



Sugar production

Boosting reliability and
cost efficiency

How to increase profitability without compromising quality

In today's sugar industry, constantly increasing competition and growing pressure for higher efficiency are forcing producers to find new ways to achieve long term success. Variable speed drives (VSDs), motors, gearing and bearings are indispensable for key processes such as cane milling, or beet slicing, extraction and crystallization, and play a critical role in generating energy savings, improving productivity, and reducing costs.



Food and personnel safety



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

Tackle diverse safety demands...

- Sugar creates a fine dust which 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 come to a safe and efficient stop.



Energy efficiency



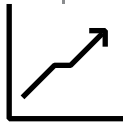
“We need to cut our energy bill and carbon footprint.”

Find the big energy users...

- Some of the biggest energy users in sugar include:
 - Milling, preparation and crystallization
 - Shredders, crushers, pumps, boilers and centrifuges

... unlock the saving potential

- Replacing traditional steam turbines with high efficiency motor and drive packages can reduce energy usage by up to 50 percent.
- Using VSDs with regenerative functionality to control centrifuges can recover energy during the deceleration phase. The operation of the plant's centrifuges can be balanced to smooth power demand, resulting in energy savings of up to 30 percent.
- ABB Ability™ Condition Monitoring tells you how your applications are performing, giving you accurate real-time efficiency and condition data.



Productivity improvement



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

Keep production agile and accurate...

- Fast throughput and delivery is key to extract optimal juice from raw product to get the maximum volume of the desired sugar quality produced.
- Changing constant-speed equipment to variable-speed in order to meet varying production volumes saves time and money.
- 100 percent reliability is crucial in production season.

... 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 scheduled around seasonal downtime, and carefully managed during production periods.

... 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.
- A drive's real-time clock allows timed tracing of faults, so operators know what happened and when.
- Motors, gearings and bearings designed for harsh conditions offer prolonged life through a best-in-class sealing system.

Improving operational efficiency helps boost output and profitability

Each stage of sugar production can be fine-tuned to improve productivity, increase sustainability and enhance safety.

1 PREPARATION AND SHREDDING (FOR BEET PRODUCTION)

Sugar beets are cut and shredded into pieces

Applications:

- Rollers, shredders, conveyors, wash pumps

Requirements:

- Torque control of rollers and cutters
- Motors must tolerate high mechanical forces
- Accurate speed and torque control to improve process flow

2 MILLING (FOR CANE PRODUCTION)

Shredded pieces of cane are fed through heavy rollers to extract cane juice

Applications:

- Pumps, rotation chamber

Requirements:

- Maximised juice extraction
- Dusty and explosive environment
- Accurate motor control for continuous operation
- Avoid tripping in the event of sudden loads

3 DIFFUSION (FOR BEET PRODUCTION)

Thin slices of sugar beet are passed repeatedly through hot water to extract juice

Applications:

- Feedwater pumps, conveyors, mixers

Requirements:

- Accurately control water stream through tank
- Accurately control mixer speed of sugar beet
- Control heavy load inside extraction tower

4 CLARIFICATION/CARBONATATION

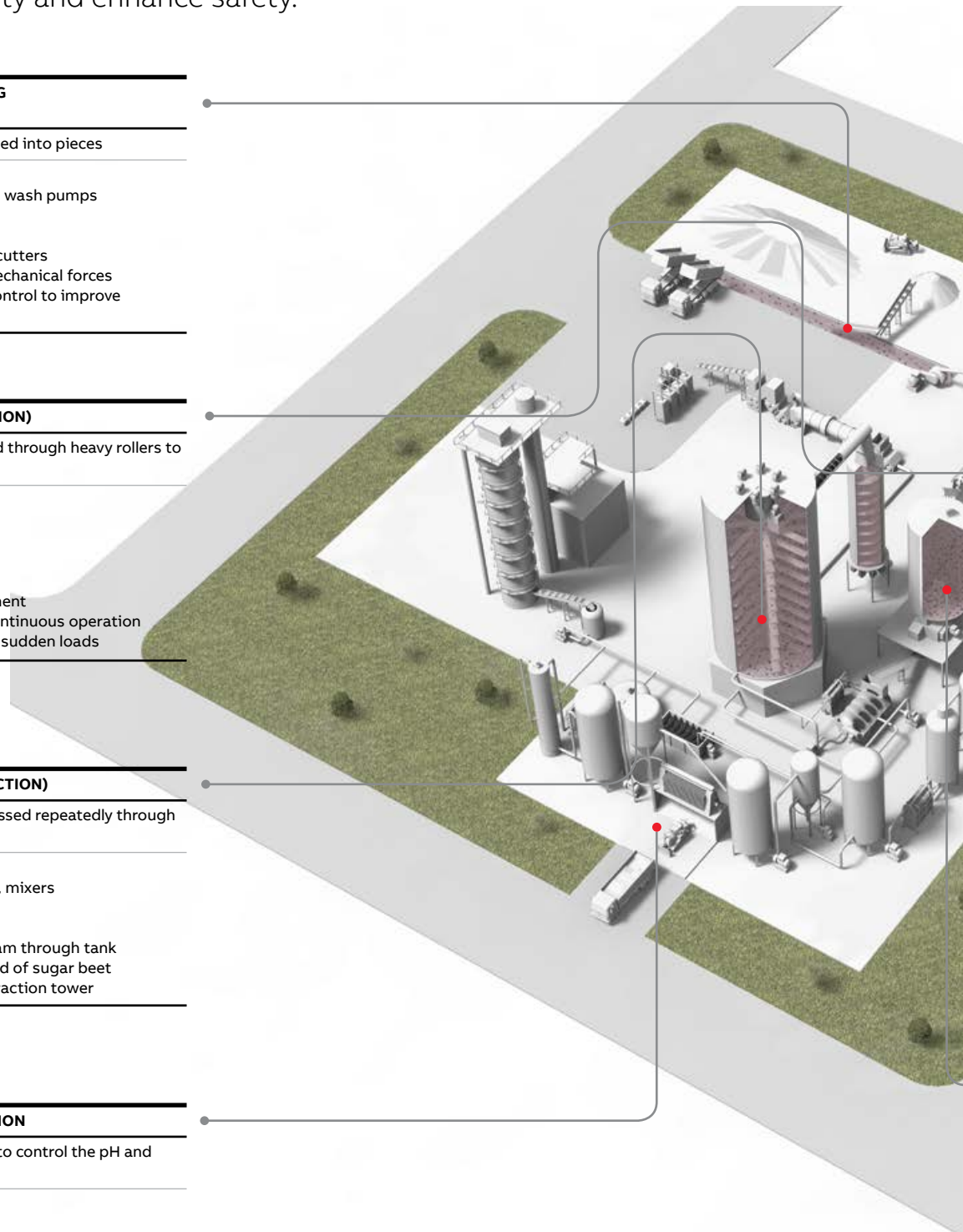
Lime milk is added to the juice to control the pH and support removal of impurities

Applications:

- Mixers, pumps

Requirements:

- Accurate monitoring and control of pH and liquid flow



5 EVAPORATION AND CRYSTALLIZATION

Juice is concentrated to increase thickness and then start crystallization in vacuum pans

Applications:

- Water and juice pumps, evaporator, vacuum boiling pan

Requirements:

- Variable torque, high starting torque for high density liquids
- Closed loop control
- Soft start to minimise stresses in the pipes
- Integration with plant DCS via fieldbus modules

6 CENTRIFUGING

Separation of sugar crystals from molasses

Applications:

- Centrifuges, pumps

Requirements:

- Precise speed control to handle fast acceleration and deceleration
- High starting torque and continuous constant torque
- Braking energy could be supplied back to the net with the regenerative drive
- Reliability

7 FILLING AND PACKAGING

Primary packaging

Applications:

- Roll and belt conveyors

Requirements:

- Explosive area due to sugar dust
- High speed packaging lines
- Synchronization

8 BYPRODUCTS FOR ETHANOL PRODUCTION

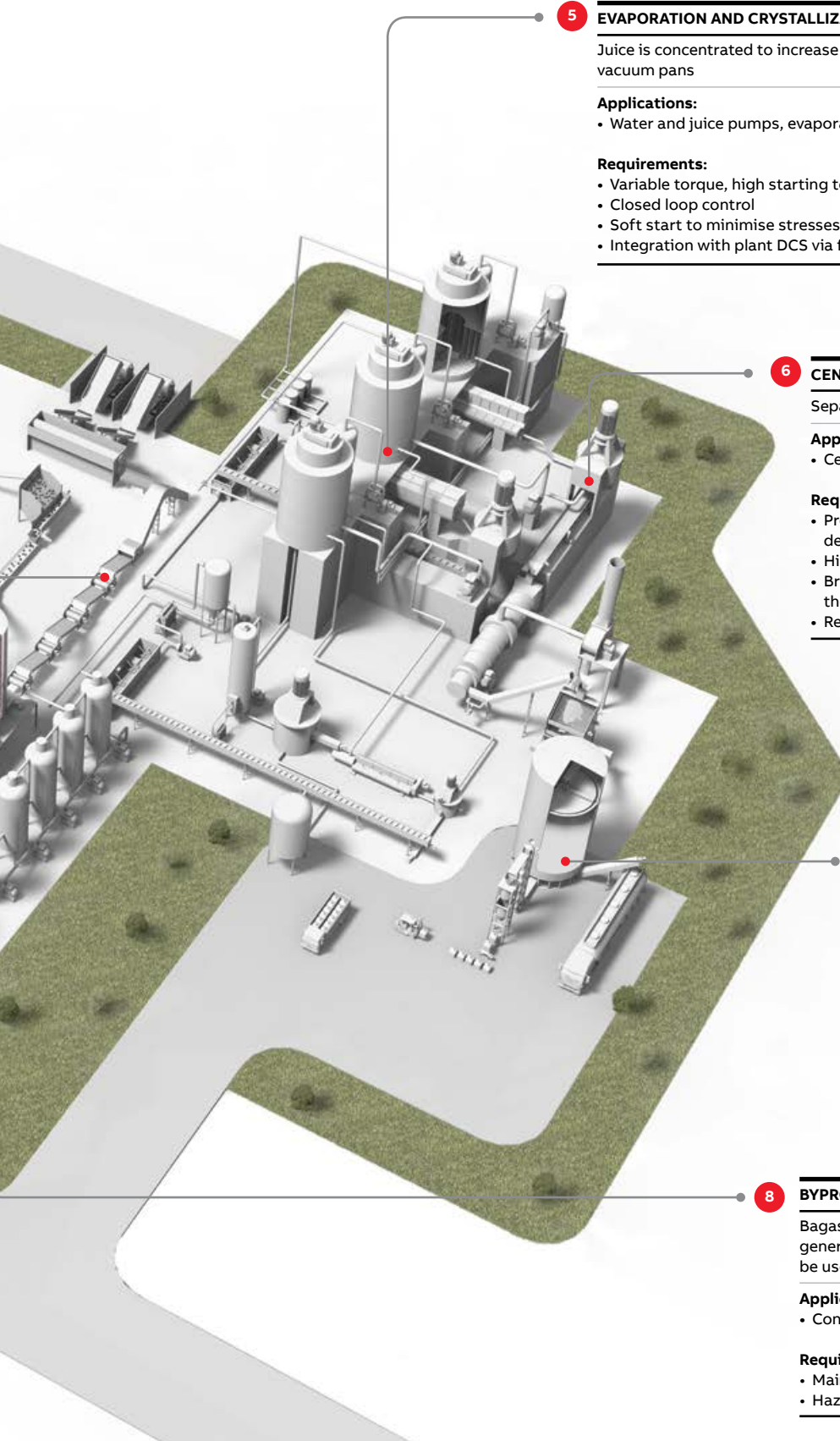
Bagasses are used for various products, for example to generate heat and electricity for a plant, while molasse can be used for ethanol production

Applications:

- Conveyors, pumps, turbines






Requirements:

- Maintain constant required pressure in the boilers
- Hazardous area products




Unlock the potential in sugar-specific 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
 Crushers/ shredders	<ul style="list-style-type: none"> • Steam turbines are traditionally used in milling but are inefficient. • Plants are often located in areas with weak electrical network. • Frequent variation in cane structure results in inefficient operation. 	<ul style="list-style-type: none"> • High power motor and drive combination up to 2 MW. • Slip ring motors are ideal for shredders and cutters that require high starting torque, low starting current and suitable for weak networks. • High power motor and drive combination up to 5 MW. • Superb torque response to pinionless mill for crushing process. • In the event of locked mechanics the motor can be reversed. 	<ul style="list-style-type: none"> • 50 percent less energy used when motor drive package is used compared to steam turbines. • Smooth system start-up solution with low current demand during start. • Low energy consumption with high system efficiency, and high productivity with less cost of ownership. • Less stress on machinery and network. • Reduce system downtime.
 Centrifuges	<ul style="list-style-type: none"> • Reduce energy consumption. • Requires high starting torque and resistance to strong mechanical forces. • Requires high reliability. 	<ul style="list-style-type: none"> • Regenerative braking. • High power motor and drive combination up to 500 kW. • Direct torque control enables extremely accurate control over entire speed range with robust process performance motors, which are designed to last in the most demanding applications. 	<ul style="list-style-type: none"> • Significant energy savings as braking energy is returned to supply the network with extremely low harmonic emission. • Reduced downtime and more reliable production.
 Mixers	<ul style="list-style-type: none"> • High starting torque, wide mixing speed range and precise control to ensure best quality end products. 	<ul style="list-style-type: none"> • Direct torque control provides accurate speed control and adapts to mixing load. • Safe torque off. 	<ul style="list-style-type: none"> • Optimizes production speed and process up-time. • Improves operational safety.
 Power production	<ul style="list-style-type: none"> • Sugar production requires up to 10 MW of power. Despite this the plants are often located in remote areas with weak electrical network. 	<ul style="list-style-type: none"> • Electrified power train with drives and motors system generates electricity that can be used for running all equipment in the production process. 	<ul style="list-style-type: none"> • Power production becomes more efficient, generating more than enough energy to run production applications. Surplus energy can be sold to the grid.
 Pumps	<ul style="list-style-type: none"> • High energy user. • Changes in liquid pressure threaten mechanical life-time of pump impellers. 	<ul style="list-style-type: none"> • Running motor at half speed requires only 1/8 of power. • Anti-cavitation software measures motor torque and speed to recognize cavitation and prevent it. 	<ul style="list-style-type: none"> • Saves energy by up to 60 percent while also providing easy pump speed control, smooth process operation, and reducing number of potentially unreliable mechanical components. • Avoids cavitation that would affect sugar juice properties, improving product quality and pump life-time.



01

	Challenge	Solution	Benefit
 Conveyors	<ul style="list-style-type: none"> Precise, smooth and consistent control and synchronization of conveyor speeds. 	<ul style="list-style-type: none"> The drives' built-in brake provides precise control of conveyor when stop command has been given, without external hardware. Safe torque off (SIL3) prevents unexpected movement of conveyor. 	<ul style="list-style-type: none"> Each conveyor speed adjusted separately and synchronized to ensure material flow between process stages.
	<ul style="list-style-type: none"> Mechanically challenging and dusty environments. 	<ul style="list-style-type: none"> Motors and mechanical power transmission products offer best in class sealing system. Continuous, intermittent or variable speed operation. 	<ul style="list-style-type: none"> Less maintenance increases process uptime. Lower maintenance costs by reducing mechanical stress on gears and belts.

01 VSDs provide precise, smooth and consistent control and synchronization of conveyor speeds.

02 VSD control of milling machinery uses 50 percent less energy compared to steam turbines.

03 Direct torque control provides accurate speed control of pumps.

02



03



Features and functions benefiting sugar processing facilities

Drives, softstarters, motors, gearing and mounted bearings all play a vital part in keeping your production moving. Choosing the right feature for the right environment is essential in ensuring an optimized production.



Variable speed drives

Energy efficiency

- Control operating costs by seeing energy costs in local currency, kWh and CO₂ emissions.
- Regenerative drive offering for sugar centrifuges

Fieldbus compatible

- Use information such as flow rates and separator centrifuge speeds 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.

Anti-cavitation software

- Extend pump lifetime and secure the process by detecting cavitation and ensuring optimal process or liquid flow.



Flying start

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

Functional safety

- Safely stop applications like mixers and sugar centrifuges 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.

Repeatability

- Accurately adjust pump speed to suit flow rates of products with varying viscosities.



Softstarters

Soft starting and stopping

- Reliable soft starting and stopping reduces electrical and mechanical stressing

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 package

- Save energy across the sugar production process with IE5 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 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



Generators

Market's most powerful 4-pole generators

- For steam and gas turbines.

Lower energy costs

- High efficiency use of sugar byproduct.



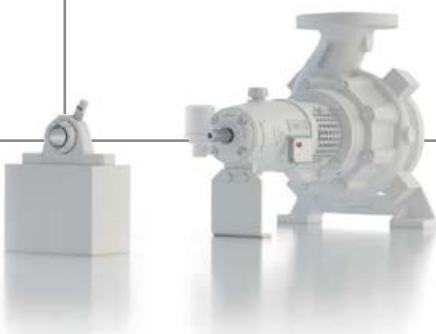
Gearings and bearings

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.

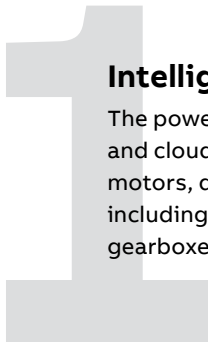
Easy mounting

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



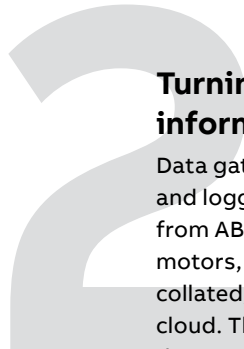
From the factory floor to the cloud and beyond

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 pumps.



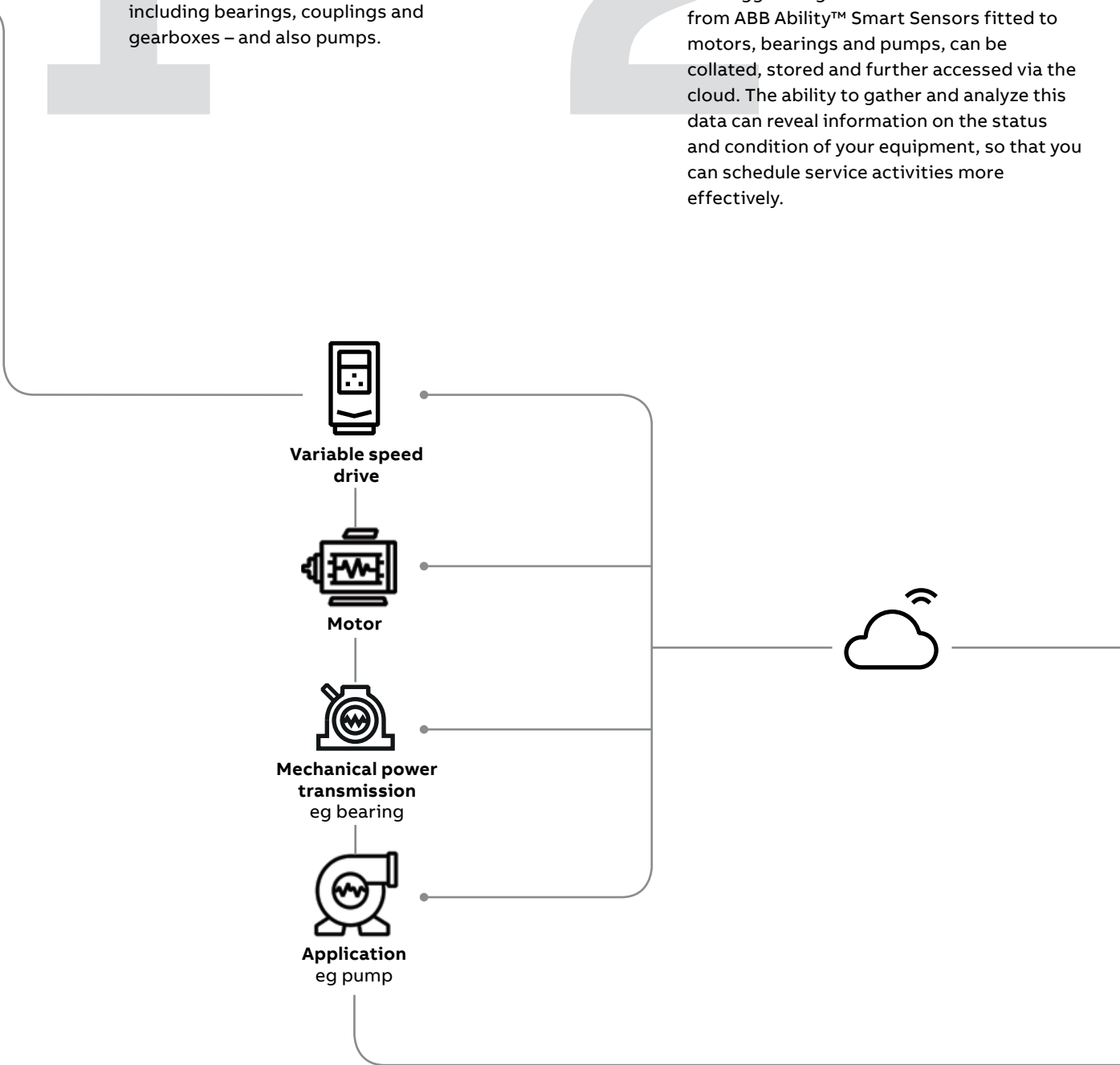
Intelligent powertrain

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



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 pumps, 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 sugar 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 sugar 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

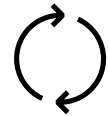
From spare parts and technical support to cloud-based remote monitoring solutions, ABB offers the most extensive service offering to fit your needs. The global ABB service units complemented by external authorized value providers form a service network on your doorstep. Maximize performance, uptime and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

With you every step of the way

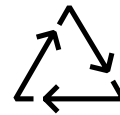
Even before you buy a drive, motor, bearing or softstarter, ABB's experts are on hand to offer technical advice from dimensioning through to potential energy saving.

When you've decided on the right product, ABB and its global network of ABB 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 operational 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.

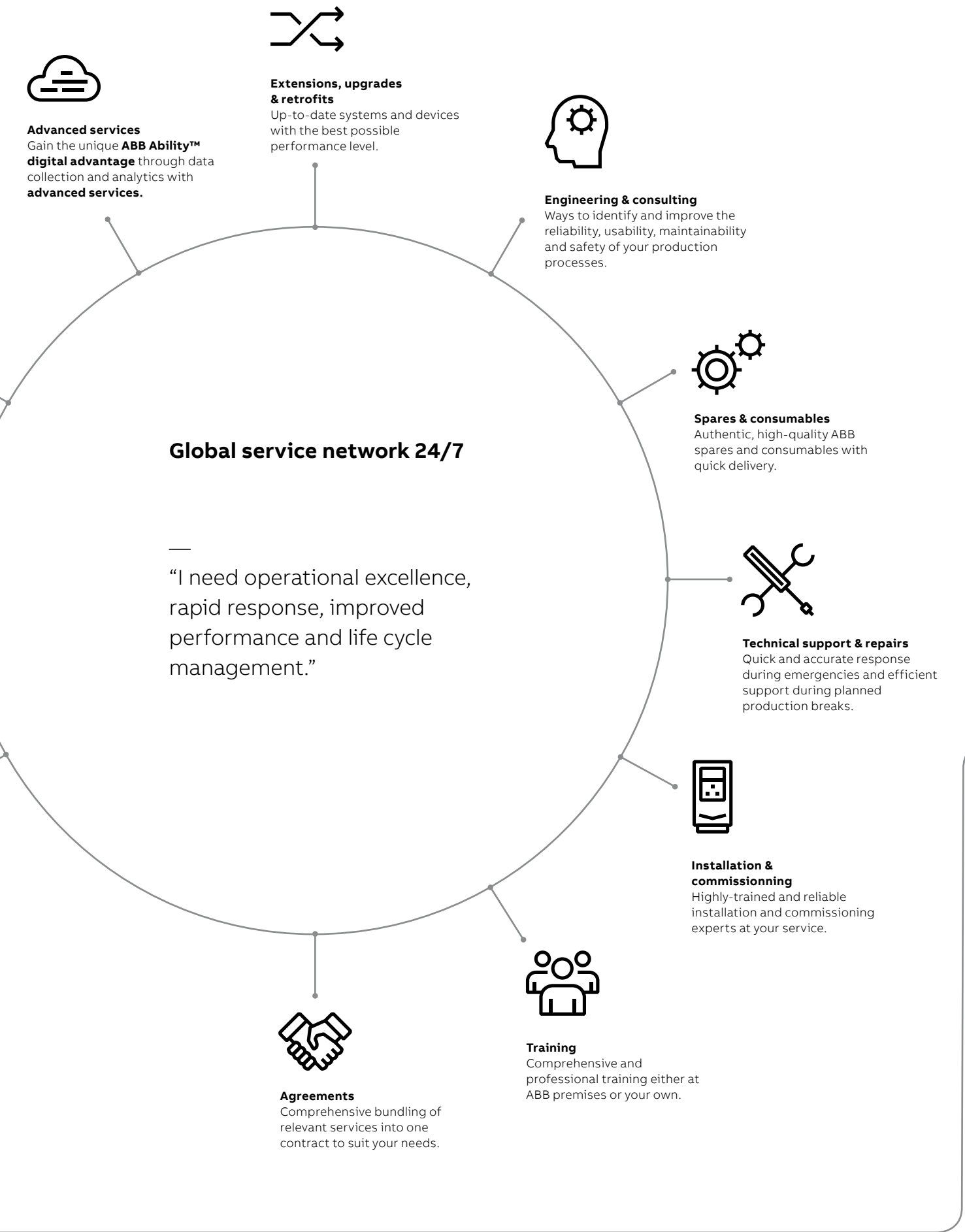


End-of-life services
Responsible dismantling, recycling and reusing of products, according to local laws and industrial standards.



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





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 sugar 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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