



Brewery production

Boosting safety, efficiency
and sustainability

How to increase profitability without compromising quality

Competition among breweries continues to intensify, forcing producers to find new ways to improve efficiency and reduce costs. Variable speed drives (VSDs), motors, gearing and bearings are indispensable for key processes, 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...

- Employees must not be exposed to hazards: from operating centrifugal blowers and cleaning and maintaining mixers, to risks associated with hot liquids and process steam.

... using best-in-class technology

- Remote monitoring protects personnel from potentially dangerous processes.
- Advanced functions, like safe torque off, make sure decanters, conveyors and mixers come to a safe and efficient stop.
- Dust ignition-certified motor and variable speed drive (VSD) packages comply with demands of dusty and explosive environments, for example in areas where malt is stored.

Conform to the latest food safety requirements...

- Updated legislation aimed at improving hygiene and food safety means producers need to change or update equipment to remain compliant.
- 360 degree accessibility for cleaning and inspection of machinery.

... with solutions that build trust

- Compliance with high ingress protection standards can prevent product/motor failures in areas where harsh wash downs/chemicals are used.
- Smooth design with no crevices ensures all areas can be cleaned thoroughly to prevent bacterial growth and contamination of ingredients.



Energy efficiency



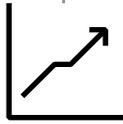
“We need to cut our energy bill and carbon footprint.”

Find the big energy users...

- Some of the biggest energy users in beverage production include pumps, mixers and decanters.
- Spotting energy wastage is a challenge.

... unlock the saving potential

- Replacing throttle valves with VSDs on pump control reduces energy costs and cuts maintenance needs.
- Replacing direct-on-line starting with a high efficiency VSD and motor package can lower energy costs up to 60 percent and reduce carbon dioxide emissions.
- ABB Ability™ Operations Data Management zenon 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 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...

- Demand is for batches of different quantities and recipes with fast availability.
- Changing constant speed equipment to meet varying production volumes takes time and money.
- Getting access to the right data and turning it into useful information is a challenge.

... with flexible motor-driven solutions

- 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.

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

Locate the right information...

- Manually extracting plant data is time-consuming and inaccurate.

... through digital solutions

- Multiple inputs and outputs (I/Os) provide a variety of process information from the VSD to the motor control.
- Fieldbus technology enables process equipment to integrate with plant control systems, giving greater insights and better control of production.



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 for powertrains deliver accurate, real-time information about VSD 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.
- VSD pump control software reduces cleaning time. Less water and fewer cleaning materials are required.

“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 using smart functionality

- Temperature, load, under/overvoltage protection and warning features within VSDs help anticipate breakdowns.
- ABB Ability™ Condition Monitoring for powertrains warns of impending failures, long before they happen, reducing unplanned downtime.
- A VSD real-time clock allows timed tracing of faults, telling operators what happened and when.
- Stainless steel motors last five times longer than standard motors in washdown environments.
- 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

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

1 RECEIVING & MILLING

Foreign objects and impurities removed from malt. Malt is passed through roller mills.

Applications:

- Screw conveyors, bucket conveyors, centrifugal blowers, mills

Requirements:

- Soft starting
- Accurate motor control for high quality output
- High exposure to dust and fibers

2 BARLEY GRAIN STEEPING (MASHING)

Malt is mixed with water and carefully heated to release sugars.

Applications:

- Mixers, pumps, centrifugal blowers

Requirements:

- Accurate control to ensure the correct temperature is reached for converting the right types of sugar

3 BOILING AND ADDING HOPS

Wort is pumped to a boiling kettle for sterilization and hops are added.

Applications:

- Pumps

Requirements:

- High reliability of all motor-driven processes
- Precision control to ensure all microbes are destroyed

CLEAN-IN-PLACE (CIP)

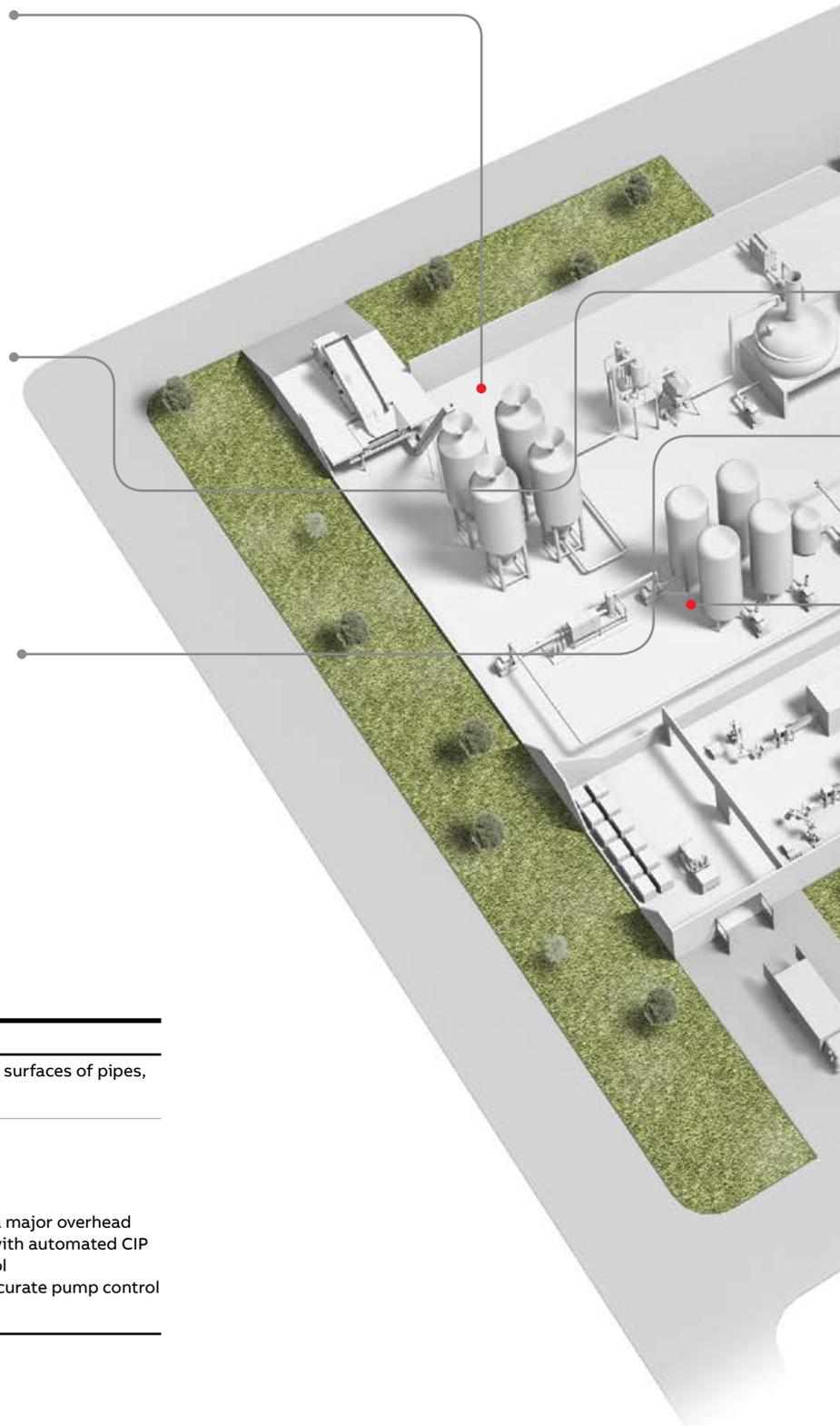
Automated systems to clean interior surfaces of pipes, processing vessels, tanks etc.

Applications:

- Pumps

Requirements:

- Water used to clean equipment is a major overhead
- Cleaning times can be shortened with automated CIP systems that use VSD pump control
- Automated CIP systems require accurate pump control to minimize water use





4 CLARIFICATION (WHIRLPOOLING)

Wort is pumped on the edge of a whirlpool to filter solids like hop residues and protein material. The wort is then cooled down so that yeast can be added.

Applications:

- Pumps

Requirements:

- Programmable VSDs with accurate speed and torque control for optimal batch conditions

5 COOLING

Improve energy efficiency and reliability of cooling pumps and fans. Cool beer hygienically and efficiently.

Applications:

- Compressors, evaporator/cooling tower, cooling water pumps

Requirements:

- Cooling is one of the most energy-intensive processes and, as such, high energy efficiency is needed
- Correct flow rate is needed to provide precise cooling of products
- High compressor reliability to avoid downtime destroying end product

6 FERMENTING & FILTERING

Oxygen allows yeast to ferment and converts dissolved sugars into alcohol and CO₂, and then filtered.

Applications:

- Pumps, decanters

Requirements:

- Torque control, accuracy and reliability is required to remove particles and to ensure high product quality

7 BOTTLING, CANNING & STORING

Primary and secondary packaging.

Applications:

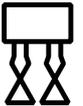
- Roll & belt conveyors

Requirements:

- High reliability of all motor-driven applications
- Precise speed control

Unlock the potential in brewery-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
 Pumps	<ul style="list-style-type: none"> Changes in liquid pressure threaten reliability of pump impeller and seals. 	<ul style="list-style-type: none"> Anti-cavitation software measures motor torque and speed to recognize cavitation. 	<ul style="list-style-type: none"> Avoids cavitation that would damage end product, and improves impeller's lifetime.
	<ul style="list-style-type: none"> Minimize water during process equipment and pipe cleaning. 	<ul style="list-style-type: none"> Clean-in-Place (CIP) with easy-to-use pump control software gives correct pressure and flow rate to pipe clean and fill functions. 	<ul style="list-style-type: none"> Cleaning time is shorter. Uses less water and cleaning materials.
	<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"> Up to 60 percent energy savings compared to throttled control system.
	<ul style="list-style-type: none"> To have better pump speed and flow control compared to throttling with the valve or on-off control with the contactor. 	<ul style="list-style-type: none"> Variable speed drives enable the pump to adjust flow over a wide range. 	<ul style="list-style-type: none"> Improved energy efficiency while more precise flow leads to better end-product quality.
 Conveyors <small>(inc. overhead, belt, chain, turn & transfer table, roller/turntables, screw)</small>	<ul style="list-style-type: none"> Precise, smooth and consistent control and synchronization of conveyor speeds. 	<ul style="list-style-type: none"> The VSD's built-in brake chopper provides precise control of conveyor deceleration rate(s), 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. Goods arrive in time and undamaged.
	<ul style="list-style-type: none"> Ultimate reliability and safety so production never stops. 	<ul style="list-style-type: none"> 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.
	<ul style="list-style-type: none"> Food safety and hygiene requirements demand harsh washdown protection. 	<ul style="list-style-type: none"> Food Safe motors and mechanical power transmission products. 	<ul style="list-style-type: none"> Meet hygiene requirements without compromising on reliability and productivity.
 Mills	<ul style="list-style-type: none"> Milling rolls must operate at different speeds to that malt is milled to the predefined quality. 	<ul style="list-style-type: none"> Each milling roll is controlled by its own VSD 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 VSD packages for hazardous environments. 	<ul style="list-style-type: none"> Personnel and plant safety.
 Mixers	<ul style="list-style-type: none"> High starting torque, wide mixing speed range and precise control are essential for high quality end product. 	<ul style="list-style-type: none"> Programmable VSDs with accurate speed and torque control provide high starting torque and adapt to different mixing loads. 	<ul style="list-style-type: none"> Mixing accuracy increases productivity, affects beverage quality, helps save energy and improves safety.
 Decanters	<ul style="list-style-type: none"> Control centrifuge speed without generating vibrations. 	<ul style="list-style-type: none"> The VSD could automatically change to maximum torque above certain speed. 	<ul style="list-style-type: none"> Smooth start up achieved without overdimensioning.
	<ul style="list-style-type: none"> Restart decanter when spinning 	<ul style="list-style-type: none"> Flying start function. 	<ul style="list-style-type: none"> Saves time and reduces wear on equipment.
	<ul style="list-style-type: none"> Efficient decanting 	<ul style="list-style-type: none"> Reuse screw braking energy with a common DC-bus to the bowl's VSD. 	<ul style="list-style-type: none"> Improved energy savings, fewer components and less wiring.
	<ul style="list-style-type: none"> Overcome high starting torque. 	<ul style="list-style-type: none"> Direct torque control (DTC) enables extremely accurate control over entire speed range. 	<ul style="list-style-type: none"> No need to over dimension system.



01

	Challenge	Solution	Benefit
 Compressors	<ul style="list-style-type: none"> Provide cold air for required temperature, precisely and energy efficiently. 	<ul style="list-style-type: none"> High efficiency motor-drive package (SynRM) provides energy savings to IE5 standard. 	<ul style="list-style-type: none"> Typically, up to 40 percent energy savings across speed range.
	<ul style="list-style-type: none"> Ensuring ultimate reliability of compressor operation. 	<ul style="list-style-type: none"> Softstarters are suitable for motors running at full speed. VSD extends speed range of compressor. 	<ul style="list-style-type: none"> Avoids wear and tear to mechanical parts, ensuring uptime.
	<ul style="list-style-type: none"> Harmonics cause interruptions, interference and downtime. 	<ul style="list-style-type: none"> Ultra-low harmonic drives have harmonic mitigation built-in. 	<ul style="list-style-type: none"> Harmonic content is reduced by up to 97 percent. Genuine unity power factor with no compensation needed.

01 Programmable VSDs provide precise speed and torque control for malt milling in breweries to ensure consistent ingredient quality.

02

02 Mixing accuracy and smooth operation saves energy and improves quality during the mixing of beer wort.

03

03 VSDs can be used to control the array of pumps used in brewery production, reducing pump system energy use by up to 60 percent, while anti-cavitation software extends equipment lifetime.



Features and functions benefiting beverage production

VSDs, 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

Anti-cavitation software

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

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 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 like mixers and mills 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 varying viscosities.

Soft pipe filling

- Increase lifetime of piping and pump system by avoiding pressure peaks.

Ingress protection

- IP55 for washdown zones.



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 (SynRM)

- Save energy across the beverage production process with IE5 efficiency motor 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 drive and motor packages

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



Motors



Bearings



Gearing



Food zone 1

- IP69 for water rating ensures suitability for aggressive, Clean-in-Place washdown procedures.
- Uses H1 grease to lower risk of contamination.

- Smooth stainless-steel housing without a grease fitting designed to minimize harboring points.
- IP69 for water rating ensures suitability for aggressive, Clean-in-Place washdown procedures.
- Sealed and lubed for life bearings to minimize maintenance costs.

- Two-piece harsh duty seal.
- Factory-filled using H1 food grade synthetic oil.
- Totally enclosed, no paths for contamination.
- Some models available in quill style or 3-piece coupled NEMA.

Splash zone 2

- Eliminate risk of paint chips entering production chain.
- Uses H1 grease to lower risk of contamination.
- Surface is easy to clean.

- Stainless steel or corrosion resistant bearings in stainless or polymer housing.
- Extend bearing life in harsh washdown conditions using factory-filled food grade grease.

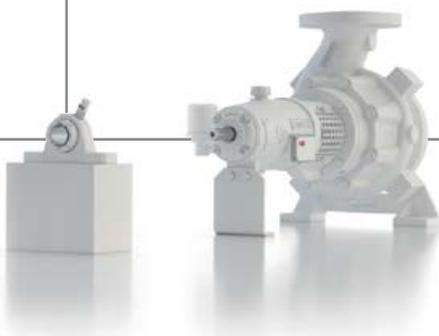
- 13-step coating system.
- Provides 3x the corrosion resistance of epoxy paint.
- Factory-filled USDA/FDA compliant using H1 food grade synthetic oil.

Dry zone 3

- Prevent dust explosions with certified dust proof motors.
- ABB Ability™ Smart Sensor ready.

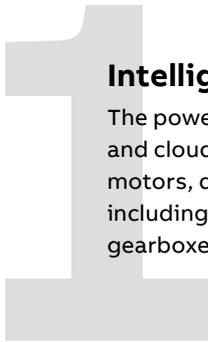
- Multiple housing styles, bore sizes and locking mechanisms.
- Variety of sealing options to protect the bearing from contamination.
- Roller bearings have patented easy-on, easy-off adapter mounting and removal system.

- 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.



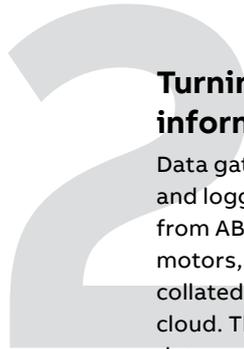
From the factory floor to the cloud and beyond

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



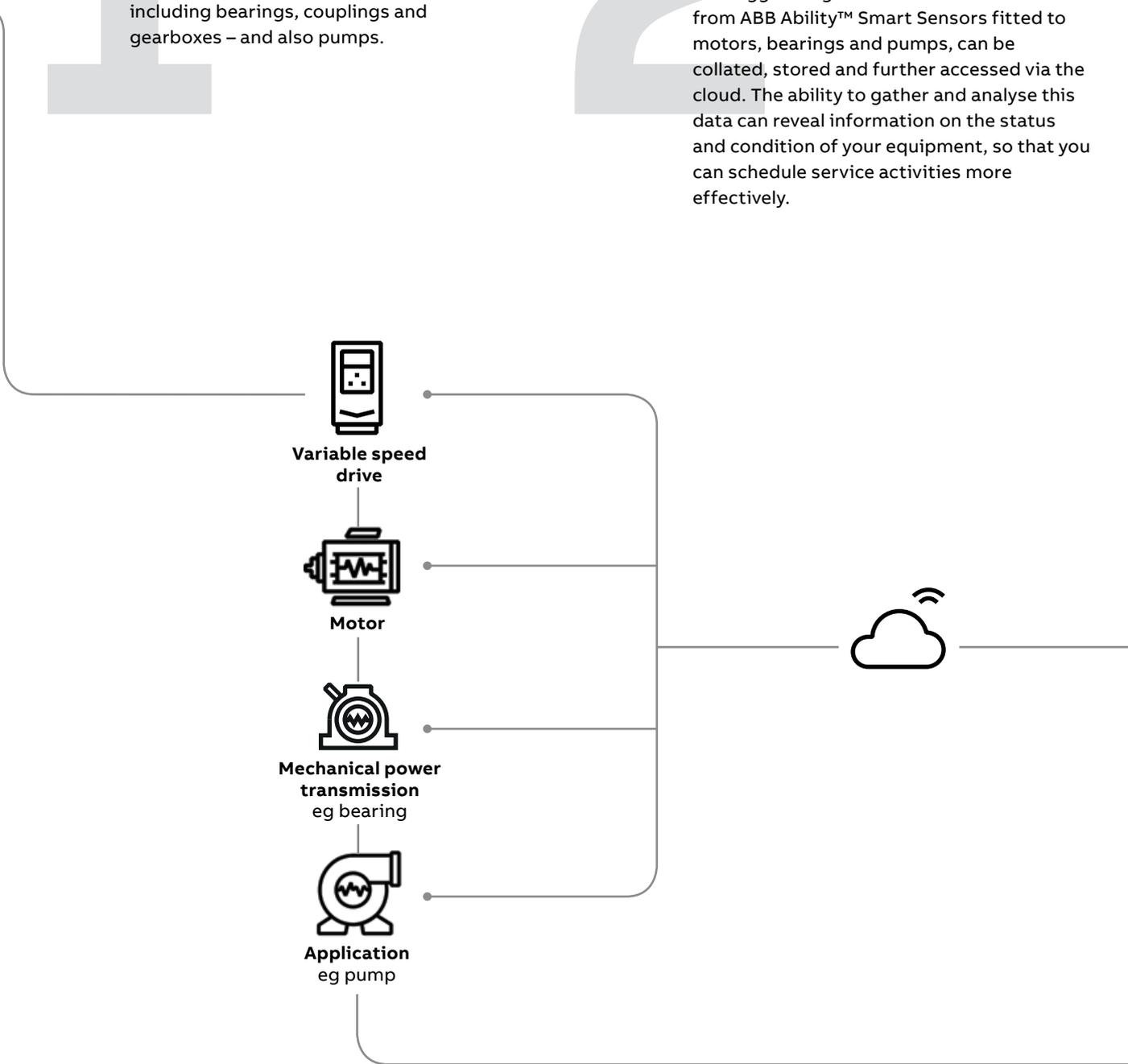
Intelligent powertrain

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 analyse 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 beverage 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, minimizing operating costs and wastage of products.
- Greater insight into various aspects of the beverage production process, thereby improving quality and reducing variations, errors and waste.
- Maximum material traceability helps fulfil regulatory compliance.
- Lower risk of production failure and changes maintenance from reactive to predictive.

Maintenance Manager



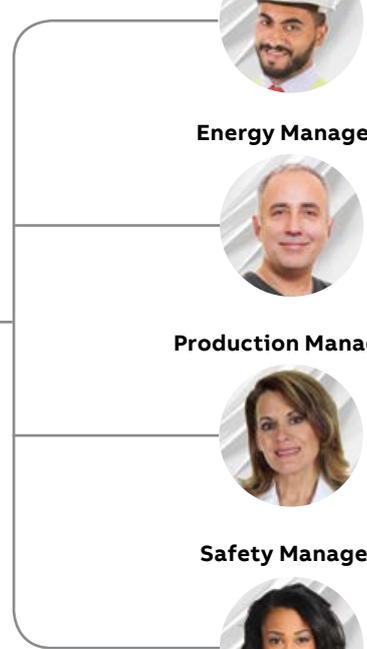
Energy Manager



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 ABB Value Providers, form a service network on your doorstep. Maximize performance, uptime and efficiency throughout the life cycle of your assets.

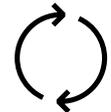
With you every step of the way

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

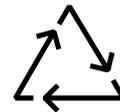
When you've decided on the right product, ABB and its global network of ABB Value Providers can help with installation and commissioning. They are also on hand to support you throughout the operations and maintenance phases of the product's life cycle, providing preventive maintenance programs tailored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

ABB will ensure you are aware of any upgrades or retrofit opportunities. If you have registered your VSDs 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 beverage 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 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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