



# **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), motors, gearing and bearings 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



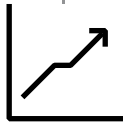
“We need to cut our energy bill and carbon footprint.”

### 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-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 pumps and low voltage motors help identify energy saving potential.
- Upgrading to IE4/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 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, gearing and bearings, 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

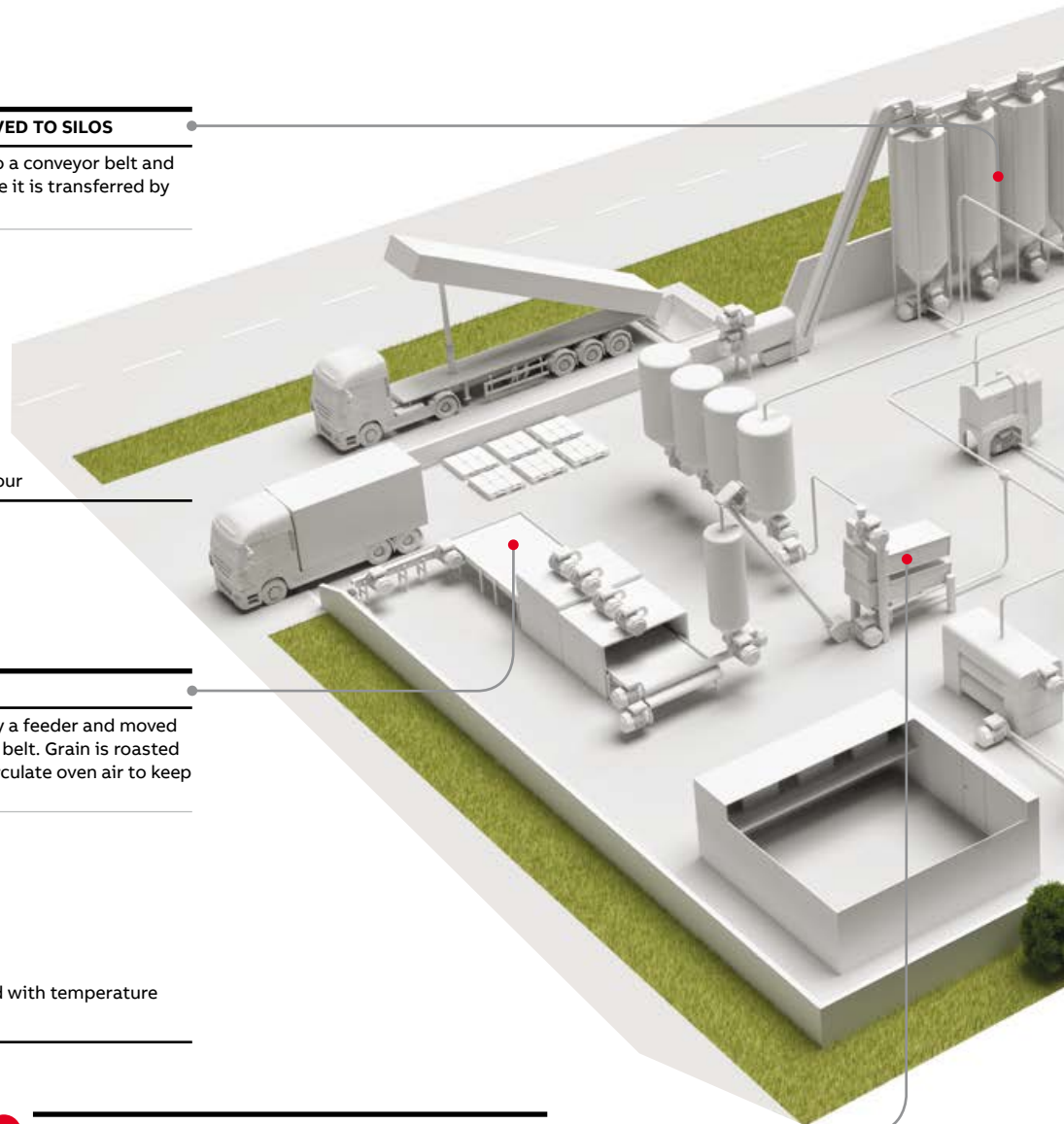
Sieves vibrate in horizontal and vertical directions. Grain is sorted by size. After sieving, grain of similar size is blown to peeling, mills or to intermediate silos prior to roasting.

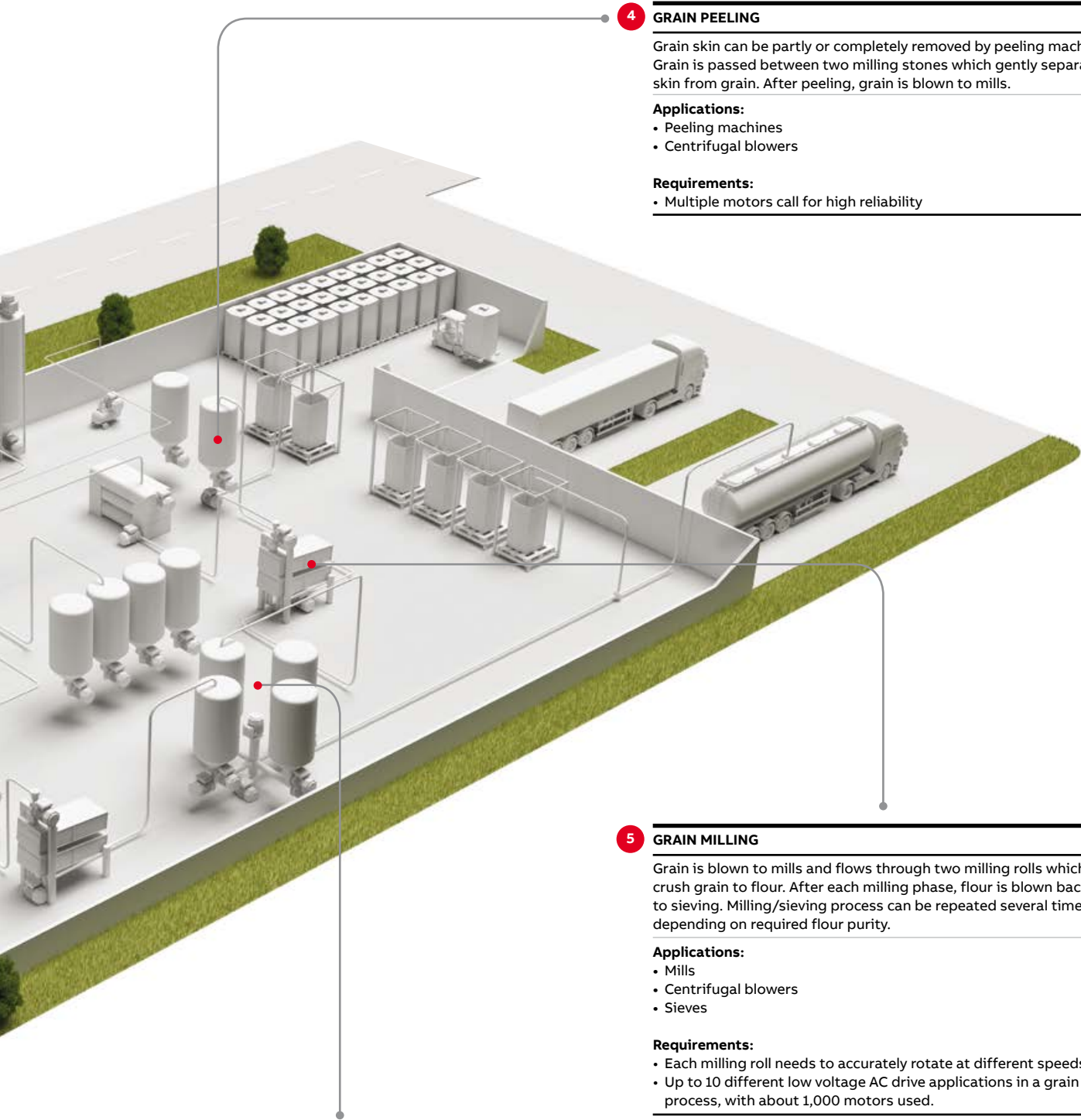
### Applications:

- 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:




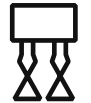
- Feeders
- Screw conveyors
- Mixers
- Centrifugal blowers

##### 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) and high efficiency motors on motor-driven applications

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





01

02



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

02 Motors, drives and mechanical power transmission products 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.

03



# Features and functions benefiting grain production

Drives, softstarters, motors, gearing and mounted bearings 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

### Energy efficiency

- Control operating costs by seeing energy costs in local currency, kWh and CO<sub>2</sub> emissions.

### Fieldbus compatible

- Use information such as flow rates to get the VSD to adjust motor speed and torque.
- Get detailed insight into productivity performance and quality control through fieldbus comms connecting VSD 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.

### Easy housekeeping

- Smooth painted motors for easier cleaning.

### Dust ignition protection

- Prevent dust explosions with certified dust ignition proof motors.

### Higher efficiency

- IE3, IE4 and higher efficiency class motors offering the lowest total cost of ownership.

### Service and monitoring

- ABB Ability™ Smart Sensor ready.



## High voltage motors

### Rib cooled motors

- Energy efficiency tailor-made motor and drive packages.
- IP66 and hazardous area designs for operating in dusty environments.
- Proven insulation system for high availability.
- High power density with state of the art cooling.
- Always delivered with ABB Ability™ Smart Sensor.

### Built-in serviceability

- Cuts service downtime.



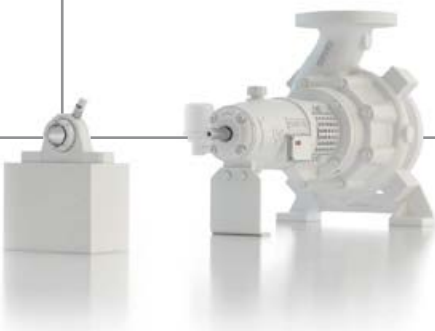
## Gearings and bearings

### Widest choice

- Multiple housing styles, bore sizes and locking mechanisms.
- Premium sealing systems used to keep contaminants out and lubrication in.
- Accessories available for protection and safety in high humidity, excessive dusty and dirty, or even extremely dry environments.

### Easy mounting

- Roller bearings have patented easy-on, easy-off adapter mounting and removal system.
- ABB Ability™ Smart Sensor ready.



# From the factory floor to the cloud and beyond

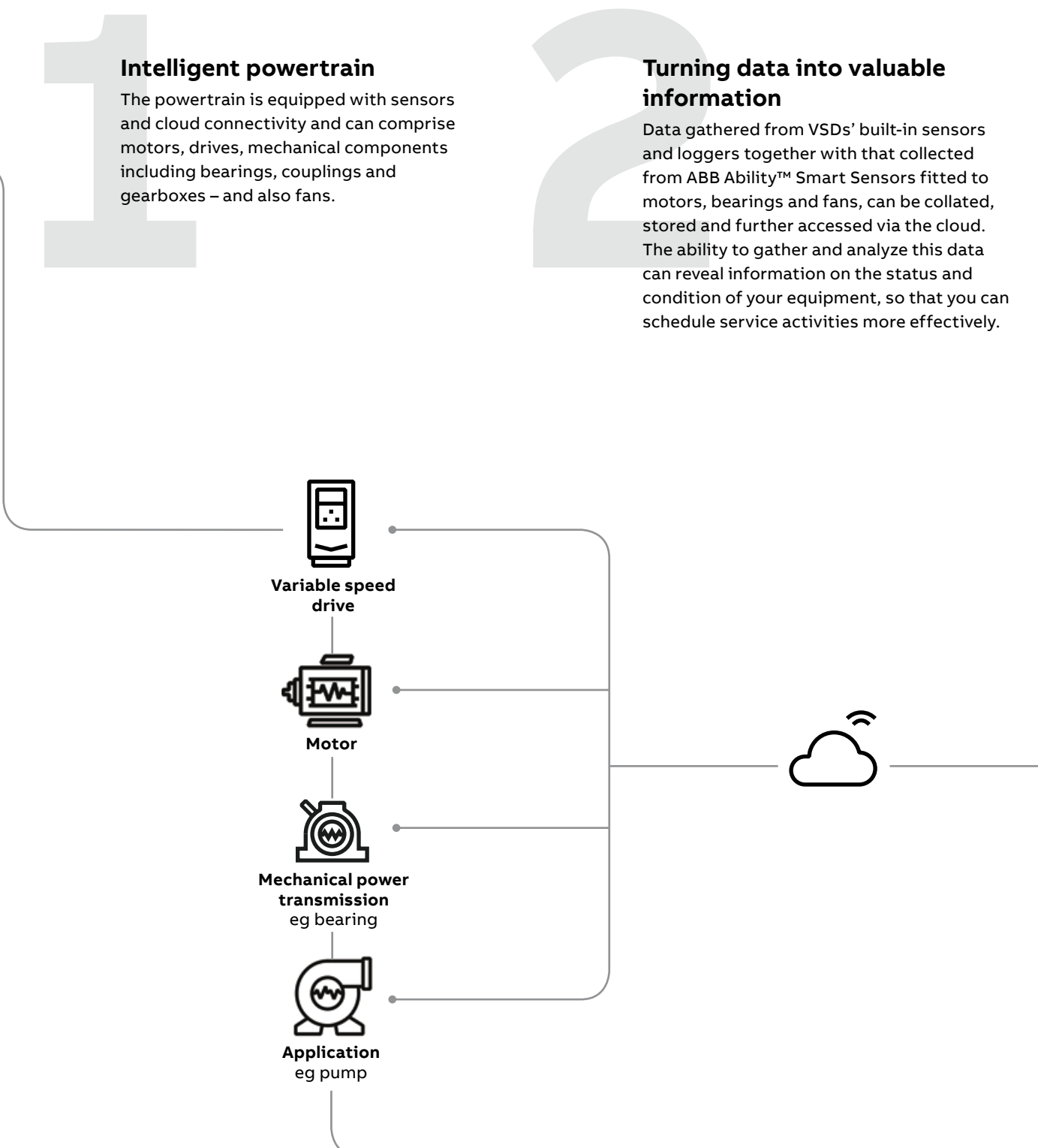
ABB Ability™ Condition Monitoring for powertrains optimizes the performance and efficiency of rotating equipment. It enables full transparency on all parameters for drives, motors, mounted bearings and fans.

## 1 Intelligent powertrain

The powertrain is equipped with sensors and cloud connectivity and can comprise motors, drives, mechanical components including bearings, couplings and gearboxes – and also fans.

## 2 Turning data into valuable information

Data gathered from VSDs' built-in sensors and loggers together with that collected from ABB Ability™ Smart Sensors fitted to motors, bearings and fans, can be collated, stored and further accessed via the cloud. The ability to gather and analyze this data can reveal information on the status and condition of your equipment, so that you can schedule service activities more effectively.



### 3 Accessing data for analytics

Detailed information can be extracted into a company's own portal and systems. Information on many aspects of the grain production 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.



### 4 Gain a digital advantage

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

- Appropriate response to production challenges, minimising operating costs and wastage of products.
- Greater insight into various aspects of the grain production 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





# Keep your production running

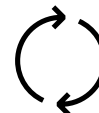
From spare parts and technical support to cloud-based remote monitoring solutions, ABB offers the most extensive service offering to fit your needs. The global ABB service units complemented by external authorized value providers form a service network on your doorstep. Maximize performance, uptime and efficiency throughout the life cycle of your assets.

### With you every step of the way

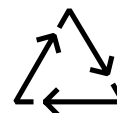
Even before you buy a drive, motor, bearing or softstarter, ABB's experts are on hand to offer technical advice from dimensioning through to potential energy saving.

When you've decided on the right product, ABB and its global network of Value Providers can help with installation and commissioning. They are also on hand to support you throughout the operations and maintenance phases of the products life cycle, providing preventive maintenance programs tailored to your grain processing facility's needs.

ABB will ensure you are aware of any upgrades or retrofit opportunities. If you've registered your drives and motors with us, then our engineers will proactively contact you advising on your most effective replacement option. All of which helps maximize performance, uptime and efficiency throughout the lifetime of your powertrain.



**Replacements**  
Fast and efficient replacement services to minimize production downtime.



**End-of-life services**  
Responsible dismantling, recycling and reusing of products, according to local laws and industrial standards.



**Maintenance**  
Systematic and organized maintenance and support over the life cycle of your assets.





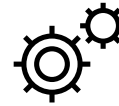
**Advanced services**  
Gain the unique **ABB Ability™ digital advantage** through data collection and analytics with **advanced services**.



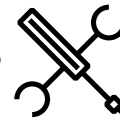
**Extensions, upgrades & retrofits**  
Up-to-date systems and devices with the best possible performance level.



**Engineering & consulting**  
Ways to identify and improve the reliability, usability, maintainability and safety of your production processes.



**Spares & consumables**  
Authentic, high-quality ABB spares and consumables with quick delivery.



**Technical support & repairs**  
Quick and accurate response during emergencies and efficient support during planned production breaks.



**Installation & commissioning**  
Highly-trained and reliable installation and commissioning experts at your service.



**Training**  
Comprehensive and professional training either at ABB premises or your own.



**Agreements**  
Comprehensive bundling of relevant services into one contract to suit your needs.

## Global service network 24/7

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“I need operational excellence, rapid response, improved performance and life cycle management.”

# With you, wherever you are in the world

Partnering with ABB gives you access to some of the world’s most innovative technology and thinking.

**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 seven global R&D centers with more than 8,000 technologists and invest \$1.5 billion annually on innovation.

**End-to-end product portfolio**

Alongside its variable speed drives, motors, softstarters, bearings and couplings, 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 to safety PLCs, you can readily implement bespoke 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.





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

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