ABB MEASUREMENT & ANALYTICS | CASE STUDY

ABB Ability

Power plant

The case – creating stability for the Energy Revolution takes ability: ABB Ability™.

Measurement made easy

Introduction

ABB provides an extensive selection of proven measurement and analytical products and solutions for power generation industry applications.

Using ABB’s measurement products, power plant operators can maximize the efficiency of their assets and comply with local and international legislation. They receive access to data on many critical measurements needed, from combustion performance and water chemistry through to stack emissions.

Digital technologies are providing new opportunities to enhance processes and productivity. This case study highlights the smart devices used in a range of power plant applications and a number of innovative solutions that combine physical devices with software to help deal with known customer needs.

Focus areas

• Overview of Measurement & Analytics devices and digital solutions applicable for power plants
• More efficient and comprehensive surveying with ABB Ability mobile and static gas leak detection systems
• Dynamic QR codes helping to remote troubleshoot emission monitoring system problems
• Condition monitoring of emission monitoring systems enhancing plant availability
• Increased productivity through improved device commissioning time with ABB Ability Field Information Manager (FIM)
• Improved Instrumentation maintenance with ABB Ability Verification for measurement devices
• Wireless devices enabling cost-effective process optimization project
• Remote monitoring and secure data back-up of effluent discharge measurements
• Commissioning and troubleshooting support with MyMeasurement Assistant
• ABB Ability™ Remote Insights for service – reducing time to resolution through improved collaboration using augmented reality technology
ABB Ability solutions for measurements

Our offering for power plants

- Verification for measurement devices
- Remote Assistance for measurement devices
- My Measurement Assistant
- Condition Monitoring for measurement devices
- Dynamic QR code assistance for analyzers
- Augmented reality/remote insights

DataManager Pro
advanced data review software

Field Information Manager (FIM)
myABB business portal
my Installed Base
Mobile and static leak detection

Recorders, controllers, indicators (remote operation of systems with secure data back-up)

Actuators
Continuous gas analyzers
Continuous water analyzers
Coriolis
Differential pressure
Electromagnetic flow

FTIR/FTNIR spectroscopy
Gas flow
Laser and radar level
Magnetostrictive level
Oxygen analyzers
pH/Conductivity

Positioners
Pressure
Temperature
Thermal mass
Ultrasonic level
Vortex/Swirl

Digital solutions helping to Do more and Do better

Process control and data recording Instruments helping to Do more

Data rich sensors helping to know more
Focus area 1

Mobile and static natural gas leak detection

Overview
Utilities, as well as gas transmission and distribution companies, face increased challenges with pipeline monitoring and compliance due to:
- aging infrastructure
- regulatory pressure to improve system integrity and safety
- desire to reduce greenhouse gas emissions
- reliance on time-consuming, error-prone paper-based monitoring systems – pressure to reduce cost
- need for data transparency

Customer situation/Industry need
Traditional leak detection processes do not meet today’s demands for fast, accurate and transparent data collection. Utilities typically employ third-party companies to survey neighborhoods and districts to check for pipeline leaks. The current surveying equipment has a short detection range, it must be operated at very low speeds, often on foot and the equipment is prone to detecting false positives. Additionally, the surveyor uses a map and pencil to mark the location of any identified leaks.

ABB solution 1
ABB Ability Mobile Gas leak Detection finds leaks fast and shares data via the Cloud.
- improves pipeline integrity and public safety whilst surveying up to 25 x greater area compared with traditional techniques
- measure, map, share while driving enabling the operator to detect leaks hundreds of meters away, this flexible solution is compatible with cars, ATV, aircraft, drones

ABB Ability mobile gas leak detection system uses ABB’s patented Off-Axis Integrated Cavity Output Spectroscopy (OA-ICOS) technique which has a sensitivity and precision more than 3000 times greater than legacy methods. This enables identification of leaks several hundred feet away from the source.

Off-Axis ICOS analyzer
(methane/ethane)

Off-Axis ICOS Analyzer
(HMI/Leak detection software)

Sonic anemometer
(wind speed and direction)

GPS
(location)

ABB Ability Mobile Gas leak Detection finds leaks fast and shares data via the Cloud.

Outcomes/Results
Significant maintenance cost savings thanks to a major reduction in surveying time. Fast and accurate detection of gas pipeline leaks with digital results immediately available within the cloud allowing utility companies to act fast and efficiently.

Mobile platform – speeds up to 50 mph/automatic leak detection using high sensitivity MicroPortable methane analyzer

Drone-based gas detection – 3D gas detection

City by night

ABB solution 2
ABB Ability Static Gas leak detection.
The static laser based system accurately measures gas concentrations with extraordinarily high sensitivity, fast response and over a wide dynamic range.

The system delivers:
- measurements of multiple gases
  - fast response (seconds)
  - high sensitivity (ppb levels)
- low total cost of ownership
  - low operational costs (no consumables)
  - high reliability (few moving parts)
- easy to service
- simple to operate
  - easy set-up
  - contextual system diagnostics
  - reduced maintenance effort
Focus area 2
Reducing risk of power plant shutdown

Overview
Emission monitoring systems are a critical plant component as loss of measurement data can have major consequences for the customer. Though the exact causes of problems aren’t always immediately evident, or easy to resolve, the indications of a problem are there for experts to recognize, often times far earlier than more overt evidence of a failure. Digitalization has made collecting and using such insights a tool for preventing system failure, and keeping systems on line.

Due to the potential for process problems, sample handling issues or analyzer failure occurring it is important to have a range of digital solutions available to quickly and reliably resolve problems:
- Dynamic QR Code Assistance for Analyzers
- ABB Ability Remote Assistance for Measurement devices
- ABB Ability Condition monitoring for measurement devices

<table>
<thead>
<tr>
<th>Plant components</th>
<th>Measurement type</th>
<th>Emissions and process control solution (e.g., SOx, NOx, CO, CO2, VOC, O2)</th>
<th>Emissions and process control solution (e.g., SOx, NOx, CO, CO2, VHC, HCl, HF, NH3, O2, H2O)</th>
<th>Extractive gas analyzers (Uras, IlmaX, Magnos, Caldos, Fidas, MultiFID)</th>
<th>Extractive gas analyzers (Uras, IlmaX, Magnos, Caldos, Fidas)</th>
<th>Ex version of Uras, Magnos, Caldos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product series</td>
<td>ACK</td>
<td>ACF</td>
<td>A02000</td>
<td>E3000</td>
<td>E3066</td>
<td></td>
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<tr>
<td>Product Image</td>
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</tbody>
</table>

- Coal bin
- Coal mill
- Fermentor
- Boiler outlet
- Generator
- Turbo generator
- Gas turbine outlet
- Gas clearing system
- FGD
- ESP or Fabric Filter
- DeNOx
- Residuals storage
- Air preheater
- Stack

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ABB Solution 2 – Remote Assistance

Overview

Customers and Industry are under pressure to improve productivity and efficiency. This means reducing process downtime is crucial. The rapid development of technology makes it possible to get fast and reliable support from ABB remotely. Saving customers time and money.

Customer situation

Emission monitoring requires high levels of accuracy and availability. It is not always practical to have skilled operators on-site 24/7 and in today’s competitive market this is often a luxury customers can afford. Customers often rely on a comprehensive service contract which includes rapid response modules such as telephone support or technicians on-site in emergencies within a specified timeframe. The above techniques work well however the ideal scenario for the customer is to have problems resolved as soon as they occur and ideally without needing a technician to come to site. Many customers are looking to Digital technologies to find new more efficient ways of working.

The solution

With ABB Ability Remote assistance customers are guaranteed quick issue identification and resolution which will reduce process downtime, lighten the burden of knowledge on employees, while saving costs by avoiding unnecessary on-site visits. The solution is cybersecure because there is no connection to the customer’s network, only direct access to the device. Designed to restore products back to normal, we know process downtime is crucial. ABB’s product specialist to remotely connect, troubleshoot the problem and provide the most effective solution.
...Focus area 2

Condition monitoring

Overview
Across the world, environmental regulations on emissions are increasing. The regulations often require control and continuous measurement of pollutant gases, dust and other toxic materials. To ensure continuous operations, it is necessary to secure the availability of data required by environmental regulatory agencies. Otherwise, fines and penalties up to and including plant shutdown could occur.

Customer situation
A leading utility company in Italy needed a reliable service provider capable of delivering 24/7 support. They also wanted to lower compliance and labor costs without impacting service quality in support of multiple sites.

The Solution
ABB Ability™ Condition Monitoring for measurement devices provides emissions equipment condition data to ABB service experts, enabling condition-based monitoring using real-time data. It increases availability and reliability of equipment and prevents unplanned outages and downtime.

Rapid response:
- 24/7 telephone and remote assistance support
- 24/7 service engineer mobilization
- 24/7 ready-to-operate spectrometer exchange unit

Lifecycle management:
- On-site preventive maintenance
- Spare parts supply and inventory management
- Supply and management of gas cylinders (including consignment stock at local ABB offices)
- Calibration of production and back-up gas analyzers

Performance improvement:
- Remote condition monitoring
- Predictive service recommendations

Health data
Step 2
Analyzer's health data is relayed to ABB service engineers for further analysis

Remote service center
Step 3
Analyzer's health data is used to provide service recommendations

Analyzer
MicroPC
Step 1
Connect gas analyzer to industrial microPC

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Performance improvement:
- Remote condition monitoring
- Predictive service recommendations

Analyzer's health data is relayed to ABB service engineers for further analysis.

Analyzer's health data is used to provide service recommendations.
Focus area 3

Increase productivity by streamlining system commissioning

Customer situation/Industry need
Configuration and commissioning of new instrumentation can be a time-consuming stressful process. Available Asset management tools are often outdated, difficult to install, difficult to use and rely on a physical connection to the device to create the initial configuration.

During unplanned shutdowns when rapid commissioning can make the difference between profit and loss what is needed by customers is a simple, universal, clean software solution that can be used with any device type to prepare the configuration offline.

Outcomes/Results
Saved configurations stored as a back-up ready for upload in a hurry when a replacement device is required. Rapid configuration and commissioning saving time and money. Operational efficiency enhancement through improved device management.

ABB solution
Introducing ABB Ability Field Information Manager (FIM), the universal tool that automatically searches for field devices, identifies suitable drivers and connects in less than 3 minutes. With the capability to connect to any HART™ device using an FDI package (or device driver) and perform offline configuration set-up.

FIM is a flexible solution that can access devices directly using a HART modem, remotely via System 800xA or even when in front of the device through the infrared service port.

*HART is a registered trademark of the HART Communication Foundation.

Plant components

<table>
<thead>
<tr>
<th>Measurement type</th>
<th>Pressure transmitter</th>
<th>Differential pressure transmitter</th>
<th>Temperature sensor</th>
<th>Temperature transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product series</td>
<td>2EX</td>
<td>266</td>
<td>TSi</td>
<td>TTx</td>
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<tr>
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<td>EDP300</td>
<td>FPD</td>
<td>FEP</td>
<td>FEW</td>
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<td>FSV/FSS</td>
<td>FSX</td>
<td>LWT series</td>
<td>LST300</td>
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<td></td>
<td>KM26</td>
<td>LLL100</td>
<td>LMT series</td>
<td>AZ20</td>
</tr>
</tbody>
</table>

Measurement type

- Pressure transmitter
- Differential pressure transmitter
- Temperature sensor
- Temperature transmitter

Product Image

Fuel system
- Gas system
- Coal mill
- Coal bin
- Fermenter
- Gas storage
- Solid dosage
- Water treatment
- Desorber
- Boiler feed water
- Boiler drum
- Boiler outlet
- Steam line
- Cooling water system
- Generator
- Turbo generator
- Gas turbine outlet
- Condenser
- Gas cleaning system
- FGD
- ESP or fabric filter
- DeNOx
- Ecomitter outlet
- Residuals storage
- Air preheater
- Stack
Focus area 4

Instrumentation verification ensuring processes continuously operate at their peak

Overview
Verification is the inspection and testing of a product to establish that it meets regulatory/technical requirements in terms of measurement performance. Industrial instrumentation is robust, very reliable and designed to operate for many years with minimal maintenance but as a critical part of the process it is best-practice to inspect and maintain these assets.

Customer situation/Industry need
Every customer is looking for ways to maximize profitability by enhancing process performance and availability, in addition stricter regulations require regular testing of instrument accuracy. Regular instrument verifications is one way to ensure processes continuously operate safely at their peak. As skilled instrument technicians grow more scarce customers are facing a real challenge to manage assets effectively.

ABB solution
ABB Ability Verification for measurement devices allows customers to quickly verify the performance of their instrumentation without the need for highly skilled instrumentation technicians. Technicians can analyze historical data to detect early signs of faults helping to reduce costly process downtime.

Outcomes/Results
Fast, efficient Instrumentation testing ensuring processes and operations are functioning at their peak, maximizing revenues whilst improving profitability.

Features of the ABB Ability Verification for measurement devices platform

<table>
<thead>
<tr>
<th>Activity</th>
<th>Basic</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance made easy</td>
<td></td>
<td></td>
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<tr>
<td>Simple connection to device</td>
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<tr>
<td>Automated test procedure</td>
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<td>Results displayed as tests are performed</td>
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<tr>
<td>Universal test platform</td>
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<td>Health assessment</td>
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<td>Health Status</td>
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<tr>
<td>Verification</td>
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<td>Internal instrument diagnostic test</td>
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<tr>
<td>Detailed certificate printing for regulatory and quality system management</td>
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<tr>
<td>Indication of measurement accuracy according to specified test conditions</td>
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<tr>
<td>Data storage</td>
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<tr>
<td>Local database storage</td>
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<tr>
<td>Historical results trending</td>
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Plant components
ABB Ability Verification for measurement devices is a software platform that can be used with a range of ABB devices, the product lines and applications from a power perspective are as follows:
- Electromagnetic flowmeters (EMF)
- Mass flow
- Vortex
- Swirl
- Level

Visit our website to see the latest products to be added
Focus area 5

Optimize processes by adding wireless measurements to your process

**Customer situation/Industry need**

When building a plant the available budget often dictates how many instruments are installed. It’s a balance between good control of the process and identifying areas to monitor for process optimization. Generally plants are fitted with wired communications between the control systems and the devices. A wired infrastructure makes it very difficult and costly to add additional measurement points in future, however once a process is operational it is often beneficial to add instrumentation as the process evolves and new requirements are established.

**ABB solution**

Wireless devices provide customers an opportunity to add measurement points without costly investments in wiring. ABB offer a range of Pressure, Temperature and Vibration devices plus WirelessHart adaptors for connection to any Hart device and Gateways to create a mesh network with up to 250 wireless products.

**Outcomes/Results**

Greater process knowledge leading to enhanced process efficiency. Reduced level of investment to run optimization projects. Solution that can be easily integrated into control system networks.

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**Plant components**

<table>
<thead>
<tr>
<th>Measurement type</th>
<th>Temperature transmitter</th>
<th>Differential pressure transmitter</th>
<th>Temperature sensor (with Energy Harvester)</th>
<th>Temperature sensor (without Energy Harvester)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product series</td>
<td>26X</td>
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<td>T5x</td>
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<tr>
<td>Product Image</td>
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<td>Fuel system</td>
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<td>Feed storage</td>
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<td>Fermenter</td>
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<td>Gas storage</td>
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<td>Water treatment</td>
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<td>Boiler feed water</td>
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<td>Boiler drum</td>
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<td>Steam line</td>
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<td>Cooling water system</td>
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<td>Generator</td>
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<td>Condenser</td>
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<td>Gas cleaning system</td>
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<td>FGD</td>
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<td>Residuals storage</td>
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<td>Stack</td>
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Focus area 6

Remote monitoring of effluent discharges

Customer situation/Industry need

Environmental legislation often requires power plants to prove to the relevant authorities the chemical content and volume discharged from their site. If plant operators are unable to present their measurement data and prove to the authorities that they have firstly monitored their discharge and additionally that they were within the legal limits then large fines can be levied. A cost-effective system to back-up the data and allow remote monitoring is required to increase plant productivity and remove the risk of inadvertent data loss.

ABB solution

Figure 1 shows a typical arrangement of an effluent flow monitoring system which is recording pH measurements and flow data.

The use of an RVG200 paperless chart recorder is ideal for this application thanks to its Ethernet communications and integrated webserver, which enables a simple, secure, remote connection.

Remote access can be either via the plant network or if no Ethernet connectivity is available then access can be provided via a GSM modem. The data coming from the recorder can then be imported into DataManager Pro, a data storage and review software used for reporting purposes – see Figure 2.

Outcomes/Results

Remote operation of the effluent flow monitoring system with secure back-up of data for peace of mind and security.

Plant components

ABB Recorders and Controllers can be used in a range of applications within a power plant:

<table>
<thead>
<tr>
<th>Measurement type</th>
<th>Panel-, field-mount recorders</th>
<th>Controllers and A/M stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effluent discharge monitoring</td>
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<tr>
<td>Fuel system</td>
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<td>Coal mill</td>
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<tr>
<td>Water treatment</td>
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<td>Boiler feed water</td>
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<td>Boiler outlet</td>
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<td>Steam line</td>
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<td>Cooling water system</td>
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<td>Gas turbine outlet</td>
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<td>Condenser</td>
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<tr>
<td>DIN/DCI</td>
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<tr>
<td>Air preheater</td>
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</tbody>
</table>

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Figure 1  Typical arrangement of effluent flow monitoring system

Figure 2  Using DataManager Pro to remotely view and store data as a back-up
Focus area 7

My measurement assistant

Customer situation / Industry need
Many companies are facing a skills shortage challenge that is hindering their objective to increase productivity in their plants. This is part of a wider change in workforce dynamics; instrumentation technicians who have a level of theoretical knowledge, combined with decades of experience in the industry, are now reaching retirement stage in their careers, leaving a knowledge vacuum. Millennials and graduates entering today’s job market do not have the technical knowledge and practical experience of their predecessors so they tend to find information as needed to solve issues. The most popular modern source of such information is short videos.

ABB solution
ABB has recently launched the most progressive web application ‘My Measurement Assistant’. The application supports service providers and maintenance teams with troubleshooting and commissioning of instrumentation devices. It gives the user access to online checklists that guide them through each step of the proper commissioning steps in the form of ‘how to’ videos. Furthermore, a downloadable commissioning report is available as an output to record steps taken and results of completed actions.

There are also online troubleshooting checklists that help pin-point the root cause of problems and gives instructions to assist in solving them. Country-specific contact details for cases where expert support is needed are also available.

Outcomes/Results
Online technical help and guidance reducing personnel burden of knowledge, ensuring right-first-time device commissioning and reduced downtime increasing productivity and saving time and money.

Supported products:
• CoriolisMaster
• HygienicMaster
• ProcessMaster
• Vortex/Swirl Master

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Supported products:
• CoriolisMaster
• HygienicMaster
• ProcessMaster
• Vortex/Swirl Master

Speed up your service:
Guided checklists with step-by-step video instructions

Easy access:
Accessible via app or cloud-based software from smartphones, tablets or desktops

For your installed device:
Database of downloadable videos and PDFs

Available where you need it:
Offline functionality (checklists & access to video downloads)

ABB support:
via ABB Service Contact

Spare parts identification:
Spare parts catalog and a possibility to request a quote

24/7 access:
Access to service knowledge and up-to-date information 24/7

Error code notification:
Translate error code notifications and receive remedial actions
Remote insights

Addressing resource gaps amidst demand for increased operational efficiency

Throughout the world, technological advancements are bringing modernized industrial operations to the furthest reaches of the planet. As industry expands across remote parts of the globe, producers struggle to find skilled workers to manage and maintain these operations.

In many markets, including the energy sector, experienced workers are retiring and taking their vast knowledge with them. As businesses seek to squeeze more out of their assets, this introduces more opportunities for error, loss of production and unplanned downtime. As a result, businesses must find a way to bridge these knowledge gaps with fewer resources and across greater distances.

Reimagining how we address field maintenance, ABB offers a wide range of control systems, software, instruments, analyzers and devices for industrial operations. Regardless of your industry, chances are there is an ABB device helping ensure smooth operation at your facility. As reliable as ABB devices are, all aspects of an operation are still susceptible to maintenance issues. When an ABB device, or even a device from a third party, does require maintenance, ABB is here to help. We strive to find increasingly innovative ways to bring continuous improvement to your operations and processes, no matter where you are.

ABB is embracing the power of augmented reality to bring significant improvements to field service. This new solution will simplify maintenance, reduce downtime, increase equipment effectiveness and improve safety. This enables you to expand the technical knowledge of your workforce as your personnel gain hands-on maintenance experience from ABB’s global expert support network.

Benefits

Receive remote expertise
- Instant access to expert diagnostic and repair guidance
- Resolve issues quickly
- Improve quality of repairs
- Take advantage of global ABB network of experts

Save time
- Chat instantly with remote experts
- Eliminate travel time
- Accelerate problem recognition and resolution

Reduce costs
- Live audio and video support
- Reduce unplanned downtime
- Eliminate travel expenses
- Support typical handheld devices such as smartphones and tablets
- Use the equipment already on hand

Increase knowledge base and productivity
- Transfer knowledge effectively
- Improve training through visual guidance and best-practice access
- Foster collaboration
- Enable fast learning for apprentices

Increase safety
- Perform hands-free field maintenance
- Troubleshoot issues with potentially dangerous equipment from a safe distance
- Increase accessibility for workers with permanent or temporary physical limitations