



MOTION

Agriculture and irrigation

Boosting efficiency,
sustainability and productivity

How to ensure efficient water management in agriculture

Freshwater is one of the world's most important resources, but it is limited. Up to 70 percent of water is used for irrigation on fields or in greenhouses, making careful distribution and conservation crucial to ensure a sustainable supply.



Food and personnel safety



"I need to make my facilities and personnel safety a priority."



Energy efficiency



"We need to cut our energy bill and carbon footprint."

Tackle diverse production demands...

- Employees must not be exposed to hazards from operating pumps used for the irrigation process. The risk is high pressure during operation or flooding in case of a broken pipe.

...using best-in-class technology and services

- Using output pressure sensors and pump protection functions in the variable speed drive (VSD)/variable frequency drives (VFD) makes it possible to protect people and the environment against high pressure water, which could be of danger.
- Pump protection features can help to avoid or minimize flood situations by stopping the pump in case of leakage.
- Advanced safety functions, like safe torque off, make sure that pumps are stopped in a safe way and that unwanted starts are prohibited.

Find the big energy users...

- Pumps are one of the biggest energy users in crop irrigation.

...unlock the saving potential

- Replacing throttle valves with VSDs/VFDs on pump control reduces energy costs and cuts maintenance needs.
- Using the VSD/VFD intelligence to reduce the risk of losing water in case of a pipe burst.
- 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.
- Upgrading to IE5 efficiency class motors, such as synchronous reluctance technology (SynRM), significantly reduces energy consumption.



Productivity improvement



“To optimize water consumption, we need to match irrigation with weather conditions.”

Keep irrigation accurate...

- Demand is varying for various crops and fruits, which all need high availability during growth season.
- Getting access to the right data and turning it into useful information is a challenge.

... with flexible motor-driven solutions

- Adaption to actual irrigation demand by variable speed pumping.
- Production increase often achieved without any extra investment due to optimal use of water.

“We need better intelligence on the performance of the irrigation process.”

Locate the right information...

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

... through digital solutions

- Multiple inputs and outputs (I/Os) provide a variety of process information from the VSD/VFD to the motor control.
- Fieldbus technology enables the drives controlling the pumps to integrate with the irrigation control systems, providing greater insights and better production control.

Operation and maintenance



“How can I control rising costs?”

Lower operational overhead...

- Operational costs must be controlled without compromising plant, personnel or end product safety.
- Maintenance must be carefully scheduled around planned downtime.

... through advanced maintenance regimes

- Soft starting reduces the risk of water hammer and pipe burst, leading to less wear and tear on pump and motor.
- ABB Ability™ Condition Monitoring delivers accurate, real-time information about VSD/VFD and motor events to ensure equipment is available, reliable and maintainable.
- Global service network and preventive maintenance contracts relieve pressure on in-house teams and increase speed of response to critical issues.
- VSD/VFD pump control software can protect the pump and the irrigation system against peak pressure and reduce the risk of water leakage.

“We need the most reliable products and systems to avoid unplanned downtime.”

Eliminate production risks...

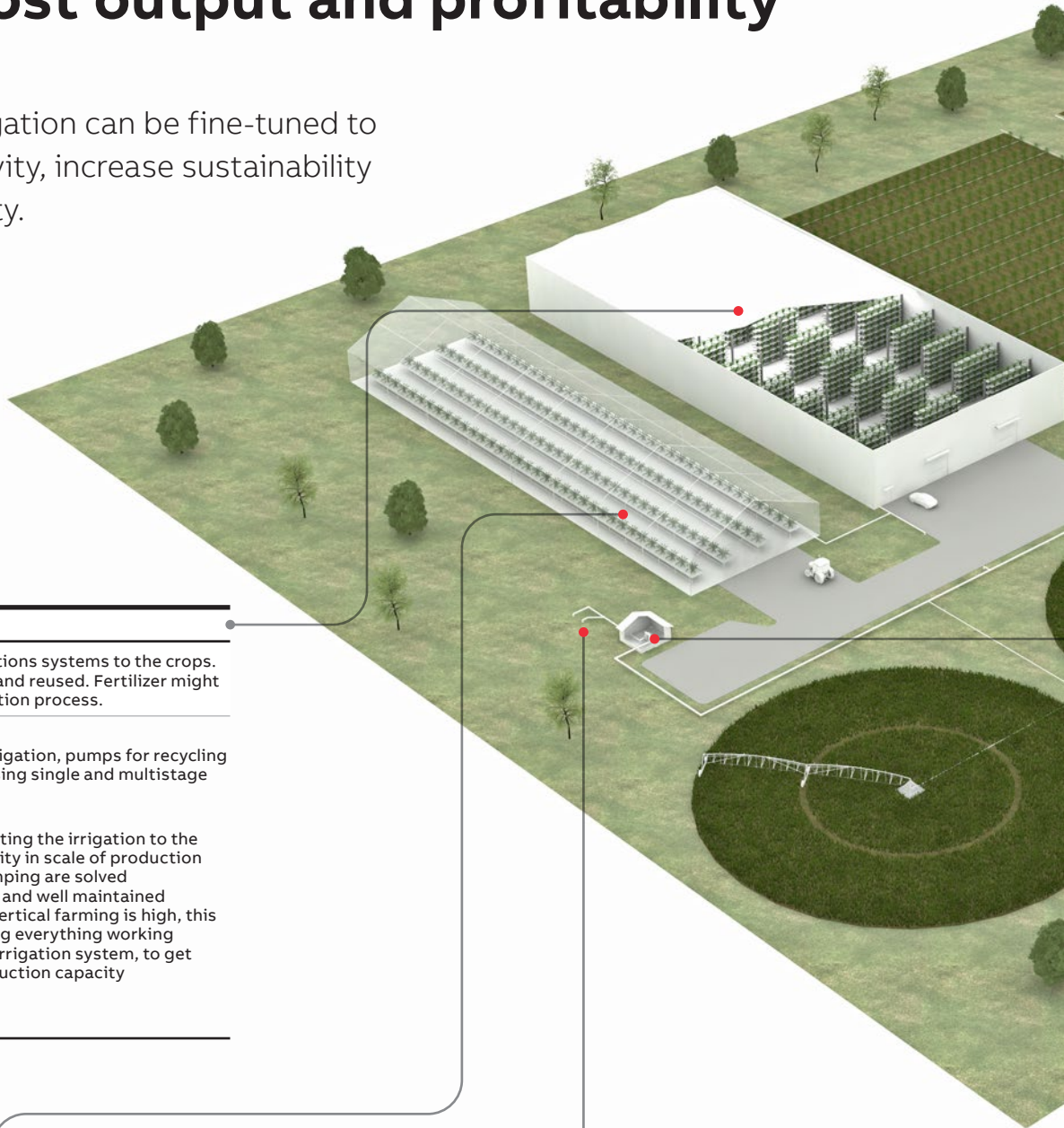
- Shutdowns are costly, because of lost production time, spoiled goods and reputational damage.

... by using smart functionality

- Pressure control, load, under/overvoltage protection and warning features within VSDs/VFDs help anticipate breakdowns.
- A VSD/VFD real-time clock allows timed tracing of faults, telling operators what happened and when.

Improving operational efficiency helps boost output and profitability

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



1 VERTICAL FARMING

Water is supplied by irrigations systems to the crops. Water is recycled, filtered and reused. Fertilizer might be added during the irrigation process.

Applications:

- Pressure boosting for irrigation, pumps for recycling of water and filtration using single and multistage pumps

Requirements:

- By using drives and adapting the irrigation to the actual need, both flexibility in scale of production and energy efficient pumping are solved
- Pumps must be efficient and well maintained
- The total investment in vertical farming is high, this creates a focus on getting everything working optimally, including the irrigation system, to get the most out of the production capacity

Typical crops:

- Lettuce and herbs

2 GREENHOUSES

Water is supplied by irrigation systems to the crops. In some cases water is recycled, filtered and reused. Fertilizer might be added during the irrigation process.

Applications:

- Pressure boosting for irrigation, pumps for recycling of water and filtration using single and multistage pumps

Requirements:

- By using drives and adapting the irrigation to the actual need, both flexibility in scale of production and energy efficient pumping are solved
- Pumps must be efficient and well maintained

Typical crops:

- Lettuce and herbs, melon, cucumber and tomatoes

3 BOREHOLE PUMPING

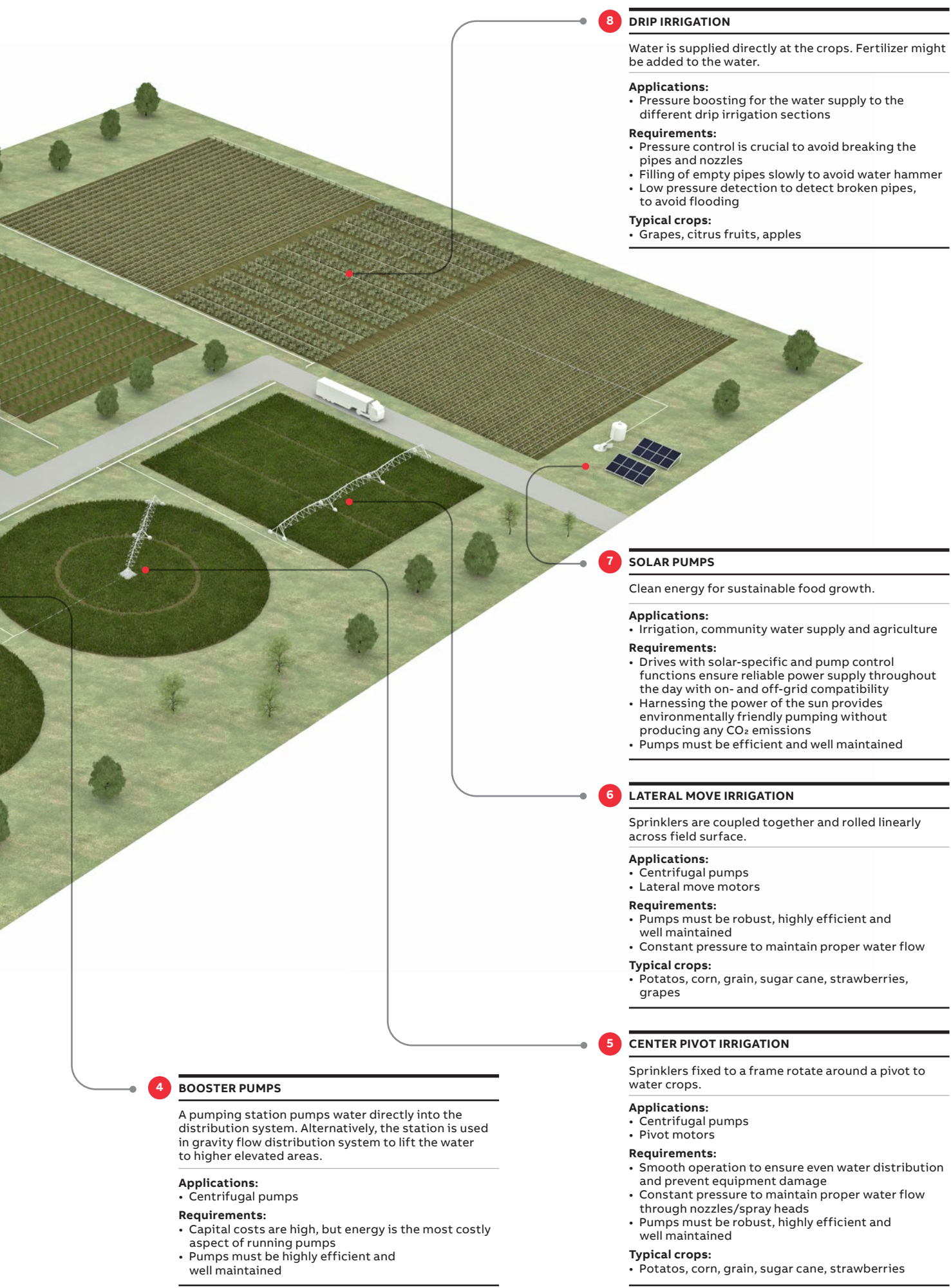
Groundwater is extracted from aquifers, which are subterranean water-bearing rocks.

Applications:

- Multi-stage pumps with submersible motors
- Vertical turbine pumps

Requirements:

- Submersible centrifugal pumps are used to raise water to point of use
- Pump and motor are installed directly in the well
- Gradual ramps to reduce turbidity
- High installation costs focuses attention on protecting well and pump to ensure a long life



4 BOOSTER PUMPS

A pumping station pumps water directly into the distribution system. Alternatively, the station is used in gravity flow distribution system to lift the water to higher elevated areas.

Applications:

- Centrifugal pumps

Requirements:

- Capital costs are high, but energy is the most costly aspect of running pumps
- Pumps must be highly efficient and well maintained

8 DRIP IRRIGATION

Water is supplied directly at the crops. Fertilizer might be added to the water.

Applications:

- Pressure boosting for the water supply to the different drip irrigation sections

Requirements:

- Pressure control is crucial to avoid breaking the pipes and nozzles
- Filling of empty pipes slowly to avoid water hammer
- Low pressure detection to detect broken pipes, to avoid flooding

Typical crops:

- Grapes, citrus fruits, apples

7 SOLAR PUMPS

Clean energy for sustainable food growth.

Applications:

- Irrigation, community water supply and agriculture

Requirements:

- Drives with solar-specific and pump control functions ensure reliable power supply throughout the day with on- and off-grid compatibility
- Harnessing the power of the sun provides environmentally friendly pumping without producing any CO₂ emissions
- Pumps must be efficient and well maintained

6 LATERAL MOVE IRRIGATION

Sprinklers are coupled together and rolled linearly across field surface.

Applications:

- Centrifugal pumps
- Lateral move motors

Requirements:

- Pumps must be robust, highly efficient and well maintained
- Constant pressure to maintain proper water flow

Typical crops:

- Potatoes, corn, grain, sugar cane, strawberries, grapes

5 CENTER PIVOT IRRIGATION

Sprinklers fixed to a frame rotate around a pivot to water crops.

Applications:

- Centrifugal pumps
- Pivot motors

Requirements:


- Smooth operation to ensure even water distribution and prevent equipment damage
- Constant pressure to maintain proper water flow through nozzles/spray heads
- Pumps must be robust, highly efficient and well maintained

Typical crops:

- Potatoes, corn, grain, sugar cane, strawberries



Unlock the potential in irrigation systems

Alongside energy saving, improved productivity and greater safety, there are many other benefits from using variable speed drives (VSDs)/variable frequency drives (VFDs) and high efficiency motors on motor-driven applications.

	Challenge	Solution	Benefit
 Pumps	<ul style="list-style-type: none"> Wide variations in pumping requirements due to seasonal changes, demand, etc 	<ul style="list-style-type: none"> Drive: Built-in multi-pump control function ensures operation of pumps according to actual demand Drive: Adapts output to react to seasonal swings in demand and available supply 	<ul style="list-style-type: none"> Fast response to changing demand Optimized energy consumption
	<ul style="list-style-type: none"> Irrigation equipment is often installed in remote, difficult to access locations 	<ul style="list-style-type: none"> Motor-drive: Intelligent drives and smart sensors enable remote control and monitoring of pumps Drive: Pump protection functions use data from pump curves and pressure transmitters to detect any abnormalities 	<ul style="list-style-type: none"> Anticipate longer operating life of the pumps Reduce travel costs Protects pumps against faults, including overload and dry running, to prevent failures and prolong pump life
	<ul style="list-style-type: none"> Pipes and sprinkler heads must be protected to prevent leakage and water waste 	<ul style="list-style-type: none"> Drive: Soft pipe filling protects networks from pressure peaks when starting pump systems. It prevents water waste by alerting if the target pressure is not reached in the set time. 	<ul style="list-style-type: none"> Reduced water hammer and other mechanical stress Avoids pipe burst Increased equipment lifetime
	<ul style="list-style-type: none"> Complex and mechanically controlled water networks 	<ul style="list-style-type: none"> Motor-drive: Simplify the water network by eliminating need for control valves, by-pass lines and instrumentation, with speed control, built-in protections and functions 	<ul style="list-style-type: none"> Reduces wear on motors Reduces leaks caused by pressure surges Lower maintenance and life cycle costs
	<ul style="list-style-type: none"> Cavitation caused by changes in pressure shortens impeller lifetime 	<ul style="list-style-type: none"> Drive: Detect inlet pressure to predict occurrence of cavitation 	<ul style="list-style-type: none"> Allows for planned maintenance
	<ul style="list-style-type: none"> Maintaining reliability in multistage/borehole pumps 	<ul style="list-style-type: none"> Drive-motor: Fast ramp to minimum speed Motor protection by using output filters (dv/dt or Sine Wave filters) 	<ul style="list-style-type: none"> Increased uptime Increased service intervals Protects motor bearings
	<ul style="list-style-type: none"> Unplanned interruptions because of power outages or weak networks 	<ul style="list-style-type: none"> Drive: Ability to keep pumps running during short power outages and automatic restart after longer power cuts 	<ul style="list-style-type: none"> Avoid mechanical stress on the pump with repetitive starts and stops Avoid unnecessary visits for manual pump start-up



Drip irrigation is an efficient way to irrigate greenhouse crops.

	Challenge	Solution	Benefit
 Sprinklers (center pivot & lateral movement irrigation systems)	<ul style="list-style-type: none"> Pressure spikes leading to water hammer and leakage 	<ul style="list-style-type: none"> Motor-drive: Adjusts motor speed to constantly achieve required pressure 	<ul style="list-style-type: none"> Protects sprinklers from damage and prolongs their life
	<ul style="list-style-type: none"> Flow can be affected by low pressure caused by broken pipes or sprinklers 	<ul style="list-style-type: none"> Drive: Pump protection functions use data from pump curves and pressure transmitters to detect abnormalities 	<ul style="list-style-type: none"> When running in constant pressure mode it is possible to turn off the system in case of pressure drop at the output. That is an indication of a broken pipe, by adding a low pressure protection function.
	<ul style="list-style-type: none"> Cavitation, caused by changes in pressure, shortens pump lifetime 	<ul style="list-style-type: none"> Drive: Soft pipe filling protects networks from pressure peaks when starting pump systems. It prevents water waste by alerting if the target pressure is not reached in the set time. 	<ul style="list-style-type: none"> Reduced water hammer and other mechanical stress Avoids pipe burst Increased equipment lifetime
	<ul style="list-style-type: none"> Dry running causes damage to pumps and sprinklers 	<ul style="list-style-type: none"> Drive: Dry run protection function 	<ul style="list-style-type: none"> Turns off the pump in case of dry run condition
	<ul style="list-style-type: none"> Outdoor installation in harsh environment 	<ul style="list-style-type: none"> Use ABB drive IP21 version in a cabinet to provide an installation that matches the harsh environment. For direct mounting on the wall IP55 protection class is available. 	<ul style="list-style-type: none"> By using a cabinet it is possible to add other elements, like fuses, disconnect, heaters etc to fit the full installation
 Drip irrigation	<ul style="list-style-type: none"> Pressure spikes leading to water hammer and leakage 	<ul style="list-style-type: none"> Motor-drive: Adjusts motor speed to constantly achieve required pressure 	<ul style="list-style-type: none"> Protects pipes from damage and prolongs their life
	<ul style="list-style-type: none"> Managing different demand levels for different drip irrigation sections 	<ul style="list-style-type: none"> Drive: Intelligent Pump Control (IPC) 	<ul style="list-style-type: none"> Allows more pumps to be started if demand is increasing, with no need for external controller Energy efficient pumping depending on actual need
	<ul style="list-style-type: none"> Flow can be affected by low pressure caused by broken pipes 	<ul style="list-style-type: none"> Drive: Pump protection functions use data from pump curves and pressure transmitters to detect abnormalities 	<ul style="list-style-type: none"> When running in constant pressure mode, automatically turns off the system in case of low pressure at the output
	<ul style="list-style-type: none"> Cavitation caused by changes in pressure shortens pump lifetime 	<ul style="list-style-type: none"> Drive: Inlet pressure measurement allows potential cavitation to be detected before it can cause damage 	<ul style="list-style-type: none"> Turns off the pump in case of low inlet pressure, protecting the pump from cavitation

Optimized functions that benefit irrigation systems

Drives, motors, PLCs and softstarters all play a vital part in keeping water flowing. Choosing the right product feature for the right environment is essential in ensuring an optimized production.



Variable speed drives/ variable frequency drives

Energy efficiency

- Control operating costs by seeing energy costs in local currency, kWh and CO₂ emissions

Communication

- Use information such as water flow rates to get the VSD/VFD to adjust motor speed and torque
- Get detailed insight into flow performance through fieldbus comms connecting VSD/VFD with plant monitoring systems

Ingress protection

- IP55 for wet and corrosive environments

Low harmonics

- Eliminate supply disturbances that could trip production with built-in active supply unit and integrated low-harmonic line filter
- Makes design and operation of the back-up generator easy and reliable



Pressure and flow control

- Ensures optimal operation of water asset using built-in VSD/VFD features
- Maintain constant pressure or constant flow

Multi-pump control

- Ensures stable and uninterrupted production with multi-pump controls by optimizing the speed and number of pumps running

Soft pipe filling

- Increases piping and pump system lifetime by avoiding pressure peaks

Flow and pressure protection

- Protects pumping system from a low and/or high pressure and flow and prevents pump from running dry

Quick ramps

- Reliable operation of submersible pumps and smooth operation of check valves



Softstarters

Built-in bypass

- Reduce system complexity and size, saving time and money during installation
- Reduce heat generation from internal losses by activating bypass at full speed

Harsh environment use

- Ensure uninterrupted production in dusty or wet environments with IP66 keypad and coated electronics

Flexible communication

- Operate in local and remote mode by accessing all major communication protocols and built-in Modbus-RTU



Solar pump drive

Maximum uptime

- Operates without grid directly from photovoltaic (PV) cells

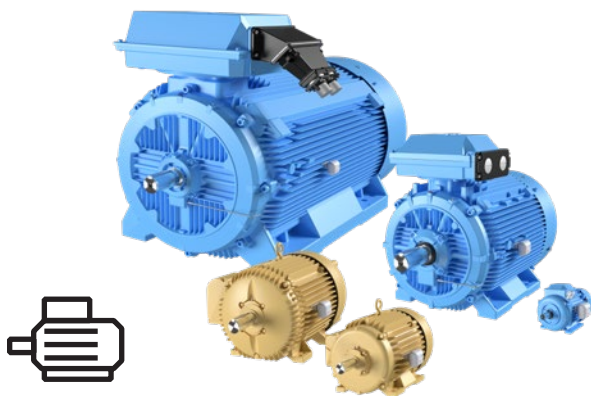
Ease of installation

- Compatible with all pump types and set up for serial production

Return on Investment (ROI)

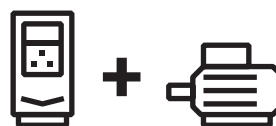
- Superior ROI compared to diesel-powered pumping





Low voltage motors

- Robust construction for outdoor environments
- Bearing locked at D-end to avoid axial play
- Bearings can be sealed or regreasable
- 60 Hz or 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 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/O 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, 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

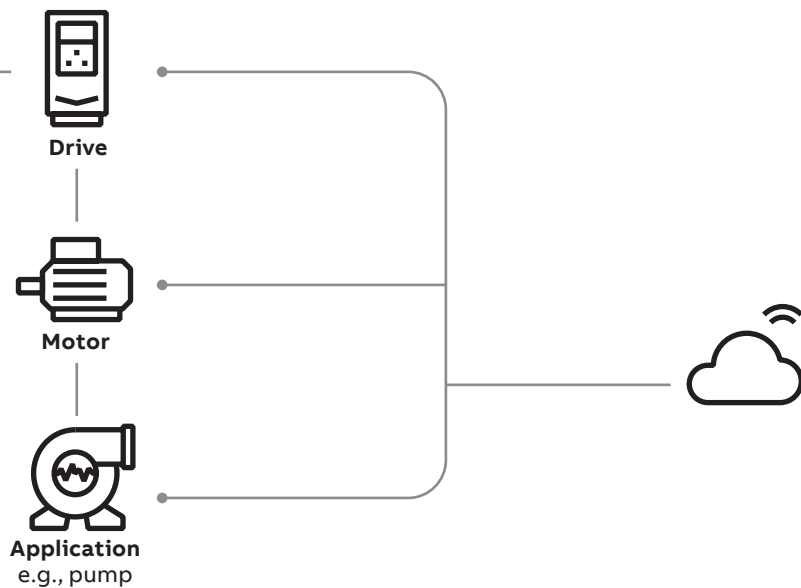
ABB Ability™ Condition Monitoring for powertrains optimizes the performance and efficiency of electric motor-driven rotating equipment. It enables better decision making by providing real-time access to data on all parameters for drives, motors and general machinery.

1 Intelligent powertrain

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

2 Turning data into valuable insights

Data gathered through VSDs/VFDs' 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.



Accessing data for analytics

Detailed information can be extracted into a company's portal and systems. Information on many aspects of the agriculture process is available, including the ability to know exactly when and how production equipment was cleaned. Detailed dashboards give full transparency so that you can take actions that lead to less downtime, extended equipment lifetime, lower costs, safer operations and increased profitability.



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.

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 agriculture 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.

Maintenance Manager



Energy Manager



Production Manager



Safety Manager



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.

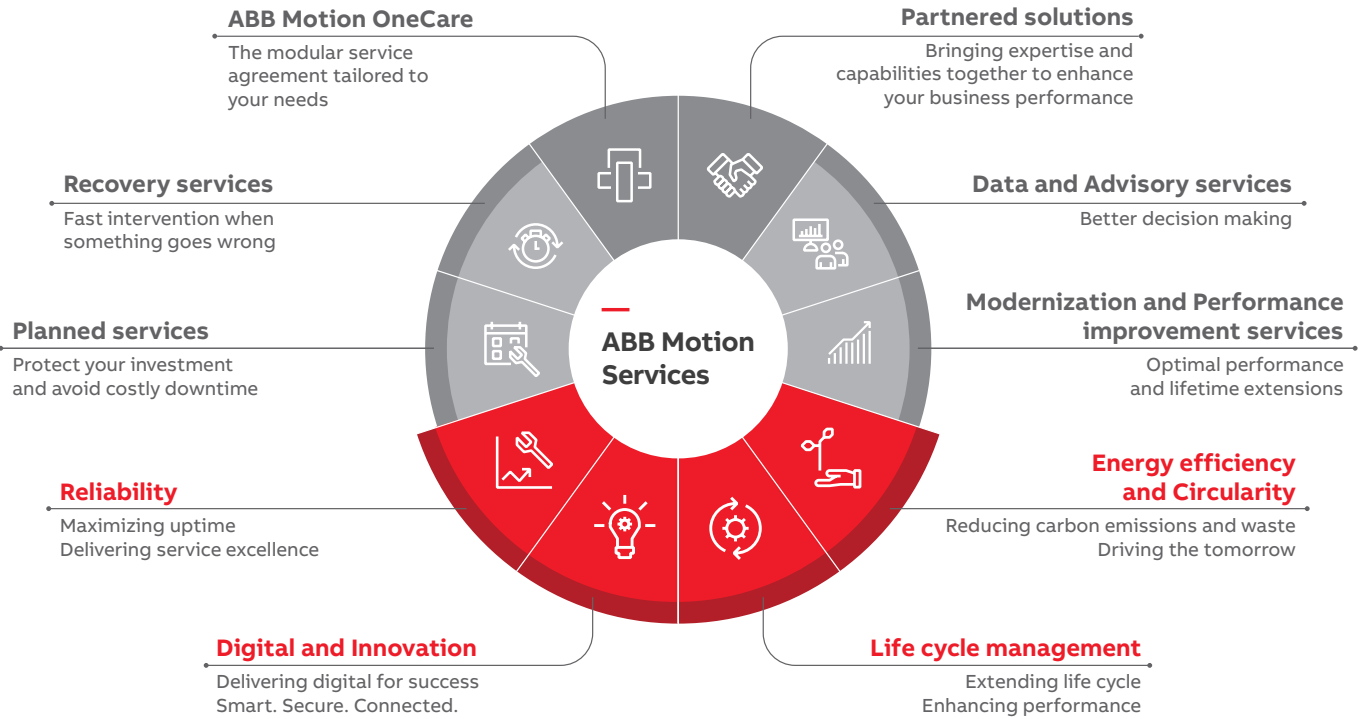
With a service offering tailored to your needs, ABB Motion Services maximizes the uptime and extends the life cycle of your electrical motion solutions, while optimizing their performance and maximizing your energy efficiency gains throughout the entire lifetime of your applications. We help to keep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

Global reach

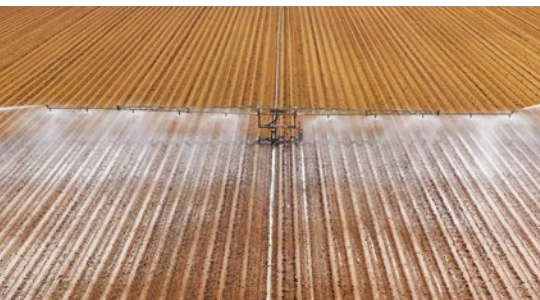
ABB operates in over 100 countries with its own manufacturing, logistics and sales operations together with a wide network of local channel partners that can quickly respond to your needs. Stock availability is good, with short delivery times for many products backed by 24-hour spare parts delivery.

In addition, we work closely with agriculture 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 safety requirements.



ABB's offering includes:

- End-to-end **power and automation solutions**, from power distribution, raw material receipt, to process and machine control, to end of line packaging
- **Power protection and power quality solutions** to safeguard equipment and processes
- Industry leading **robotic automation solutions** that improve your speed-to-market, flexibility and help make packaging a differentiator
- A complete range of **protection, connection and wire management solutions** that

withstand harsh environments and extreme temperature swings, and provide the reliability needed for continuous operations

Streamline sourcing

ABB's end-to-end product and services portfolio streamlines your sourcing and purchasing activities and standardizes production across multiple sites, saving you money on spare part inventories while reducing maintenance costs.





For more information, please contact
your local ABB representative or visit

new.abb.com/drives

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