



MOTION

Grains and ingredients handling

Boosting productivity, safety
and energy efficiency

Increasing profitability without compromising quality

While milling properties are important, even more critical is producing flour with the baking quality and characteristics required for the ultimate end products in which it will be used. Variable speed drives (VSDs)/variable frequency drives (VFDs), motors and PLCs can play an important role in adjusting production to meet these quality challenges.



Food and personnel safety



“I need to make my plant and personnel safety a priority.”

Tackle diverse safety demands...

- As grain dust is as explosive as gas, employees must be protected from exposure to risks associated with dust ignition, wherever in the world they work.

...using best-in-class technology

- Dust ignition-certified motor and drive packages comply with demands of dusty and explosive environments.
- Remote monitoring protects personnel from potentially dangerous machinery.

Conform to the latest safety standards...

- Applications such as milling machines can be dangerous to work around.

... with solutions that build trust

- Advanced drive functions, like safe torque off, ensure milling machines and mixers come to a safe and efficient stop.



Energy efficiency



“We need to cut our energy bill and carbon footprint.”

Find the big energy users...

- The biggest energy users in the grain mill process include centrifugal blowers, convection fans, mills, compressors and sieves.

... unlock the saving potential

- Replacing direct on-line starting with high efficiency VSD/VFD-motor-package can lower energy costs up to 60 percent and reduce carbon dioxide emissions.
- ABB Ability™ Operations Data Management zenon software helps detect ways to optimize energy and resource consumption. Offers excellent reporting functions that give full production transparency.
- ABB Ability™ Smart Sensors for general machinery and low voltage motors help identify energy saving potential.
- Upgrading to IE5 efficiency class motors, such as synchronous reluctance technology (SynRM) significantly reduces energy consumption.



Productivity improvement



“Our production must adapt quickly to meet evolving customer tastes.”

Keep production agile and accurate...

- Fast throughput and delivery are key to maximize grain durability.
- Changing constant-speed equipment to variable-speed in order to meet varying production volumes saves time and money.
- 100 percent reliability is crucial as most mills run 24 hours a day, seven days a week, with one shutdown every 10 weeks.

... with flexible motor-driven solutions from one supplier

- Wide speed variation possible.
- Production increase often achieved without any extra investment.
- Safely interlink processes from production to logistics and warehousing, through fieldbus and built-in sensors.
- Immediate response to process demand, with no need to wait for power plant response.
- Less mechanical stress, with the possibility to drive motors in reverse direction.

“We need better intelligence on how production lines are performing.”

Locate the right information...

- Manually extracting plant data is time-consuming and inaccurate.
- Getting access to the right data and turning it into useful information can be difficult.

... through digital solutions

- Multiple inputs and outputs (I/Os) provide a variety of process information from the VSD/VFD to the motor control.
- Open fieldbus systems allow easy drive integration to any PLC or similar control equipment, giving greater insight, information and better production control. This helps avoid product recalls.

Operation and maintenance



“How can I control rising costs?”

Lower operational overheads...

- Operational costs must be controlled without compromising safety of plant, personnel or end product.
- Maintenance must be carefully scheduled around planned downtime.

... through advanced maintenance regimes

- Soft starting avoids sudden shock loading, leading to less wear and tear to gears, belts and driven machine.
- ABB Ability™ Condition Monitoring services deliver accurate, real-time information about drive and motor events to ensure equipment is available, reliable and maintainable.
- Global service network and preventive maintenance contracts relieve pressure on in-house teams and increase speed of response to critical issues.

“We need the most reliable products and systems to avoid unplanned shutdowns.”

Eliminate production risks ...

- Plant shutdowns are costly, from lost production time, spoiled goods and reputational damage.

... by utilizing smart functionality

- Temperature, load, under/overvoltage protection and warning features within drives help anticipate breakdowns.
- ABB Ability™ Condition Monitoring for powertrains warns of impending failures, long before they happen, reducing unplanned downtime.
- Motors designed for harsh conditions, offer prolonged life through a best-in-class sealing system.

Improving operational efficiency helps boost output and profitability

Many mills operate around the clock, so any downtime needs to be planned and minimized.

1 GRAIN RECEIVED, CLEANED AND MOVED TO SILOS

Grain is dropped through hopper onto a conveyor belt and moved to the main pipe system, where it is transferred by air from centrifugal blowers.

Applications:

- Drag flight conveyors
- Enclosed belt conveyors
- Screw conveyors
- Bucket elevators
- Centrifugal blowers

Requirements:

- High shock loads
- Reliability due to difficult access
- High exposure to dust, fibers and flour

2 GRAIN ROASTING

Grain is fed from intermediate silos by a feeder and moved on a screw conveyor to oven conveyor belt. Grain is roasted as it moves through the oven. Fans circulate oven air to keep temperature and moisture constant.

Applications:

- Feeders
- Centrifugal blowers
- Bucket, screw and belt conveyors
- Convection fans

Requirements:

- Conveyor belt speed is synchronized with temperature according to required roasting level

3 GRAIN SIEVING

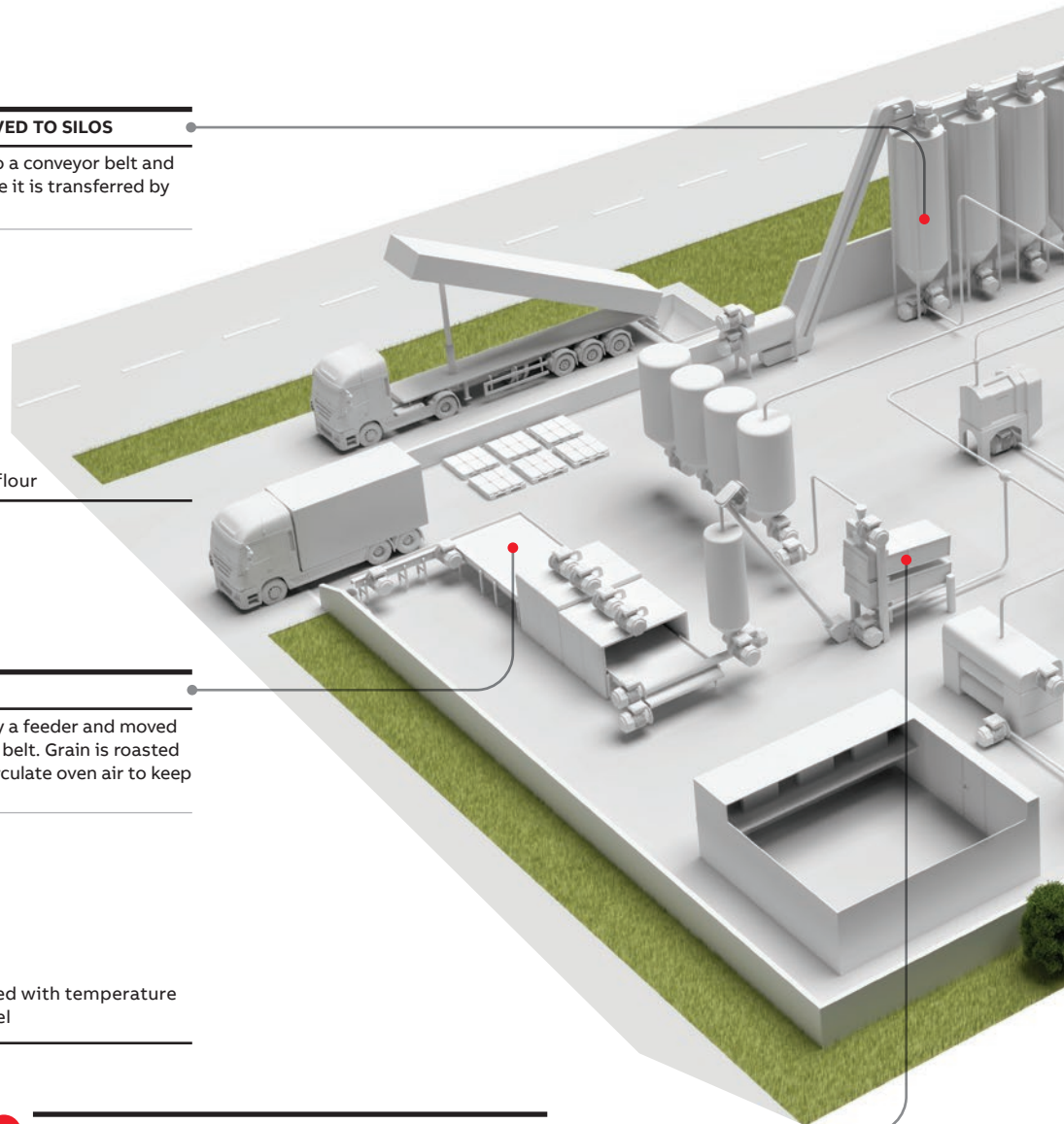
Sieves vibrate in horizontal and vertical directions. Grain is sorted by size. After sieving, grain of similar size is blown to peeling, mills or to intermediate silos prior to roasting.

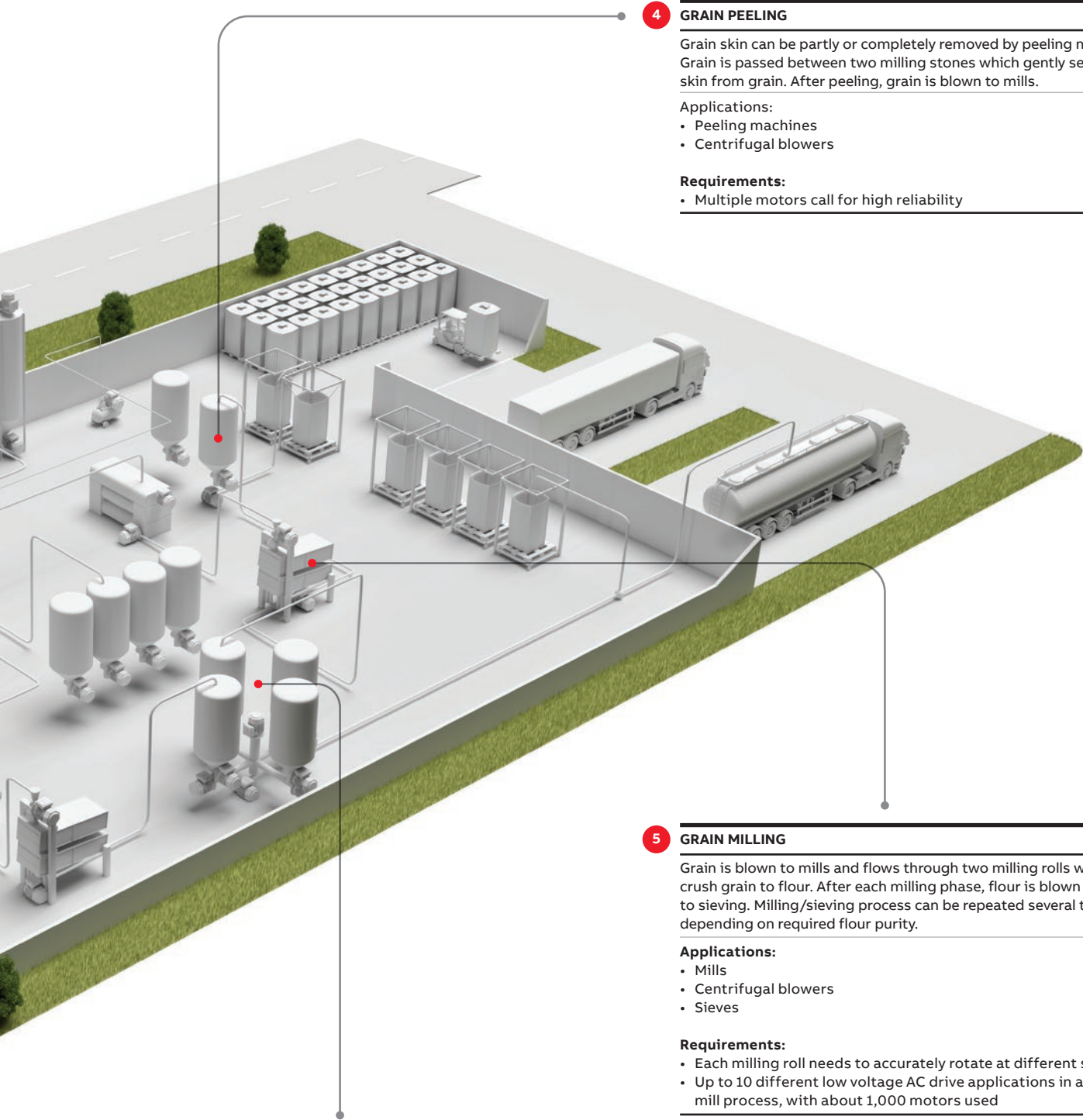
Applications:

- Sieves
- Centrifugal blowers
- Compressors

Requirements:

- In the pipe systems, all three-way valves can be controlled pneumatically by compressors
- Proper loading of the purifier sieves is critical to the effectiveness of the separations





4 GRAIN PEELING

Grain skin can be partly or completely removed by peeling machine. Grain is passed between two milling stones which gently separates skin from grain. After peeling, grain is blown to mills.

Applications:

- Peeling machines
- Centrifugal blowers

Requirements:

- Multiple motors call for high reliability

5 GRAIN MILLING

Grain is blown to mills and flows through two milling rolls which crush grain to flour. After each milling phase, flour is blown back to sieving. Milling/sieving process can be repeated several times, depending on required flour purity.

Applications:

- Mills
- Centrifugal blowers
- Sieves

Requirements:

- Each milling roll needs to accurately rotate at different speeds
- Up to 10 different low voltage AC drive applications in a grain mill process, with about 1,000 motors used

6 MIXING, PACKING AND MOVING FLOUR

Grain is blown to be packed or mixed. Different flours mixed by feeding measured amounts of each flour into intermediate silos. Flours are moved on a screw conveyor to mixer.

Applications:





- Feeders
- Screw conveyors
- Mixers
- Centrifugal blowers

Requirements:

- High reliability of all motor-driven applications

Unlock the potential in grains and ingredients handling production applications

Alongside energy saving, improved productivity and greater safety, there are many other benefits from using variable speed drives (VSDs)/variable frequency drives (VFDs) and high efficiency motors on motor-driven applications.

	Challenge	Solution	Benefit
 Conveyors (inc. screw, belt and bucket)	<ul style="list-style-type: none"> Mechanically challenging, dirty and dusty environments, subject to shock loads and constant starting and stopping, but must never break down 	<ul style="list-style-type: none"> Motors and drives ensure continuous, intermittent or variable speed 	<ul style="list-style-type: none"> Lower maintenance costs by reducing mechanical stress of gears and belts. Less maintenance increases process uptime
	<ul style="list-style-type: none"> Products must be conveyed smoothly and evenly 	<ul style="list-style-type: none"> Machinery drives with built-in brake chopper provide precise control of conveyor deceleration, without any extra external hardware 	<ul style="list-style-type: none"> Smooth start and stop means products move steadily, avoiding spillages and waste
	<ul style="list-style-type: none"> Precise, smooth and consistent control and synchronization of conveyor speeds 	<ul style="list-style-type: none"> Safe torque off (SIL 3) prevents unexpected conveyor movement 	<ul style="list-style-type: none"> Each conveyor's speed can be adjusted separately and synchronized
	<ul style="list-style-type: none"> Products must be conveyed at correct speed to synchronize with other processes 	<ul style="list-style-type: none"> Gearbox, motor and drive connected to PLC keeps correct speed on each conveyor 	<ul style="list-style-type: none"> Synchronized control helps speed up production without malfunction
	<ul style="list-style-type: none"> Visibility of process performance 	<ul style="list-style-type: none"> Drives with integrated direct torque control (DTC): Better information on process performance and diagnostics 	<ul style="list-style-type: none"> Uniform load and speed control of carriers, feeders and conveyors
	<ul style="list-style-type: none"> Difficult to access and maintain machinery 	<ul style="list-style-type: none"> Robust and reliable motors 	<ul style="list-style-type: none"> More productivity through reliability Savings in service
 Centrifugal blowers/ convection fans	<ul style="list-style-type: none"> High energy user 	<ul style="list-style-type: none"> Running motor at half speed requires only 1/8 of power 	<ul style="list-style-type: none"> Avoiding traditional mechanical throttling arrangements saves energy as right fan speed achieved
	<ul style="list-style-type: none"> Precise roasting temperature and ventilation levels 	<ul style="list-style-type: none"> Drive replaces mechanical components such as chokes and control dampers 	<ul style="list-style-type: none"> Save up to 60 percent energy, improve productivity and reduce costs
	<ul style="list-style-type: none"> Ensuring ultimate reliability of fan operation 	<ul style="list-style-type: none"> Softstarters are suitable for motors running at full speed 	<ul style="list-style-type: none"> Avoids wear and tear to mechanical parts, ensuring uptime
	<ul style="list-style-type: none"> More flexible production line in order to get better productivity 	<ul style="list-style-type: none"> Drives extend speed range of fans 	<ul style="list-style-type: none"> Increases production capacity
 Milling	<ul style="list-style-type: none"> Milling rolls must operate at different speeds so that grain is milled to the predefined quality 	<ul style="list-style-type: none"> Each milling roll is controlled by its own drive and motor to ensure high quality 	<ul style="list-style-type: none"> Achieves precise speed control
	<ul style="list-style-type: none"> High power application creates serious safety risk 	<ul style="list-style-type: none"> Safe torque off brings machine safely into a no-torque state and/or prevents it from starting accidentally 	<ul style="list-style-type: none"> Improves operational safety without any additional components to the machine
	<ul style="list-style-type: none"> Explosive atmospheres due to grain dust 	<ul style="list-style-type: none"> Certified Ex motor and drive packages for hazardous environments 	<ul style="list-style-type: none"> Personnel and plant safety
 Mixing	<ul style="list-style-type: none"> Precise control is essential for high quality end product 	<ul style="list-style-type: none"> Programmable drives with accurate speed and torque control manages high starting torque and different mixing speeds 	<ul style="list-style-type: none"> Mixing accuracy increases productivity, affects food quality, helps save energy and improves safety



01

02

03


01 VSD/VFD provides precise speed and torque control of milling rolls to ensure that grain is milled consistently and to the required quality.

02 Motors and drives ensure continuous, intermittent or variable conveyor speed with less stress on mechanical components.

03 Direct torque control manages starting torque for milling and peeling machines.



Features and functions benefiting grain production

Drives, motors, PLCs and softstarters all play a vital part in keeping your production moving. Choosing the right product with the correct features is essential in ensuring an optimized production.



Variable speed drives (VSDs)/variable frequency drives (VFDs)

Energy efficiency

- Control operating costs by seeing energy costs in local currency, kWh and CO₂ emissions

Fieldbus compatible

- Use information such as flow rates to get the VSD/VFD to adjust motor speed and torque
- Get detailed insight into productivity performance and quality control through fieldbus comms connecting VSDs/VFDs with plant monitoring systems



Flying start

- Reduce wear and save time by starting a motor while the load is still spinning

Functional safety

- Safely stop applications using built-in safe torque off (safety level SIL3)

Low harmonics

- Eliminate supply disturbances that could trip production with built-in active supply unit and integrated low harmonic line filter

Reduced noise

- Protect staff health and safety with lower motor noise through adaptive switching frequency control

Repeatability

- Accurately adjust conveyor speed to suit filling rates of products with different characteristics

Ingress protection

- IP55 for dusty environment



Softstarters

Built-in bypass

- Reduce system complexity and size, saving time and money during installation
- Reduce heat generation from internal losses by activating bypass at full speed

Harsh environment use

- Ensure uninterrupted production in dusty or wet environments with IP66 keypad and coated electronics

Flexible communication

- Operate in local and remote mode by accessing all major communication protocols and built-in Modbus-RTU



Drive and motor packages

High efficiency motor and drive packages

- Save energy across the grain production process with high efficiency motors and drive packages

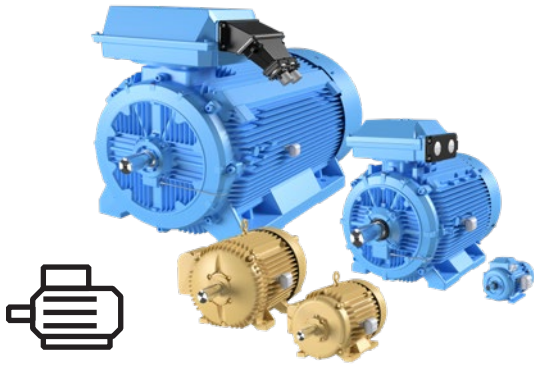
Cooling tower packages

- Reduce energy, vibration, noise and maintenance costs using a package that removes the gearbox from cooling towers
- Special low-speed permanent-magnet motor

Globally certified Ex drives and motors packages

- Protect plant and people and conform to global regulations using tested and certified motors and drives for potentially explosive atmospheres





Low voltage motors

Process performance motors

- Designed to last in the most demanding applications

Robust construction for outdoor environments

- 60 Hz and 50 Hz designs are available in IEC and NEMA frames

Easy housekeeping

- Smooth painted motors for easier cleaning

Dust ignition protection

- Prevent dust explosions with certified dust ignition proof motors

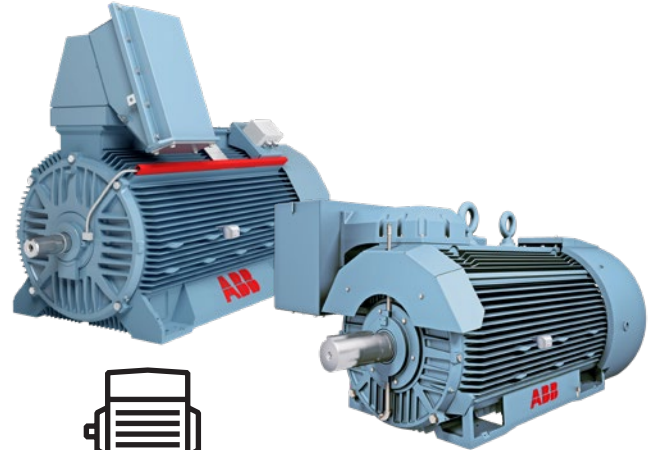
Higher efficiency

- IE3, IE4 or ultra-premium IE5 efficiency motors offering the lowest total cost of ownership

Suitable for VSD/VFD operation

Service and monitoring

- ABB Ability™ Smart Sensor ready



Medium voltage motors

- High power density with easy configurability
- Dedicated standards for both NEMA and IEC
- Built-in serviceability features reduce downtime and cost of not running
- Flexible repositioning of main terminal box
- Optimized motor and drive packages for simplified installation



Programmable logic controllers (PLCs)

- Comprehensive range of scalable PLCs, I/Os and robust HMI control panels delivering performance, quality and reliability
- One integrated engineering tool for programming, simulation and commissioning for PLCs, safety, drives, control panels and network
- Flexible choice of network and fieldbuses to integrate I/O's, drives, HMI, Scada and 3rd party devices fulfilling the needs of tomorrow
- IIoT gateway functionality onboard the PLCs and control panels offer secure connection to cloud



From the factory floor to the cloud and beyond

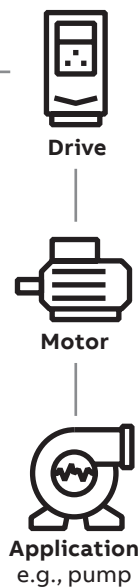
ABB Ability™ Condition Monitoring for powertrains optimizes the performance and efficiency of electric motor-driven rotating equipment. It enables better decision making by providing real-time access to data on all parameters for drives, motors and general machinery.

1 Intelligent powertrain

The powertrain is equipped with sensors and cloud connectivity and can consist of motors, drives and general machinery.

2 Turning data into valuable insights

Data gathered through VSDs/VFDs' built-in sensors and loggers together with that collected from ABB Ability™ Smart Sensors fitted to motors and general machinery, can be collected, stored and further accessed via the cloud. The ability to gather and analyze this data insights paired with service expertise can reveal information on the status and condition of your equipment, so that service activities can be scheduled more effectively.



Accessing data for analytics

Detailed information can be extracted into a company's portal and systems. Information on many aspects of the grains and ingredients handling process is available, including the ability to know exactly when and how production equipment was cleaned. Detailed dashboards give full transparency so that you can take actions that lead to less downtime, extended equipment lifetime, lower costs, safer operations and increased profitability.



Gain a digital advantage

While the data is always at your disposal, ABB service experts can work with you to provide help on how you analyze the data and define the steps for improving your operations.

Ensuring that the right person is exposed to the right information at the right time brings:

- Appropriate response to production challenges, lowering operating costs and product waste.
- Greater insight into various aspects of the grains and ingredients handling process, thereby improving quality and reducing variations, errors and waste.
- Maximum material traceability helps fulfil regulatory compliance.
- Lower risk of production failure and change the maintenance from reactive to predictive.

Maintenance Manager



Energy Manager



Production Manager



Safety Manager



Our service expertise, your advantage

ABB Motion Services helps customers around the globe by maximizing uptime, extending product life cycle, and enhancing the performance and energy efficiency of electrical motion solutions. We enable innovation and success through digitalization by securely connecting and monitoring our customers' motors and drives, increasing operational uptime, and improving efficiency. We make the difference for our customers and partners every day by keeping their operations running profitably, safely and reliably.

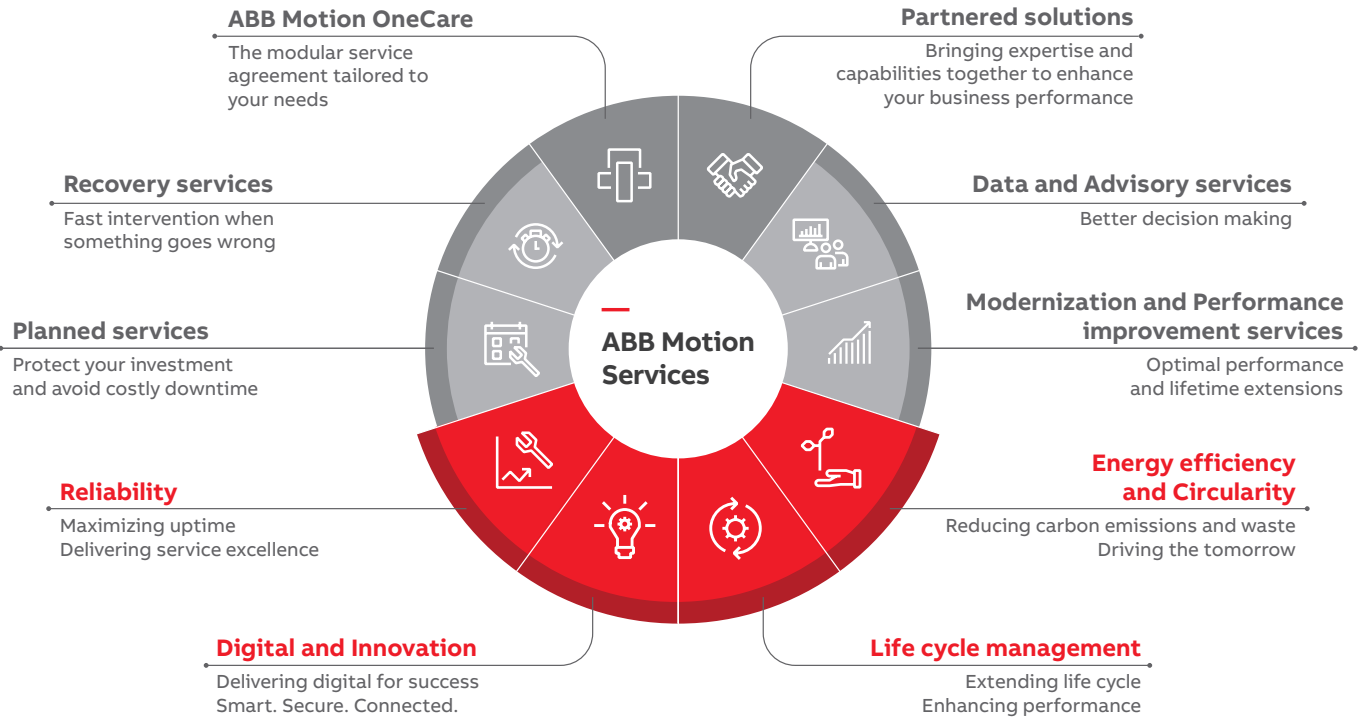
With a service offering tailored to your needs, ABB Motion Services maximizes the uptime and extends the life cycle of your electrical motion solutions, while optimizing their performance and maximizing your energy efficiency gains throughout the entire lifetime of your applications. We help to keep your applications turning profitably, safely, and reliably.

Digitalization enables new smart and secured ways to prevent unexpected downtime while optimizing the operation and maintenance of your assets. We securely connect and monitor your motors, drives or your entire powertrain to our easy to use cloud service solutions. Connecting your applications also gives you access to our in-depth service domain expertise.

We quickly respond to your service needs. Together with our partners, local field service experts, and service workshop networks, we provide and install original spare parts to help resolve any issues and minimize the impact of unexpected disruptions.

Our tailored to your needs service offerings and digital solutions will enable you to unlock new possibilities. Not only are we your premier supplier of motion equipment, we are your trusted partner and advisor offering support throughout the entire life cycle of your assets. We ensure your operations run profitably, safely and reliably and continue to drive real world results, now and in the future. Our service teams work with you, delivering the expertise needed to keep your world turning while saving energy every day.





OUR EXPERTISE
YOUR ADVANTAGE

With you, wherever you are in the world

Partnering with ABB, gives you access to some of the world's most innovative technology, expertise and solutions.

Global reach

ABB operates in over 100 countries with its own manufacturing, logistics and sales operations together with a wide network of local channel partners that can quickly respond to your needs. Stock availability is good, with short delivery times for many products backed by 24-hour spare parts delivery.

In addition, we work closely with grain producers to develop custom products, services and solutions to help standardize processes across multiple sites and streamline your supply chain.

We have several global R&D centers with thousands of technologists and considerable investments annually on innovation.

End-to-end product portfolio

Alongside its variable speed drives (VSDs)/ variable frequency drives (VFDs), motors and soft starters, ABB's automation offering includes a wide range of scalable PLCs, a selection of HMIs, instrumentation and robotics. With functional safety options, from built-in safe torque off in drives to safety PLCs, you can readily implement safety requirements.



ABB's offering includes:

- End-to-end **power and automation solutions**, from power distribution, raw material receipt, to process and machine control, to end of line packaging
- **Power protection and power quality solutions** to safeguard equipment and processes
- Industry leading **robotic automation solutions** that improve your speed-to-market, flexibility and help make packaging a differentiator
- A complete range of **protection, connection and wire management solutions** that

withstand harsh environments and extreme temperature swings, and provide the reliability needed for continuous operations

Streamline sourcing

ABB's end-to-end product and services portfolio streamlines your sourcing and purchasing activities and standardizes production across multiple sites, saving you money on spare part inventories while reducing maintenance costs.





For more information, please contact
your local ABB representative or visit

new.abb.com/drives

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