

MOTION

Production of baked goods - from farm to fork

Sustainably, reliably and safely



Introduction

Farm to Fork strategies focus on making value chains ethical, healthy and sustainable. The grain, flour and baked goods production industries are facing considerable challenges. Energy and raw material prices are increasing, while consumers are demanding ever lower prices. Meanwhile, the global population continues to grow. The need to improve safety and sustainability while ensuring profitability is putting increasing pressure on producers to improve productivity while reducing both energy usage and waste. As such, the industry requires solutions that can help to make vital improvements within the areas of:

- **Sustainability** – where improvement comes in the form of energy savings, optimized use of water, raw materials and ventilation, protection of the local environment, and reduction of waste
- **Reliability** – where the need to reduce wear and tear on assets prolong equipment life, and eliminate the risks of unplanned stoppages are all critical to profitable operation
- **Safety** – where keeping personnel safe from harm is non-negotiable, and ensuring that food quality is maintained throughout the value chain

ABB offers application-based solutions for grain growth, milling, bakery and logistics sectors across the entire value chain. Our domain expertise, energy efficient motors and variable speed drive / variable frequency drive (drive) technology can help to substantially reduce energy costs, while programmable logic controllers (PLCs) can deliver integrated control systems that help to provide enhanced digital visibility and control over processes in grain and flour production, bakeries, and onwards to logistics – providing solutions from Farm to Fork.

Table of contents

002	Introduction
003 – 006	Grain growth
007 – 012	Flour production
013 – 017	Bakeries
018 – 020	Logistics and cold storage
021	ABB solutions for the bakeries industry
022	Case studies
023 – 024	Advanced services
025	Summary





Grain growth



Challenges facing grain producers

Grain growth is vital to feed a growing global human population, as well as farm animals. It's one of the oldest industries in existence. However, it faces new challenges as the world changes. In this time of uncertainty and global logistical issues, the grain market is more unpredictable, while an increase in unusual weather events across the world have made grain prices more volatile. As a result, grain producers must learn to adapt.

Reliability and repeatability are key

Reliability is vital to ensure that mechanical equipment is available during harvesting season, and that no product is wasted. Historically, the success of a grain harvest has always depended on a number of factors. Some of these, such as weather conditions or insect populations, are largely outside the control of producers. However, advances in irrigation and storage methods have made yields much more predictable.

Ensuring optimal efficiency without compromising on quality

Once harvested, grain must be dried and stored in silos, and then sorted and cleaned.

To ensure consistent product, moisture levels must be carefully controlled, requiring a high degree of precision and repeatability. Because applications, such as blowers and driers can be high energy consumers, efficiency is key to keep costs down. With pressure to keep wholesale prices low, producers are increasingly forcing to do more, with less.

Solutions across the value chain

ABB offers a suite of solutions that can deliver vast benefits for grain producing facilities, as well as the equipment manufacturers and system integrators that supply them. ABB understands the applications and issues that matter across the grain industry and can help tackle sustainability, reliability and safety challenges faced within the sector.





Grain growth



Challenge

SUSTAINABILITY

I need to reduce my water consumption, particularly in remote areas where it can be more costly or complicated to provide a consistent supply

RELIABILITY

Pumps are often situated outdoors, exposing them to weather and dirt

SAFETY

I need to ensure my crops are kept healthy to ensure that my end product is of the highest quality

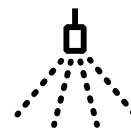


Solution

Solar pump drive harnesses clean energy from the sun, facilitating efficient water pumping - ideal for remote areas with low quality power grids

Remote monitoring of assets ensures early warning of any equipment wear that may require attention

PLC can adjust watering cycles depending on the environmental conditions



Irrigation



Grain handling



Challenge

SUSTAINABILITY

I need to optimize the energy consumption of my drying equipment to ensure correct moisture levels

RELIABILITY

Grain growth is a mechanically challenging and dusty environment, and I cannot afford for equipment to break down

SAFETY

I must keep personnel safe from moving machinery



Solution

Drives allow conveyor speed to be regulated with high accuracy, potentially reducing the amount of heating required

Robust motors combined with drives ensure maximum uptime and low maintenance requirements

Ex-certified motors reduce explosion risk in potentially explosive atmospheres



Conveyors and augers



Grain growth



Challenge

SUSTAINABILITY

Fans are energy-intensive applications, and I need to reduce my energy costs

RELIABILITY

Blowers/pneumatic transport are the easiest way of moving materials from one point to another, any downtime will affect production

SAFETY

I need to keep explosion risks to a minimum wherever possible



Solution

Drive and high efficiency motors can reduce a motor's energy usage by up to 50%

Remote monitoring equipment ensures that potential faults can be identified long before they cause failures

Drives ensure optimal airflow, while Ex-certified motors reduce explosion risk in potentially explosive atmospheres



Fans and blowers



Flour production



Ensuring consistency

Flour milling is a high precision process, and end-product quality is crucial. This can be affected by a wide range of factors, including the origin and type of grain used, its water content, and storage conditions. Too much moisture and the grain may become damaged; too dry and the texture and taste can be affected. As such, flour recipes must be precisely followed to ensure the consistency and saleability of end products.

Quality is key

Even in ideal conditions, grain farmers can have good years and bad years, resulting in varying qualities of raw grains. As a result, flour producers must have the ability to adapt their processes quickly to ramp production up or down, and tweak recipes to meet the requirements of the bakeries downstream in the production chain. Accuracy of motor control is therefore vital to ensure end-product quality is optimal at all times.

Stringent safety standards

Flour dust, when concentrated, is a potentially explosive material. As such, safety is a high priority for flour production facilities. Equipment used in explosive atmospheres must meet stringent safety standards, including protection for dust ignition, flameproofing, and non-sparking or surface temperature protection. Safety concerns add an extra layer of complexity, and facilities cannot afford to take it lightly.

Flour power

ABB products are designed to meet the needs of the increasing sophistication of modern industrial flour production facilities. From Ex-rated motors across a wide power range, to advanced PLCs and energy saving drives, ABB is equipped to help flour producers improve the sustainability, reliability, and safety of their operations.





Flour production



Challenge

SUSTAINABILITY

Conveyors are extensively used in flour production, making them big energy users

RELIABILITY

Flour dust can get into machinery and cause equipment wear

SAFETY

I must keep personnel safe from dangerous moving machinery



Solution

Drive and high efficiency motors can reduce energy usage by 25% or more

Washdown motors have smooth stainless steel surfaces to ensure easy cleaning

Integrated functional safety in drives reduces risk to personnel



Peelers



Flour production



Challenge

SUSTAINABILITY

Blowers are energy-intensive applications, and I need to reduce my energy costs

RELIABILITY

Flour can easily clog fans and motors, reducing efficiency while requiring more frequent maintenance

SAFETY

Flour dust in high concentrations is an explosive substance



Solution

Drive can reduce a motor's energy usage by up to 50%

Washdown motors have smooth stainless steel surfaces to ensure easy cleaning

Drives with ATEX-certified thermistor protection disconnect from power supply if they risk overheating



Blowers



Flour production



Challenge

SUSTAINABILITY

Sieving can be a high intensity process requiring large amounts of energy

RELIABILITY

Sieves vibrate rapidly, and my equipment needs to be able to withstand the process continuously

SAFETY

Flour must be sifted meticulously to separate grades and prevent contamination

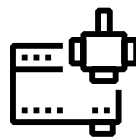


Solution

Drives, high efficiency motors and PLCs from ABB deliver substantial energy and carbon dioxide savings, optimizing process performance

Robust motors combined with drives ensure maximum service life and low maintenance requirements

PLC provides precise control over processes, ensuring errors and cross-contamination are kept to a minimum



Sieves/Plansifters



Flour production



Challenge

SUSTAINABILITY

My milling rolls must operate at different speeds to ensure the right grade is reached and reduce wastage

RELIABILITY

Without milling capabilities my plant cannot function properly

SAFETY

I must keep personnel safe from moving machinery



Solution

Drive and PLC can synchronize multiple rolls based on torque signal, improving quality and efficiency

Remote monitoring of assets ensures that any potential maintenance issues can be flagged early

Safe torque off brings machine safely into a no-torque state, reducing risk to personnel





Flour production



Challenge

SUSTAINABILITY

Mixers can consume a lot of energy, and I'm under pressure to reduce my costs

RELIABILITY

Mixers require high starting torque, putting strain on equipment

SAFETY

I have to keep my employees safe from machinery, and ensure that contaminants do not enter the food chain



Solution

Drives, high efficiency motors and PLCs from ABB deliver substantial energy and CO₂ savings, optimizing efficiency while improving performance

Drives provide precise speed and torque control to reduce strain on mechanical equipment

Integrated functional safety within drives reduces personnel risk, while ABB's Food Safe motor is designed to withstand harsh washdowns

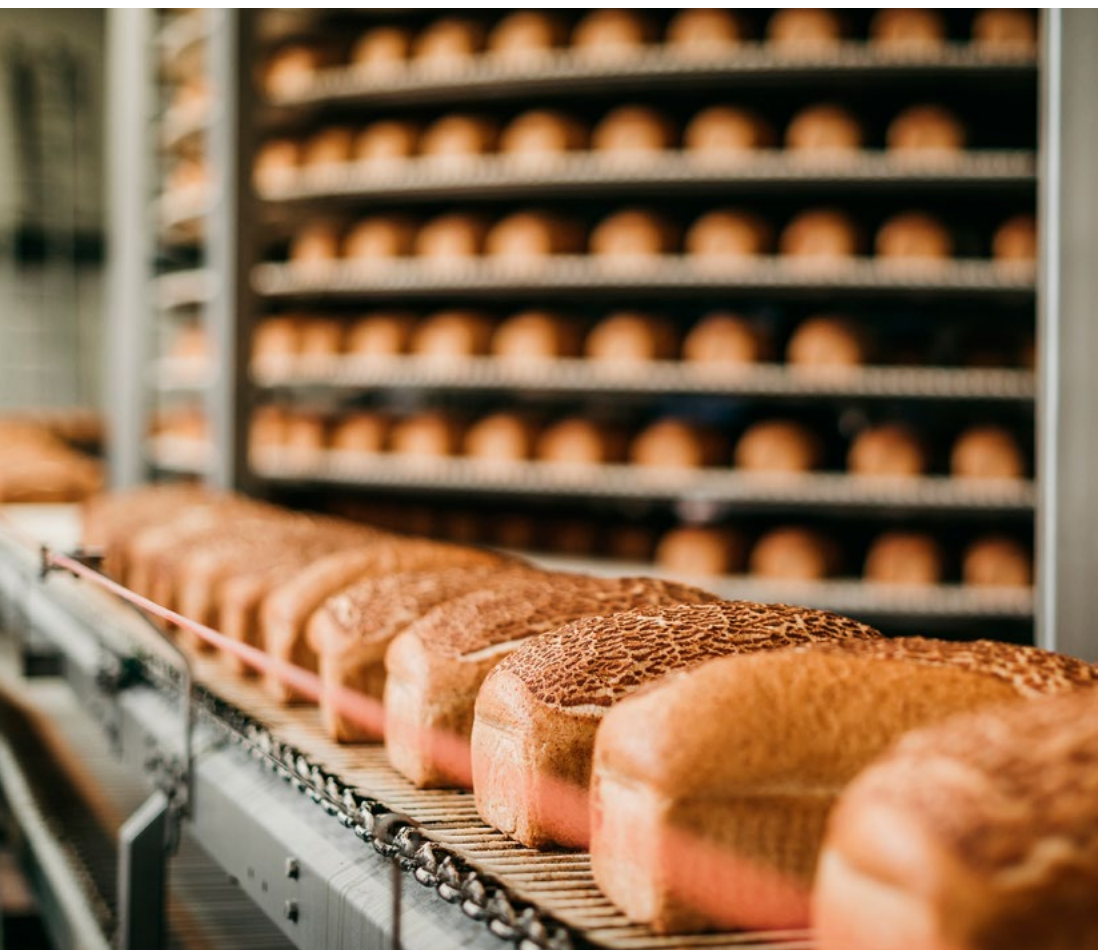


Mixers





Bakeries



Every second counts

Changing consumer habits and tastes means bakeries not only need to produce identical, high volume products but also small batches of bespoke goods with shorter delivery times. Repeatability is vital and operators must follow recipes with precision, Perfection at every step critical to end product quality. Mixing dough for too long, or baking at the wrong temperature, can ruin an entire batch. Obviously, reducing scrap reduces cost.

A clean bake

When it comes to conveyor productivity, timing is everything. Conveyors are a common sight in bakeries, and as they transport goods from one station to another, applications must be synchronized to ensure that the right goods, in the right amount, are in the right place at the right time. Because it's necessary to keep equipment clean and free of bacteria to prevent cross contamination, there are stringent cleaning processes in place. This requires extremely reliable equipment that can withstand harsh environments, including high pressure washing and cleaning chemicals. Heavy-duty mixers can create a risk, making safety of plant

personnel critical. Equipment with built-in functional safety can help prevent accidents and injury.

Tackling rising energy costs

Rising energy costs are driving up the costs of raw materials and affecting every bakery facility. At the same time, the industry is under increasing pressure to reduce its carbon footprint and accelerate the adoption of renewable technologies.

Rising to the challenge

Many production facilities will often handle a wide variety of different product types in a single day, including breads, pastries and partially-baked goods. Flexibility is key to be able to adapt processes quickly to cater for seasonal changes in demand, and the increasing amount of choice available to customers.

Proven solutions for bakeries

Across all applications in the modern bakery, energy efficiency is vital. Bakeries often operate on fine margins. The use of energy efficient equipment such as ABB drives, motors and PLCs can help to lower unit costs, reduce waste, and improve profitability.





Bakeries



Challenge

SUSTAINABILITY

Mixing, in an industrial bakery, requires extremely high precision levels

RELIABILITY

Mixers require high starting torque, putting strain on equipment

SAFETY

I have to keep my employees safe from machinery, and ensure that contaminants do not enter the food chain

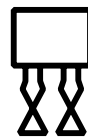


Solution

Precision motor control in drives can deliver highly accurate precision control without the need for an external encoder, improving efficiency

Drives provide precise speed and torque control to reduce strain on mechanical equipment, while PLCs ensure control of mixing for consistent end product

Integrated functional safety within drives reduces personnel risk, while ABB's Food Safe motor is designed to withstand harsh washdowns



Mixers





Bakeries



Challenge

SUSTAINABILITY

Pumping is a high energy process, and I need to improve efficiency wherever possible

RELIABILITY

Equipment outage can halt production, leading to food wastage and additional costs

SAFETY

I need to keep equipment clean to prevent contaminants from entering the food chain



Solution

Drive and SynRM motor packages can achieve IE5 levels of efficiency, with Ex-certified variants also available

Drive's multi-pump functionality can provide redundancy in systems using multiple pumps

ABB's motors are built with a robust design to ensure easy cleaning and maintenance



Pumps





Bakeries



Challenge

SUSTAINABILITY

I need to optimize my conveyors to prevent damage to products

RELIABILITY

Each conveyor may have different maintenance requirements, while longer conveyors require numerous motors and long cables

SAFETY

I must keep personnel safe from moving machinery



Solution

Drives provide precise conveyor control, ensuring accurate timings for baking and cooling

PLC combined with drives and motors ensures perfect utilization of multiple conveyors for less wear on equipment

Integrated functional safety in drives reduces risk to personnel



Conveyors



Bakeries



Challenge

SUSTAINABILITY

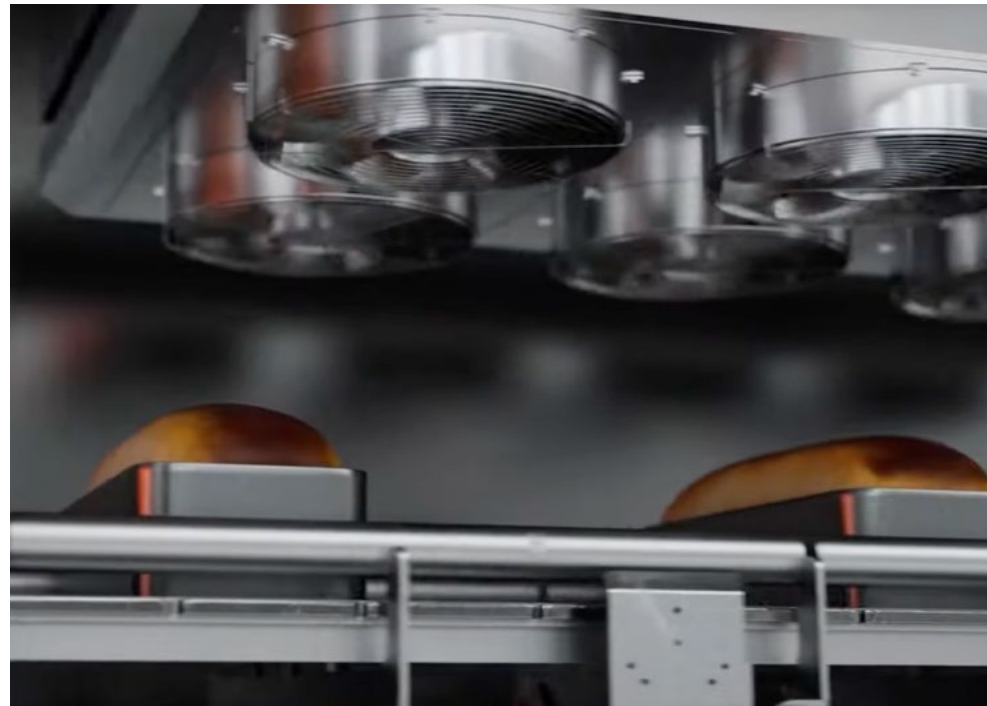
My ovens are high energy users, and it's important that I reduce energy use and carbon footprint

RELIABILITY

Precise temperature control is essential for the baking oven operation, while avoiding overloading of fans at lower temperatures

SAFETY

Industrial ovens create a risk of fire and injury, so I need to take reasonable safety precautions



Solution

ABB Drives allow the use of different energy sources, including renewable sources like solar or wind, while optimizing energy consumption

Thyristor power controller's precise control allows temperature to be kept constant to ensure consistent quality of output products

Ovens equipped with Thyristor power controller are safer than gas burning ovens, and can be easily integrated into overall plant's safety systems



Ovens



Logistics and cold storage



Locking in freshness

Once baked, after baked products have to be cooled very quickly to ensure maximum freshness once they reach the supermarket shelf. Cooling systems, including compressors, pumps, fans and condensers,

Every second counts

Conveyors are widely used at the distribution center. These must transport goods rapidly from point to point, and require precise synchronization with seamless transfer between stations, as the clock is ticking from the moment a product leaves the bakery.

Solutions for baked goods logistics

ABB offers a wide range of solutions designed to address the needs of baked goods logistics operators. High energy efficiency motors can deliver considerable savings while drives and PLCs ensure seamless control of conveyors and compressors to reduce wear and tear on components. Digital remote monitoring services can also help to detect potential faults before they turn into failures, keeping downtime to a minimum.





Logistics and cold storage



Challenge

SUSTAINABILITY

Baked goods have a very limited shelf life, so it is vital to get them into the logistics chain as fast as possible

RELIABILITY

Any delay due to equipment downtime can be costly to my operations

SAFETY

Food must reach shelves quickly to ensure that it is fresh and fit for consumption



Solution

Drive and PLC automatically collect, transmit and compare data, to ensure that correct temperatures and relative humidity are maintained at all times

Drive helps to extend equipment lifetime through smoother operation, ensuring less wear and tear

Drives ensure system uptime to maintain uninterrupted cooling chain



Cooling and refrigeration



Logistics and cold storage



Challenge

SUSTAINABILITY

I need to optimize my conveyors to prevent damage to products

RELIABILITY

Each conveyor may have different maintenance requirements, while longer conveyors require numerous motors and long cables

SAFETY

I must keep personnel safe from moving machinery



Solution

Drives provide precision speed control, and can vary according to demands of different product variants

PLC combined with drives and motors ensures perfect synchronization of multiple conveyors for less wear on equipment

Integrated functional safety in drives reduces risk to personnel



Conveyors



ABB Motion solutions for bakery production



High efficiency motors

- ABB offers a comprehensive range of reliable and high efficiency motors for all grain, flour and baked goods production processes and logistics applications from farm-to-fork.
- Super premium efficiency IE4 induction and permanent magnet motors can significantly reduce energy usage, while meeting and exceeding Minimum Energy Performance Standards (MEPS) around the world.
- Ultra-premium efficiency IE5 SynRM motor (including Ex-certified variants) / NEMA EC titanium motors and drive packages can achieve unprecedented energy savings for processing and logistics applications.
- Ex motors ensure maximum equipment safety in hazardous and dust-affected areas.

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Variable speed drives/variable frequency drives

- ABB drives are made with efficiency and performance in mind to empower productivity for baked goods producers. They provide flexibility to optimize processes and control across the value chain, while achieving high reliability for less downtime.
- Achieves substantial energy savings by delivering precision control to ensure that a motor only uses the energy it needs for a given output.
- Built-in features and functionality tailored to bakery production processes.
- EnergySave Calculator tool allows you to predict energy performance and savings prior to investing.
- Functional safety built-in.
- DCT880 is a thyristor power controller for heating applications whose integrated power optimization algorithms reduce costs by reducing peak power demands.

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Programmable Logic Controllers (PLCs) and Human Machine Interfaces (HMIs)

- ABB automation devices deliver solutions with high performance and flexibility to be effectively deployed in applications across the baked goods value chain.
- ABB range of PLCs can provide solutions for small, medium and high-end applications.
- Ideal choice for high availability, extreme environments, condition monitoring, motion control and safety solutions.
- Constantly monitors process variables and can instruct motor and drive equipment to adjust operations instantaneously to match requirements in real-time.
- Safety PLC specifically designed for safety applications involved in machinery and process automation.

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ABB success stories in bakery production



ABB technology runs refrigeration system at Switzerland's largest bakery

The Coop Group's new logistics center in Schafisheim houses Switzerland's largest bakery and patisserie, as well as regional and national distribution hubs for frozen products, fresh food products, and household goods. The facility produces around 60,000 tons of baked products a year.

Cooling plays an important role in the production process. There are four refrigeration systems providing a total cooling power of 8 megawatts (MW) – the same as around 40,000 domestic refrigerators. Seeking to improve its efficiency and reduce its carbon footprint, Coop sought ABB to upgrade the refrigerator compressors with high-efficiency motors and variable speed drives.

The motors have the maximum efficiency class rating, IE4, with up to 97 percent efficiency when operating at full load. The drives enable further electricity savings by accurately controlling the speed of the motors, in accordance with the cooling output required.

Since installation, Coop has reduced its CO₂ emissions by more than 10,000 tons a year – an annual saving equivalent to taking nearly 2,000 average cars off the road, while putting the company on track to meet its ambitious targets to reach carbon neutrality across all its divisions by 2023.



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Swissmill chooses ABB to supply customized motors for roller mills

Roller mills are at the heart of Swissmill's production process. When the company decided to replace all its roller mills and the motors that power them, it selected ABB to supply the new motors. ABB customized the motors to meet Swissmill's safety, efficiency and installation requirements. To enable maximized availability and uptime, the motors are digitally connected to ABB Ability™ Condition Monitoring for powertrains.

Swissmill is the largest mill company in Switzerland and processes around 30 percent of the grain used in the country. With a capacity of 35,000 tons, it plays a vital role as part of Switzerland's emergency food reserves.

Each mill is powered by two motors ranging in output from 7.5 to 22 kilowatts. The new motors had to meet special requirements regarding safety, energy efficiency and mechanical installation, which involved fine-tuning ABB's ATEX motors to meet IE3 efficiency. The remote monitoring service tracks the health and performance of motor-driven systems, enabling customers to make better decisions that maximize uptime as well as optimizing performance and energy efficiency.



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Advanced services



ABB offers a range of advanced services and digital solutions based around the ABB Ability™ platform, which can help to maximize the potential of your motor-driven applications across the entire powertrain.

ABB Ability™ Mobile Connect

ABB Ability™ Mobile Connect for drives allows equipment manufacturers to communicate with drive users or service personnel on-site, helping them easily commission and troubleshoot drives remotely. Chats and sharing of images and backups via smartphone makes the technical support process quick and efficient.

This increases opportunities to provide online technical support for end customers – without complex connectivity infrastructure. This is ideal for facilities in remote locations lacking in modern communications provision.

ABB Ability™ Condition Monitoring for drives

ABB Ability™ Condition Monitoring for drives keeps you one step ahead of process issues. The service provides fact-based insight into the performance and efficiency of drives, via KPIs and signal data, to keep processes running smoothly.

Irregularities in operations can be identified and solved long before they result in equipment failure, reducing downtime while enabling a shift towards predictive maintenance, while allowing additional opportunities to optimize performance based on the data.

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Advanced services



ABB Ability™ Condition Monitoring for powertrains

ABB Ability™ Condition Monitoring for powertrains optimizes the performance and efficiency of rotating equipment. It enables full transparency on all parameters for drives, motors and pumps, and can also be applied to applications, such as compressors, conveyors, pumps and aerators.

ABB Ability™ Smart Sensors

ABB's Condition Monitoring solutions are underpinned by Smart Sensors: small devices which can be fitted directly to the chassis of a motor with minimal installation and no wiring required. The device gathers near real-time data measuring parameters, such as temperature, vibration, magnetic flux and noise, which can then be aggregated, stored and analyzed by the cloud to gain unprecedented insight into equipment condition and performance. Potential equipment issues can therefore be detected before they turn into faults, without having to manually inspect the motor.

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Engage ABB support locally

As well as serving the market directly, ABB continuously develops a network of value-adding channel partners that enhance ABB's market reach and proximity around the world. Local expertise, combined with a world-leading product and service offering, can help to provide support at every stage of the bakery value chain.

ABB's carefully selected channel partners are regularly trained in the latest products, techniques and best practices, as well as being periodically assessed on their core competencies to ensure that customer expectations can always be fulfilled, 24 hours a day, anywhere in the world.

The ABB Value Provider program ensures that approved third parties deliver authorized sales, support, service and engineering in cooperation with ABB, bringing ABB's products and services straight to the customer's front door.

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Summary



Across the baked goods production value chain, from grain farming through to transportation of finished goods, key stakeholders face an array of challenges in ensuring maximum efficiency with minimum waste, while attempting to reduce costs wherever possible. Meanwhile, the industry is also working hard to improve its environmental footprint.

ABB's Motion portfolio delivers solutions with tangible benefits for improving the sustainability of operations, and the reliability and safety of baked goods production processes, from Farm to Fork.

**To find out more about how
ABB can help you**

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ABB Motion

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