XI Jornadas Técnicas ABB en Chile
Solutions for desalination plants and conveyance systems.
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Solutions for desalination plants and conveyance systems.

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Today’s challenges in desalination
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Challenges facing operators, utilities, EPCs

1. Reduced commissioning and ramp-up
2. Rely on knowledgeable local support
3. Reduce total cost of ownership
4. Reduce operational and maintenance costs
5. Plant Performance Optimization
6. Rely on 24/7 remote assistance

Today’s challenges in desalination
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ABB Ability™ DCS
ABB Ability™ DCS at a glance

- More than 40 years of continuous system enhancement and support through our policy of ‘Evolution without obsolescence’

- 1+ TW of installed capacity
- 9,000+ power and water installations worldwide
- 800+ water, wastewater and desalination installations worldwide
- ~10,000 DCS running worldwide
- 3,400+ Turbine / Rotating Machine control systems in operation
- #1 in DCS for 19 years as reported by ARC Advisory Group
- 25% of large power plants run on ABB systems
- 72 GW+ of additional capacity controlled since 2011
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Reduced commissioning and ramp-up
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Reduced commissioning and ramp-up through integrated Instrumentation control and electrical solutions

A truly comprehensive and integrated portfolio...

**Automation**
- Distributed Control System (DCS)
- Supervisory Control And Data Acquisition (SCADA)
- Telemetry and communication systems
- Advanced functions (simulation, optimization)

**Instrumentation**
- Field instrumentation
- Analytics
- Electrical Equipment
- Substations (high, medium, low voltage)

- Transformers (high, medium, low voltage)
- Bus ducts
- Medium and low voltage drives and motors
- Uninterruptable power supply (UPS)
- Emergency power supplies
- Cabling

**Service**
- Life cycle service
- Advanced applications

... for the full water cycle

- Desalination
- Pumping stations
- Water & wastewater treatment
- Water transfer & distribution schemes

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Reduced commissioning and ramp-up through for faster commissioning and minimize project cost

Simulations

- Typically, ABB includes a full replica of the control room including HMI, engineering tools, process model, and instructor station with the ability to simulate many scenarios while being disconnected from the actual process.
- The process can be simulated manually via the instructor workstation or automatically via dynamic process simulation. Customer needs and application specifics dictate the process model fidelity.
- **BENEFITS:**
  - Creates a digital twin to test control modifications (e.g. loop tuning)
  - Increases operator efficiency and reduces errors by training operators prior to
  - Reduces plant and control system costs by providing a training environment that teaches operators how to perform “soft landings” and fast plant recovery
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Simulation is comprised of hardware and software solutions that help reduce commissioning costs by evaluating operating procedures, testing and pre-tuning the control system, and training operations staff.

What does it do for our customers?

- Creates a digital twin to test control modifications (e.g. loop tuning) prior to implementation on the actual plant.
- Increases operator efficiency and reduces errors by training operators prior to commissioning on what to do, how to do it, when to do it, and the expected result.
- Reduces plant and control system costs by providing a training environment that teaches operators how to perform “soft landings” and fast plant recovery.

How is it supplied to our customers?

A customer, with input from ABB, decides on the purpose of the simulator for the specific application(s).

With this information, ABB works with the customer to decide on the simulator fidelity (basic, premium, or professional).

The customer purchases the hardware, software, and services from ABB required to build an on-premises control system simulator.

What is included?

Typically ABB includes a full replica of the control room including HMI, engineering tools, process model, and instructor station with the ability to simulate many scenarios while being disconnected from the actual process.

The process can be simulated manually via the instructor workstation or automatically via dynamic process simulation. Customer needs and application specifics dictate the process model fidelity.
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Rely on knowledgeable local support
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Rely on knowledgeable local support and remote assistance 24/7

Rapid response
- Repairs
- Spares and consumables
- Replacement
- Training
- Service agreements

Lifecycle management
- Installation and commissioning
- Maintenance, Extensions, upgrades and retrofits
- Replacement, Training
- Spares and consumables
- End of life services
- Service agreements

Operational efficiency
- Engineering and consulting
- Maintenance
- Advanced services
- Extensions, upgrades, retrofits and Training
- Service agreements

Performance improvement
- Advanced services
- Engineering and consulting
- Extensions, upgrades and retrofits
- End of life services
- Service agreements

Planning Partner - Product Solutions - Systems Provider - Operations Partner
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Service: providing cost effective life cycle support

**Life cycle service solutions for power plants**

ABB offers professional life cycle services for your installed products and systems to support cost effective long-term decisions concerning overall system operation and maintenance.

‘Evolution without obsolescence’ policy grants backward compatibility between ABB’s new offerings and heritage systems, and support across the investment life cycle.

Using past investments to solve future needs: Increase performance and efficiency, extend asset life, complement technical resources, protect financial and intellectual investments, maximize reliability.
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Reduce total cost of ownership
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Reduce total cost of ownership through advanced digital applications

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<th>Performance visibility</th>
<th>Prevent outages and faults</th>
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<td>All ABB Ability Digital solutions for water facilities can be operated independently or by ABB Collaborative Operations experts</td>
<td>Full visibility into equipment, plant, or fleet performance against defined KPIs.</td>
<td>Vibration monitoring for a baseline assessment and ongoing monitoring of rotating equipment</td>
<td>Asset Health software to detect the health of critical plant equipment and recommend corrective maintenance actions</td>
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### Optimization
- **Performance optimization** to connect generation and energy storage assets with controllable loads to satisfy demands
- **Fast commissioning**
  - **Reduced costs** and time by prior evaluation of procedures, testing and pre-tuning the control system, and staff training
- **Focused operations**
  - Advanced optimization of alarm configurations and management at the fleet, site, or plant level control system
- **Security**
  - Cyber security automates security patching, antivirus updates, and backups for ABB DCS owners
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Reduce total cost of ownership through the power of digitalization

- ABB’s portfolio of digital solutions, ABB Ability™, helps customers turn the potential of digitalization and the Industrial Internet of Things, Services and People into real, tangible value
  - >70,000,000 digitally enabled devices connected
  - >70,000 digital control systems installed
  - >6,000 enterprise software solutions installed
  - 50 cloud-based services and advanced analytics
  - ABB continuously expands its cloud-connected portfolio with new digitally enabled devices, systems and software, as well as retrofit solutions

Open access, intelligent cloud
New end-to-end digital solutions
Systems to master process control
Closing the loop with connected devices
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Reduce operational and maintenance costs
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Reduce operational and maintenance costs using Asset Health

Plant health under control

- Real-time visualization of equipment health on-site or at remote locations like customer headquarters
- Customizable dashboards that describe fleet or plant level assets, with drill down capability that supports diagnostic analysis by a reliability or process engineer

- BENEFITS
  - Increases equipment mean time between failures by as much as 15%
  - Reduces equipment maintenance cost as much as 20%
  - Reduces planned outages by as much as 20%
  - Reduces unplanned outages by as much as 20%
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Reduce operational and maintenance costs using digital solutions to prevent outages and faults

**ABB Ability™ Vibration Monitoring**

- Vibration monitoring is a software product and subscription service that monitors real-time vibration of rotating equipment to avoid premature failure and unplanned downtime for rotating equipment operators

- **ABB provides:**
  - Baseline vibration assessment
  - Monthly reports that include rotating equipment performance and recommendations

- **BENEFITS:**
  - Provides early visibility into potential causes of failure through real time vibration thresholds and trend analysis
  - Prevents unplanned outages through proactive rather than reactive maintenance
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Reduce operational and maintenance costs using digital solutions for focused operations

**ABB Ability™ Alarm Management**

- A consulting service that helps optimize alarm configurations and management at the fleet, site, or plant level control system.

- Scope of service agreement can range from a basic recommendations report to full-scope alarm rationalization and recommendations implementation by ABB control system specialists.

- **BENEFITS:**
  - Increases abnormal situation detection rate by as much as 5x
  - Increases success in managing abnormal situation by as much as 26%
  - Reduces time to complete abnormal situation tasks by as much as 41%
  - Reduces the total number of alarms to as little as 10 per week from a maximum of 1 alarm every 2 seconds.
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Reduce operational and maintenance costs using digital solutions for secure operations

ABB Ability™ Cyber Security Workplace

- ABB commissions software and server that automates deployment of updates and performs backups
- ABB updates the control system during commissioning to the latest standard, completes system backup, and configures automated patching and backup schedule
- ABB provides monthly patches and antivirus updates
- BENEFITS:
  - **Reduces internal labor** required to maintain and update ICS security by a minimum of 24 hours or more a month*
  - **Provides greater visibility** to access ICS security status reporting
  - **Minimizes risk** of updates not being completed on a timely basis or potential operational impacts from manual application (i.e., impact to communication from un approved patch being applied)
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Plant performance optimization
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Plant Performance Optimization using digital solutions

- ABB commissions the software and a server that supports a baseline assessment and ongoing monitoring of selected equipment and operating parameters
- ABB provides:
  - Baseline performance assessment
  - Monthly reports that show performance against defined KPIs
  - Quarterly reports that include analysis with performance improvement recommendations
- BENEFITS
  - Provides real-time visibility into equipment, plant, or fleet performance
  - Identifies deviations from expected performance
- Multivariable Predictive Control (MPC)
- Control loop optimization
- Short term production optimization
- Long-term production optimization
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Digital solutions for optimized performance

Performance and Lifetime Monitoring

- **Unit**: overall actual and nominal Specific Energy Consumption (SEC)
  - **Membrane**: Actual and Nominal Salt Rejection, Salt Passage, Recovery, Concentration Factor, Mass balance Difference, Transmembrane Differential Pressure, Osmotic Pressure, Net Driving Pressure Actual and Nominal Flux decline, Fouling Factor;
  - **Pumps**: Head vs. Flow, Actual and Nominal Flow, Efficiency vs. Nominal Efficiency;
  - **Transformer and Auxiliaries Losses**: actual losses vs. expected losses and impact of such deviation on the unit efficiency and power.
  - **Other Losses**: the other losses are typically related to the plant and not for a single unit. They are losses due to common services like control room and offices electrical consumption, compressed air, cooling, etc.
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Rely 24/7 remote assistance
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Rely on 24/7 remote support through ABB Ability™ Collaborative Operations to turning data into more profitable business decisions.
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Summary

1. Seamless integration and digital solutions to minimize start-up costs.
2. Life cycle support with knowledgeable local support.
3. ABB Ability™ platform for digital solutions.
4. Today’s challenges in desalination.
5. Collaboration Operation Center.
6. Unique combination of best-in-class products and power and water applications know-how.
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Latest water project references
Minera Escondida SWRO Desal Plant, Chile

Complete control solution for Pumps and Desal

Antofagasta, Chile

Customer
- Black and Veatch + Doosan
- End Customer: BHP Billington

Business case
- R.O. Desalination plant, 216,000 m³/day
- 4 Pumping stations, 114 Km pipeline
- Customer’s need: integrated DCS
- Project start: February 2014

ABB solution
- ABB Ability System 800xA

Customer benefits
- State-of-art technology
- Interface with the mine
Spence SGO SWRO Desal Plant, Chile
Complete control solution for Pumps and Desal

Mejillones, Chile

Customer
- Tedagua, ACS Group + S:E.I. Saipem, ENI group
- End Customer: BHP Billington

Business case
- R.O. Desalination plant, 86,400 m3/day
- 3 Pumping stations, 155 Km pipeline
- Customer's need: integrated DCS
- Project start: August 2018

ABB solution
- ABB Ability System 800xA

Customer benefits
- State-of-art technology
- Interface with the mine
- Integrated Condition Monitoring System
Al Hoceima SWRO Desal Plant, Morocco
Distributed Control System

Al Hoceima, Morocco

Customer
– Tedagua, ACS Group
– End Customer: ONEE, Office Nationale de l’Electricité et l’Eau

Business case
– R.O. Desalination plant, 17,300 m3/day
– Customer’s need: DCS with short delivery time
– Project start: July 2018

ABB solution
– ABB Ability System Symphony Plus

Customer benefits
– State-of-art technology
– Platform well-known end-user side
Shoaiba III phase II SWRO Desal Plant, Saudi Arabia
Distributed Control System

Shoaiba, Kingdom of Saudi Arabia

Customer
- JV between Abeinsa EPC, Abengoa and Fisia Italimpianti
- End Customer: Acwa Power, SWCC

Business case
- R.O. Desalination plant, 250,000 m3/day
- Customer’s need: DCS with short delivery time
- Project start: Nov 2017

ABB solution
- ABB Ability System Symphony Plus

Customer benefits
- State-of-art technology
- Platform well-known end-user side
- Integrated Condition Monitoring System
Barka I SWRO Desal Plant, Oman
Distributed Control System

Customer
– Abeinsa EPC, Abengoa
– End Customer: ACWA Power

Business case
– R.O. Desalination plant, 45,000 m3/day
– Customer’s need: DCS with short delivery time
– Project start: Jan 2013

ABB solution
– ABB Ability System Symphony Plus

Customer benefits
– State-of-art technology
– Platform well-known end-user side
Al Ghubrah SWRO Desal Plant, Oman
Distributed Control System

Al Ghubrah, Oman

Customer
- Cadagua
- End Customer: Muscat City Desalination Company S.A.O.C

Business case
- R.O. Desalination plant, 191,000 m3/day
- DCS with short delivery time
- Integration with existing pumping station
- Integration with substation with IEC61850
- Project conclusion: 2016

ABB solution
- ABB Ability System Symphony Plus

Customer benefits
- State-of-art technology
- ABB’s experience in desalination automation projects
Salalah SWRO Desal Plant, Oman
Automation and Main Electrical Component integrated solution

Salalah, Oman

Customer need: build an energy efficient seawater reverse osmosis membrane desalination facility (IWPP)

ABB's response
- Complete engineered electrical packaged solution, distribution transformers, LV and MV switchgears, VFD drives, diesel generator and harmonic filters
- State-of-the-art control system for seamless electrical integration of plant monitoring, control and optimization

Customer Benefit
- Common platform for electrical and automation, for increased security, efficiency and reduced maintenance cost
- Minimizing total power loss of entire plant
- One single reliable supplier contact point for overall electrical balance of plant

Integrated electrical and automation solution