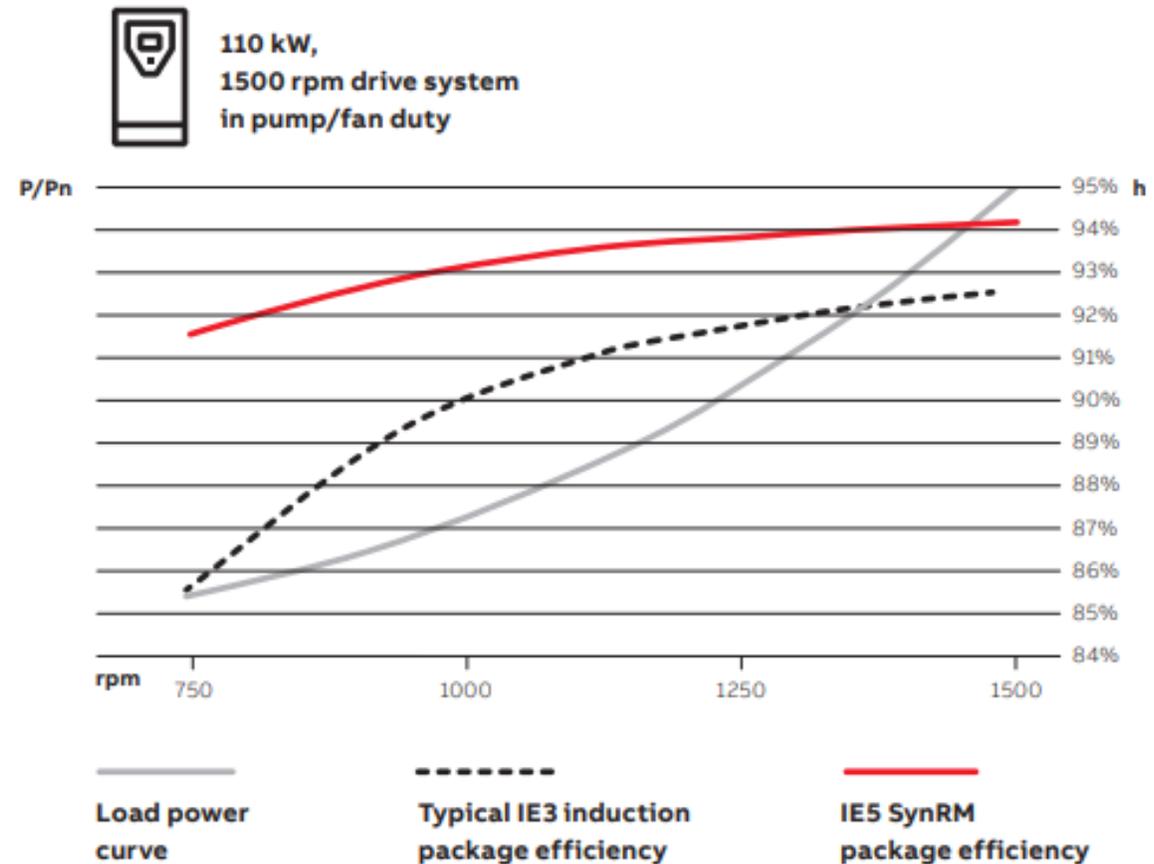
- Output 5.5–315 kW
- IE5 efficiency
- No rare earth magnets
- Increased reliability with lower winding and bearing temperatures

IE5 SynRM + Drive vs. IE3 motor + Drive

Full load and part load efficiency

Measurements confirm synchronous reluctance (SynRM) efficiency advantage also at partial load conditions

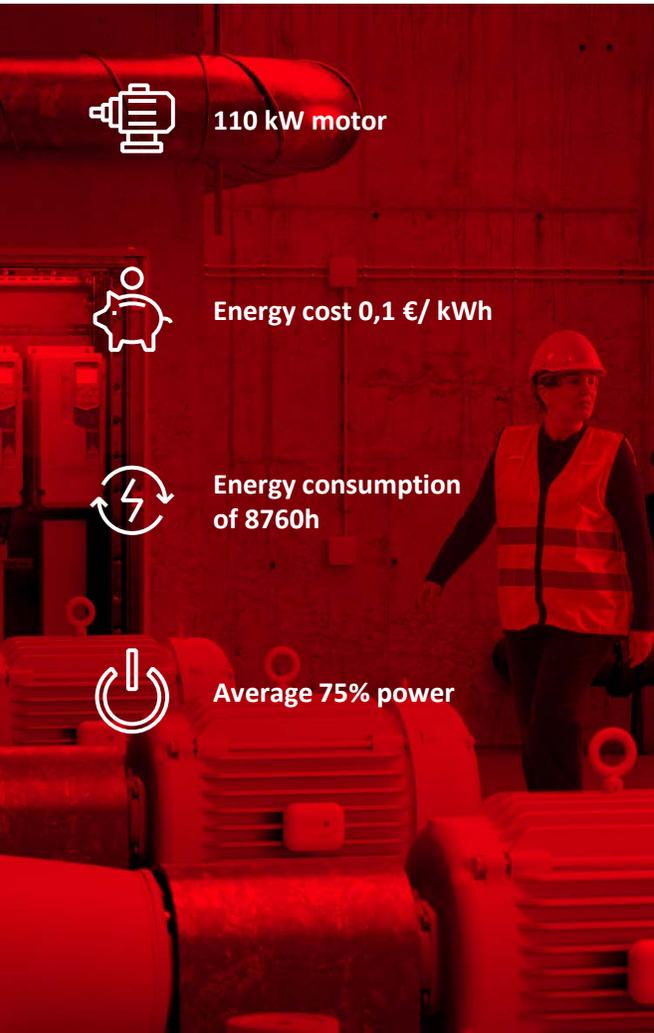
There is about a 2-3% of benefit at full load, while at partial load the benefit can be as much as 6-7%



Example: For a 110 kW 1500 rpm drive system in pump/fan duty, with an IE3 induction motor the package efficiency is 92.5%, while for an IE5 SynRM motor the package efficiency is 94.2%.

IE5 SynRM motor + drive package vs IE3 package in 2021

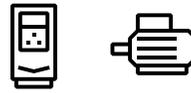
Practical example



IE5



14,445 \$



Nominal package
efficiency **94,8%**



Energy consumed
762 MWh
79,238.36 \$

↑ ~ 17%

↑ ~ 3%

↓ ~ 3%

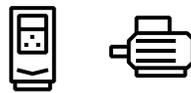
Annual saving
in energy
~2,354 \$

↑ Incremental
investment with an
estimated ROI
~1 year

IE3



12,305 \$



Nominal package
efficiency **92,1%**



Energy consumed
784 MWh
81,569.28 \$

A complete drive product portfolio

Optimized package selections available in the catalogues

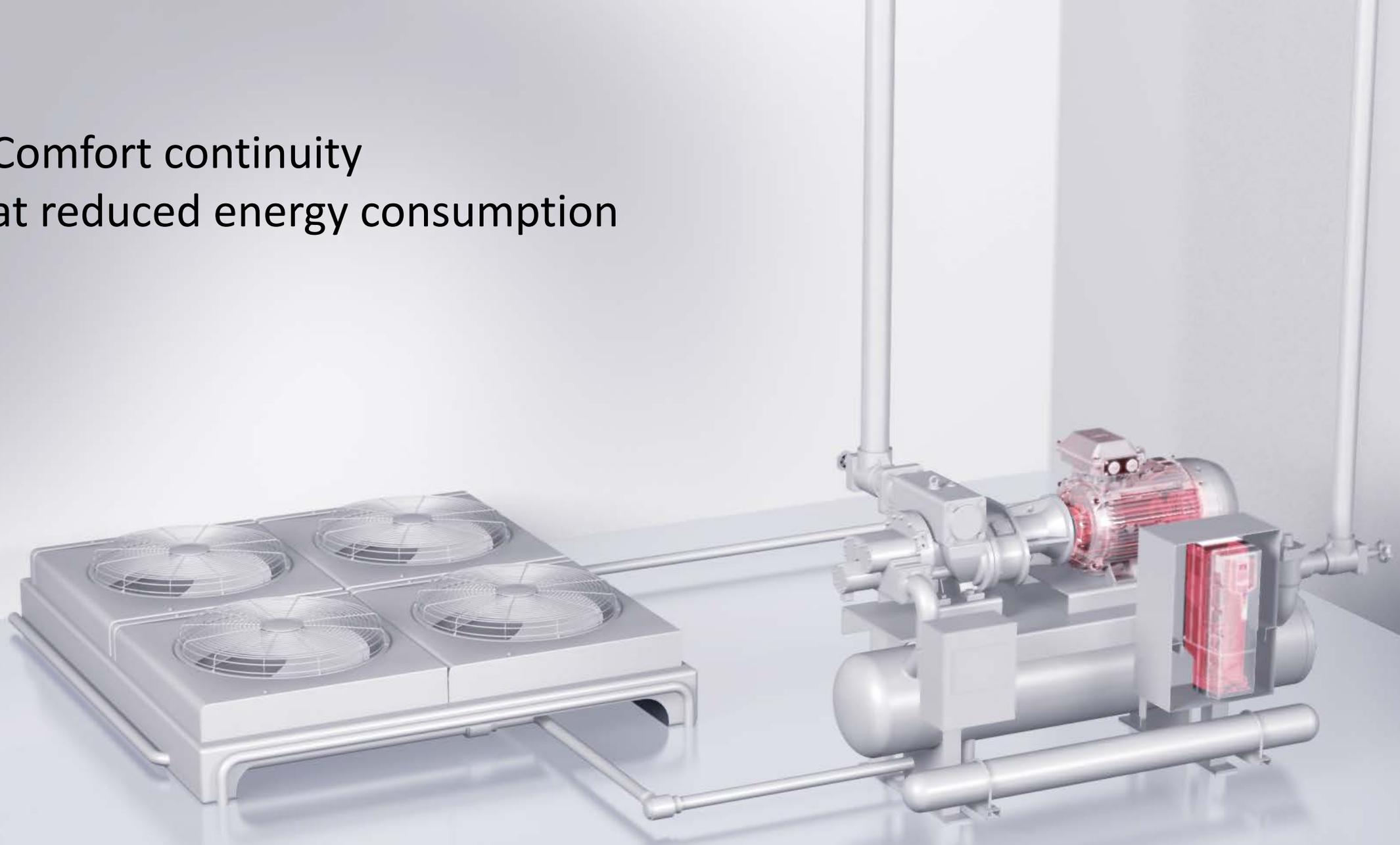
Synchronous reluctance motor and drive packages with verified performance and efficiency!

Advantages with variable speed drives

- Synchronous reluctance motors and optimized drive types
- For all applications including water and wastewater, HVAC, food and beverage and many more
- Support various motor types including induction, permanent magnet, and synchronous reluctance motors



Comfort continuity
at reduced energy consumption



Lowest energy consumption

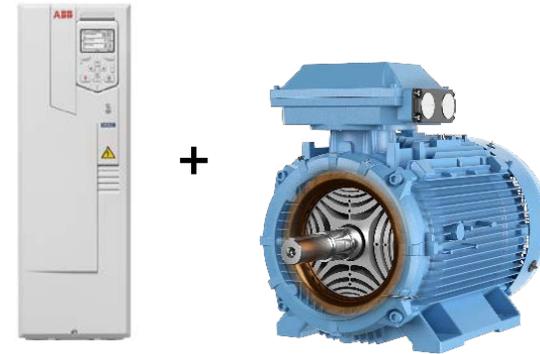
Save 0.5 kW each hour

A wide range of pump installations in buildings are still using IE2 motors. Replacing them with SynRM IE5 will decrease the energy consumption

Calculation on the energy consumption based on:

- 11kW/4 pole motor and drive combination
- running 2000 hours

IE5 motor and drive
energy savings



0.43 kW/h

Compared to IE2 motor and drive system

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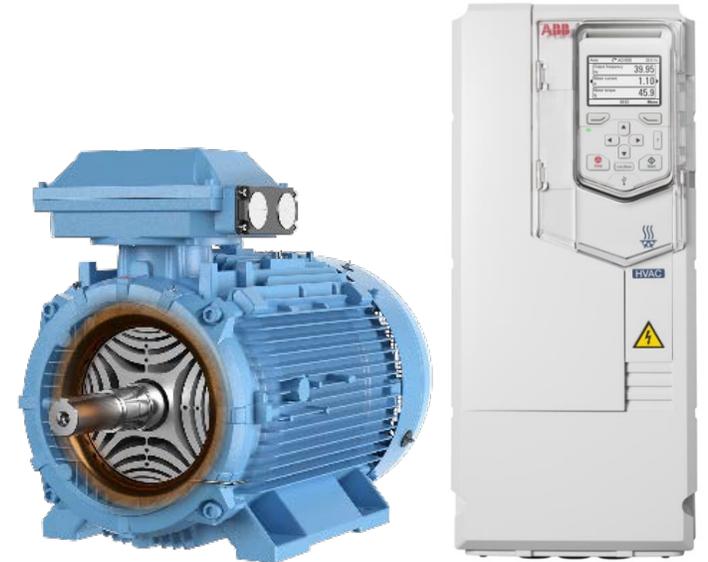
Upgrading existing solution

Matched motors and drives

IE2 induction motor with drive



IE5 synchronous reluctance motor with drive



Less cooling required
Lower noise level
Same size

Increased uptime

With improved process control
and reliability

Lower motor temperature → **Longer lifetime**

Magnet-free rotor → **Easy service**

Factory tested units → **Verified performance**

Extended warranty option → **Peace of mind**

Remote condition monitoring → **Reduce unplanned downtime**



The Energy Efficiency Movement

Join today!



Join the movement

We are delighted to accept participants from around the world, whether from industry, academia, public sector organizations, or any other institutions. Please complete the form below and we will be in touch. We look forward to ensuring an energy efficient future with you.

<https://join.energyefficiencymovement.com/join-form/>



ABB