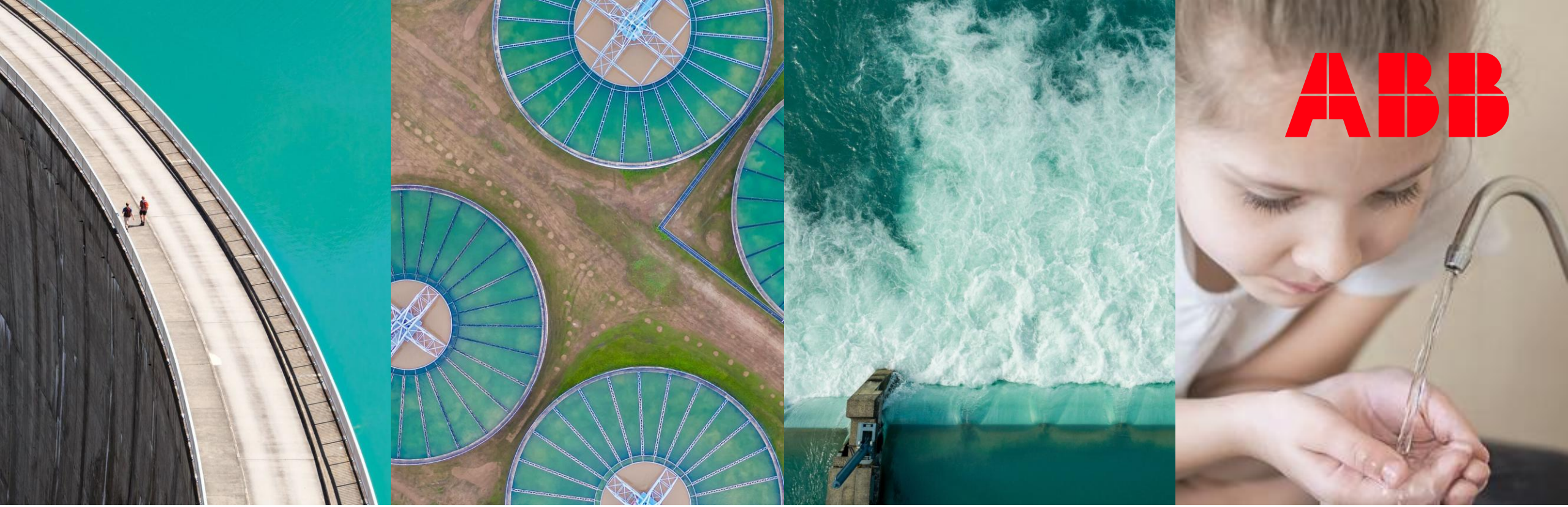


MOTION – MAY 2025

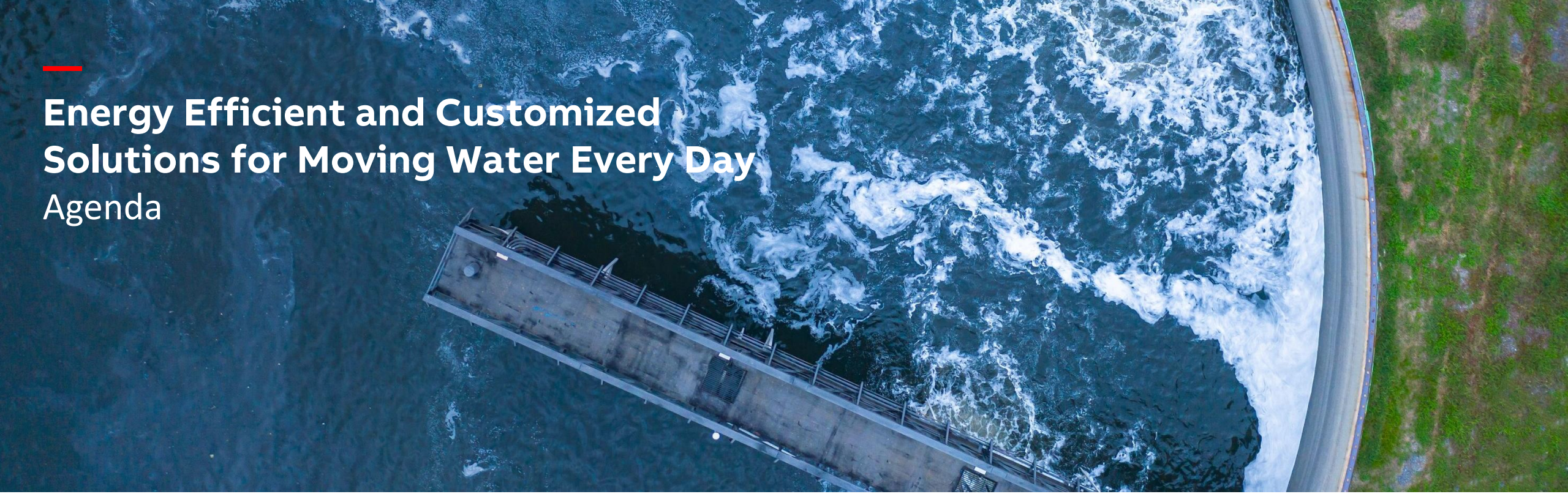
ENERGY EFFICIENT AND CUSTOMIZED SOLUTIONS FOR MOVING WATER EVERY DAY

ENGINEERED TO OUTRUN

Presenter

COURTNEY PICKETT

Global Product Specialist, NEMA Motors



Energy Efficient and Customized Solutions for Moving Water Every Day

Agenda

NEMA – SP4
NEMA Premium®
Efficiency 4

Motion Drive Products –
Preventing Downtime
in your Water Process

Motion Services – Enhancing
Water Industry Efficiency with
ABB Ability™ Condition
Monitoring Service

Agenda – NEMA

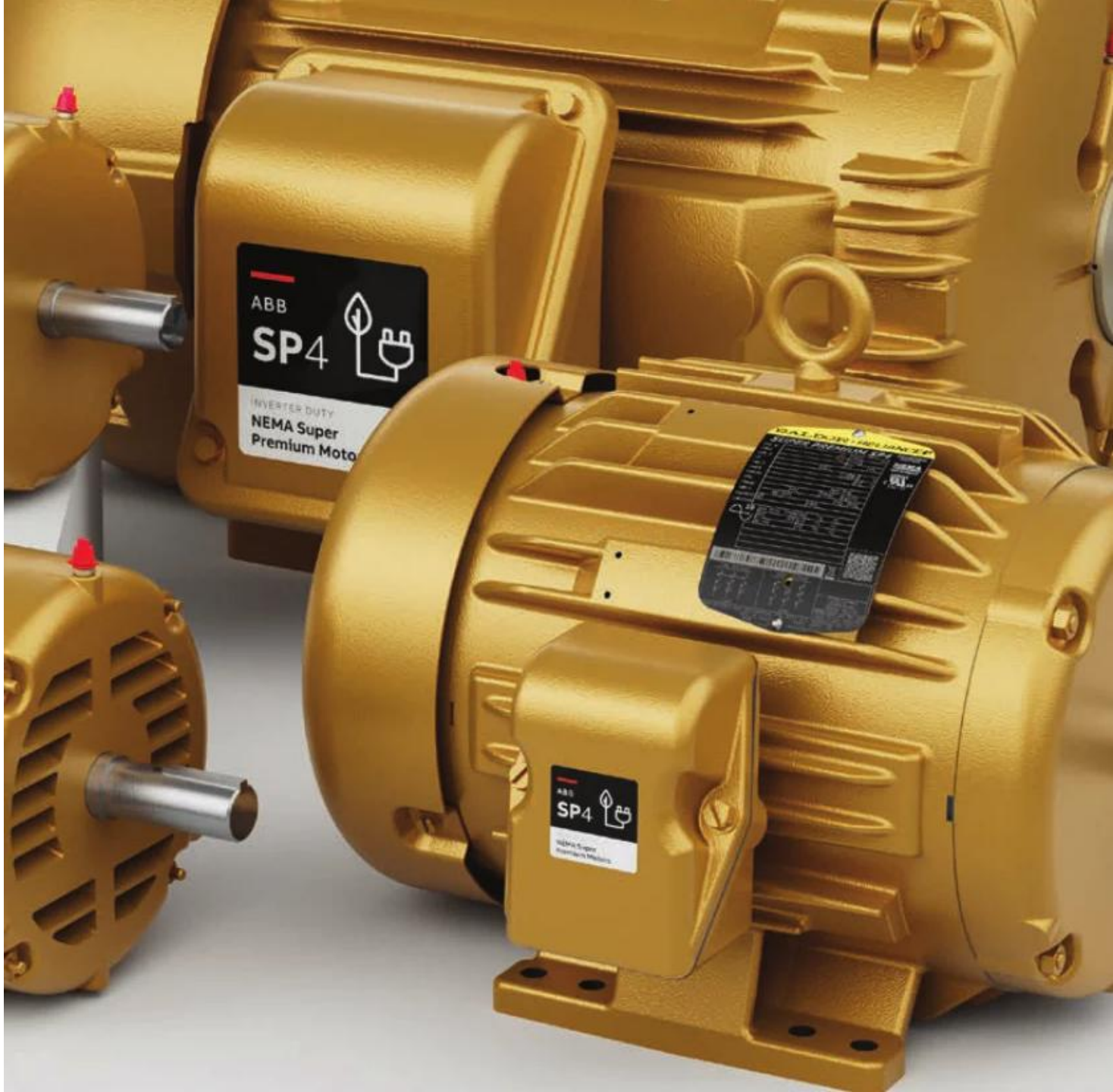
SP4 NEMA Premium® Efficiency 4

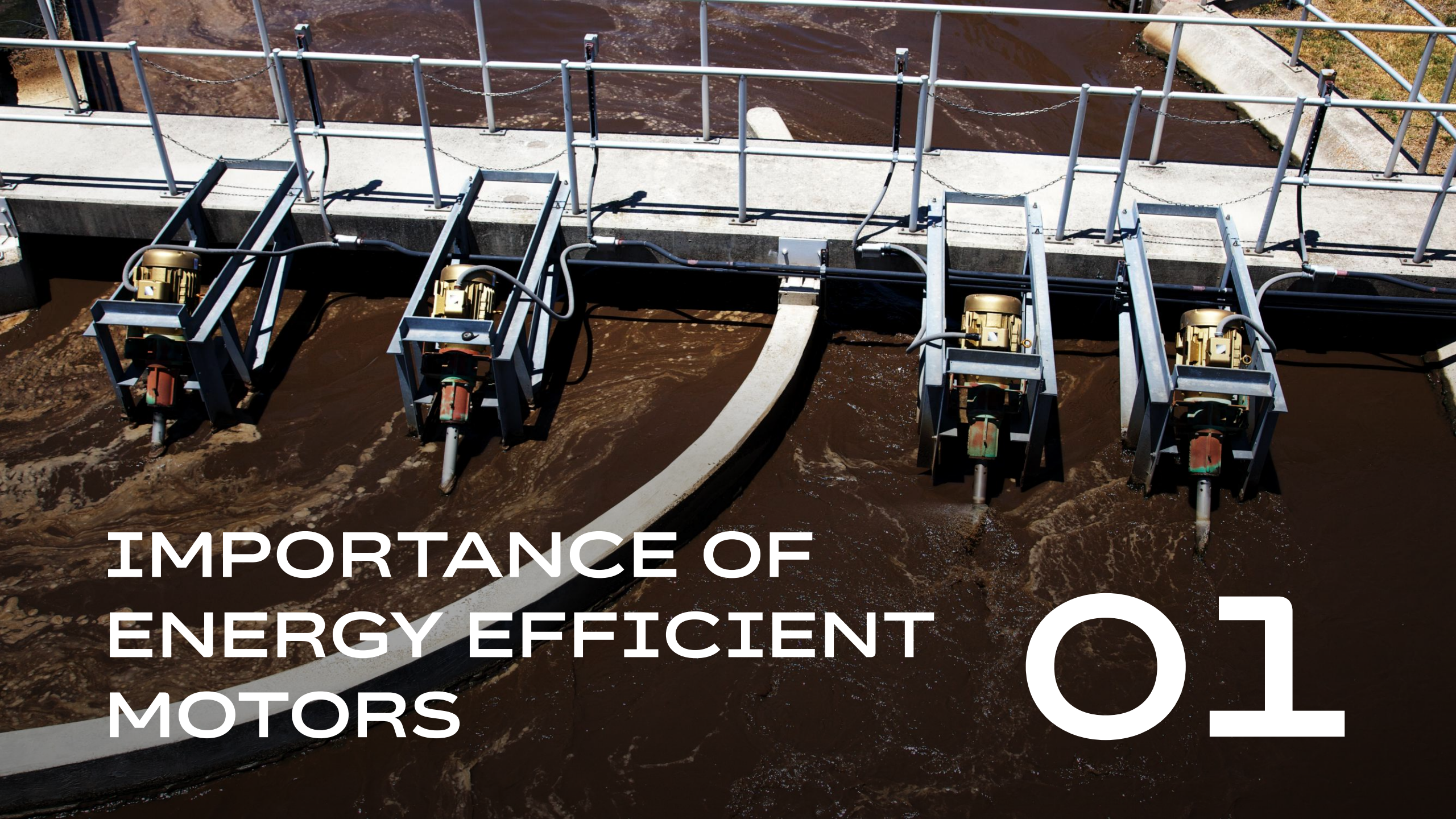
01 The importance of energy efficient motors

02 Product Introduction

03 Applications

04 Support & digital tools





IMPORTANCE OF ENERGY EFFICIENT MOTORS

01

Energy and cost efficiency

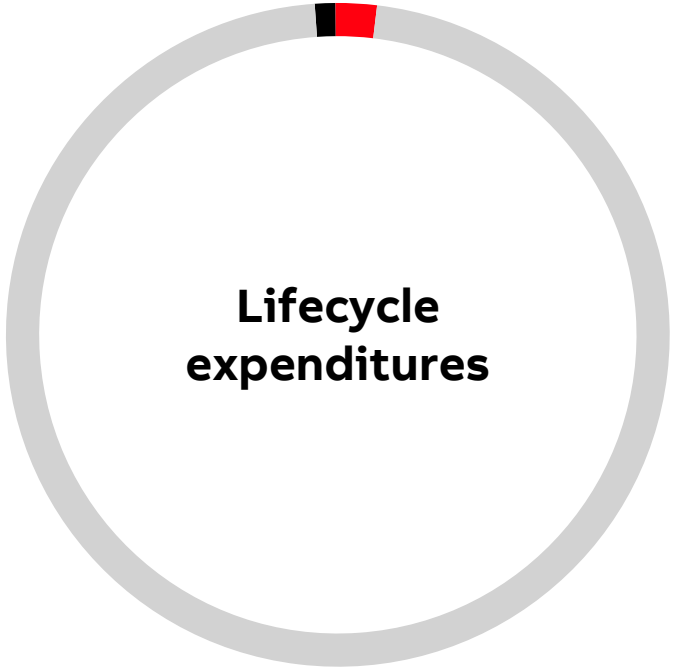
What is the total cost of an electric motor?

The purchase price of a motor is only a fraction of the cost of energy used to run it

With a moderate investment to update your electric motor to a higher efficiency, the return of investment (ROI) can be achieved within as little as one year

Purchase + Cost of running + Cost of not running

Total Cost of Ownership



97% Energy

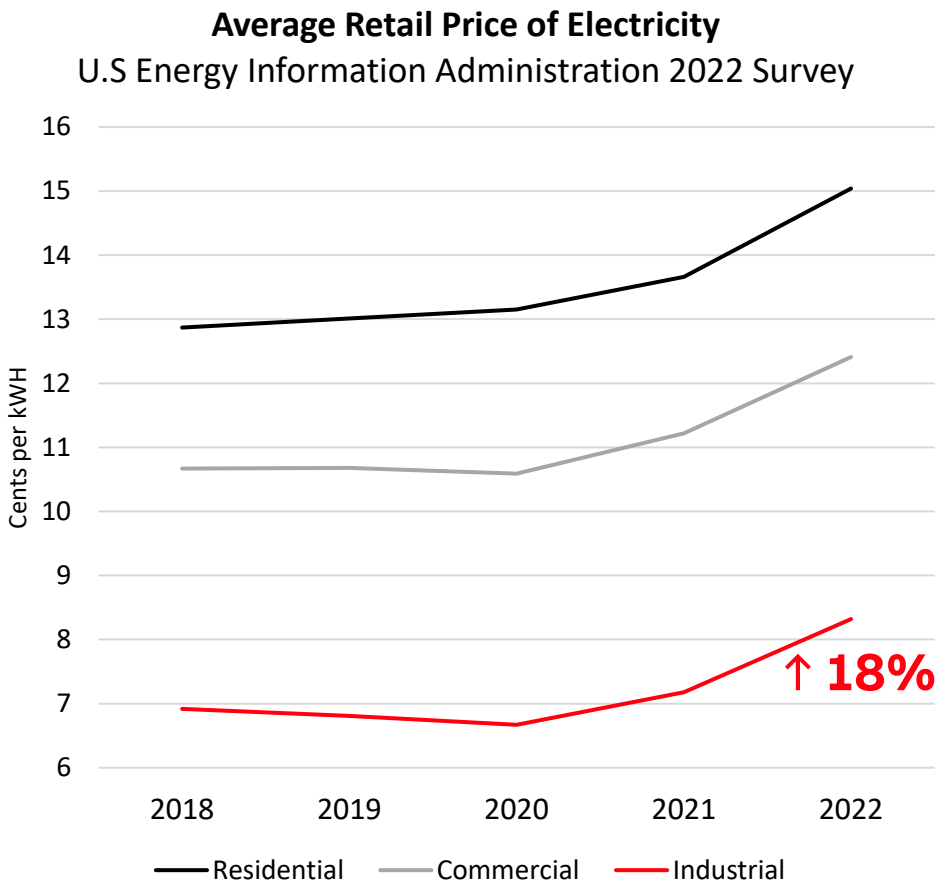
1% Maintenance

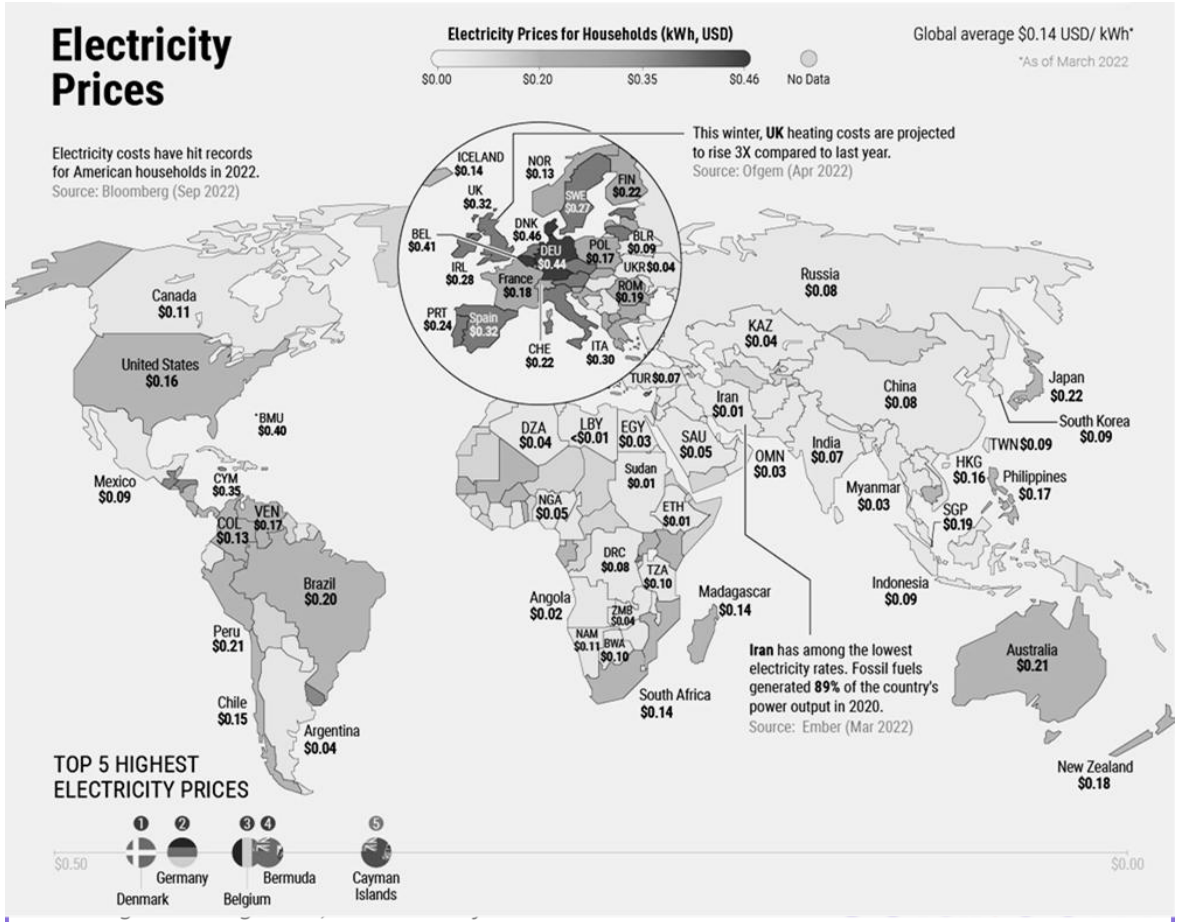
2% Purchase

Example:100HP motor, 5,000 hours/year, $0.083/kWh electricity cost, 20 years of operation

Trends Creating Demand for NEMA Premium® Efficiency 4 Motors

Higher cost of energy





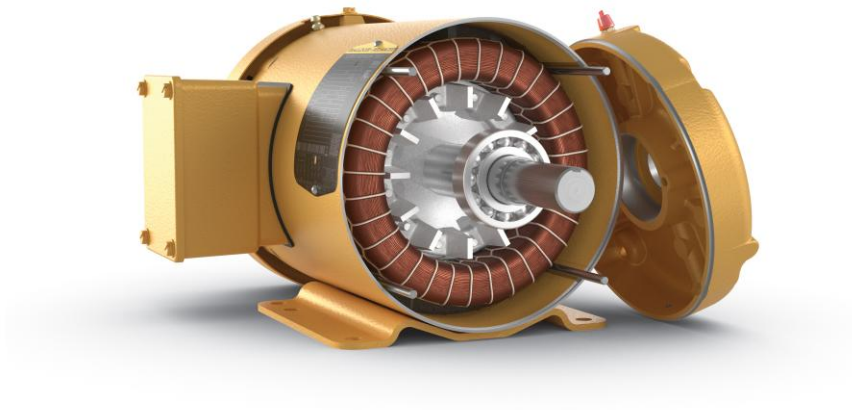
SP4 PRODUCT INTRODUCTION

02

SP4™ NEMA Premium® Efficiency 4 Motors

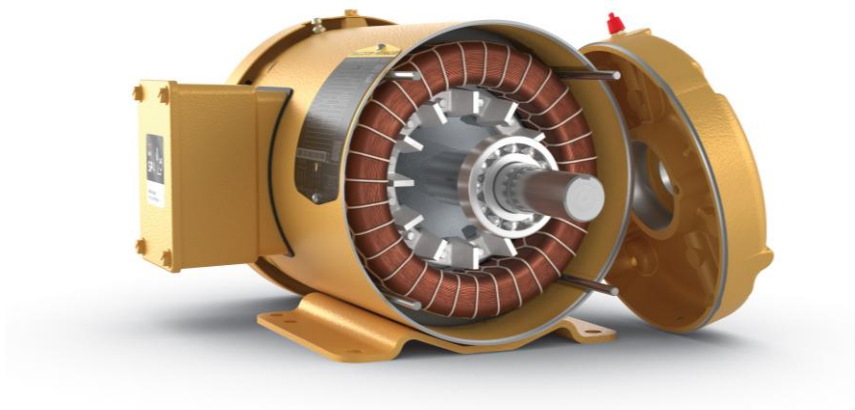
A look inside

Take the best and proven AC induction design and make it better by reducing motor losses
by an average of 20% while maintaining the simplicity of todays installed base of AC induction motors



Premium IE3: Standard Induction Motor

Higher Losses in Rotor and Stator



SP4 Super Premium: Standard Induction Motor

20% Lower Losses in Rotor and Stator

No new technology or training required. No Magnets or Rare Earth Materials (Eco-friendly choice).
Just simple drop-in replacement and instant cost saving on electric bill

SP4™ Runs Cooler

NEMA Premium® Efficiency 4 motors minimize losses

Every 10°C cooler doubles insulation life + A cooler motor increases bearing life = Longer motor life

SP4 Product Offering

Understanding the customers application can produce enhanced value!

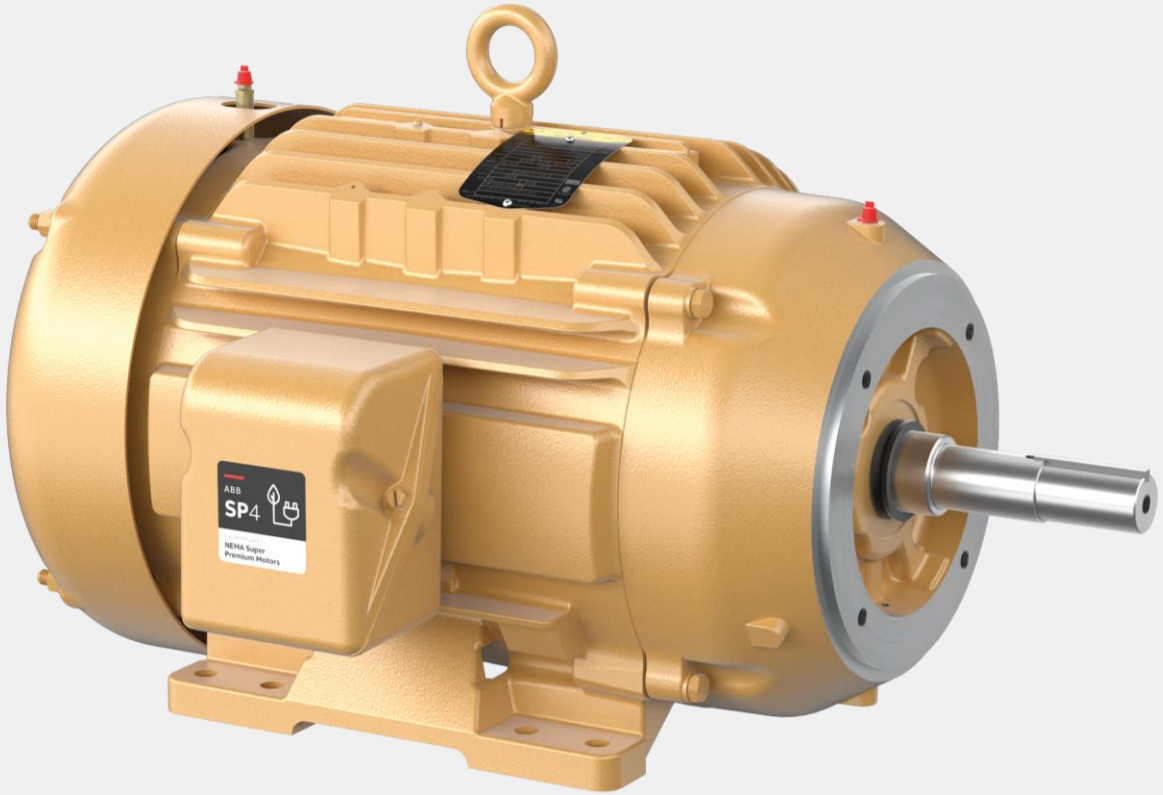
General Purpose

- NEMA Premium® Efficiency 4
- ¼ to 20 horsepower
- 2 , 4 and 6 Pole
- Open and Enclosed frames
- Direct Drop-in replacement whether it be DOL or VFD operation
- Cooler operation for longer lifespan
- **48 Month Warranty**

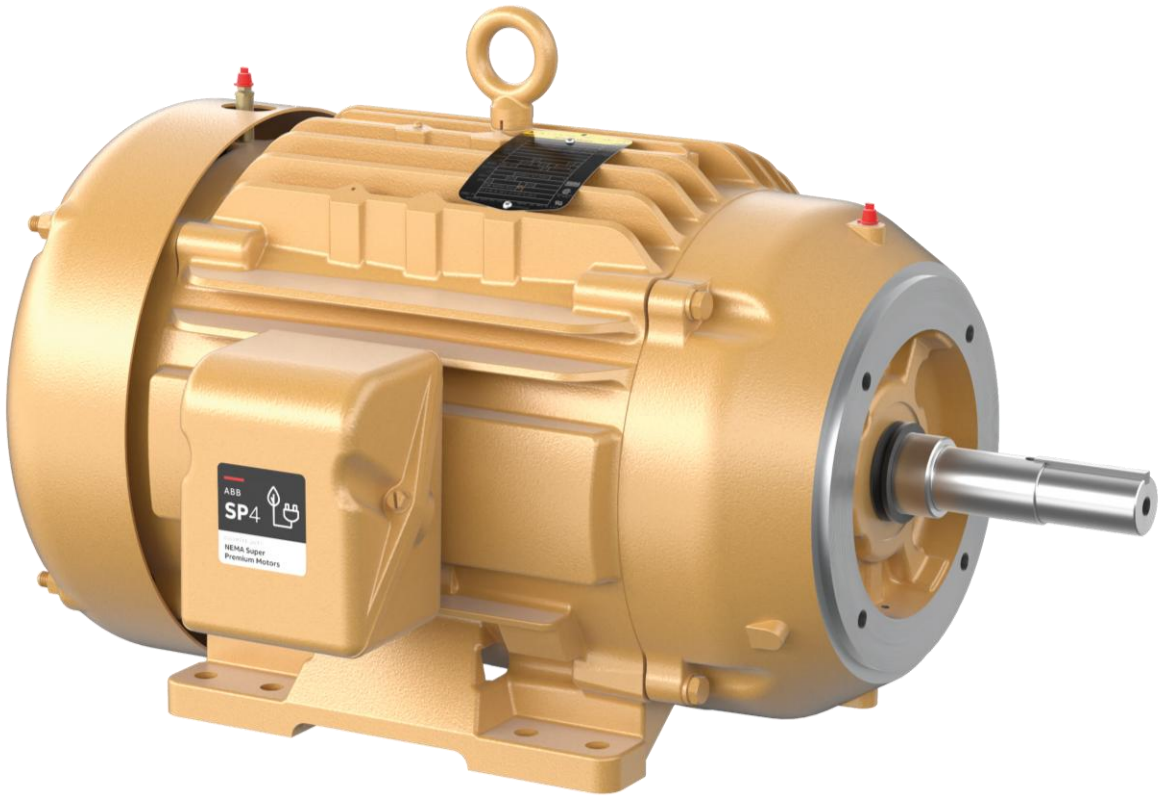
Severe Duty

- NEMA Premium® Efficiency 4
- 25 to 300 horsepower
- 2, 4, and 6 pole
- 280T thru 449T frames
- Direct Drop-in replacement whether it be DOL or VFD operation.
- Design B torque performance
- IP55
- **Div 2, Class I A, B, C, D & Class II F, G**
- Inverter Duty
- **48 Month Warranty**

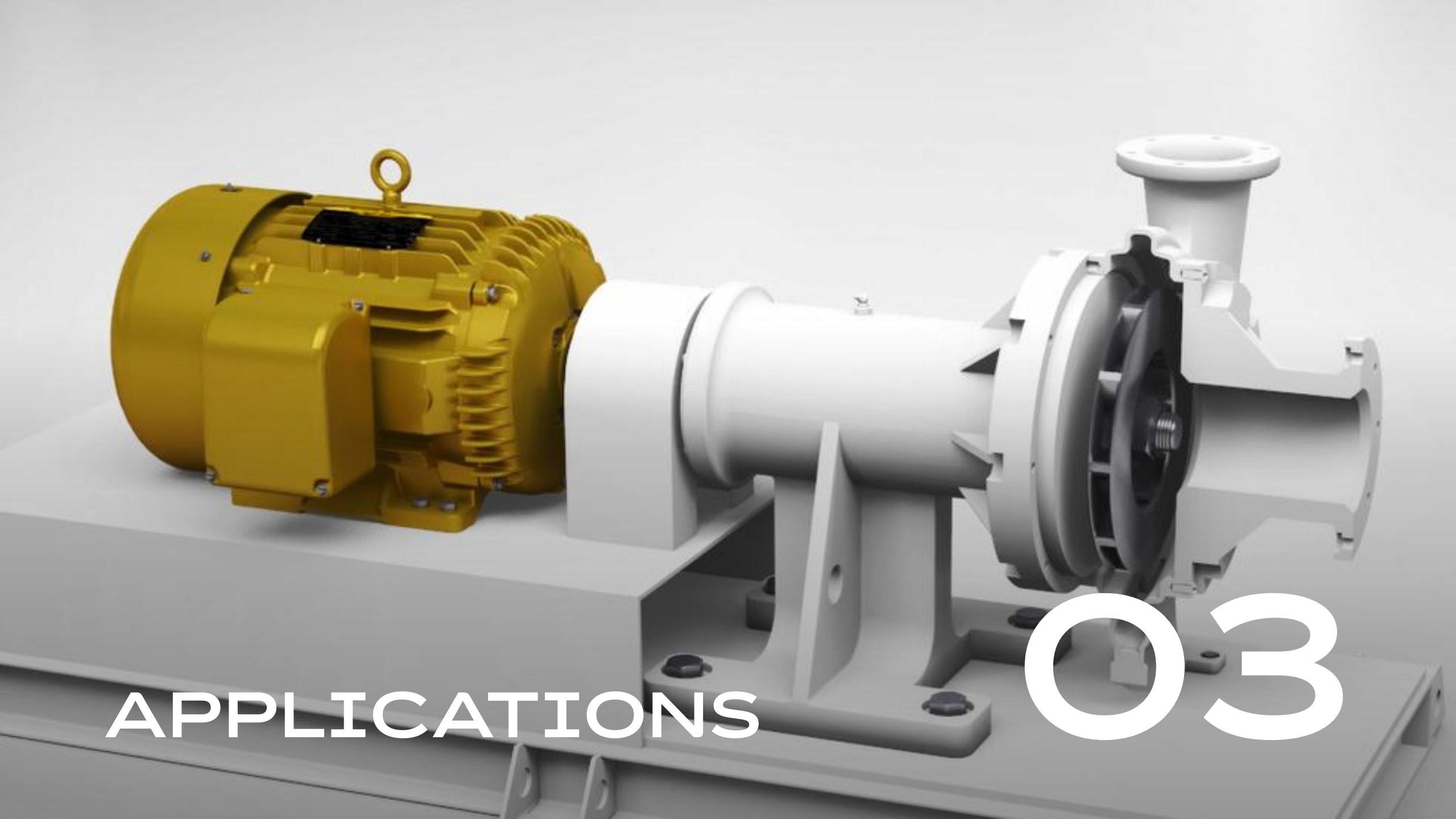
SP4™ Close-Coupled Pump



SP4™ Close-Coupled Pump



Coming
2025



APPLICATIONS 03

Water Segment critical requirements

Energy efficiency

Electrical energy is estimated to account for up to 45% Water plant's running costs. Reducing energy usage wherever possible is key to increasing profitability and sustainability.

Environment

In many cases, plants are located in places with high ambient temperatures, high humidity and corrosion, which impose demanding requirements on the equipment.

High reliability

Water plants operation is very critical and maintenance outages must be predictable. Unplanned shutdowns can create a lot of trouble on the population.

Complex projects

Water projects are highly demanding due to their large scale and involvement of numerous parties. They require strong support, comprehensive documentation and global coverage.

Bigger capacity

- Plant capacities are increasing with technology advancement, reliability and scale of economies
- Drives and Motors ratings are increasing

Optimized to the application

A wide range of motor sizes are needed for different applications. Coordination with Drives and pump OEMs is essential to ensure the process is working to the best efficiency point.

Motors for pump applications in Water

Your requirements

- With pumps, motors and other equipment operating 24 hours a day, seven days a week, water facilities are amongst the biggest consumers of energy
- Pumps are often oversized, while electrical system efficiency can be up to 20% less efficient through poor design
- Power quality, lowering harmonics and generator operation

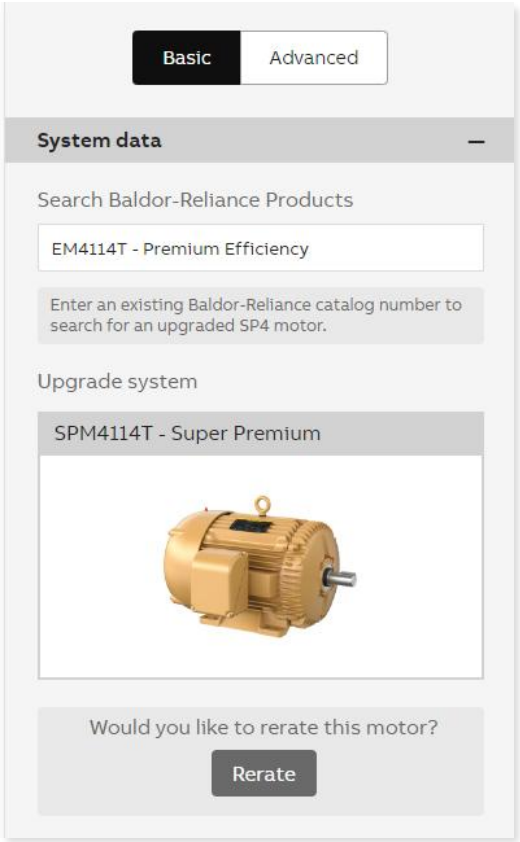
Motors for pumps

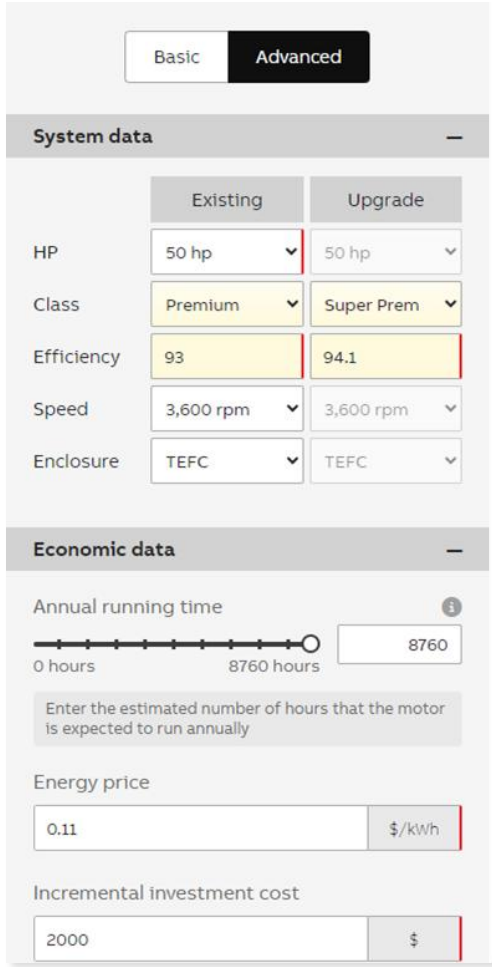
- Booster stations
- Distribution & circulating pump systems
- Clean water distribution
- Slurry and dredge pumps
- Water lifting system, usually vertical pump with long shaft
- Mixer, agitator, aerator, and clarifier pumps
- Headworks grinder pumps
- DOL and VSD options

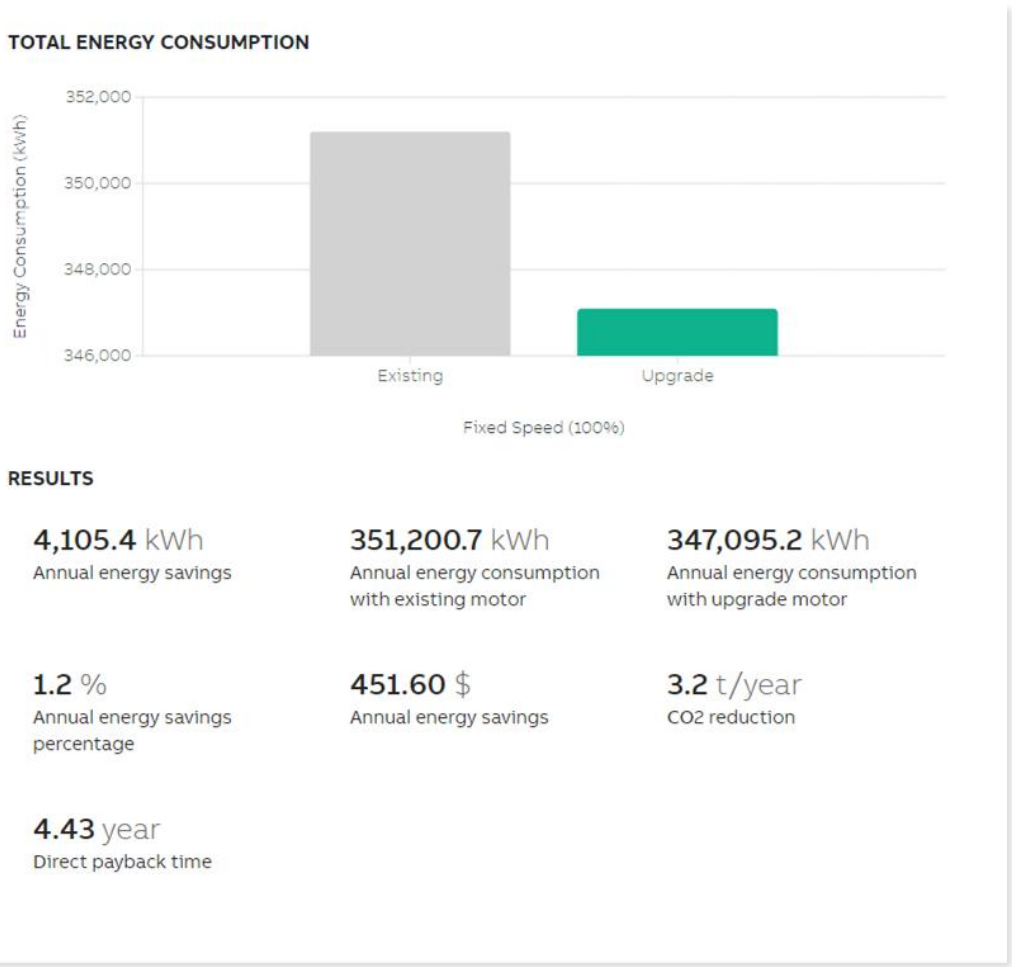
SUPPORT & DIGITAL TOOLS

04

Energy Savings Calculator



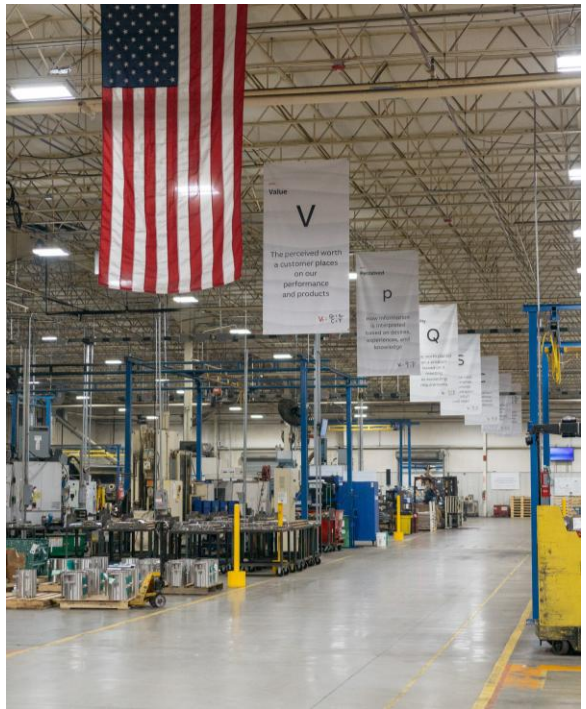




Scan me

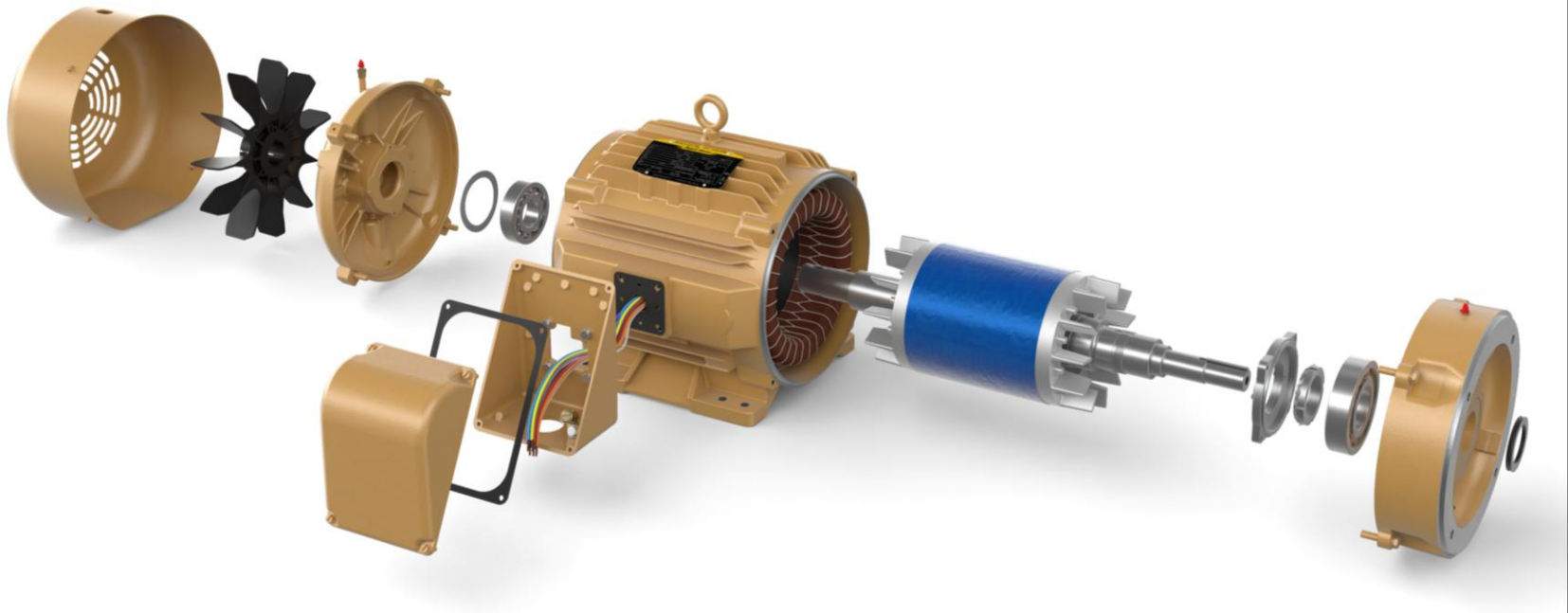
Buy-American Act (BAA) Compliant

- Over **95%** of Baldor-Reliance® rolled steel motors fall under the Buy-American Act
- Proudly designed and manufactured in the United States



New standard for energy management & performance

When it comes to electric motors, you trust in ABB. Baldor-Reliance SP4 motors are a shortcut to energy savings, ensuring you meet all MEPS regulation standards without having to make significant changes to your existing system.



Easy choice

- Reduced energy use
- Longer motor life
- Backed by a 4-year warranty

Easy retrofit

- Drop-in NEMA frames
- No new training or tech
- Simple catalog number selection

Easy savings

- <2-year payback in most cases
- NEMA Premium Efficiency 4 performance
- Supports energy cost reduction goals

MOTION DRIVE PRODUCTS – PREVENTING DOWNTIME IN YOUR WATER PROCESS

Motion Drive Products Water & Wastewater solutions

Presenter

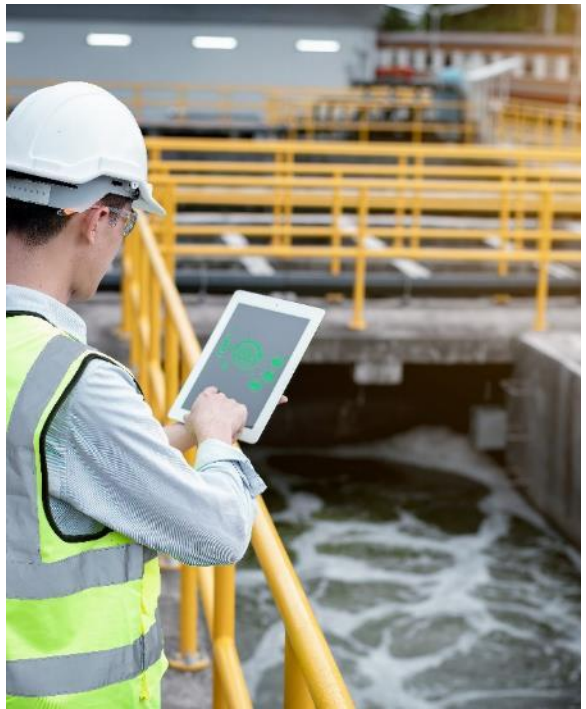
Jim Turner

Water Industry Segment Manager,
Drive Products

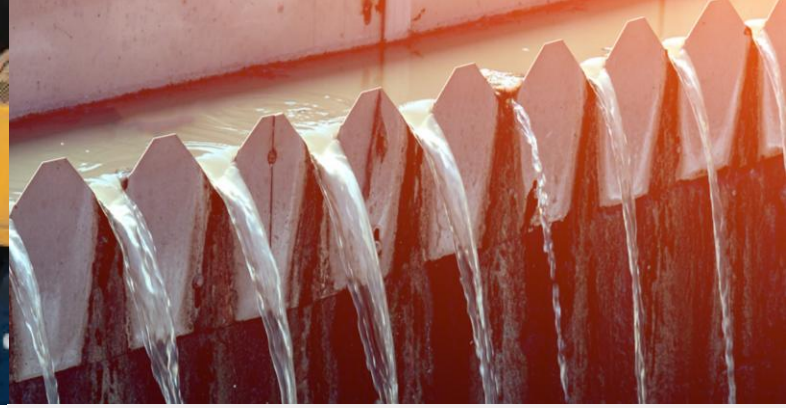
Fight your operational enemies

There are many common enemies that threaten your operations.

ABB can help you strategically eliminate their impact to ensure your processes run, uninterrupted.



- Process control efficiency
- Water hammer
- Cavitation
- Poor power quality and generator instability
- Outdated installation practices
- Extreme environments
- Aging infrastructure



Process control efficiency

How to improve your process control efficiency

Are you losing system performance?

- Regulatory compliance is the key focus, innovation and process efficiencies sometimes take a back seat.
- The longer it takes to address process inefficiencies, the more operational budget is wasted.
- Process optimization and energy savings opportunities are available within both water and wastewater plants regardless of treatment or flow capacity.

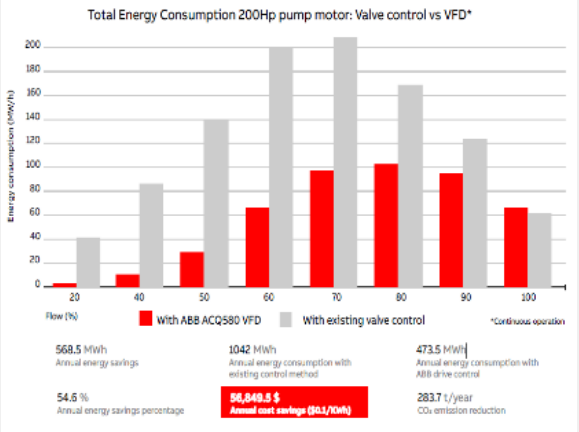
Missing out on efficiency gains?

- Pumps and blowers running full speed with outlet restrictions (valves or vanes) can **waste up to 40% of electrical energy**.
- Manually controlled dosing, pumping or even aeriation with no process feedback can be inefficient and introduce waste.

Our experts can help with improvement identification:

- Creating a baseline for your processes.
- Evaluating your facility, **identifying** where and how you can achieve **the best return on investment**.
- Using your application data and energy costs to calculate payback.
- Creating a proposal based on optimization upgrades and energy savings.

Energy usage comparison using ABB energy saving calculator



Water hammer

Prevent its impact on force mains, pumps, and valves

What is it?

- It's a destructive force that seriously affects watermains, pipes, pumps, valves, seals, and network operation and lifespan.
- Named for the hammer-like sound pressure shock waves make.
- These shock waves potentially cause valves to leak and pipes to rupture, or collapse.

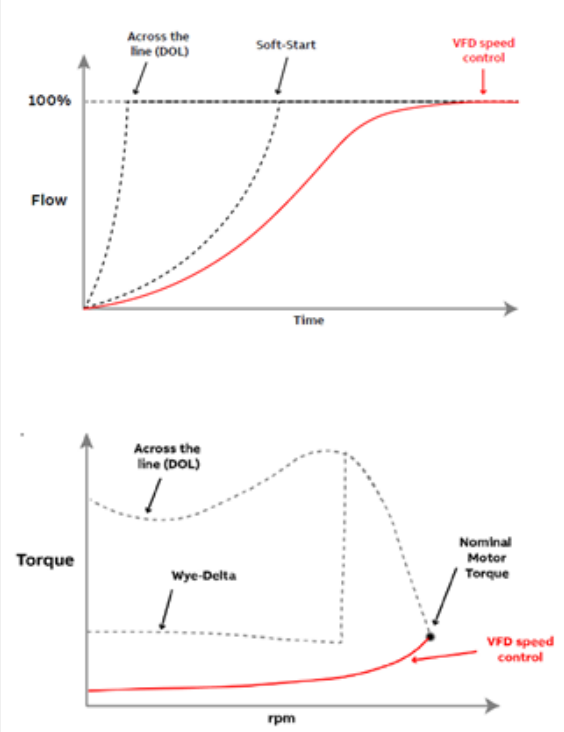
Do you see?

- Water and revenue loss from leaks.
- Drops in pressure and flow.
- Failures of pipes, valves, seals and other infrastructure.
- Interruptions to your processes and costly repairs.

Solution – VFD speed control

- **Soft pipe filling** removes pressure peaks in pipework.
- **Multi-pump control** ensures stable and uninterrupted operation of multiple pumps.
- **Pressure protection** monitors and reacts to high and low-pressure situations.
- **Sleep boost** extends pump and asset lifetime by decreasing the daily stop/start cycles.

Why does starting method matter?



Cavitation

Prevent its impact on impellers and pumps

What is it?

- It’s a destructive force that seriously affects pump operation and lifespan.
- Air bubbles can form due to changes in the liquid pressure inside the pump.
- Bubble implosions and shock waves can cause serious mechanical damage the pump.

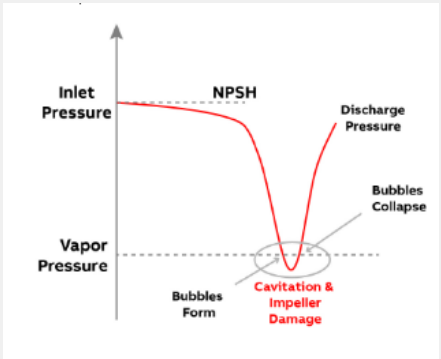
Do you see?

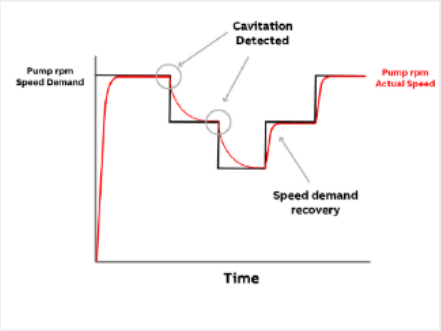
- Excessive noise from your pumps.
- Drop in pump efficiency or increase in current demand with no operational changes.
- Impeller and pump failures that need costly maintenance and repair.
- Interruptions to your processes.

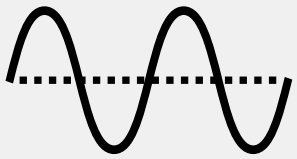
Solution – Cavitation control

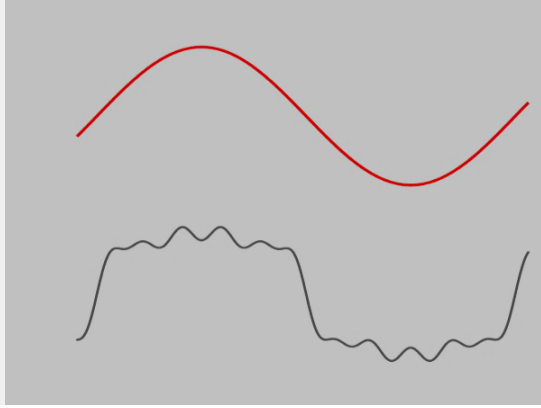
- Built into the ACQ580 Water dedicated VFD.
- VFD detects cavitation and **reduces pump speed to control and stop damage occurring.**
- Then returns to process pump speed demand.
- All without costly sound, pressure, or vibration sensors.
- Easy to retrofit with addition of just the VFD.

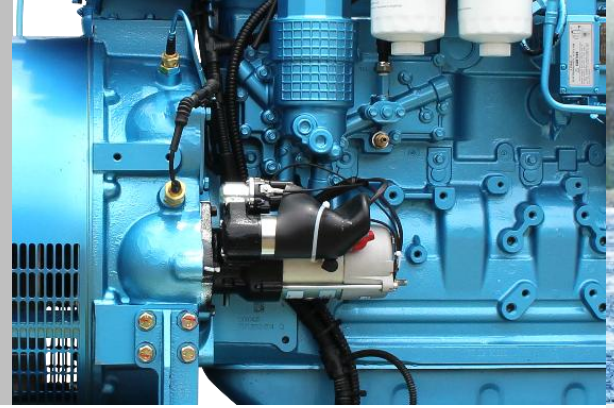
What causes cavitation?











Poor power quality and generator instability

Combat unseen “dirty” power quality problems

Why?

- You need a stable, uninterrupted power supply to operate reliably.
- Your facilities must be impervious to utility power interruptions and poor power quality.

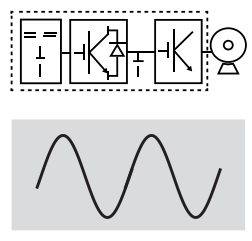
Do you see?

- **Overheating motors and transformers.**
- Erratic behavior from electronic devices.
- **VFDs, generators and equipment tripping without any obvious cause.**
- Interruptions from voltage dips, imbalances and waveform distortion and harmonics.

Solution – ABB ULH

- Does not create damaging levels of harmonic waveform distortion.
- Meets stringent IEEE519 harmonic standards.
- **Immune to many power dips and imbalances.**
- Generator safe – no need to up-size to cope with 6 Pulse VFD loads on Gensets and Transformers.

Active rectifier (ULH drives)



Typical input current distortion **3 – 5 %**

Ultra-low harmonic drives (ULH)

- Control line current to near Sinusoidal waveform
- Low total distortion of current and voltage
- Meet most stringent standards (IEEE519) at VFD input terminals
- Not susceptible to unbalanced supply voltages and background voltage distortion



Outdated installation practices

Prevent trips & interruptions caused by improper installation

Why check?

- Motors windings can prematurely fail because of poor cabling, wiring, and grounding practices.
- Motor bearings can also suffer when proper practices are not followed.
- Long motor cables and non-VFD rated motors may require additional external devices for successful operation.
- Even brand-new installations can use outdated practices.

Are you taking care of?

- Location and environmental factors.
- Heat and humidity of installation.
- Electrical connections, cable types and installation routing.
- Protective devices and grounding.
- Filters and electrical noise suppression.

ABB Experts can offer advice:

- **Guides to best practices** for VFD installation.
- Motor cable type recommendations.
- Filter and noise suppression techniques.
- **How to protect your VFD assets.**
- White papers and technical guides written by industry and technology experts.
- ABB's network of regional partners speed support and expertise right to your door.

Extreme environments causing failures?

How to protect and extend your VFD’s lifetime

What are the issues?

- Equipment must be able to withstand a wide range of extreme conditions from process gases, chemicals or humidity and water ingress.
- Equipment can suffer from damage, degradation, and premature failure.
- Prolonging these negative effects significantly decreases equipment life & exponentially affect the cost of repair.

Do you suffer from?

- **Corrosion of exposed** electrical and electronic **components**.
- Damage to enclosures, and externally mounted devices.
- Premature failures leading to service and process interruption.

Choose VFDs designed for extremes:

- Accelerated lifetime tested to ensure service life and uninterrupted operation.
- **Enclosure classes** designed to prevent gases, liquids and chemicals from reaching sensitive electronics.
- **Conformal coated printed circuit boards** protects to electronic component level.
- Wide operating temperature range.

- **Nitrogen dioxide (NO2)**
- **Hydrogen Sulfide (H2S)**
- **Sulfur dioxide (SO2)**
- **Ammonia (NH3)**

Aging infrastructure

Identify how aging infrastructure increases your costs

What are the issues?

- Power electronics, like VFDs and other solid-state devices, can have a short service life without regular maintenance.
- **Heat, moisture, corrosion, and obsolete components** all contribute to **reducing the useful life** of these devices.
- Old or obsolete VFDs are no longer supported by the manufacturer.
- The risk of breakdown or total failure increases day by day.

Do you suffer from?

- Burst pipes and mechanical failures.
- Water and wastewater leaks and spills with added risk of penalties and maintenance costs.
- Failure of electrical equipment.
- Interruptions to your treatment processes.

Solution – Modern VFDs

- Protect pumps, valves and pipes from pressure transients.
- **Monitor pump flow and pressure** performance to spot problems before they stop processes.
- Protect VFD/Pump health and notify when operating out of standard operating parameters.
- Replace obsolete harmonic mitigation technology and perform to a higher level.

Summary

Defeat your enemies and enjoy uninterrupted operations

ABB experts will help you plan your battles

Best practices

Identify where improvements can be made and how to implement them with new technologies

VFD Technology

Apply the latest technologies and techniques to gain confidence and efficiencies

Scan here

…to download your own copy of our full playbook

ACQ580 Ultra-low Harmonic Technologies
Defeats power quality and generator problems

ACQ580 Cavitation control function
Defeats its damaging effects in your pump's impellers

ACQ580 dedicated pump functions
Defeat the damage to assets and leakage from water hammer

ABB's WWW experts
Help defeat outdated installation practices to extend life

With the ACQ580 and ABB's WWW experts
Defeat the causes of failures in aging infrastructure

ACQ580 high protection class
Defeat failures in chemical, gas and extreme environments

ACQ580 process control functions
Defeat your process inefficiencies and high running costs

ENHANCING WATER INDUSTRY EFFICIENCY WITH ABB ABILITY™ CONDITION MONITORING SERVICE

Motion Services Water & Wastewater solutions

Presenter

Vijay Anand

Service Agreements and
Digital Offering Manager, Service

ABB Ability Digital Powertrain

Storyline

What is life cycle management

Benefits of Digital Condition Monitoring

Introduction to ABB Ability Powertrain

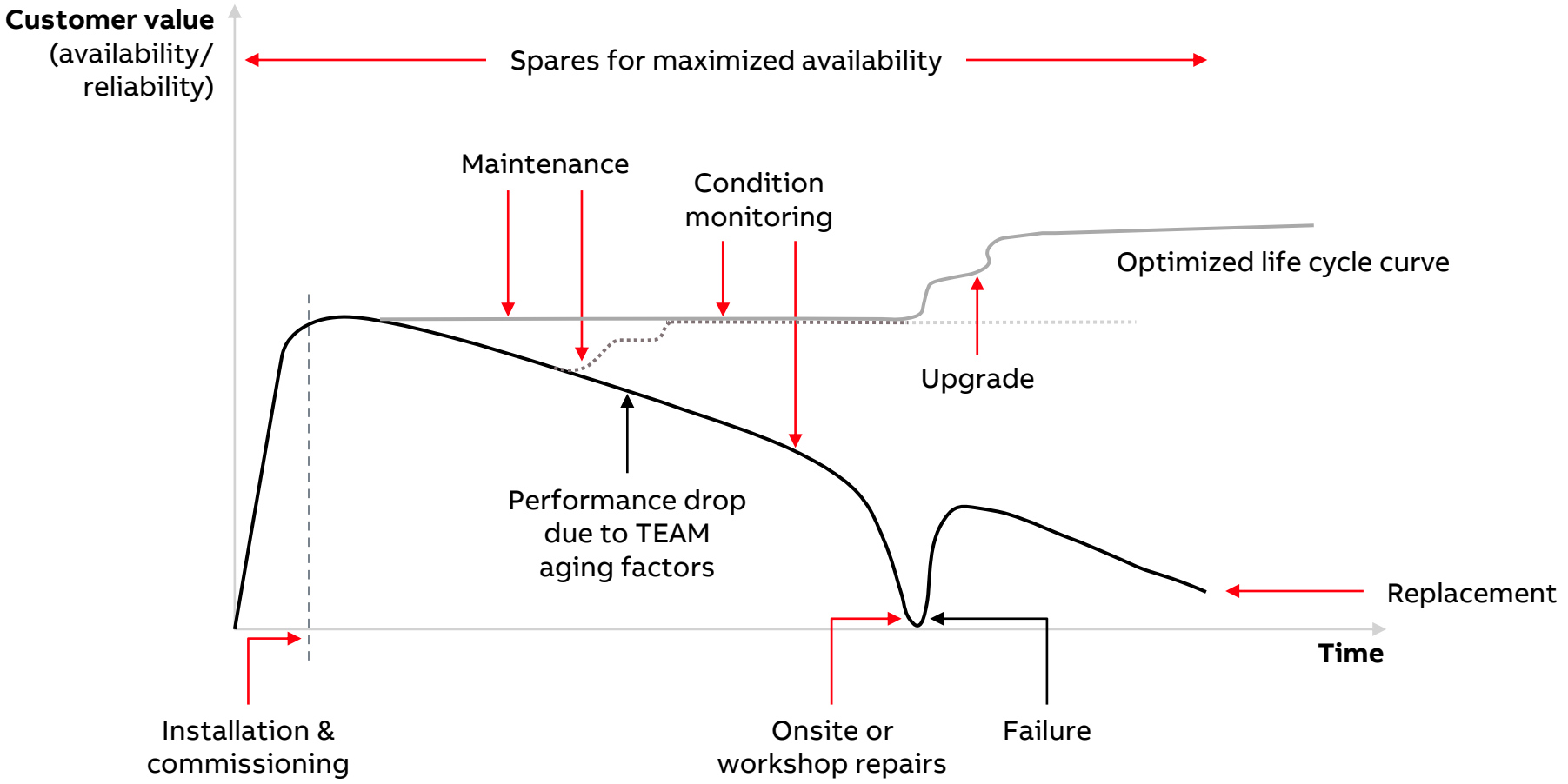
Technology used by ABB for Digital Condition Monitoring

- Drive monitoring
- Smart Sensor
- Electrical Signature Analysis (ESA)

A brief overview of each technology

Service Agreements

Life cycle management



Maintenance strategy

1

Run to fail/reactive strategy

Only fixing equipment when a failure occurs (spare parts, remote/on-site support, replacement service, etc.

2

Time-based maintenance strategy

Fixing equipment on a predetermined schedule (preventive maintenance, reconditioning, inspection and diagnostics, etc.)

3

Condition-based maintenance strategy

Fixing equipment based on its condition (predictive maintenance, etc.)

4

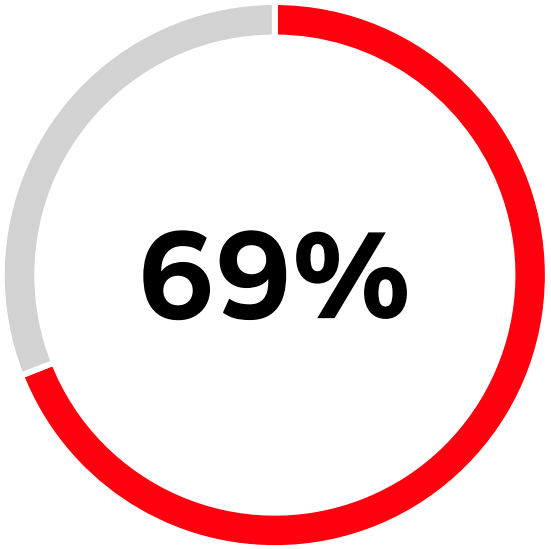
Outcome-based maintenance strategy

Only paying a service partner for the achieved outcomes (e.g., uptime, energy savings)

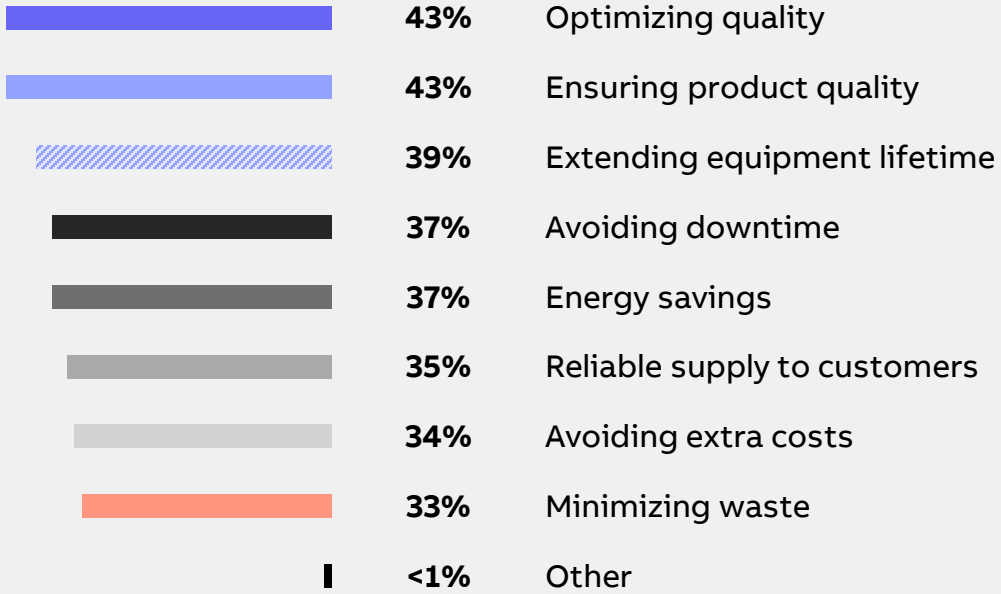
High risk **Low risk**

Cost of downtime

Percentage of plants facing unplanned outage at least once per month

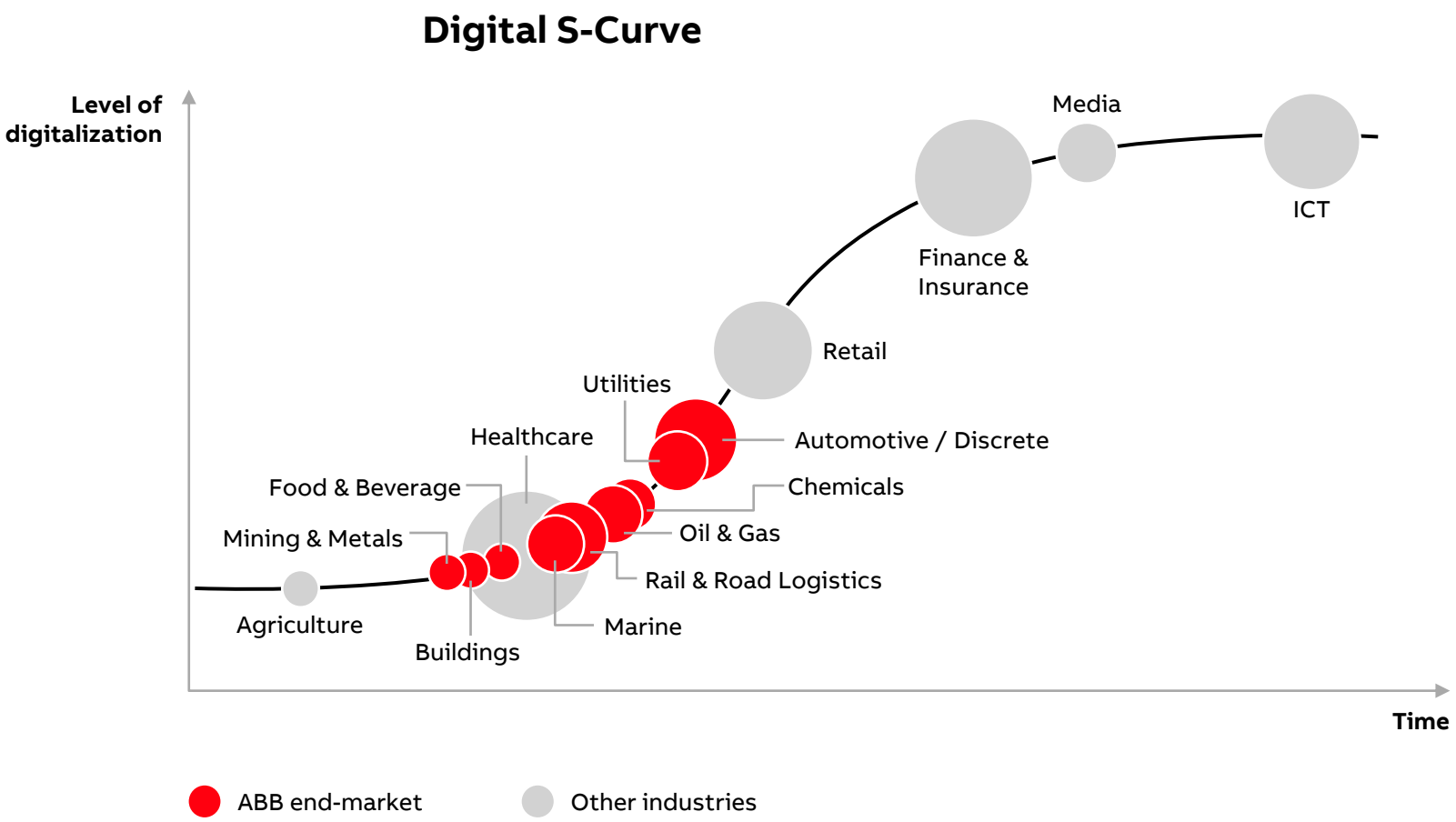


Benefits of maintenance and reliability



Median cost of downtime in Water/Waster Water $98,222 USD per hour

Industrial markets primed to adopt digital technologies



Remember how the hotels were laughing at the booking portals 10 years ago.

Now they lost a large chunk of their market to Airbnb and others like them.

And they have lost ownership of the rest of their market to Booking.com, Tripadvisor and similar digital service providers.

Digital add value
Industrial IoT

Improve sustainability

Empower productivity

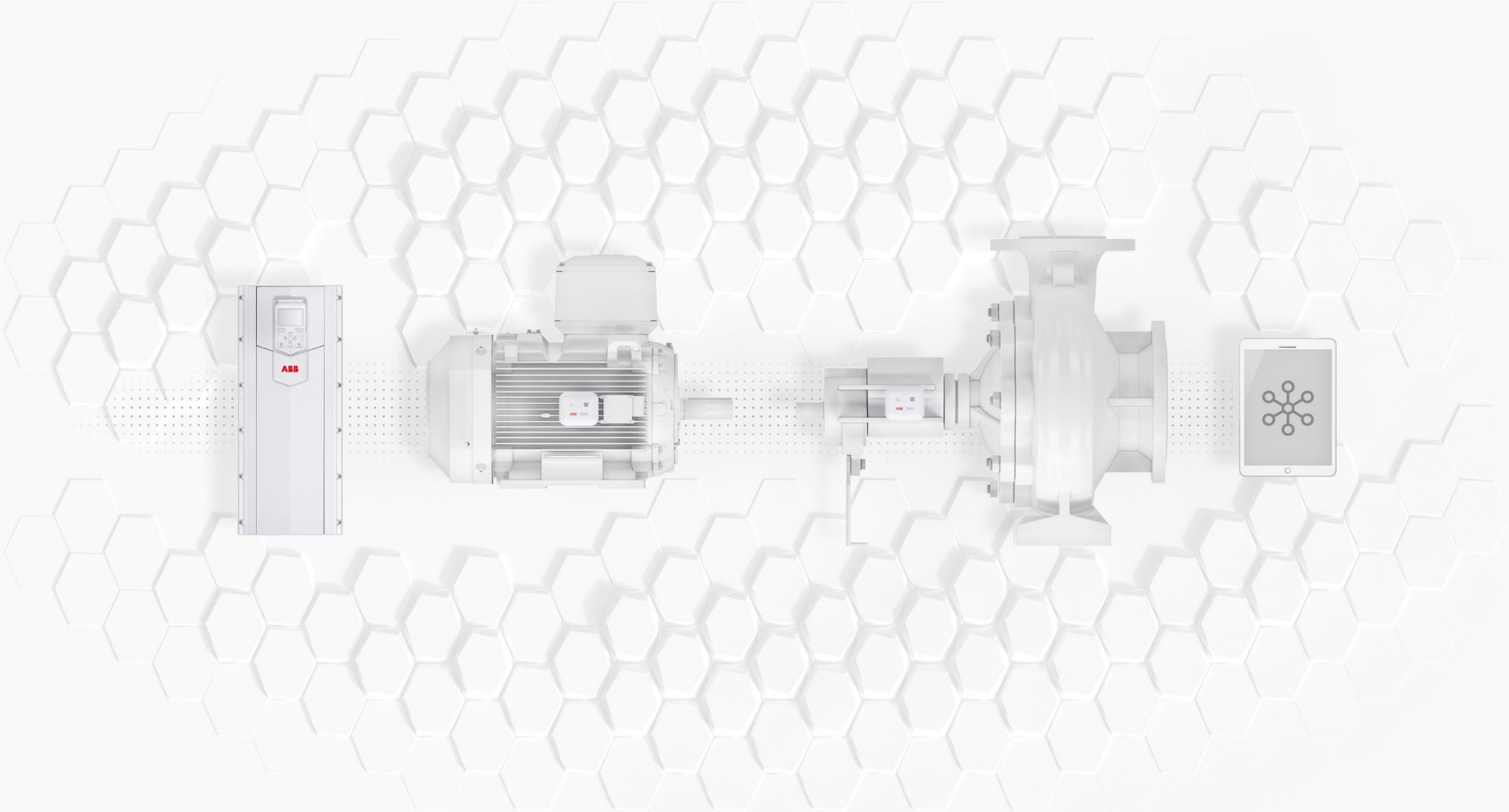
Increase safety

Enable digital services

Boost competitiveness

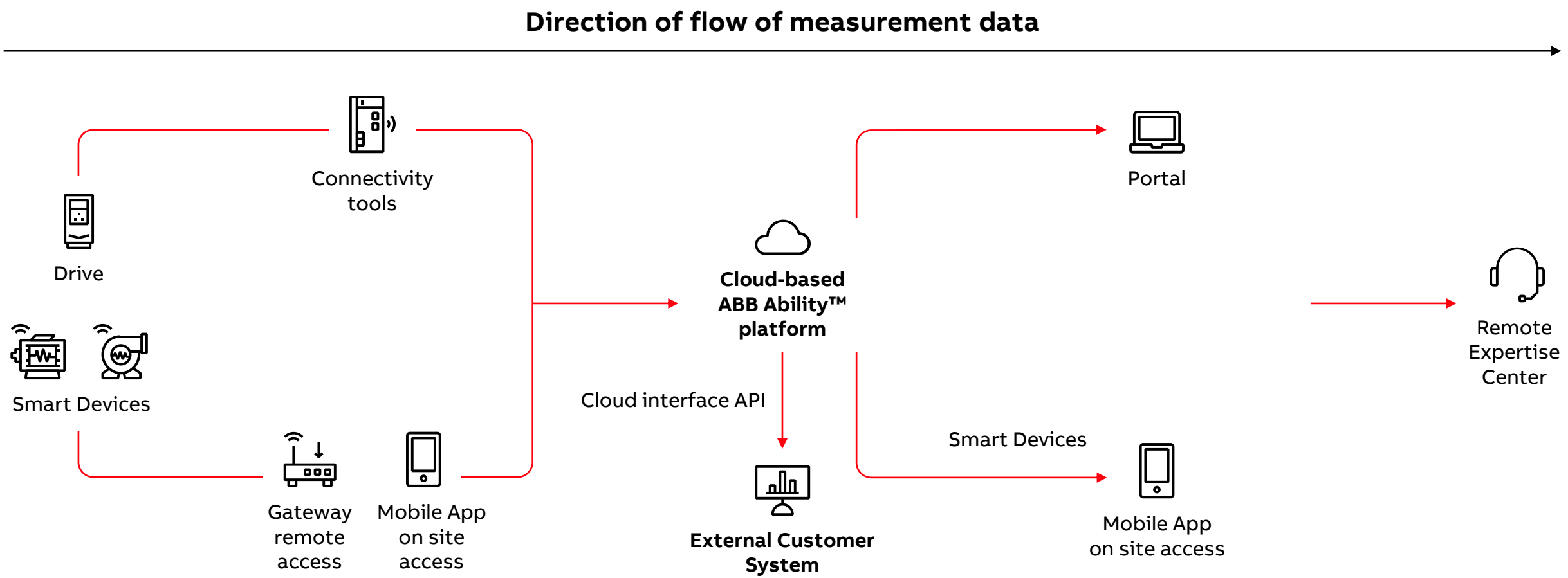
Revolutionary change in user experience

ABB Ability Digital Powertrain



Digital Powertrain – solutions, platform and service

How does this work?



Digital Powertrain

Connectivity devices

Motors and rotating equipment

Connectivity device for ABB and non-ABB motors and general machinery, such as gearboxes and fans.

- Available in 2 variants: standard performanceand high-performance sensor
- Battery life up to 15 years (high performance sensor) under standard usage conditions
- Used for all segments where the sensor hardware can be placed and where Bluetooth connection will be available
- ATEX, IECEx and NEC 500 certified

Drives

Connects drives to the cloud via the Internet or local Ethernet network.

- The module comes with a built-in web server and requires no Flash/Java plug-ins
- Only applicable on ABB drives (starting from ACS880 models – …)
- RMDE module with IP54 enclosure is available for already installed drives

Rotating equipment

Connectivity device for ABB and non-ABB motors and general machinery in extreme environments.

- Installed in the motor cabinet, not on the asset itself
- Using ESA technology, via current and voltage sensors
- Used for assets where the sensor and/ or Bluetooth can not work (submerged or extreme temperatures)

Condition monitoring for powertrains

Stay one step ahead with accurate information about the health, performance and energy efficiency of your equipment for better operational decision making and cost management.

Condition monitoring for powertrains

Monitoring of VFDs

What is monitored

Standard

- Condition indexes & digital graphs
- Alarm management
- Asset Health
- Team Support
- Backup Management

Monitored

- Faults and alarms
- Operational signals
- Conditions
- Environmental KPIs
- Parameter change

Power modules

Condition-based maintenance predicts remaining life of semiconductors

DC bus capacitors

Condition-based maintenance predicts remaining life of DC bus capacitor

Cooling unit

Condition-based maintenance predicts remaining life of fan

Condition monitoring for powertrains

Monitoring based on vibrations and magnetic flux

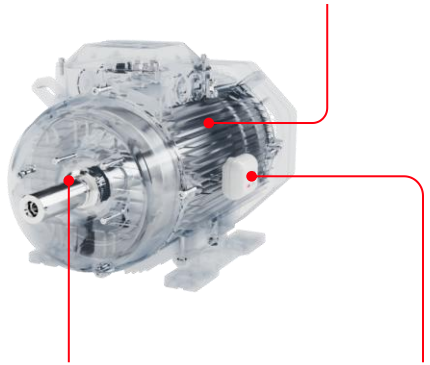
Motor

Energy efficiency

Identify energy wasteful motor-driven applications and get recommendations on how to boost efficiency

Overheating

Detect overheating to increase your motor's lifetime



Bearing condition

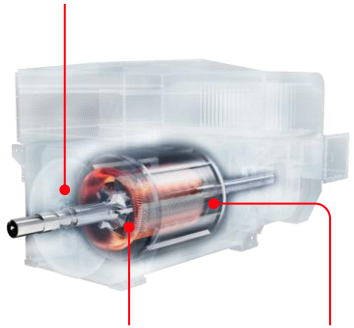
Early detection of bearing wear – the most common cause of motor failure

Overall vibration

Detect vibration that can cause severe motor damage if left unattended

Overall vibration

Detect vibrations that can cause problems, such as rotor unbalance, that lead to severe motor damage if left unattended



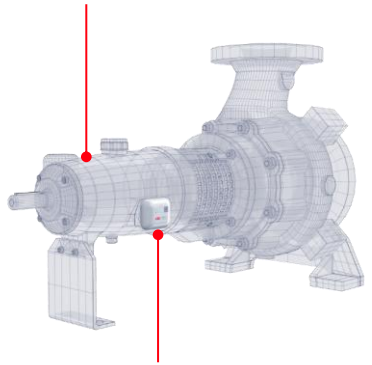
Bearing condition

Early detection of bearing wear – the most common cause of motor failure

General Machine-Pumps

Vibration

Detect vibration that can cause problems if left unattended

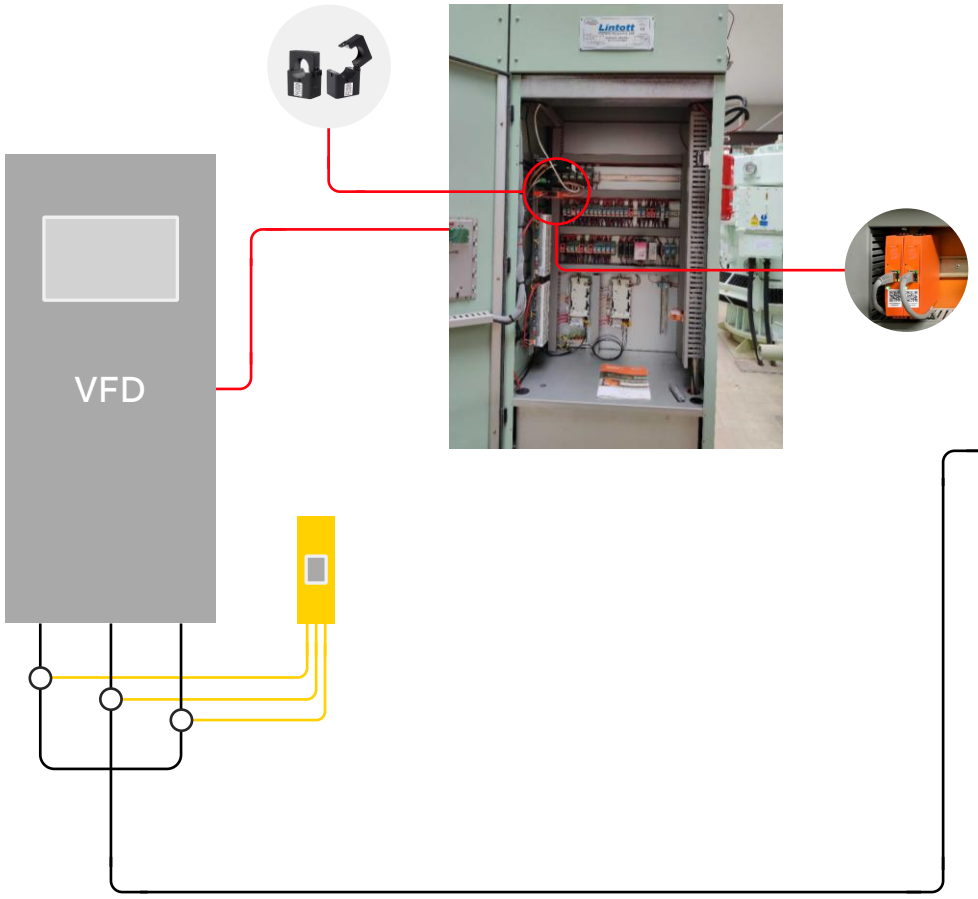


Temperature

Detect overheating to extend the lifetime of your machinery

Set up for ESA technology – Electrical Signature Analyses

Monitoring based on current and Voltage instead of vibrations



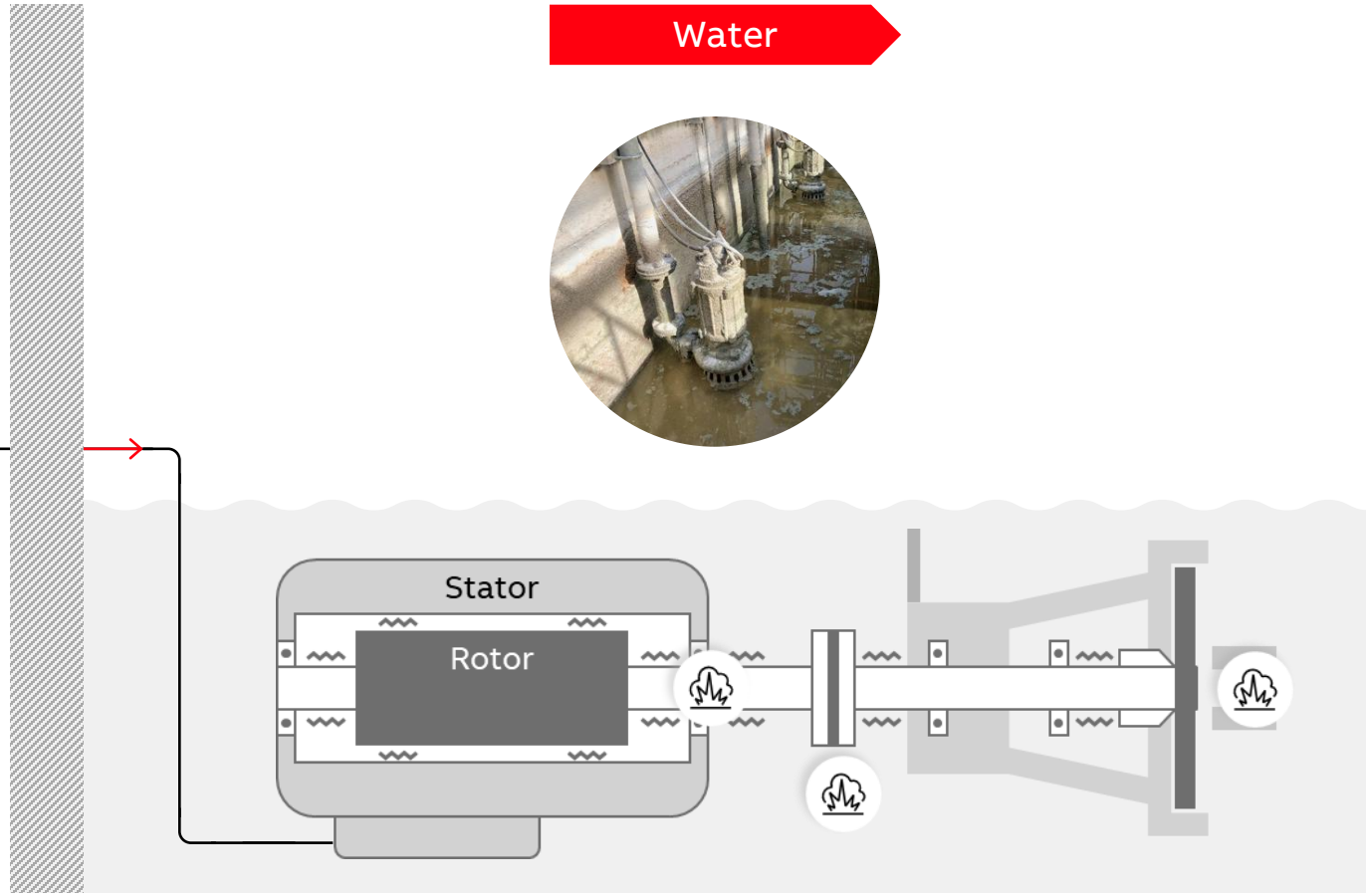


ABB Motion Services
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We look forward to connecting with you!

Q&A


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