



MOTION

# **Alternative protein production**

Boosting sustainability,  
reliability and safety

# Helping to solve the protein problem

Alternative protein using insects is a rapidly growing sector of food production, and represent a low-cost and more sustainable alternative for e.g. soya. Variable speed drives (VSD) / variable frequency drives (VFD), electric motors and PLCs are at the heart of many of the processes involved in this innovative new protein source, and provide vast opportunities to improve the industry's efficiency, productivity and sustainability.



## Facility operator



“Alternative proteins are a sustainable and cost-effective source of protein, particularly for animal feed, but I have to make sure that the process is clean, safe, and follows regulatory standards.”

### Challenges

- Alternative protein farming and processing facilities are often being constructed as conversions to existing conventional farms, or industrial new plants, requiring large amounts of capital investment in new equipment.
- Processing has to take place on-site to prevent insects from entering the local population and disrupting the ecosystem.
- Processes require vast amounts of energy to maintain required humidity, temperature and airflow levels for optimal growth.

### Solutions

- Applying drives and high efficiency motors to as many applications as practical – from ventilation fans and pumps to mixers, decanters and pressers – reduces energy use by up to 25 percent or more, and cuts maintenance needs.



## System integrator



“I have to make sure that my equipment is as efficient as possible, with smooth integration and trouble-free commissioning for production plants that are often being built at pace.”

### Challenges

- Connecting and integrating components into ventilation and pumping systems must be straightforward, ensuring smooth interoperability.
- Efficient facility management requires detailed access to fault logs and operational data for condition monitoring and troubleshooting.
- Equipment reliability is vital to avoid breakdowns, hazardous incidents, and reputational damage.

### Solutions

- Support of all major communication protocols ensures drives and PLCs are an integral part of a building management system and can contribute to an overall control strategy.
- ABB Ability™ Operations Data Management zenon helps detect ways to optimize energy and resource consumption. It also offers excellent reporting functions that give full production transparency.
- ABB Ability™ Smart Sensors for motors and general machinery help identify energy saving potential.



### Installer



“Facilities often involve unique processes and specialist designs. I need equipment that is easy to install, commission and maintain.”

#### Challenges

- Typical facilities may have over 500 motors and drives in operation, each with their own performance characteristics and maintenance requirements.
- Equipment must above all be safe, and ensure that personnel are not exposed to hazardous environments (e.g. ammonia, high humidity), or risk environmental contamination incidents.
- Air ventilation systems are highly sophisticated, requiring constant monitoring to ensure that they are operating optimally.

#### Solutions

- Drives, motors and generators are critical to the continuous operation of ventilation, emergency power back-up and pumping systems.
- Powertrain equipment helps meet specific design requirements, while reducing power consumption and increasing safety for personnel.
- Remote monitoring allows sophisticated analysis of equipment performance and maintenance requirements without the need for in-person inspection.



### Original Equipment Manufacturer (OEM)



“We require components that are reliable, priced realistically, available for instant delivery and from suppliers with a global reach.”

#### Challenges

- A portfolio of automation technologies that are matched and fully compatible from selection and dimensioning to installation and commissioning.
- Local supply of genuine spare parts and field servicing engineers is essential for machinery shipped globally.

#### Solutions

- Broad offering including drives, motors, PLCs, HMIs, safety products, choice of real-time Ethernet technologies, software programming.
- Global service network and preventive maintenance contracts relieve pressure on in-house teams and increase speed of response to critical issues.
- Drives can provide relevant information about conditions and send notifications via cloud solutions so preventive maintenance can be carried out, reducing downtime.

# Improving operational efficiency boosts output and profitability

Insects like the black soldier fly is the most commonly used source of alternative protein in modern industrialized production, due to its fast growth and reproductive processes. Crickets and mealworms may also be used. Farming these organisms for protein on an industrial scale requires highly sophisticated processes, and precise control of environmental conditions.

## 1 FEED KITCHEN

Food waste from supermarkets, or products from food production, are stored in tanks and silos before being transported to fermentation tanks. This is then mixed and pumped into containers for mature black soldier flies to feed on, helping them to grow.

### Applications:

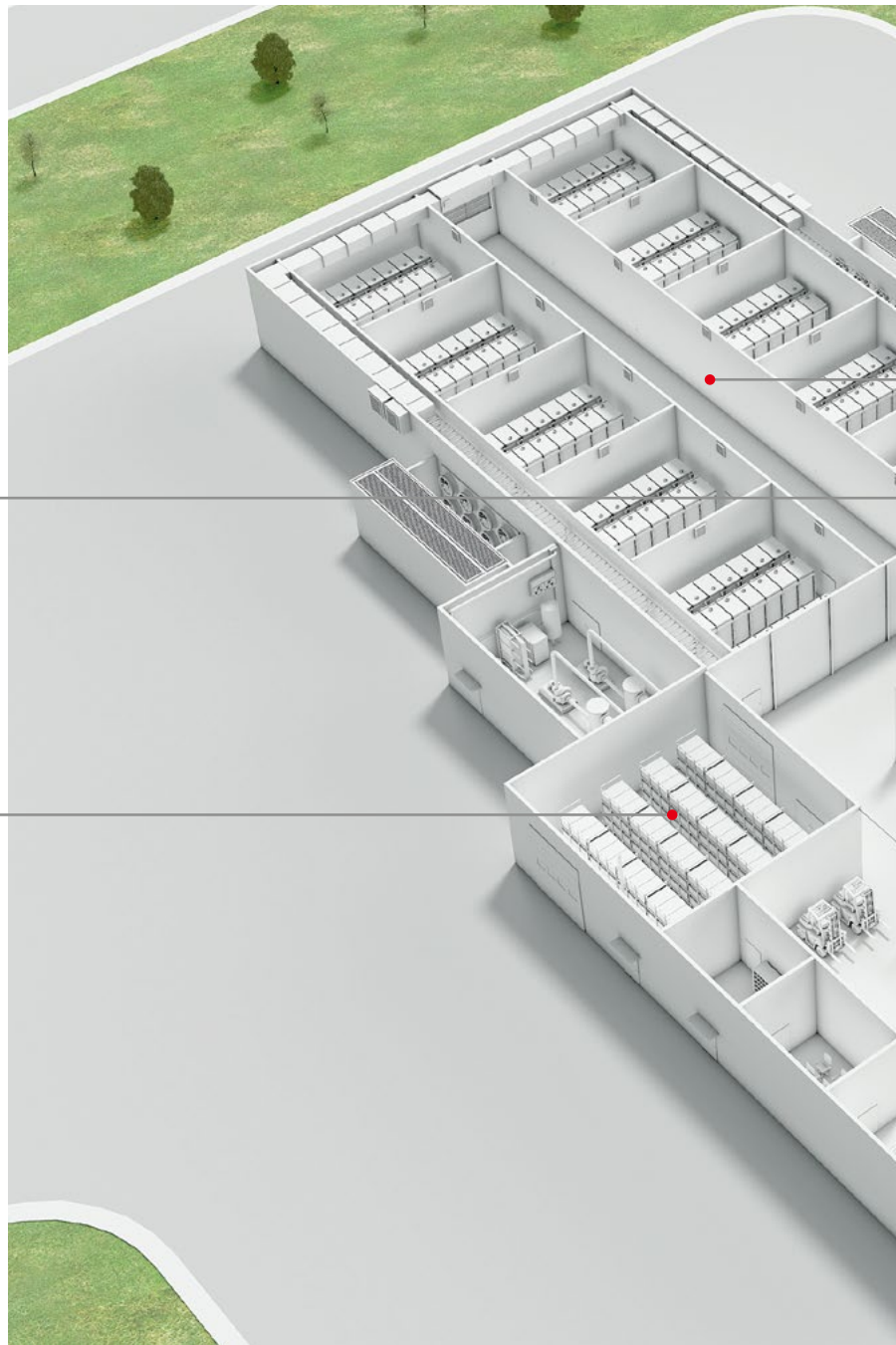
- Fans
- Pumps
- Feed kitchen mixers
- Fermentation mixers
- PD and centrifugal pumps
- Silos to store liquid organic material

## 2 EGG COLLECTION

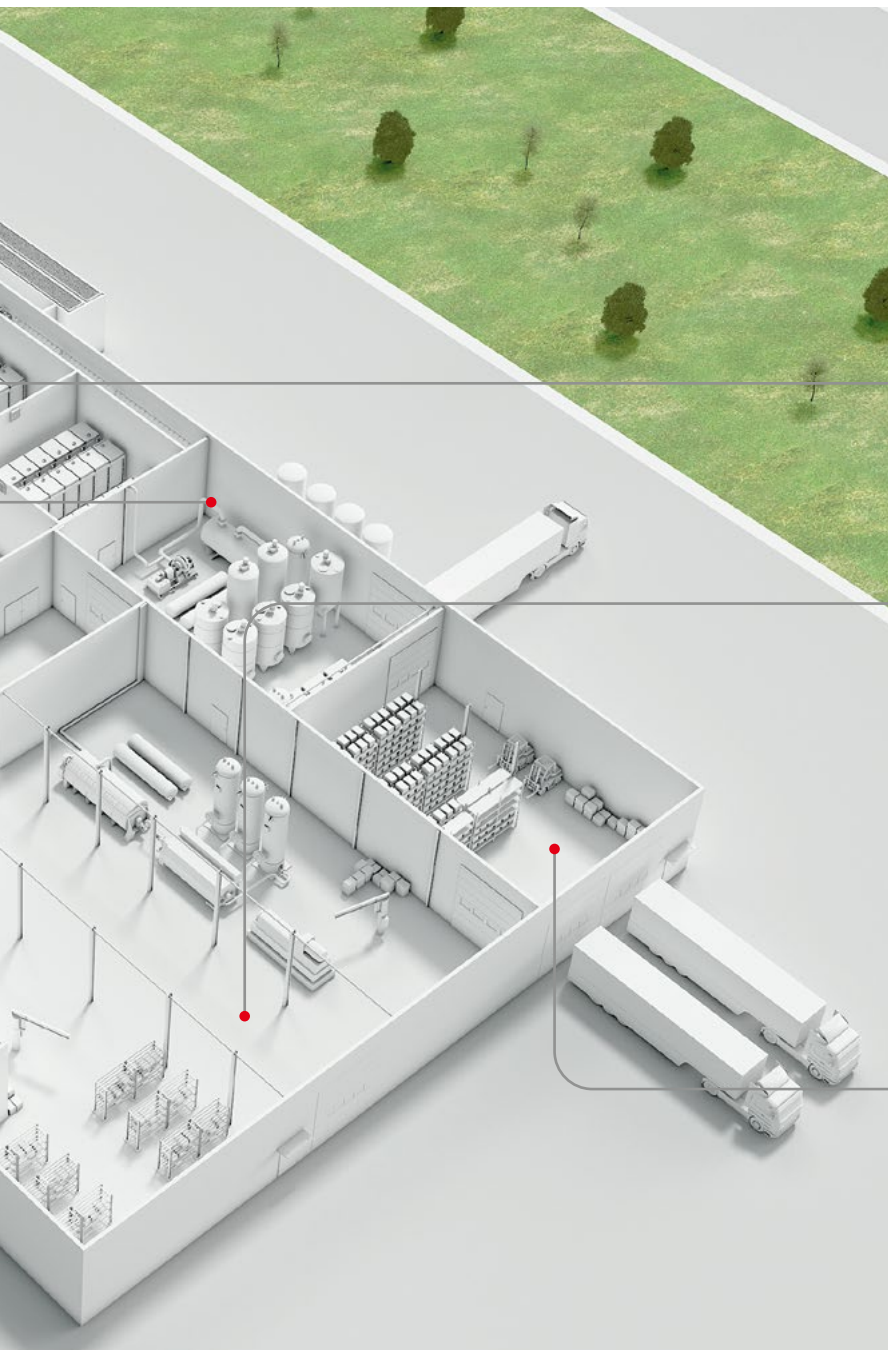
Adult flies will live 7 to 14 days, but their eggs will continue to grow, making them one of the fastest sources of protein available. Eggs are collected to be utilized in protein harvesting, requiring very sophisticated ventilation systems to manage insect populations and optimize growth cycles.

### Applications:

- Fans
- Pumps







### 3 REARING ROOM / GROWTH CHAMBERS

Eggs are distributed into growing containers and feed is introduced to ensure growth. It is vital to ensure that temperature and humidity of air are carefully controlled to provide optimal growth conditions.

#### Applications:

- Fans
- Pumps
- Humidification
- Wet feed conveyors

### 4 PROCESSING

When ready for processing, larvae are transported to the processing facility on-site. Centrifuges break down deceased larvae and separate them into their constituent parts of fat, protein and fibre

#### Applications:

- Fans
- Pumps
- Grinders/Pressers
- Residue mixers
- Decanters
- Pellet extruders

### 5 STORAGE & LOGISTICS

All processing will typically take place on-site, due to the risk of environmental hazard from transporting live insects. Once processed, the end products may require cold storage

#### Applications:

- Dryers
- Conveyors
- Compressors

# Specific solutions for air treatment

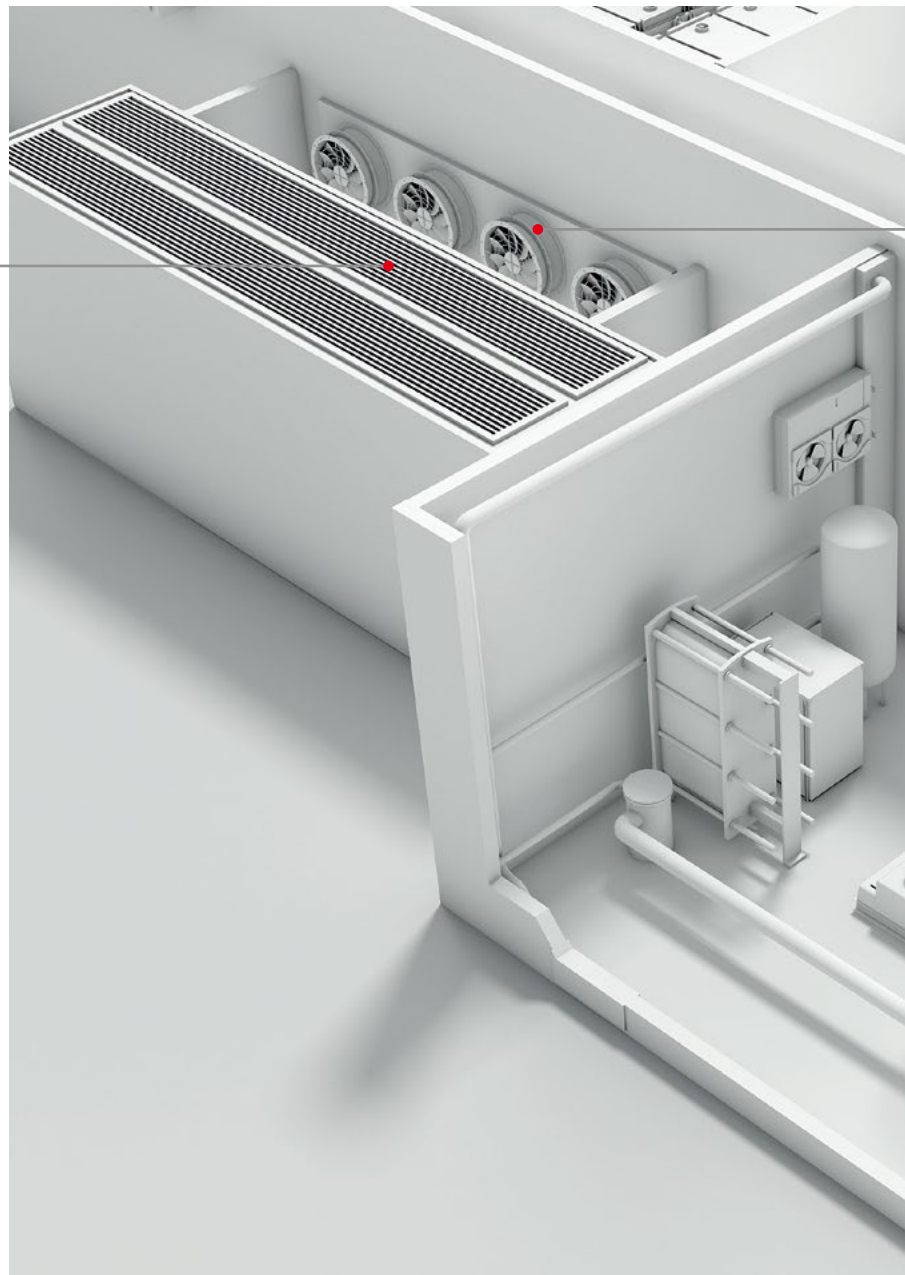
Insects such as the black soldier fly require highly specific conditions to encourage optimal growth. This necessitates innovative airflow solutions to both control insects and ensure their health.

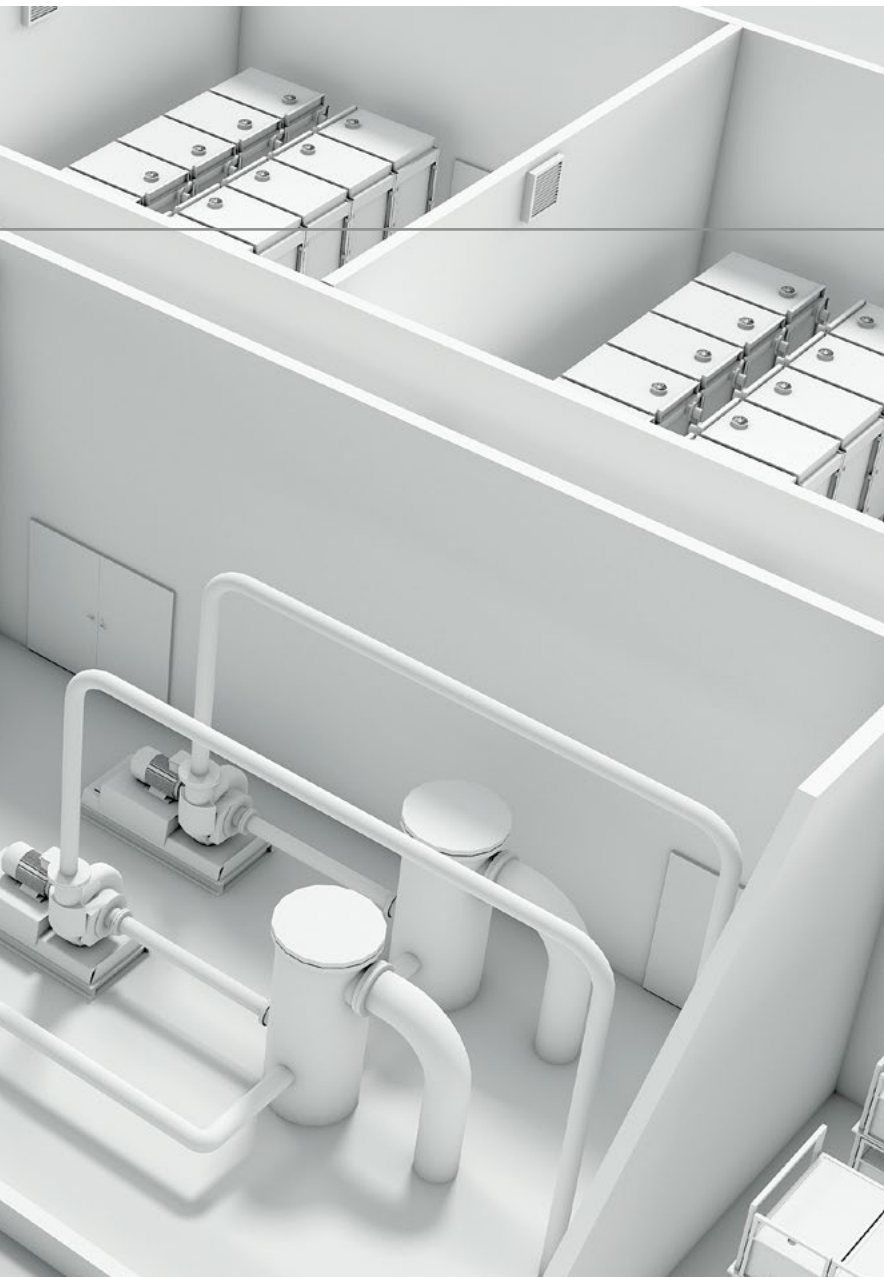
## 1 AIR SCRUBBING

Air scrubbing is vital in the cultivation of insects. Larvae produce large amounts of ammonia, and so dirty air must be removed from the process and replaced by fresh air, while dirty air must be cleaned of ammonia and dust to prevent pollution. Heat can be recovered from recycled air to ensure maximum efficiency.

### Applications:

- Fans
- Pumps
- Compressors





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**AIR VENTILATION**

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Ventilation is used not only to sustain insects, but to control them. At all times, temperature and humidity must be carefully controlled to create optimal conditions for growth, while air quality must also be controlled to remove ammonia created by natural processes. Because growth is often very fast, large amounts of oxygen are required to sustain the metabolism of developing insects.

**Applications:**

- Fans
  - Pumps
  - Compressors
-








# Maximizing application potential throughout alternative protein production

Alternative protein is not like most other forms of farming; processing is often done on-site, meaning that all equipment for breeding and processing must be in one place. As such, variable speed drives / variable frequency drives, motors and PLC can offer benefits across a vast spectrum of applications.

	Challenge	Solution	Benefit
 <b>Fans</b> <ul style="list-style-type: none"> <li>• Circulation fans</li> <li>• Exhaust fans</li> <li>• Protein lipids storage fans</li> </ul>	<ul style="list-style-type: none"> <li>• High temperature and high humidity air contains high enthalpy, so energy must be used intelligently and conserved where possible</li> </ul>	<ul style="list-style-type: none"> <li>• Applying VSDs / VFDs and high efficiency motors to fans will result in optimum usage against best lowest energy cost</li> </ul>	<ul style="list-style-type: none"> <li>• Precise control of airflow results in lower electricity consumption, and reduced water and heating requirements</li> </ul>
	<ul style="list-style-type: none"> <li>• High pressure fans needed to push air through scrubbers consume large amounts of energy</li> </ul>	<ul style="list-style-type: none"> <li>• High efficient motors and integrated pressure control using VSDs / VFDs</li> </ul>	<ul style="list-style-type: none"> <li>• Keeps energy costs low</li> </ul>
	<ul style="list-style-type: none"> <li>• Temperatures and heating must be constantly controlled, while making optimum use of cooling capacity</li> </ul>	<ul style="list-style-type: none"> <li>• High efficient motors and integrated pressure control using VSDs / VFDs</li> </ul>	<ul style="list-style-type: none"> <li>• Keeps energy costs low</li> </ul>
 <b>Pumps</b> <ul style="list-style-type: none"> <li>• Heating pumps</li> <li>• Air scrubber pumps</li> <li>• Heat recovery pumps</li> <li>• Wet feed positive displacement (PD) pumps</li> <li>• Protein lipids storage pumps</li> <li>• High pressure pumps for sprinkler evaporation</li> </ul>	<ul style="list-style-type: none"> <li>• Low temperature heating systems require high capacity pumps that need to be reliable and energy efficient</li> </ul>	<ul style="list-style-type: none"> <li>• Applying VSDs / VFDs and high efficient motors</li> </ul>	<ul style="list-style-type: none"> <li>• Ensures optimal production temperature</li> </ul>
	<ul style="list-style-type: none"> <li>• Water levels can vary, and pumps may cavitate when levels are too low</li> </ul>	<ul style="list-style-type: none"> <li>• Load monitoring and anti-cavitation features in VSD / VFD</li> </ul>	<ul style="list-style-type: none"> <li>• Fewer components, easier operation, and longer pump lifetime</li> </ul>
	<ul style="list-style-type: none"> <li>• Water from air scrubbers can be dirty, so pumps and filters require constant monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Delta P and pump curve measuring indicate filters require cleaning, and prevent cavitation due to low level reservoir</li> </ul>	
	<ul style="list-style-type: none"> <li>• Energy recovered from exhaust air needs reuse on required temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Applying VSDs / VFDs and high efficient motors and PLC</li> </ul>	<ul style="list-style-type: none"> <li>• Energy savings and reduced energy requirements</li> </ul>
	<ul style="list-style-type: none"> <li>• Positive displacement pumps need maintenance, while starting torque can be high</li> </ul>	<ul style="list-style-type: none"> <li>• Slow start and improved starting torque by drives</li> </ul>	<ul style="list-style-type: none"> <li>• Longer pump lifetime and lower maintenance costs</li> </ul>
	<ul style="list-style-type: none"> <li>• Cavitation is a major problem when pumping protein from and to storage tanks. It can easily destroy vital equipment and impact food product quality</li> </ul>	<ul style="list-style-type: none"> <li>• VSDs / VFDs offer dedicated anti-cavitation functionality to detect the likelihood of cavitation and prevent it before it occurs, reducing damage to pumps, pipes and valves</li> </ul>	<ul style="list-style-type: none"> <li>• Longer pump lifetime and lower maintenance costs</li> </ul>
 <b>Mixers</b> <ul style="list-style-type: none"> <li>• Feed kitchen mixer</li> <li>• Fermentation mixers</li> <li>• Residue mixers</li> </ul>	<ul style="list-style-type: none"> <li>• Precision control is required to ensure the right mix is reached for different types of product. Any mistakes can result in unusable product</li> </ul>	<ul style="list-style-type: none"> <li>• Precision motor control in drives provides accurate speed control of feeders and mixers that can adapt to the mixing load</li> </ul>	<ul style="list-style-type: none"> <li>• Better and more consistent product quality</li> </ul>
	<ul style="list-style-type: none"> <li>• Fermentation mixers are vital for feed production to ensure optimal feed conversion</li> </ul>	<ul style="list-style-type: none"> <li>• Drives optimize production speed</li> </ul>	<ul style="list-style-type: none"> <li>• Improved process uptime</li> </ul>
	<ul style="list-style-type: none"> <li>• Residue is a high value product if mixed and kept in the right mixture</li> </ul>	<ul style="list-style-type: none"> <li>• Drives optimize production speed</li> </ul>	<ul style="list-style-type: none"> <li>• Process uptime and quality</li> </ul>





	Challenge	Solution	Benefit
 <b>Conveyors</b> • Dry feed conveyor (auger)	<ul style="list-style-type: none"> <li>• Frequent starts and stops will cause premature wear of long augers</li> </ul>	<ul style="list-style-type: none"> <li>• Soft start/stop and speed control by drives</li> </ul>	<ul style="list-style-type: none"> <li>• Significantly improved conveyor lifetime with lower maintenance requirements</li> </ul>
 <b>Crushers</b> • Residue crusher	<ul style="list-style-type: none"> <li>• Crushers are very sensitive for mechanical overload</li> </ul>	<ul style="list-style-type: none"> <li>• Drives can control the feeding conveyor while monitoring and optimizing the main motor load</li> </ul>	<ul style="list-style-type: none"> <li>• More efficient and effective crushing process and less maintenance costs</li> </ul>
 <b>Pelleting</b> • Residue pellet press	<ul style="list-style-type: none"> <li>• Pellet press needs accurately controlled supply, and is sensitive to vibrations, while also being large energy consumers</li> </ul>	<ul style="list-style-type: none"> <li>• VSDs / VFDs with high efficient motors reduce energy consumption</li> <li>• PLC and drive can control feeding conveyor to improve pellet press results</li> </ul>	<ul style="list-style-type: none"> <li>• Improved end product quality with less maintenance and lower energy usage</li> </ul>
 <b>Siever</b> • Internal transport crates/containers	<ul style="list-style-type: none"> <li>• Requires high starting torque that is energy intensive</li> </ul>	<ul style="list-style-type: none"> <li>• VSDs / VFDs with high efficient motors reduce energy consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Improved end product quality with less maintenance and lower energy usage</li> </ul>
 <b>Compressors</b> • Heat pumps	<ul style="list-style-type: none"> <li>• Cooling compressors and heat pumps used at the storage, packaging and logistics phase are one of the single largest energy consumers on-site</li> </ul>	<ul style="list-style-type: none"> <li>• VSDs / VFDs together with high efficiency motors reduce energy consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Lower energy costs and more stable temperature control</li> </ul>
	<ul style="list-style-type: none"> <li>• Compressors require utmost reliability due to their criticality</li> </ul>	<ul style="list-style-type: none"> <li>• Drives make throttling valves obsolete, ensuring cooling media (water, glycol) temperatures are maintained at correct levels at all times</li> </ul>	<ul style="list-style-type: none"> <li>• Improved product quality</li> </ul>
 <b>Grinding press</b>	<ul style="list-style-type: none"> <li>• High starting torque</li> <li>• Easy overload</li> </ul>	<ul style="list-style-type: none"> <li>• Drives offer integrated safety functionality</li> <li>• Precise main motor load monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Safer operation</li> <li>• Effective end efficient use of machinery</li> </ul>
 <b>Separators</b> • Decanters • Centrifuges	<ul style="list-style-type: none"> <li>• Separation can be an energy-intensive process</li> </ul>	<ul style="list-style-type: none"> <li>• Drives reduce energy usage by reusing brake energy to main motor or regenerative into mains</li> </ul>	<ul style="list-style-type: none"> <li>• Lower energy bills</li> </ul>
	<ul style="list-style-type: none"> <li>• Centrifuges can vibrate when in operation</li> </ul>	<ul style="list-style-type: none"> <li>• Drives and PLCs control the speed of centrifuge optimally to eliminate vibration, while overcoming long starting times and high starting torque</li> </ul>	<ul style="list-style-type: none"> <li>• Better end product quality</li> <li>• Longer equipment lifetime</li> </ul>

# Features and functions benefit alternative protein producers

Drives, motors and PLCs all play a vital part in keeping protein production moving. Choosing the right products and features for the right environment is essential in ensuring an optimized production.



## Variable speed drives / variable frequency drives

### Anti-cavitation software

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

### Energy efficiency

- Control operating costs by seeing energy costs in local currency, kWh, and CO<sub>2</sub> emissions

### Fieldbus compatible

- Get detailed insight into productivity performance and quality control through fieldbus comms connecting drives with plant monitoring systems

### Flying start

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

### 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 and animal welfare with lower motor noise through adaptive switching frequency control

### Repeatability

- Accurately adjust conveyor speed to suit different products



### Ingress protection

- IP55 / IP66 for washdown zones

### Protection

- Temperature, load, under/overvoltage protection, and warning features within drives help anticipate breakdowns

### Multiple I/Os

- Provide a variety of process information from the drives to motor control

### Mains imbalance outage de-rate

- Should one main phase fail or out of balance, the drives reduces speed to 80 percent, giving a 50 percent load to the drive to keep it running. Improves motor reliability

### Bypass function

- Although seldom used, enables load to be connected directly to the mains

### Temperature de-rate

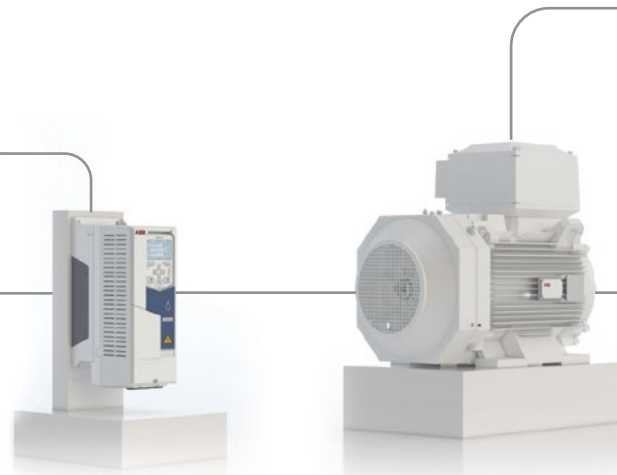
- If drive becomes too hot it will reduce its switching frequency to produce less heat but will not stop running

### C4 conformal coating

- Protects sensitive electronics against ammonia and other aggressive gases

### Condition monitoring

- Supervising features to avoid unwanted downtime





## Low voltage motors

- Robust construction for harsh environments
- Bearing locked at D-end to avoid axial play
- Bearings can be sealed or regreasable
- 60 Hz and 50 Hz designs are available in IEC and NEMA frames
- Fan and motor fins optimized for low noise levels
- Oversized terminal box fitted as standard for ease of installation
- IP55 protection against ingress of water or solids with higher ratings as options. IP56 protection available as option
- Surface treatment (polyurethane or epoxy) in accordance with corrosion class C3, with C4 and C5 as an option
- IE3, IE4 or ultra-premium IE5 efficiency offering to support emissions reduction
- Suitable for VSD/ VFD operation



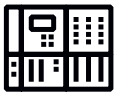
## Drive and motor packages

### High efficiency motor and drive (SynRM/ EC Titanium)

- Save energy across all applications with IE5 ultra-premium efficiency motors and drive packages

### 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



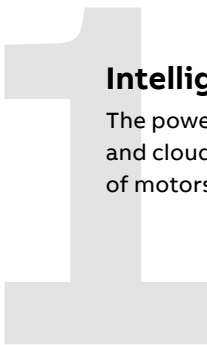
## Programmable logic controllers (PLCs)

- Comprehensive range of scalable PLCs, I/Os and robust HMI control panels delivering performance, quality and reliability
- One integrated engineering tool for programming, simulation and commissioning for PLCs, safety, drives, control panels and network
- Flexible choice of network and fieldbuses to integrate I/O's, drives, HMI, SCADA and 3rd party devices fulfilling the needs of tomorrow
- IIoT gateway functionality onboard the PLCs and control panels offer secure connection to cloud



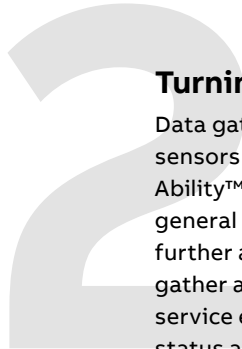
# From the factory floor to the cloud and beyond

ABB Ability™ Condition Monitoring for powertrains optimizes the performance and efficiency of electric motor-driven rotating equipment. It enables better decision making by providing real-time access to data on all parameters for drives, motors and general machinery.



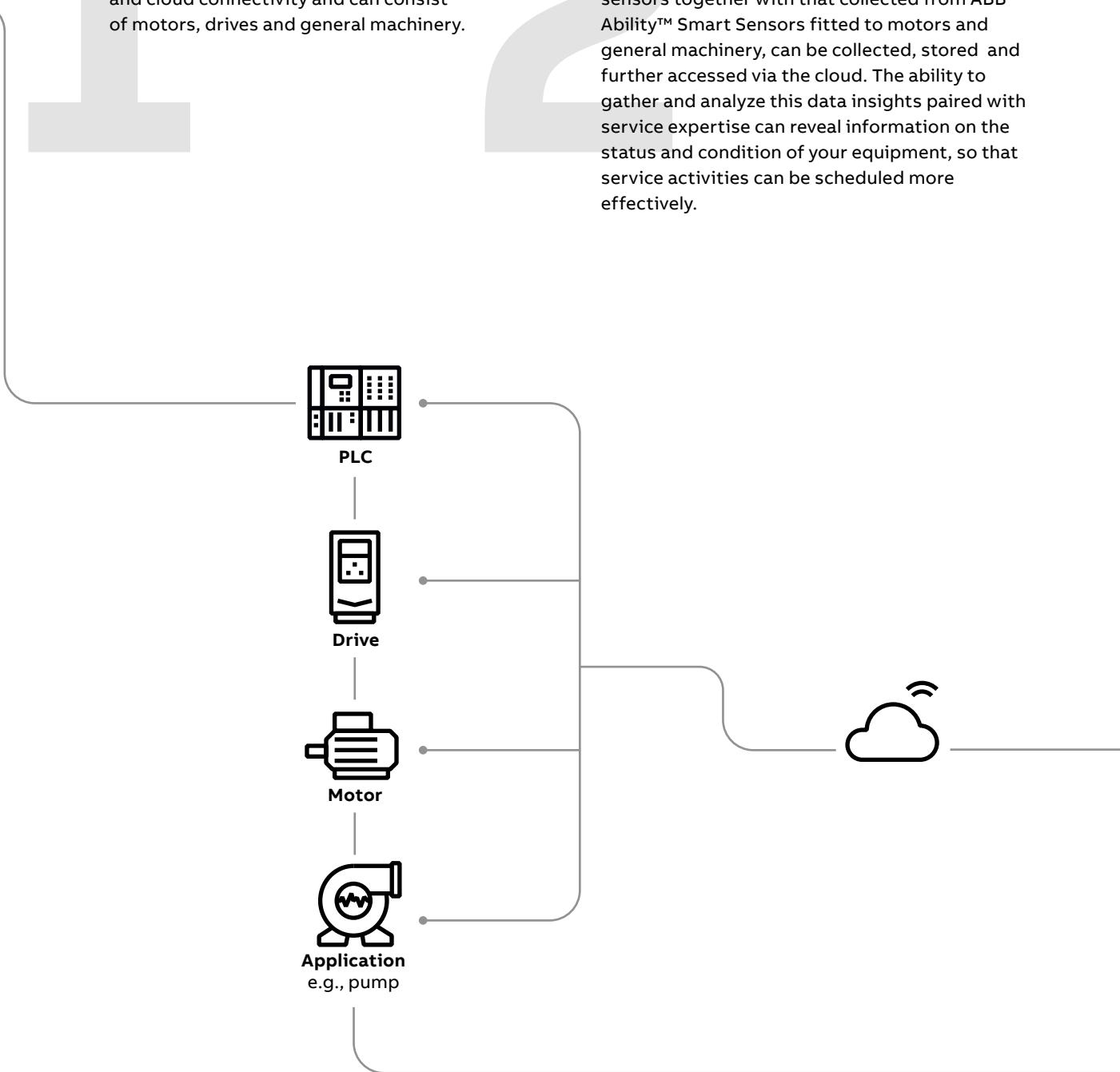
## Intelligent powertrain

The powertrain is equipped with sensors and cloud connectivity and can consist of motors, drives and general machinery.



## Turning data into valuable insights

Data gathered through VSDs/VFDs and PLCs via sensors together with that collected from ABB Ability™ Smart Sensors fitted to motors and general machinery, can be collected, stored and further accessed via the cloud. The ability to gather and analyze this data insights paired with service expertise can reveal information on the status and condition of your equipment, so that service activities can be scheduled more effectively.





### 3 Accessing data for analytics

Detailed information can be extracted into a company's portal and systems. Information on many aspects of the industry 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

While the data is always at your disposal, ABB service experts can work with you to provide help on how you analyze the data and define the steps for improving your operations.

Alternatively, you can outsource the monitoring to ABB experts. They will proactively track the performance of your assets, provide regular reports, trigger early warnings and highlight areas for improvement.

Ensuring that the right person is exposed to the right information at the right time brings:

- Appropriate response to production challenges, lowering operating costs and product waste.
- Greater insight into various aspects of the industry 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.

**Facility operator**



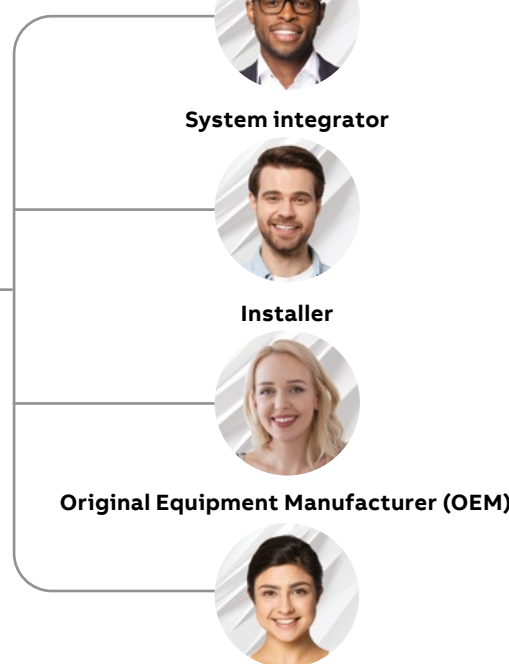
**System integrator**



**Installer**



**Original Equipment Manufacturer (OEM)**



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# Our service expertise, your advantage

ABB Motion Services helps customers around the globe by maximizing uptime, extending product life cycle, and enhancing the performance and energy efficiency of electrical motion solutions. We enable innovation and success through digitalization by securely connecting and monitoring our customers' motors and drives, increasing operational uptime, and improving efficiency. We make the difference for our customers and partners every day by keeping their operations running profitably, safely and reliably.

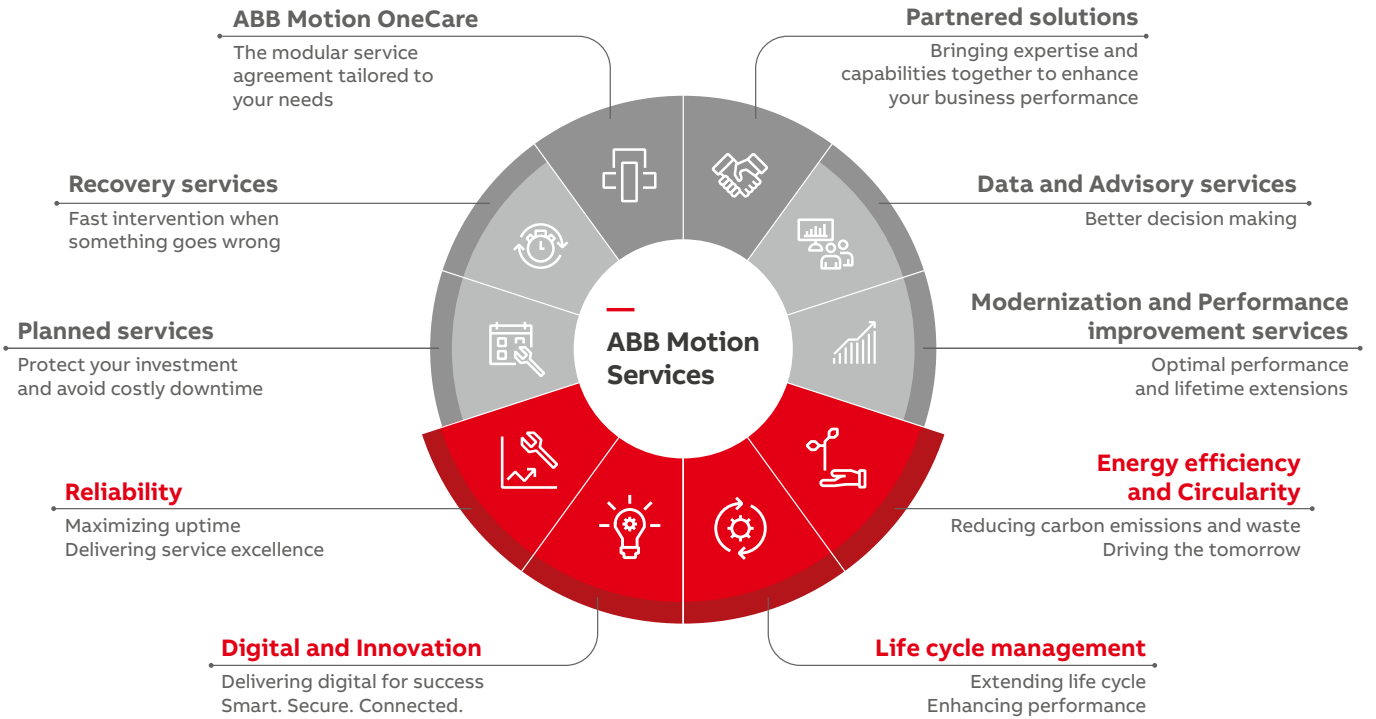
With a service offering tailored to your needs, ABB Motion Services maximizes the uptime and extends the life cycle of your electrical motion solutions, while optimizing their performance and maximizing your energy efficiency gains throughout the entire lifetime of your applications. We help to keep your applications turning profitably, safely, and reliably.

Digitalization enables new smart and secured ways to prevent unexpected downtime while optimizing the operation and maintenance of your assets. We securely connect and monitor your motors, drives or your entire powertrain to our easy to use cloud service solutions. Connecting your applications also gives you access to our in-depth service domain expertise.

We quickly respond to your service needs. Together with our partners, local field service experts, and service workshop networks, we provide and install original spare parts to help resolve any issues and minimize the impact of unexpected disruptions.

Our tailored to your needs service offerings and digital solutions will enable you to unlock new possibilities. Not only are we your premier supplier of motion equipment, we are your trusted partner and advisor offering support throughout the entire life cycle of your assets. We ensure your operations run profitably, safely and reliably and continue to drive real world results, now and in the future. Our service teams work with you, delivering the expertise needed to keep your world turning while saving energy every day.





**OUR EXPERTISE**  
**YOUR ADVANTAGE**



# With you, wherever you are in the world

Partnering with ABB, gives you access to some of the world’s most innovative technology, legacy of expertise and solutions.

### 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 alternative protein producers to develop custom products, services and solutions to help standardize processes across multiple sites and streamline your supply chain.

We have several global R&D centers with thousands of technologists and considerable investments annually on innovation.

### End-to-end product portfolio

Alongside its variable speed drives (VSDs)/ variable frequency drives (VFDs), motors and soft starters, 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 in drives 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 materials 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

[new.abb.com/drives](https://new.abb.com/drives)

[new.abb.com/drives/segments/food-and-beverage](https://new.abb.com/drives/segments/food-and-beverage)

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