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 frequency drives (VFDs), 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 plant and personnel safety a priority.”

Tackle diverse safety demands...
- Airborn grain dust can be explosive. Employees must be protected from exposure to risks associated with dust ignition.

...using best-in-class technology
- Explosion-proof motor and drive solutions certified for safe operation in locations with hazardous gases or dust.
- 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 VFD/motor solutions can lower energy costs up to 60 percent and reduce carbon dioxide emissions.
- ABB Ability™ Operations Data Management zenon software platform helps optimize energy usage and provides 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

“Keep production agile and accurate…”

• Fast throughput and delivery are key to maximizing product freshness.
• 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 24/7/365 with minimal scheduled downtime.

… with flexible motor-drive solutions from one supplier

• Wide speed variation is possible.
• Production increase is 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.
• Less mechanical stress, reducing maintenance and repair costs, extending equipment life.
• Run motors in reverse direction to reduce jams.

“Lower operational overheads…”

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

… through advanced maintenance regimes

• Soft starting avoids sudden shock loading, leading to less wear and tear on 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.
• A global service network and preventive maintenance contracts relieve pressure on in-house teams and increase the speed of response to critical issues.

“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 VFD to the motor control.
• Open network connectivity to systems allows easy drive integration to any PLC or similar control equipment, giving greater insight, providing better production control and improving product quality.

“Eliminate production risks…”

• Plant shutdowns are costly, resulting in 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.

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

How can I control rising costs?”

—

“Our production must adapt quickly to meet evolving customer tastes.”
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 a 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 an 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 the 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.
**MIXING, PACKING AND MOVING FLOUR**

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

**Applications:**
- Feeders
- Screw conveyors
- Mixers
- Centrifugal blowers

**Requirements:**
- High reliability of all motor-driven applications.

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**GRAIN PEELING**

Grain skin can be partly or completely removed by a 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

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**GRAIN MILLING**

Grain is blown into mills and flows through two milling rolls that crush the grain into flour. After each milling phase, flour is blown back to sieving where the milling/sieving process can be repeated several times to achieve the 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.
Unlock the potential in grains and ingredients handling applications

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

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<thead>
<tr>
<th>Challenge</th>
<th>Solution</th>
<th>Benefit</th>
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<tbody>
<tr>
<td><strong>Conveyors</strong> (screw, belt and bucket)</td>
<td>• Mechanically challenging, dirty and dusty environments, subject to shock loads and constant starting and stopping, but must never break down.</td>
<td>• Motors, drives and mechanical power transmission products ensure continuous, intermittent or variable speed.</td>
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<td>• Products must be conveyed smoothly and evenly.</td>
<td>• Machinery drives with built-in brake chopper provide precise control of conveyor deceleration, without any extra external hardware.</td>
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<td>• Safely and efficiently performing maintenance and repairs.</td>
<td>• Safe torque off (SIL3) prevents unexpected conveyor movement.</td>
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<td>• Products must be conveyed at correct speed to synchronize with other processes.</td>
<td>• Gearbox, motor and drive connected to PLC keeps correct speed on each conveyor.</td>
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<td>• Visibility of process performance.</td>
<td>• Automation network technology enables better information on process performance and diagnostics.</td>
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<td></td>
<td>• Difficult to access and maintain machinery.</td>
<td>• Robust and reliable motors and mechanical power transmission products.</td>
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<td><strong>Centrifugal blowers/convection fans</strong></td>
<td>• High energy user.</td>
<td>• Motor-drive: Running motor at half speed requires only 1/8 of power.</td>
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<td>• Precise roasting temperature and ventilation levels.</td>
<td>• Drive: Replaces mechanical components such as chokes and control dampers.</td>
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<td>• Ensuring ultimate reliability of fan operation.</td>
<td>• Softstarters: suitable for motors running at full speed.</td>
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<td>• More flexible production line in order to get better productivity</td>
<td>• Drives: extend speed range of fans.</td>
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<td><strong>Milling</strong></td>
<td>• Milling rolls must operate at different speeds so that grain is milled to the predefined quality.</td>
<td>Each milling roll is controlled by its own drive and motor to ensure high quality.</td>
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<td></td>
<td>• High torque application creates serious safety risk.</td>
<td>• Safe torque off brings machine safely into a no-torque state and/or prevents it from starting accidentally.</td>
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<td>• Explosive atmospheres due to grain dust.</td>
<td>• Certified Ex motor and drive packages for hazardous environments.</td>
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<td><strong>Mixing</strong></td>
<td>• Precise control is essential for high quality end product.</td>
<td>• Programmable drives with accurate speed and torque control manages high starting torque and different mixing speeds.</td>
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</table>
VFD provides precise speed and torque control of milling rolls to ensure that grain is milled consistently and to the required quality.

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

Direct torque control manages starting torque for milling and peeling machines.
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 frequency drives**

**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 VFD to adjust motor speed and torque.
- Get detailed insight into productivity performance and quality control through fieldbus comms connecting VFD with plant monitoring systems.

**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 solutions**

**High efficiency motor and drive solutions**
- Save energy across the grain production process with high efficiency motor and drive solutions.

**Cooling tower solutions**
- Reduce energy, vibration, noise and maintenance costs using a solution that removes the gearbox from cooling towers.
- Special low-speed permanent-magnet motor.

**Globally certified Ex drives and motors solutions**
- 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, excessively dusty and dirty, or even extremely dry environments.

Easy mounting
- Roller bearings have a 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.

**Intelligent powertrain**

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

**Turning data into insight**

ABB Ability™ enables you to monitor both onsite and remote assets and collect data from the VFD’s built-in sensors and data loggers, as well as from smart sensors fitted to motors, bearings, and pumps. This data can be used to evaluate efficiency of operation as well as diagnose conditions to ensure appropriate decisions are made.
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 life, lower costs, safer operations and increased profitability.

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, minimizing operating costs and product waste.
- Greater insight into various aspects of the grain production process improves quality and reduces variations, errors and waste.
- Maximum material traceability to meet regulations.
- Lowers risk of production failure and changes maintenance from reactive to predictive.
Keep 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. ABB and its local partners form a service network at your doorstep and help you to maximize performance and ensure uptime and efficiency through 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 partners 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.
Agreements
Comprehensive bundling of relevant services into one contract to suit your needs.

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

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

Engineering & consulting
Resources who can provide ways to identify and improve the reliability, usability, maintainability and safety of your production processes.

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

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

Training
Comprehensive and professional training either at ABB or your site.

Global service network 24/7

"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 frequency 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 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, provide flexibility and simplify packaging.
- 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

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