
MOTION

Moving your Dairy business from farm to fork

Sustainably, reliably and safely



Introduction

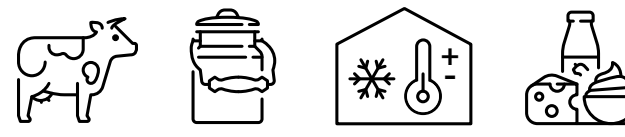
Farm to Fork strategies focus on making value chains ethical, healthy and sustainable. The dairy farming and processing industries are facing strong challenges. Energy and raw material prices are increasing, while consumers are more inclined to pay for better sustainability and animal welfare. Meanwhile, the global population continues to grow. The need to improve animal welfare, maintain a sustainable environment and retain profitability is putting pressure on producers to improve productivity. Producers need to reduce 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 and raw materials, improved ventilation, protection of the local environment, and reduction of waste
- **Reliability** – where reducing wear and tear on assets, prolonging equipment life, and eliminating unplanned stoppages are all critical to profitable operation
- **Safety** – where keeping animals and personnel safe from harm is non-negotiable, and ensuring that food safety is maintained throughout the value chain

ABB offers application-based solutions for the dairy farming and processing and logistics sectors. The domain expertise, along with energy efficient motors and drives technology can help to substantially reduce energy costs, while programmable logic controllers (PLCs) can deliver integrated control systems that help to provide enhanced visibility and control over the processes within the dairy production, processing and, logistics sectors – from Grass to Glass.

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Dairy production



Challenges faced by the farming and milking industry

The farming and milking industry is undergoing a rapid transformation. Changes in culinary tastes and a heightened interest in animal welfare have forced dairy farmers, processors and retailers to introduce and develop new products. Meanwhile, increasing energy costs are squeezing already tight profit margins at every stage of the supply chain.

Ensuring optimal profitability in a changing market

Dairy production is historically associated with high greenhouse emissions, and with Net Zero dominating the agenda, solutions must be found to reduce its environmental impact. Through innovation and commitment to sustainability and animal welfare, dairy producers are beginning to shed their reputation for contributing to high emissions. At the same time, there is continued pressure from retailers, wholesalers and consumers to find new ways to cut costs and boost incomes, without compromising on quality.

Effective and efficient cooling at every stage of milk production

Effective cooling systems are fundamental to the milk supply chain. Any deviation outside of acceptable parameters can result in an unusable product. Ensuring that milk is stored in proper conditions prior to and during transportation is vital to ensure profitability, making effective cooling essential.

Solutions across the dairy farming value chain

ABB offers a suite of solutions for equipment that can deliver vast benefits for both small and large dairy farms, as well as the equipment manufacturers that supply them. ABB understands the applications and issues that matter to farmers, and can help them tackle sustainability, reliability and safety challenges in a rapidly changing market.





Dairy production



Challenge

SUSTAINABILITY

I need to make efficient use of water to reduce costs and lessen environmental impact, while recirculating where possible

RELIABILITY

I cannot afford downtime on my water pumps as my animals will suffer

SAFETY

Hygiene is a key issue, and I need to make sure my equipment is kept free of contaminants



Solution

Drives provide accurate control of motor-driven applications. In addition, drives eliminate the need for valves to control the flow. This brings substantial savings in the energy consumption.

Drives are optimized for pump applications. Soft pipe filling function reduces stress on pipes, valves and pumping equipment

Drives and PLCs ensure that processes operate within required parameters. Motors are available up to IP69k making it easier to run in heavy CIP applications



Pumping
(e.g., drinking/cleaning water)



Dairy production



Challenge

SUSTAINABILITY

My farm is situated in remote areas with weak grid connections. This means that I have to think carefully about how and where I use my electricity

RELIABILITY

I need to ensure optimal running of ventilation systems to prevent downtime

SAFETY

Heat stress, caused by temperature and humidity, can harm my animals and reduce milk production



Solution

Drives run on weak mains or even use DC mains supplied with PV panels

A drive with an high efficiency motor can be used to run the cooling system on demand, at the same time save energy and costs by not running at full speed 24/7

Drives allow animal cooling to be adapted to ambient temperature and humidity, resulting in improved animal welfare and reduced heat stress



Animal cooling



Dairy production



Challenge

SUSTAINABILITY

I need to optimize the flow through processing and transportation from raw material to feed stations

RELIABILITY

Dairy production is a 24 hour operation, which makes maintenance a challenge

SAFETY

I need to ensure that an adequate nutritional mix is provided to my animals



Feeding



Solution

PLCs combined with drives helps to provide an optimal mix of ingredients with minimal waste, while optimizing speed and improving energy efficiency

Use of drives, PLCs and motors improves reliability and extends equipment lifetime, while reducing downtime

PLCs allow precision control of dosing and management of multiple weighing systems simultaneously, as well as speed controlled dosing conveyors.



Dairy production



Challenge

SUSTAINABILITY

I need to accurately control pressure while also keeping energy usage to a minimum

RELIABILITY

My vacuum pumps don't need to operate at 100% all the time, as this can put stress on equipment

SAFETY

Comfort for my animals is hugely important to ensure their welfare and best quality product



Solution

Drives can save energy up to 5 kWh/1000 liters (6.7 Hp / 264 gallons) of milk by controlling motor speed, without compromising pressure set points

Drives allow controlled ramp start/stop of motors, reducing strain on mechanical equipment

Drives ensure smooth operation, and PLCs ensures precise and accurate control over many motors simultaneously. Motors are available up to IP69k to prevent contamination



Milking



Dairy production



Challenge

SUSTAINABILITY

To reduce waste I have to keep pumping to an absolute minimum, while also ensuring efficient system design and thorough cleaning

RELIABILITY

Any delay in transportation, or storage at the wrong temperature, risks affecting the quality of my product, so any downtime must be avoided

SAFETY

The pipes and storage tanks at my facility must be cleaned thoroughly after every batch to prevent residue build-up



Solution

Drives can be used to slow down a pump's motor, and ensure that it only runs when necessary

PLCs combined with drives and motor ensure perfect synchronization of discrete processes for less wear on equipment and lower maintenance requirements

The use of drives in the cleaning process ensure a smooth operation, can reduce the use of sensors and protect the piping



Milk transport/storage



Dairy production



Challenge

SUSTAINABILITY

Manure is high in ammonia levels, creating a potential hazard to the local environment, while nitrogen processors are energy-intensive applications

RELIABILITY

My nitrogen processor has several pumps and fans, and I cannot afford for them to fail

SAFETY

Ammonia is corrosive. It can damage my equipment and affect personnel



Solution

Drives ensure more efficient and effective operation of nitrogen processor, with lower costs for fertilizer or to convert emissions into liquid circular fertilizer slurry

Drives extend equipment lifetime while reducing downtime, while PLCs can precisely control the process of removing nitrogen

Stainless steel motors and C4 conformal coating of the drives are designed to withstand corrosive environments and harsh washdowns



Nitrogen processing and manure collection



Dairy processing



Addressing industry challenges head-on

Fluctuating prices and shifting consumer trends mean that the situation in dairy processing has never been more challenging. Customers demand an increasing array of options in terms of end product, each of which requires its own discrete process. Catering to shifting trends in demand, while continuing to supply the more conventional products with less demand elasticity, requires agility to try new things, and resilience to fail fast and move on to the next promising innovation.

Keeping it chilled

Dairy processing facilities are incredibly sophisticated, but at every stage cooling is essential to ensure that the end product is safe to consume, appealing to the consumer, and profitable for the supplier. Milk must be kept at a low temperature from the farm to the table. Reliable operation of chillers and compressors are therefore critical to many dairy operations.

Challenges of Clean-in-place (CIP)

Milk leaves a residue in every vessel in which it is kept, potentially creating a

hygiene risk. Consequently, every vessel must be thoroughly cleaned to ensure hygiene and quality standards are met. Clean-in-place (CIP) is a method of automated cleaning of the interior surfaces of pipes, tanks, filters and associated fittings, without the need for major disassembly, avoiding product contamination. CIP can require vast amounts of water. Efficient operation of the processes that govern dairy processing can have a substantial impact on the sustainability and profitability of the industry.

Ensuring sustainability, reliability and safety in dairy processing

ABB products are designed to meet the needs of the increasingly sophisticated modern industrial processing facility. From ultra-premium efficiency IE5 SynRM motor / EC titanium motor and drive packages, to advanced industrial PLCs, ABB is equipped to help dairy producers improve the sustainability, reliability and safety of their operations.





Dairy processing



Challenge

SUSTAINABILITY

Separation can be an energy-intensive process, with several different end products (e.g., milk, cream, butter, cheese)

RELIABILITY

My centrifuges vibrate when in operation, which can affect the separator and equipment around it

SAFETY

My separators are required to be in a safe state when personnel perform maintenance



Separators



Solution

Efficient motors controlled by drives reduce energy usage while PLCs can ensure that discrete processes are run effectively

Drives control the speed of the centrifuge optimally to eliminate vibration, while overcoming long starting times and high starting torque

The safe torque off function in the drive can prevent unexpected start-up



Dairy processing



Challenge

SUSTAINABILITY

My cooling compressors are one of the single biggest energy consumers on-site

RELIABILITY

I need to ensure the ultimate reliability of my compressor operation

SAFETY

It is essential that I keep my product at the correct temperature



Compressors



Solution

SynRM motor / EC Titanium motor-drive packages provides energy savings up to IE5 standard

Drives extend the speed range of compressors, while cooling compressor control function reduces reliance on any single compressor motor

Drives make throttling valves obsolete, ensuring cooling media (water, glycol) temperatures are maintained at all times. (e.g., water, glycol) to ensure correct temperature is maintained at all times



Dairy processing



Challenge

SUSTAINABILITY

For every liter of milk produced, 4 liters (1 gallon) of clean water are used

RELIABILITY

Cavitation is a major problem that can easily destroy vital equipment and impact food product quality

SAFETY

I want to keep my dairy equipment free of bacteria and pollutants. I need to be extremely thorough when washing down to remove any pollutant



Solution

For every litre of milk produced, 4 litres (1 gallon) of clean water are used so efficiency is vital. IE5 SynRM motor / EC titanium motor and drive package can vastly improve pumping efficiency.

Drives offer dedicated anti-cavitation functionality to detect the likelihood of cavitation and prevents it before it occurs, reducing damage to pumps, pipes and valves

Stainless steel motors and paint-free motors allow easier cleaning and better hygiene



Pumps



Dairy processing



Challenge

SUSTAINABILITY

I need precision control to ensure the right mix is reached for different types of product. Any mistakes can result in unusable product

RELIABILITY

Downtime costs me money, so I must avoid it

SAFETY

Heavy machinery like mixers must not pose a threat to human operators



Solution

Precision motor control in drives provides accurate speed control that can adapt to the mixing load

Drives optimize production speed and improves process uptime

Advanced functional safety features integrated in the drive can allow more safe working environments



Mixers/Standardization



Dairy processing



Challenge

SUSTAINABILITY

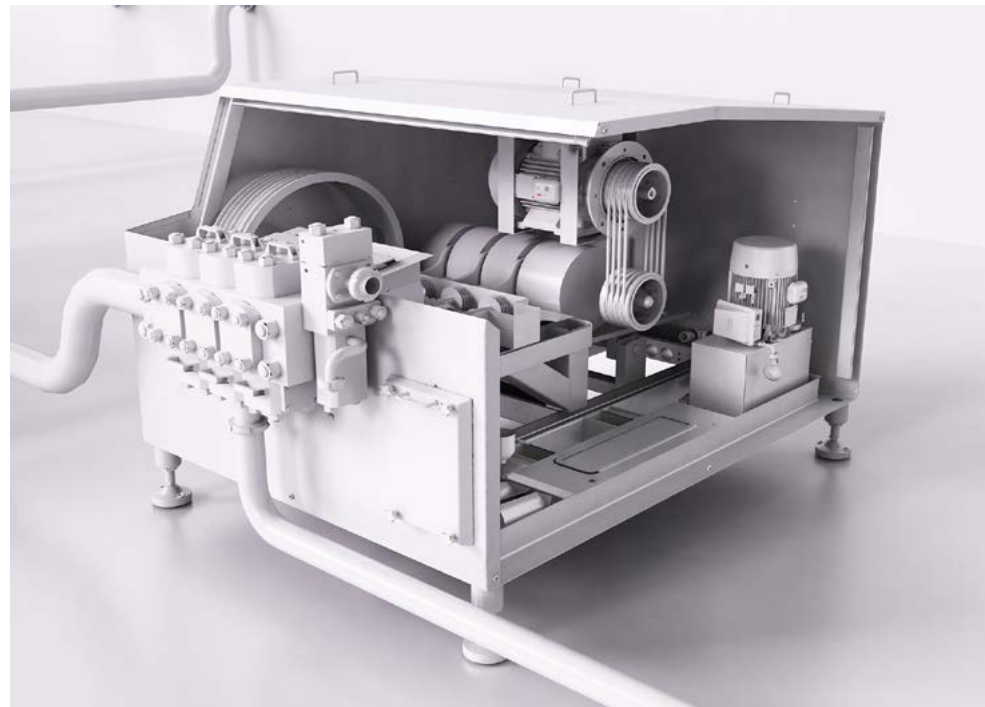
Homogenization is an energy-intensive process, so I need to improve efficiency wherever possible

RELIABILITY

Temperature cycling can reduce the lifetime of my equipment

SAFETY

My product has to meet stringent hygiene and quality requirements



Solution

Drives reduce motor energy usage, achieving the desired particle breakdown by applying just the right speed and pressure

Motors are built to withstand extreme temperatures and harsh operating conditions

PLCs and drives provide control and monitoring of processes to ensure standards are always met



Homogenization



Cavitation detection and control with the anti-cavitation feature in ABB drives



A widespread problem, yet not widely understood

Ideally milk should not be pumped at all, as any form of pumping can damage the structure of the raw product. As a result, many dairy farmers and processors instead use gravity-based systems. However, in many cases some pumping must still occur to transport milk from one place to another. This introduces the risk of cavitation causing damage to pumps, valves and pipework, as well as product.

Prevention is better than cure

Drives offer the most cost-effective method of controlling cavitation in existing systems, allowing it to be detected and prevented in real-time. Because the drive is measuring directly from the motor shaft, any potential flow issues can be picked up immediately with zero latency, and no need for additional sensors, controllers or interfaces. For pump systems incorporating drives, this represents an easy and cost-effective cavitation solution requiring no additional equipment.

Cavitation detection and control in ABB drives

ABB drives (ACS580 general purpose drives, ACS880 industrial drives) have the anti-cavitation software that uses patented algorithms to look for specific patterns in the motor and drive operating data, and automatically reduces pump speed to decrease the risk of cavitation occurring. The algorithm is based on measurement of pump torque and speed, comparing results with normal torque and adapting accordingly to slow down the pump with the aim of stopping cavitation.

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Storage for dairy products



Improving the efficiency and speed of the dairy logistics chain

Logistics operations for dairy products differ across the world. Some provide several, but not all parts of the supply chain. Many are vital component parts in a wider ecosystem, which has the shared goal of delivering the highest quality at the best price. Manufacturers supplying refrigeration equipment to food manufacturers and logistics centers need to be able to trust in the quality of their components to ensure maximum uptime and reduced maintenance.

Your trusted partner for motors and motor control in dairy logistics applications

ABB offers a wide range of motion solutions designed to address the needs of cold chain logistics operators. High energy efficiency motors can deliver considerable savings while drives and PLCs ensure seamless operation 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.





Storage for dairy products



Challenge

SUSTAINABILITY

It is vital that there are no interruptions to the cold chain process

RELIABILITY

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

SAFETY

Milk storage and transportation is very highly regulated to ensure the required hygiene



Solution

Drives and PLCs offer confidence that correct temperatures are maintained at all times

Drives help to extend motor equipment lifetime through smoother operation and improved monitoring, ensuring less wear

Remote monitoring capabilities ensure that any potential issues can be flagged long before they develop into failures



Cooling and refrigeration



Storage for dairy products



Challenge

SUSTAINABILITY

My facility houses multiple conveyors and I need to protect against bottles falling due to harsh speed changes

RELIABILITY

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

SAFETY

I have a duty to keep my employees safe from dangerous machinery

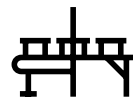


Solution

Drives can smoothly vary conveyor speeds, reducing the risk of goods being wasted

PLCs combined with drives and motors ensures synchronization of multiple conveyors for less wear on equipment and low maintenance requirements

Integrated functional safety in drives reduces risk to personnel



Conveyors



ABB solutions for dairy producers



High efficiency motors

- ABB offers a comprehensive range of reliable, hygienic high efficiency motors for all dairy production, dairy processing 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 motors / NEMA EC titanium motors and VSD packages can achieve unprecedented energy savings for processing and logistics applications
- Food Safe motors contribute to more hygienic working practices while prolonging motor lifetime

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Variable speed drives/variable frequency drives

- ABB drives are made with efficiency and performance in mind to empower productivity for dairy farmers and processors. They provide flexibility to optimize processes and control across the value chain, while achieving high reliability for less downtime
- Achieve 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 dairy production processes including cooling compressor control and anti-cavitation (in ACS580 and ACS880 drives)
- EnergySave Calculator tool allows you to predict energy performance and savings prior to investing
- Functional safety built-in

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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 dairy value chain
- ABB's 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 PLCs specifically designed for safety applications involved in machinery and process automation

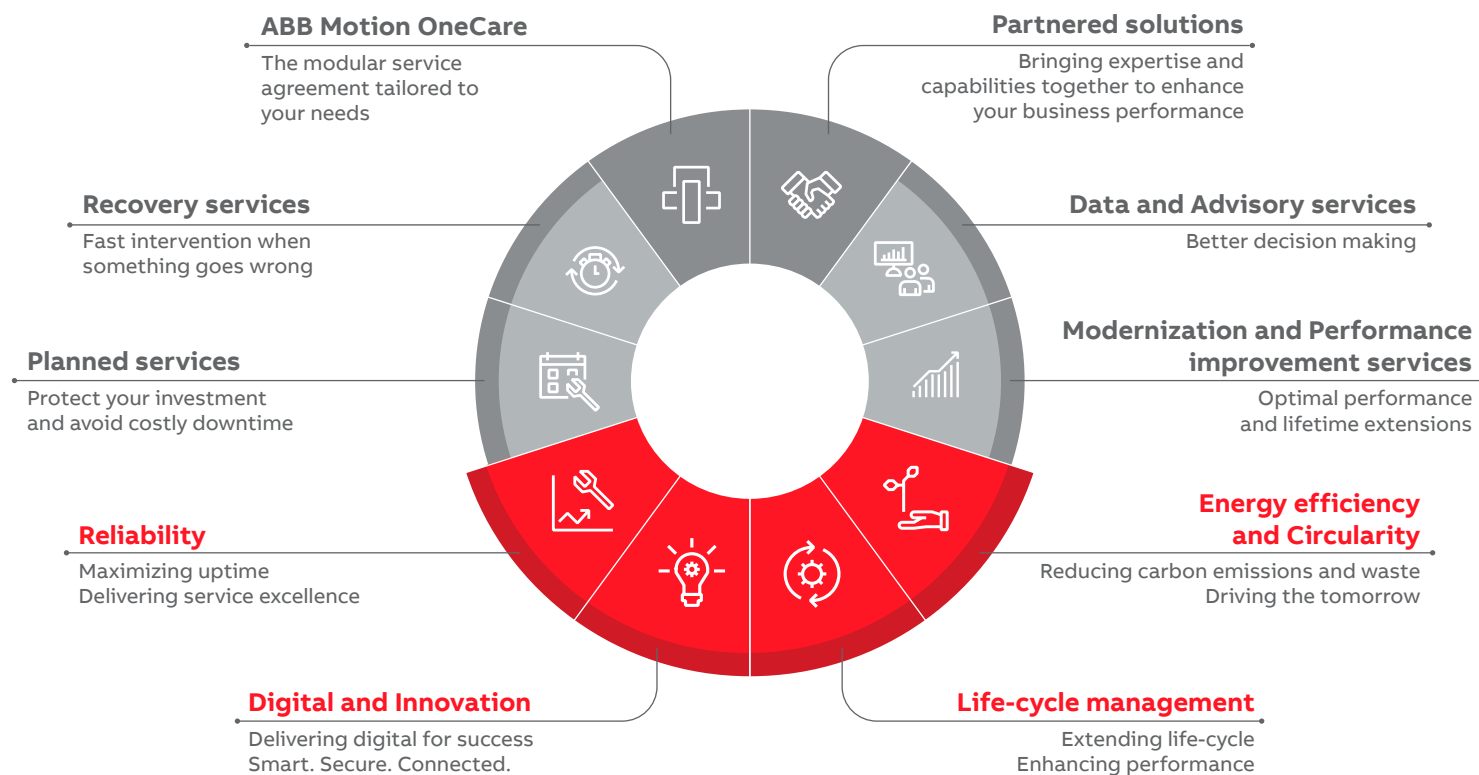
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Our service expertise, your advantage

Keep your operations running profitably, safely and reliably

- Maximize uptime, extend product life cycle, and enhance the performance and energy efficiency of your assets.
- Enable innovation and success through digitalization by securely connecting and monitoring your motors and drives, increasing reliability and improving efficiency.
- Our domain expertise is strengthened by a service offering tailored to your needs, enabling you to unlock new possibilities and achieve more sustainable outputs.



OUR EXPERTISE
YOUR ADVANTAGE



ABB Ability™ digital solutions



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

ABB Ability™ Mobile Connect for drives

It allows equipment manufacturers to communicate with drives users or service personnel on-site, helping them easily commission and troubleshoot drives remotely. Chats and sharing of images and backups via smartphone make 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 powertrains

ABB Ability™ Condition Monitoring service for powertrains optimizes the performance and efficiency of rotating equipment. It enables full transparency on key parameters for drives, motors, and pumps, and can also be used in applications such as compressors, conveyors, mixers and extruder main shafts.

The powertrain is equipped with sensors and cloud connectivity and you can choose the assets you want to monitor.

Data gathered from drives' inbuilt sensors and loggers together with that collected from ABB Ability™ Smart Sensors fitted to motors and pumps, can be aggregated, 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.

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ABB Access and local support



ABB Access – unlocking your drives, motors, and PLCs

With ABB Access, you can unlock all aspects of your drives, motors or PLCs, from one central location: the palm of your hand. Simply scan the QR code on the ABB product to get started.

ABB Access helps you to easily find up-to-date online product data. It also provides fast access to documentation and manuals. If you happen to experience issues with your ABB product, this can be quickly and easily reported online to reach expert support from ABB.

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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 including ABB Value Providers 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 dairy value chain.

ABB Value Providers 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 are always 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 dairy production value chain, from farming to logistics, 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 dairy production processes, from Grass to Glass.

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

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ABB Motion

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