

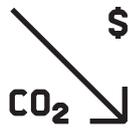


MOTION

Food retail stores

Reliable and efficient refrigeration for product freshness and business profitability

Improving food retail store performance



Store manager/owner



“To make a store function as intended and reduce product waste, while making shoppers happy

and the business profitable, it is critical to invest wisely in HVACR.”

Smart food stores demand a proper food-safe environment...

- As margins in the business are often in the area of only 1 to 3%, food should stay fresh and safe a long time, to reduce costly waste and avoid fines from regulatory bodies.
- Smart stores should react rapidly to changing conditions, while running their systems in an optimal manner.

... at optimized costs...

- High capital costs deter potential investors, while high operating costs make the business less profitable.
- Refrigeration systems are the biggest energy users in food stores, accounting for up to 50% of the total energy use.

... ensured by innovative control solutions

- Modern HVACR control solutions for stores, particularly digitally enabled variable speed drives (VSDs), can significantly cut both capital and operating costs.
- VSDs for HVACR ensure more optimal control of the store environment to make products last longer, while reducing energy use by 20 to 60%.
- Advanced IE5 synchronous reluctance motors (SynRM) offer about 40% less energy losses compared to IE3 induction motors.
- Return on investment can be improved with ultra-low harmonic HVACR drives, since they ensure power network stability for store operation continuity, while reducing the size of power network components.
- Digitalization improves environment control in different store zones further and prevents costly breaks.
- Energy Efficiency appraisals on-site by ABB experts help identify further possibilities for improvement.
- Remote ABB Ability™ Condition Monitoring enables targeted maintenance when needed, eliminating the need for regular inspections.

Consultant



“We design and verify systems that ensure a food-safe environment 24/7, in compliance

with stringent industry standards.”

Meet strict requirements for food stores...

- Food store HVACR must precisely maintain air exchange, temperature and humidity in different store climate zones for keeping various types of food safe and fresh, and prevent spoiling, shrinking and molding.
- Contamination- and bacteria-free air is ensured by proper filtering – filters should be cleaned/exchanged regularly.
- Power quality might affect the reliability of a store’s electrical network and HVACR processes as a result.
- Supermarkets use five times more energy per square meter than other commercial buildings like offices and leave a massive carbon footprint due to intensive cooling and refrigerant leaks. Changing to refrigerants with a lower global warming potential helps, but sustainability goals are only achieved when focus also includes energy efficiency of HVACR.
- Safety of shoppers in case of fire emergency in big stores should also not be overlooked.

... by utilizing best-in-class technologies

- VSDs accurately control HVACR processes to match stringent food safety needs.
- Drives can alert about clogged filters or leakage in HVACR systems.
- VSD-based override mode helps reduce smoke spread while ensuring safe evacuation from the store.
- HVACR VSD compliance with EMC standards and proper installation practices eliminate radio-frequency interference with other equipment in the store.
- Ultra-low harmonic drives prevent disturbances in the power supply, also ensuring smooth backup generator operation.
- SynRM motors offer increased HVACR reliability thanks to lower winding and bearing temperatures.
- Use of drives and efficient IE5 motor technologies brings substantial energy savings.

Modern food retail stores require smart heating, ventilation, air conditioning and refrigeration (HVACR) systems that create proper environments for keeping food fresh, while minimizing energy consumption and making their business more profitable.



System integrator



“Component compatibility with common standards and interfaces ensures smooth integration into

a supermarket management system.”

From easy connection and integration...

- Connecting and integrating components into food retail HVACR systems should be straightforward.
- Digital capabilities of system components are a must for running smart store management systems.

... to high interoperability...

- Efficient retail building management requires detailed access to operational data and fault logs.
- Smart stores demand transparency, that can be ensured by digitalizing and interlinking all systems and their components.

... using world leading protocols and standards

- Support of all major communication protocols, such as BACnet, LonWorks and Modbus, easily integrates the VSD into a store building management system to facilitate central control.
- Drive-based Bluetooth and 5G connectivity enables remote commissioning, monitoring, and troubleshooting.

Technician



“Maximum uptime of my supermarket’s refrigeration systems is of the utmost importance.”

Eliminate interruptions and malfunctioning of food store HVACR...

- HVACR in retail stores requires regular maintenance to avoid emergency breakdowns.
- Service offering by HVACR solutions and component suppliers should be able to guarantee its 24/7 operation and rapid response in case of failure.

... via advanced functionality and services

- Protection features within VSDs help prevent failures in store HVACR system control.
- Drive-based load curve monitoring warns about upcoming fan, pump or compressor failures.
- VSD use in HVACR eliminates both mechanical and electrical shocks, providing smooth control for pumps, fans and compressors, thus extending their lifetime.
- Resonance control in drives running compressors prevents mechanical equipment damage.
- Drive-based real-time recording of trips and faults assists with root cause identification.
- VSD’ safe-torque-off allows safe conduct of maintenance on mechanical parts of equipment, without shutting down the whole system.
- Drives can be installed both inside and outside the air handlers, for the best serviceability.
- VSD’s wireless connectivity allows remote access to hard-to-reach equipment.
- Fast remote support possible through ABB Ability™ Mobile Connect service in Drivetune app.

Demands on food store HVACR systems

An HVACR system must ensure certain thermal, humidity and air exchange requirements depending on the store department.



1 COLD AND FREEZING ROOMS

The temperature range in freezing rooms is often between -15 to -22 °C, while the temperature range in cold rooms is adjustable between 0 to 15 °C. The rooms are intended for storing large volumes of products in big stores.

Applications:

- Compressors, evaporators and condensers, fans, pumps

Requirements:

- Maintaining required space temperature and humidity
- Cooling compressor, pump and fan speed control for efficient energy use
- Refrigeration process continuity and stability to avoid massive product waste

2 FRESH MEAT AND SEAFOOD

The ideal temperature for storage is just above 0 °C, as crystals cannot be allowed to form. As storage temperatures approach 4 °C, perishability increases. Rapid growth of bacteria begins at about 10 °C. Fresh meat and seafood are typically placed in serve-over counters.

Applications:

- Evaporator, fans, compressor, condenser

Requirements:

- Cooling compressor and fan speed control for efficient energy use and temperature stability

3 DAIRY

For optimal quality and safety, dairy products should be stored at refrigerated temperatures below 4 °C.

Applications:

- Evaporator, air curtains (fan), compressor, condenser

Requirements:

- Cooling compressor and fan speed control for efficient energy use and temperature stability

4 ENTRANCE AND COMMON AREAS

HVACR in the lobby area is supposed to ensure the comfort of shoppers while keeping the environment healthy and safe. Air curtains at the entrance create a barrier between the indoor and outdoor air, so the conditioned indoor air will not leave the store, while too hot or too cold air, as well as dust, dirt or insects, will not come into the store from outside.

Applications:

- Air curtains, air handlers, smoke extraction and pressurization fans

Requirements:

- High air exchange rate to prevent the spread of diseases; comfortable temperature
- Pressurization in case of fire to protect evacuation routes
- Smoke extraction in case of fire



5

FRESH PRODUCE SECTION

Includes farm produced crops like fresh fruits and vegetables that haven't been further processed. Requiring temperatures below 12 °C and high relative humidity (up to 95%) to slow metabolic rates and transpiration to retain a healthy amount of water weight to stay fresh longer. Placed on refrigerated displays.

Applications:

- Evaporator, air curtains (fan), compressor, condenser, humidifier, adiabatic spray cooling

Requirements:

- Maintaining required temperature and humidity
- Cooling compressor, pump and fan speed control for efficient energy use

6

BAKERY

Odors and heat from baking generated in the zone need to be extracted from the store building.

Applications:

- Exhaust fans, filter units, heat pumps

Requirements:

- High air exchange rate to prevent the spread of odors and heat to other store sectors
- Heat regeneration for space/domestic water heating, to improve efficiency of on-site heat generation

Unlock greater potential for cost and efficiency gains in your store's HVACR systems

Application	Challenge	Solution	Benefit
 Compressors	High energy use	<ul style="list-style-type: none"> High efficiency IE5 motors offering up to 40% less losses compared to IE3 motors Drives adjust compressor speed to retail needs VSD-based multi-compressor control to ensure optimal system efficiency 	<ul style="list-style-type: none"> Energy savings of 25-30% in retail store refrigeration
	Too high or too low pressure	<ul style="list-style-type: none"> VSD-based pressure control can warn about abnormal values or even stop the operation, if needed 	<ul style="list-style-type: none"> Operational safety
	Resonance	<ul style="list-style-type: none"> VSD-based resonance control allows skipping of resonant frequencies 	<ul style="list-style-type: none"> Quiet environment and no equipment damage due to vibrations
	Wear and tear	<ul style="list-style-type: none"> VSDs minimize the number of starts and stops VSDs prevent mechanical shocks and high starting currents thanks to smooth starts and stops 	<ul style="list-style-type: none"> Longer machine lifetime
	High starting torque	<ul style="list-style-type: none"> VSDs allow 50% overload for 1 minute every 10 minutes 	<ul style="list-style-type: none"> Smaller drives can be used
	Electrical harmonics in the network	<ul style="list-style-type: none"> ULH drives reduce harmonics content in the network to a minimum of 3% THDi 	<ul style="list-style-type: none"> Network stability and elimination of costly active harmonic filters No interruptions in cooling due to power quality issues No fines from the utility
 Air handling units / fan coils	Pressure drop over filters	<ul style="list-style-type: none"> Traditional fans with non-integrated controls (standalone drives) create sufficient pressure to overcome filtering while some integrated motor drive fans (EC) can provide only limited pressure 	<ul style="list-style-type: none"> No need for filtering units with extra fans to overcome pressure More compact AHU design
	Clogged filter	<ul style="list-style-type: none"> Drives can alarm about clogged filters when drawn current starts being higher than normal 	<ul style="list-style-type: none"> No need for additional pressure sensors
	Air handler uptime	<ul style="list-style-type: none"> VSD-based overcurrent, overvoltage, motor overheating, under/overload safeties Less mechanical and electrical stress with VSD control vs. direct-on-line start Smart sensors collect information on fan performance, enabling predictive maintenance 	<ul style="list-style-type: none"> Air conditioning runs continuously
	Air quality	<ul style="list-style-type: none"> VSD manages temperature, humidity and air exchange by adjusting fan speed, humidification and circulation in heating/cooling coil 	<ul style="list-style-type: none"> Healthy and comfortable environment for personnel and shoppers, preserved products
	High energy use	<ul style="list-style-type: none"> VSDs adjust fan speed to the supermarket needs Motors with IE5 efficiency Filter monitoring via the VSD, alarming if the filter is clogged and the pressure drop is too high 	<ul style="list-style-type: none"> 20 to 60% energy savings with VSDs vs. damper/valve control Up to 10% higher efficiency at partial loads with ABB IE5 SynRM Cleaning a dirty filter can lower air conditioning energy use by 5% to 15%
	Control redundancy	<ul style="list-style-type: none"> In case of external communication loss, VSDs can take over the control 	<ul style="list-style-type: none"> Air conditioning will run in a preset local control mode, until the external communication is recovered
	Automation system complexity	<ul style="list-style-type: none"> VSD-based control capabilities, for local control and to extend external controller tasks Fieldbuses in VSD eliminate external gateways 	<ul style="list-style-type: none"> Decreased infrastructure complexity and costs, lower risk for errors
	Fire emergency	<ul style="list-style-type: none"> VSD-based fireman's override makes regular ventilation fans a part of a fire suppression system – shuts them down, or turns them into smoke exhaust or pressurization units to maintain safe escape routes 	<ul style="list-style-type: none"> Safe evacuation for people No undesired tripping of drives in extreme conditions Flexible fire suppression strategy

Motors equipped with variable speed drives and controllers that run heating, ventilation, air conditioning and refrigeration applications contribute to creating a proper food retail environment. This ensures both superior product shelf life, while also making the shopping comfortable. But there are other important and profitable benefits to be gained as well.

Application	Challenge	Solution	Benefit
 Cooling tower or condenser fans	Gearbox failure, oil leak, misaligned drive shafts, vibrations	<ul style="list-style-type: none"> ABB provides a direct drive motor and VSD package for cooling towers, eliminating the need for a gearbox and associated components 	<ul style="list-style-type: none"> Reduced maintenance time and cost Longer life as motors have up to five times the life expectancy of gearboxes Fast installation Reduced noise
	Energy efficiency	<ul style="list-style-type: none"> VSDs adjust fan speed to reach the required condenser water return temperature 	<ul style="list-style-type: none"> Energy savings
 Smoke exhaust fans	Availability	<ul style="list-style-type: none"> VSDs allow fans to start without power system overload VSD-based motor phase loss monitoring VSD-based derate functionality in case of input phase loss 	<ul style="list-style-type: none"> Smoke extraction system is always available Safety of personnel and customers
	High temperatures	<ul style="list-style-type: none"> VSDs are tested for operating 1 h at 70 °C Smoke extract motors operating at 200 °C / 120 min, 300 °C / 60 min, 400 °C / 120 min, 250 °C / 120 min 	<ul style="list-style-type: none"> Smoke extraction process continuity, even at high temperatures
 Pumps in HVACR and water supply	Energy use	<ul style="list-style-type: none"> VSD adjusts pump speed to retail store needs VSD sleep mode for circulators, to stop the pump during low demand, instead of running it slowly below its efficient operating range 	<ul style="list-style-type: none"> Energy savings
	Pump uptime	<ul style="list-style-type: none"> VSD supervisory functions indicate upcoming mechanical failures or events like a dry pump run Smart sensors measure pump motor health parameters like vibration and temperature Auto-restart after power failure VSD-based duty/standby pump auto changeover for balancing run hours 	<ul style="list-style-type: none"> Process continuity Better maintenance time planning
	Pressure shock	<ul style="list-style-type: none"> Soft pump start and stop thanks to VSD 	<ul style="list-style-type: none"> Pump and piping system longer lifetime and lower maintenance costs
	Pipe leakage	<ul style="list-style-type: none"> Leak monitoring via VSD, which indicates when pressure drops by a set amount, thus sending an alarm 	<ul style="list-style-type: none"> No infrastructure damage and associated costs due to leakage
	Booster set lifetime	<ul style="list-style-type: none"> VSD-based intelligent pump control distributes the pump work hours equally over several pumps 	<ul style="list-style-type: none"> Optimized operation for extended equipment life

01



01 Cold rooms ensure required temperature and humidity regimes to make the products stay fresh longer.

02

02 Refrigeration is the most energy consuming application in food retail so choosing IE5 motors and variable speed drives for compressor speed control allows for tremendous 25 to 30% energy savings.

02



Features and functions that give tangible benefits to HVACR systems in food stores

ABB offers an extensive range of devices for heating, ventilation, air conditioning and refrigeration in food stores, extending from motors and drives to management systems. It's easy to choose the right products and features for your needs, making any store environment healthy, comfortable, safe and energy efficient.



Variable speed drives

EMC

- Compliance with C2 and optionally C1 electromagnetic filtering levels for protection against disturbances

Low harmonics

- Built-in active front end and integrated line filters reduce harmonics in the store network to a minimum, for reliable operation

Built-in redundancy

- Communication loss is handled seamlessly by a VSD taking control until the external communication is restored

Fireman's override mode

- Makes ventilation part of a fire suppression system, protecting people and property
- Disables warnings and faults, allowing the drive to run in adverse conditions

Power-loss ride-through

- Controlled process continuity during short power supply interruptions

Robust design

- High IP protection against humidity and dust
- Compliance with vibration/seismic standards

High reliability

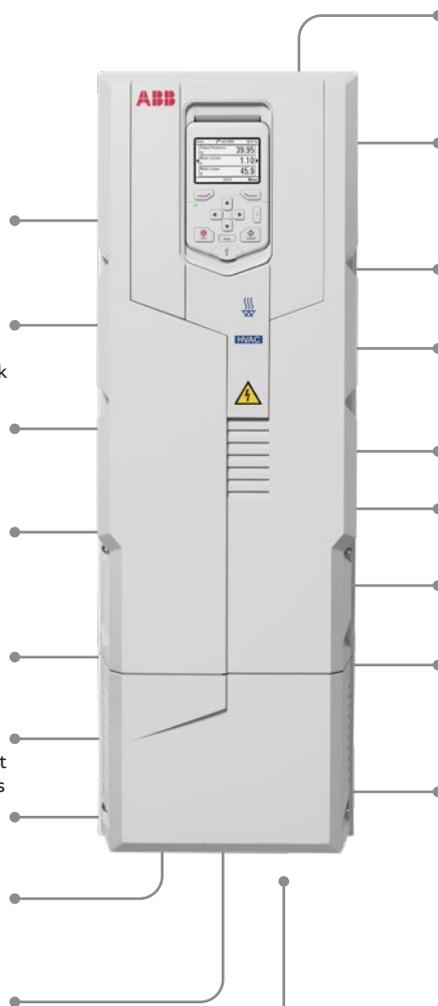
- Factory acceptance testing for every drive unit to ensure impeccable performance

Real-time clock with backup power

- Trips and faults are time stamped, so the technicians know what has happened and when

System efficiency

- VSDs increase HVACR efficiency by adjusting motor speeds to the store needs
- Energy Optimizer feature cuts energy use by reducing magnetic losses in the motor
- Meeting highest efficiency standards of Ecodesign requirements
- ULH drives reduce power system losses, due to almost non-existent harmonics



Built-in PID control

- Precise control of temperature, pressure, humidity, and air exchange rate, without employing external controllers, thus decreasing automation system complexity and costs

Embedded communication

- Control, monitoring and diagnostics through embedded Modbus RTU or BTL-certified BACnet MS/TP, and other optional protocols to eliminate external gateways

Resonance control

- Helps avoid fan, pump or compressor resonance by skipping resonant frequencies

Multi-compressor control

- Ensures optimal system efficiency through starting next compressor in the set when needs exceed the first one controlled by the drive

Reduced number of equipment starts and stops

- Decreased mechanical wear

Air filter monitoring

- Alarms when filters get clogged, via user defined load curve

Leakage monitoring

- Alarms when coolant / water leaks detected in the system

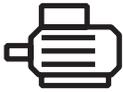
Power/motor cable phase loss

- Handling input phase loss by derating drive capability to make sure it won't trip
- Alarm about motor phase loss during standstill – critical for smoke extraction fans

Wireless connectivity

- Bluetooth and 5G enabled user interface for commissioning from a distance and remote monitoring
- Firsthand technical support via Mobile Connect service through Drivetune app





Motors

High reliability

- Protection against external conditions, with IP55 as standard
- Wide range of surface treatment and corrosion protection solutions
- Protection against bearing currents with an extended portfolio of solutions including insulated bearings and shaft grounding
- Bearings locked at D-end to avoid axial play

Efficiency

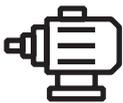
- Up to IE5 efficiency to reduce energy use and improve total cost of ownership

Dust ignition protection

- Prevent dust explosions with certified dust ignition proof motors

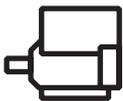
Easy installation

- Oversized terminal box as standard to ease installation
- Flexible cabling solutions
- Various mounting arrangements including direct drive, belt or transmission
- Horizontal and vertical mounting



Smoke extraction rated motors

- Operate reliably even at high temperatures of a fire zone
- Comply with smoke and heat control systems standard EN 12101-3
- Designed for direct-on-line and VSD operation



Integrated motor and drive packages

- IE5 efficiency – highly efficient at full load and partial load conditions
- Integrated design saves control cabinet space and wiring costs
- Tune and control flexibility with multiple options including wired keypads and PC tools as well as Bluetooth communication
- Plug and play concept with the pre-programmed drive only requiring two inputs to run out of the box
- High power density with more power available from the same frame size

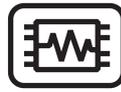


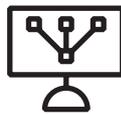
ABB Ability™ Smart Sensors for motors and pumps

Minimized unplanned downtime

- Upcoming failures can be detected well before equipment fails

Reduced maintenance costs

- Eliminate the need for manual motors and pumps check-ups
- By changing from scheduled to condition-based maintenance, service costs can be reduced



Store management solutions

Flexibility, scalability, ease of integration

- BTL-certified BACnet IP and MS/TP controllers for store building mechanical and electrical systems control
- Support for Modbus TCP and Modbus RTU without external gateways
- Replace or extend I/O points easily, according to the needs
- Freely programmable for enhanced store automation performance and reduced time on task
- Support of multi-protocol communications simultaneously
- Future-proof architecture with upgrade paths

Better and more cost-efficient energy use

- Cloud-based energy management can greatly increase a store building's energy efficiency
- Optimize operational costs
- Reduce the store's CO₂ footprint

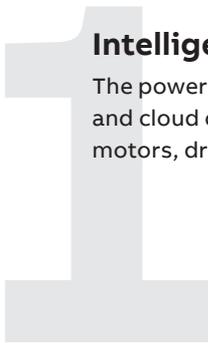
Improved food storing environment

- Embedded schedules and trend logs for tuning the store multi-zone environment
- Onsite user control via touch screen
- Access store controls, anytime, anywhere via web enabled smart devices



From the facility 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.



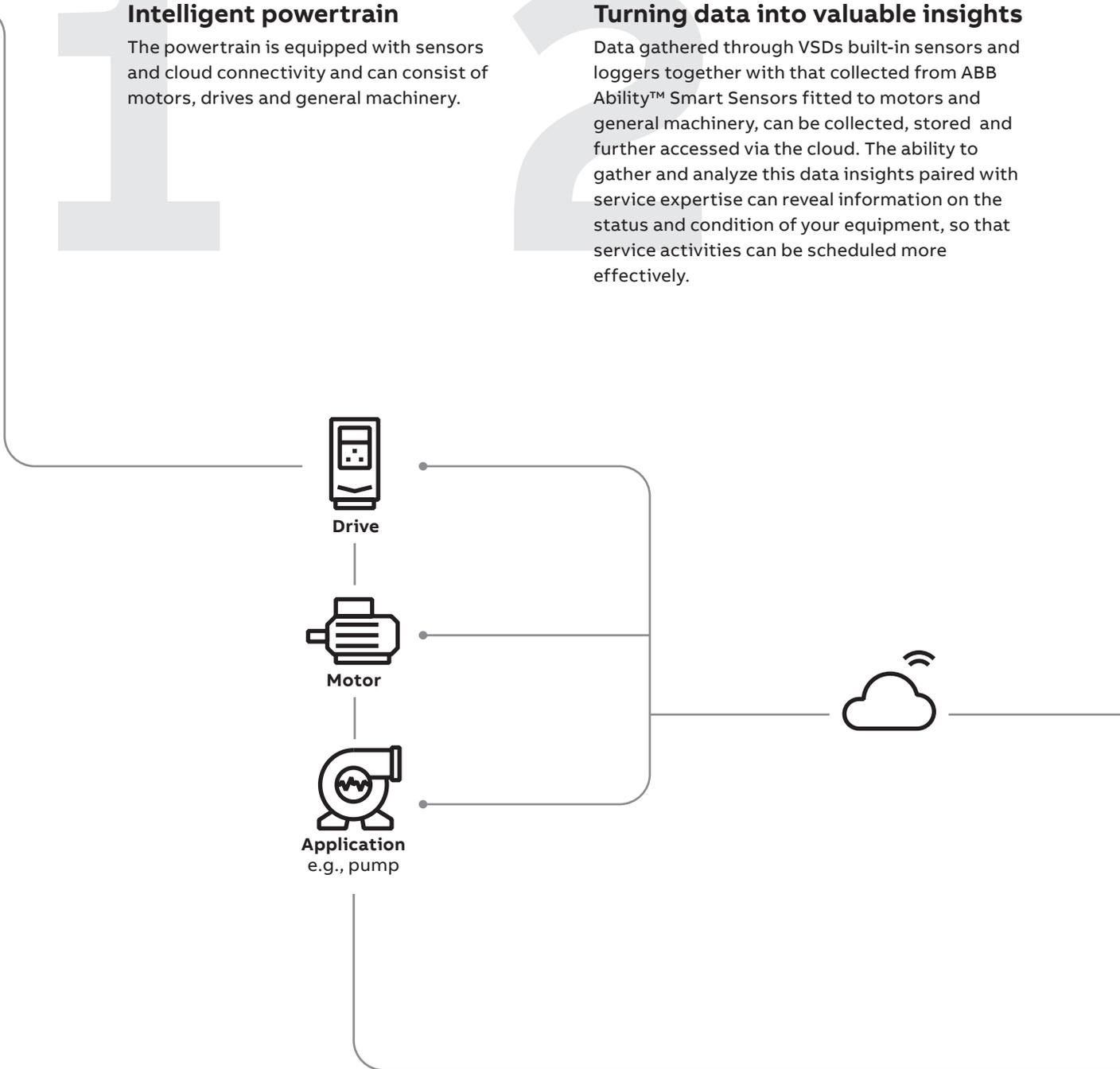
Intelligent powertrain

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 built-in sensors and loggers 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

You have access to a monitoring portal to view key operational parameters of individual assets as one unified system. 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 process challenges, minimizing operating costs
- Greater insight into various aspects of the process, thereby improving system performance
- Lower risk of process failure, while changing your maintenance from reactive to predictive



Technician



System integrator



Consultant



Store manager/owner



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.

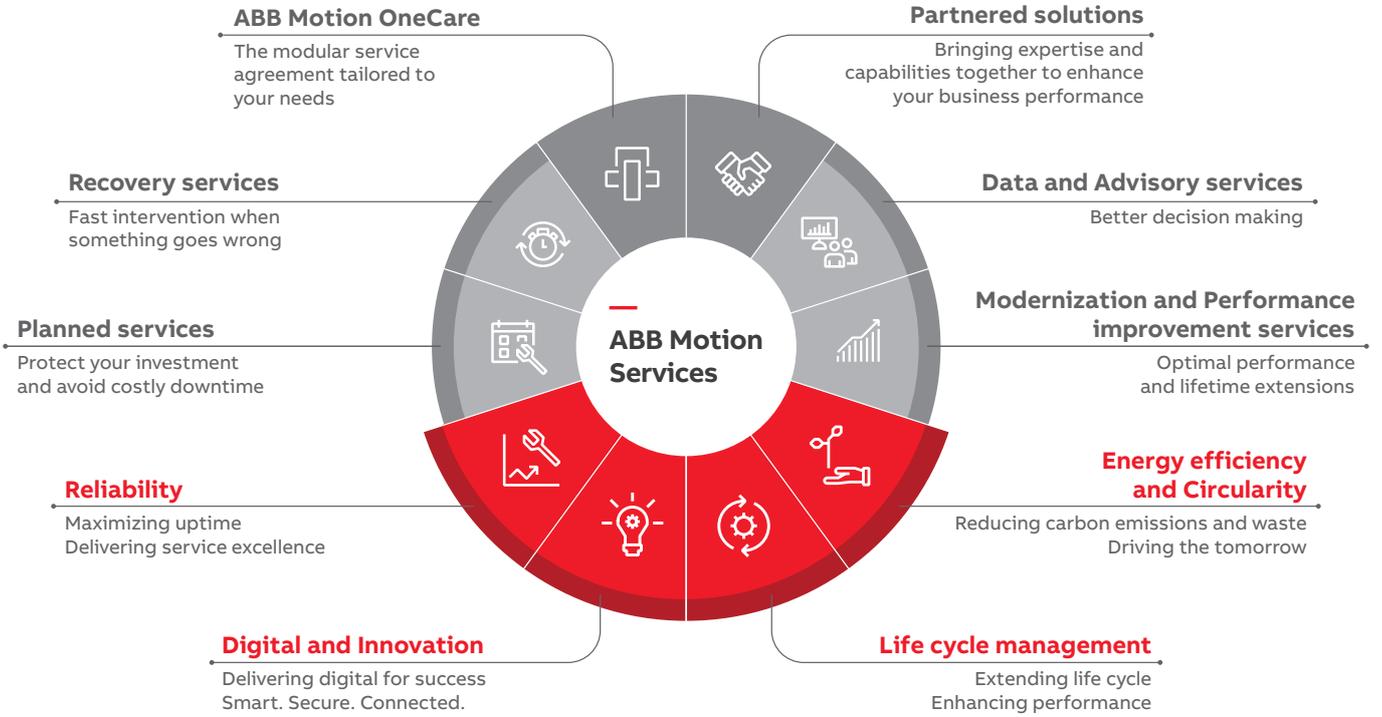
With a service offering tailored to your needs, ABB Motion Services maximizes the uptime and extends the life cycle of your electrical motion solutions, while optimizing their performance and maximizing your energy efficiency gains throughout the entire lifetime of your applications. We help to keep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

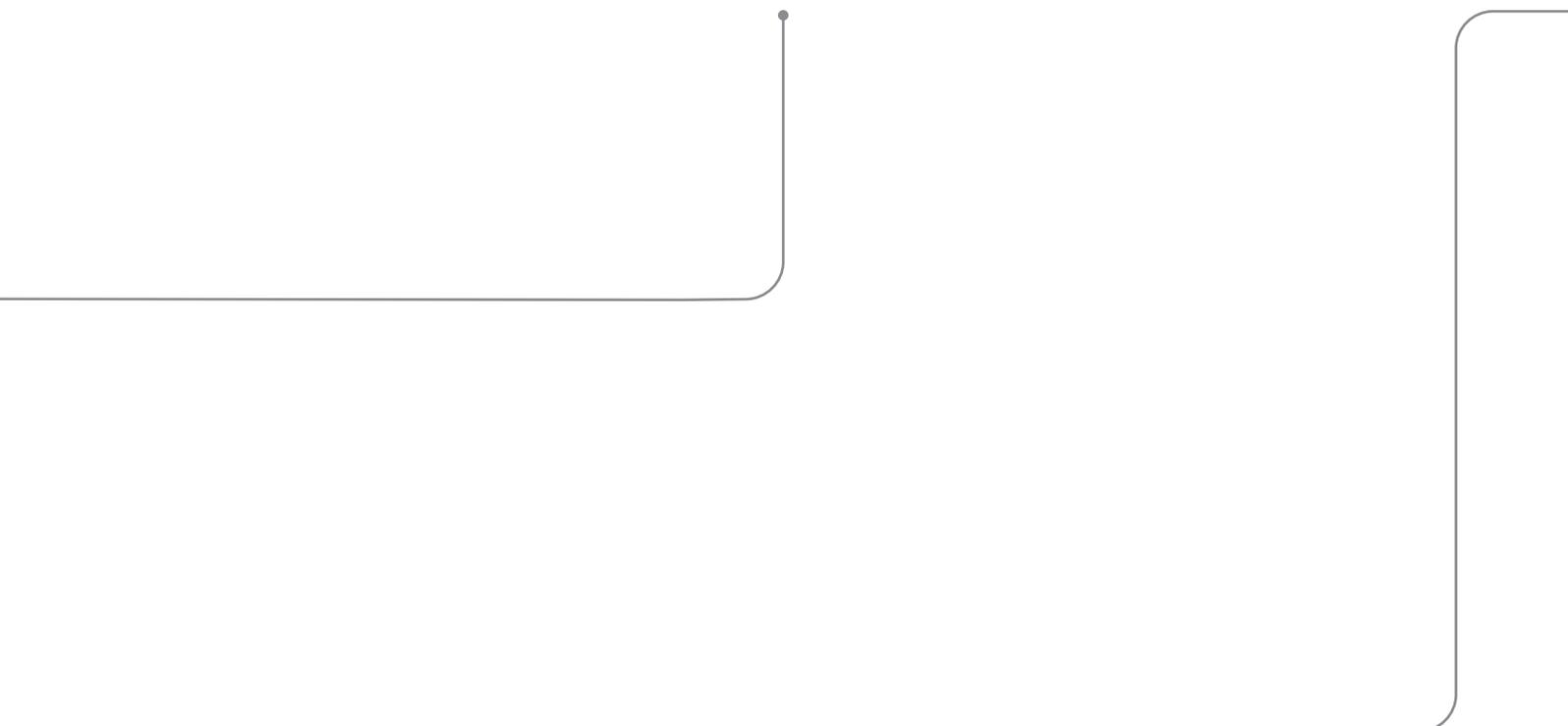
We quickly respond to your service needs. Together with our partners, local field service experts, and service workshop networks, we provide and install original spare parts to help resolve any issues and minimize the impact of unexpected disruptions.

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 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, ABB interacts closely with food retail industry players including business owners, consultants, inspectors, engineering societies and other dedicated organizations. This helps increase performance of food stores and keeps

engineering systems reliability and efficiency at an absolute maximum, while providing a dedicated environment to make products last longer with minimal waste.

ABB has seven global R&D centers with more than 8,000 technologists and invests \$1.5 billion annually on innovation.

End-to-end product portfolio

Alongside its diverse portfolio of PLCs, VSDs, motors and generators, ABB offers food stores:

- Medium voltage components and systems such as air- and gas-insulated switchgears,



uninterruptible power supply units, relays, ultra-fast earthing switches, Is-limiters to reduce high short-circuit currents, and more.

- Low voltage components and systems such as switchgears, uninterruptible power supply units, breakers, industrial plugs and sockets, RCD blocks, power distribution units, remote power panels, a wide range of HMIs, and more.
- Digital solutions including ABB Ability™ digital cross-product and system offering providing intelligence all the way to the component level, improving overall visibility and making the system safe, reliable and efficient.

Streamline sourcing

ABB's end-to-end product and services portfolio streamlines your sourcing and purchasing activities and standardizes processes 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
- new.abb.com/drives/drivespartners
- new.abb.com/drives/segments/hvac
- new.abb.com/motors-generators
- solutions.abb/motionservices

