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SANTIAGO – CHILE - JULIO 30-31, 2019

# XI Jornadas Técnicas ABB en Chile

Solutions for desalination plants and conveyance systems.

Cristian Muñoz, Sales Specialist & Market Analyst - Chile

**ABB**

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# XI Jornadas Técnicas ABB en Chile

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# Solutions for desalination plants and conveyance systems.

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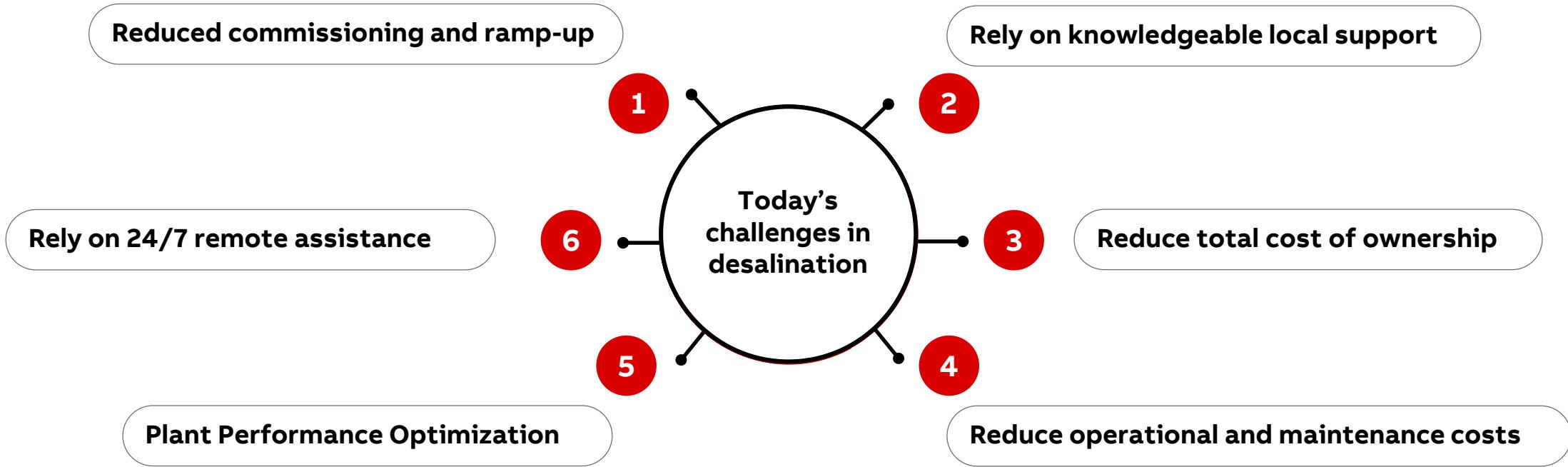
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# XI Jornadas Técnicas ABB en Chile

Today's challenges in desalination

# Solutions for desalination plants and conveyance systems.

Challenges facing operators, utilities, EPCs



# XI Jornadas Técnicas ABB en Chile

ABB Ability™ DCS

# Solutions for desalination plants and conveyance systems.

## ABB Ability™ DCS at a glance



**1+ TW**

of installed capacity



**9,000+**

power and water installations  
worldwide



**800+**

water, wastewater and  
desalination installations  
worldwide



Of continuous system enhancement  
and support through our policy of  
**'Evolution without  
obsolescence'**



**~10,000**

DCS running worldwide



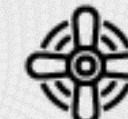
**#1 in DCS**

for 19 years as reported by ARC  
Advisory Group



**25%**

of large power plants run on ABB  
systems



**3,400 +**

Turbine / Rotating Machine  
control systems in operation



**72 GW+**

of additional capacity controlled  
since 2011

# XI Jornadas Técnicas ABB en Chile

Reduced comissioning and ramp-up

# Solutions for desalination plants and conveyance systems.

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

## Instrumentation

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

## Service

- Life cycle service
- Advanced applications



**... for the full water cycle**

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

# Solutions for desalination plants and conveyance systems.

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



# Solutions for desalination plants and conveyance systems.

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.

# XI Jornadas Técnicas ABB en Chile

Rely on knowledgeable local support

# Solutions for desalination plants and conveyance systems.

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

# Solutions for desalination plants and conveyance systems.

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



# XI Jornadas Técnicas ABB en Chile

Reduce total cost of ownership

# Solutions for desalination plants and conveyance systems.

Reduce total cost of ownership through advanced digital applications

## At yours or at ABB's CoC



All ABB Ability Digital solutions for water facilities can be operated independently or by ABB Collaborative Operations experts

## Optimization



Performance optimization to connect generation and energy storage assets with controllable loads to satisfy demands

## Performance visibility



Full visibility into equipment, plant, or fleet performance against defined KPIs.

## Fast commissioning



Reduced costs and time by prior evaluation of procedures, testing and pre-tuning the control system, and staff training

## Prevent outages and faults



Vibration monitoring for a baseline assessment and ongoing monitoring of rotating equipment

## Focused operations



Advanced optimization of alarm configurations and management at the fleet, site, or plant level control system

## Plant health under control



Asset Health software to detect the health of critical plant equipment and recommend corrective maintenance actions

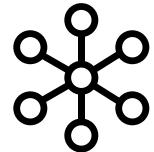
## Security



Cyber security automates security patching, antivirus updates, and backups for ABB DCS owners

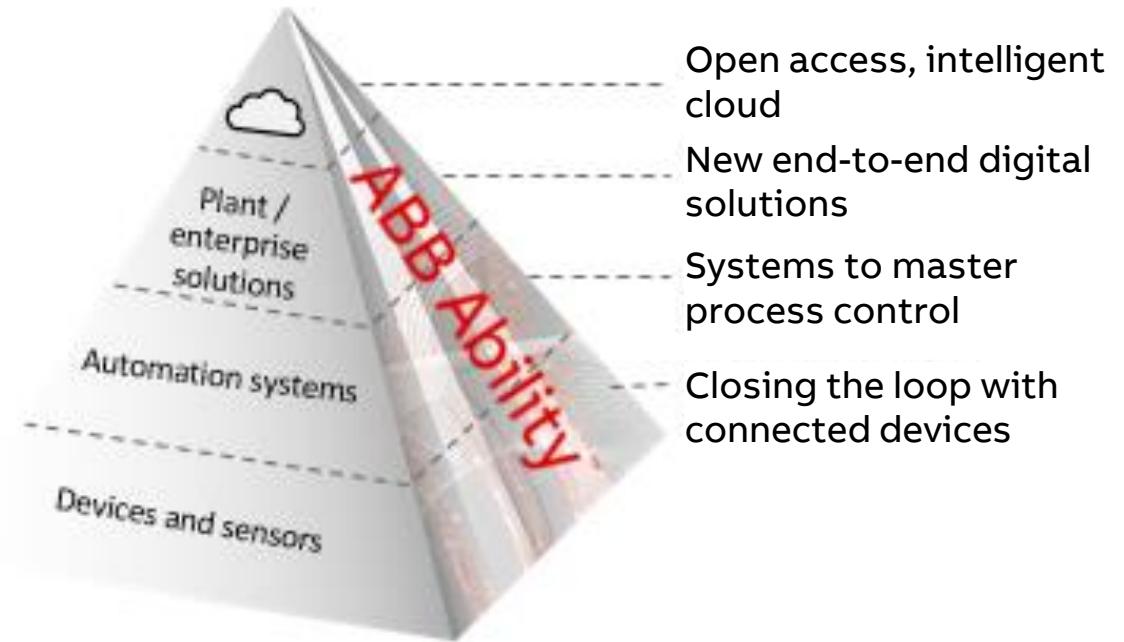
# Solutions for desalination plants and conveyance systems.

Reduce total cost of ownership through the power of digitalization



Connectivity

- 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



# XI Jornadas Técnicas ABB en Chile

Reduce operational and maintenance costs

# Solutions for desalination plants and conveyance systems.

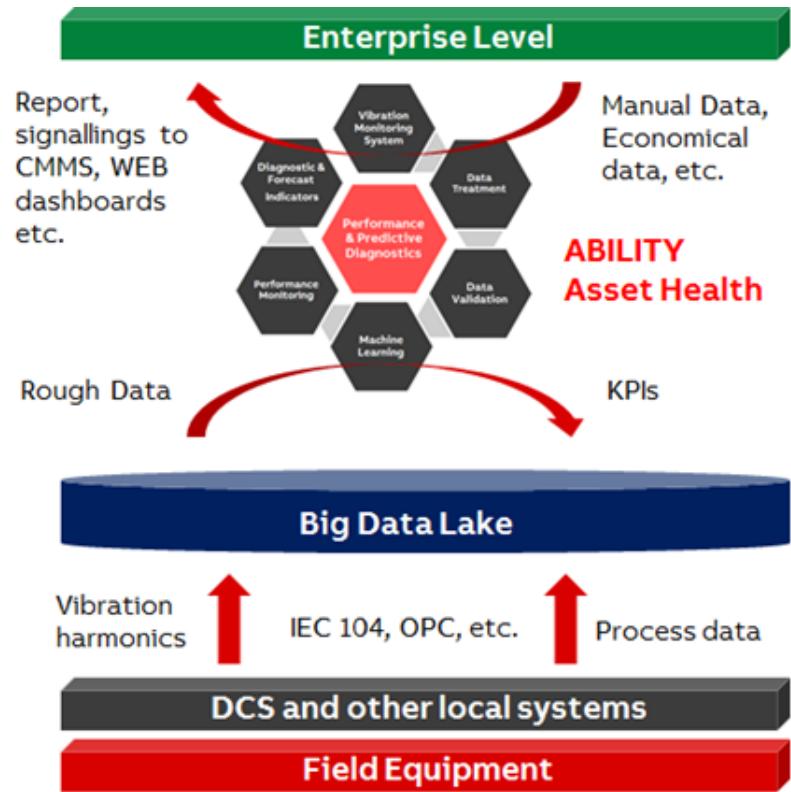
**Reduce operational and maintenance costs** using Asset Health

## 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%

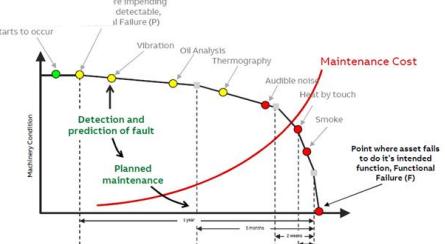
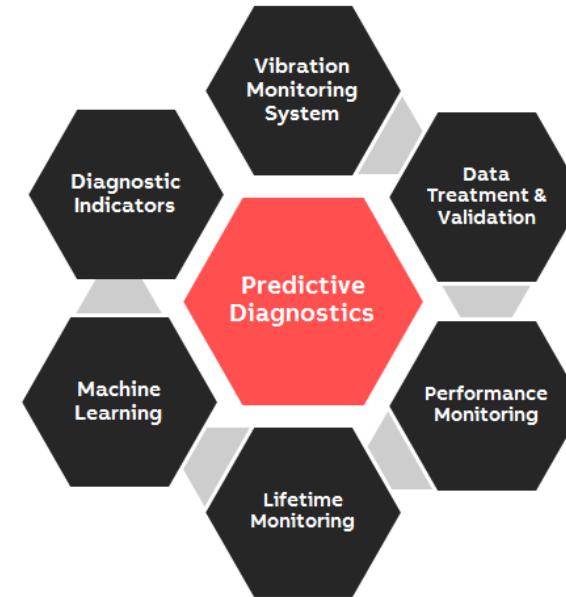


# Solutions for desalination plants and conveyance systems.

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

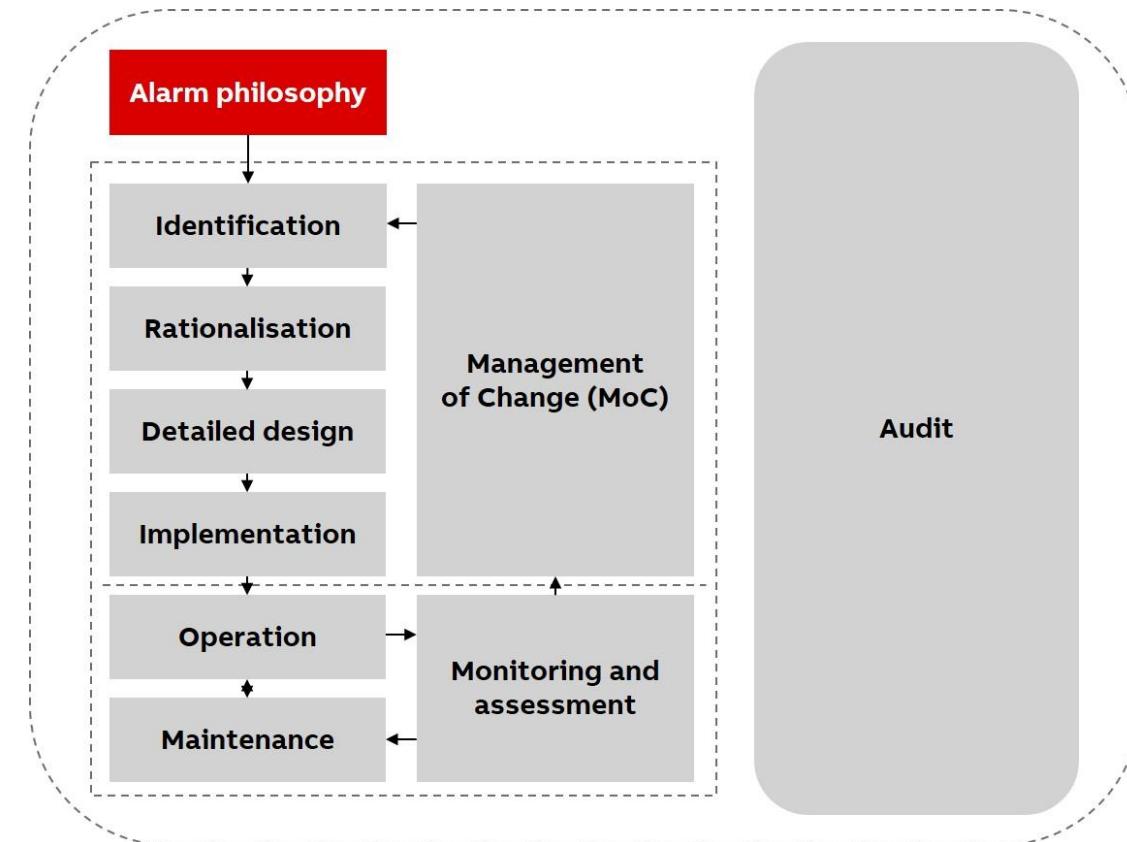


# Solutions for desalination plants and conveyance systems.

**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.



# Solutions for desalination plants and conveyance systems.

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)



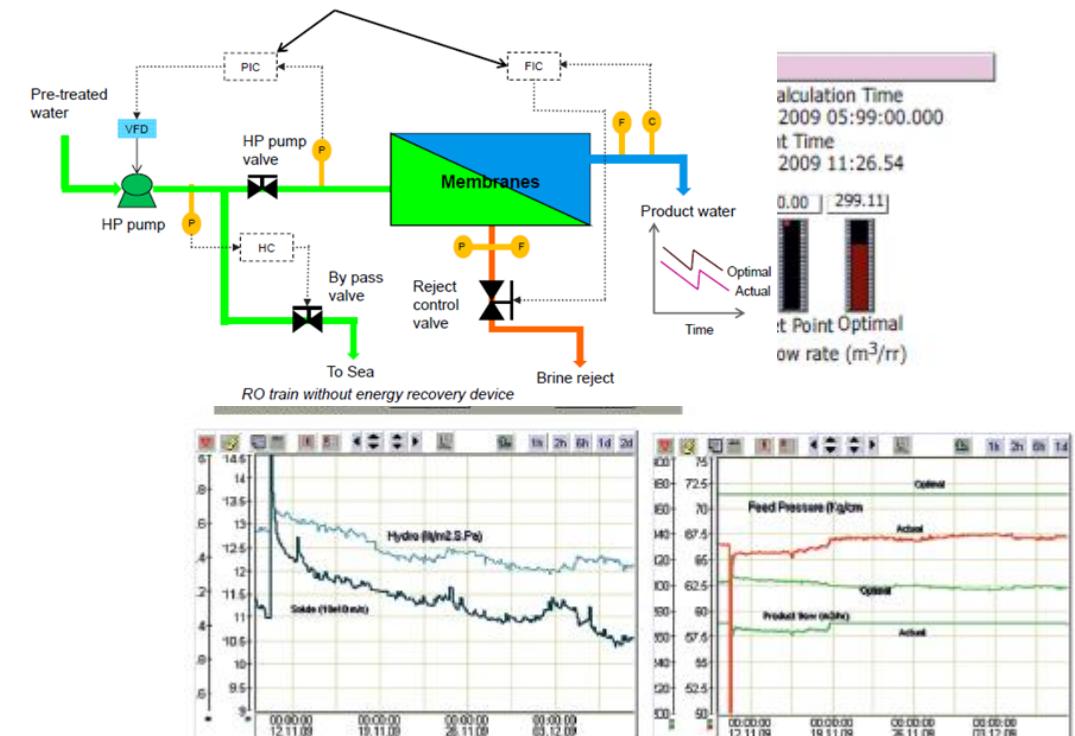
# XI Jornadas Técnicas ABB en Chile

Plant performance optimization

# Solutions for desalination plants and conveyance systems.

## 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

©ABB  
Short term production optimization  
August 8, 2019

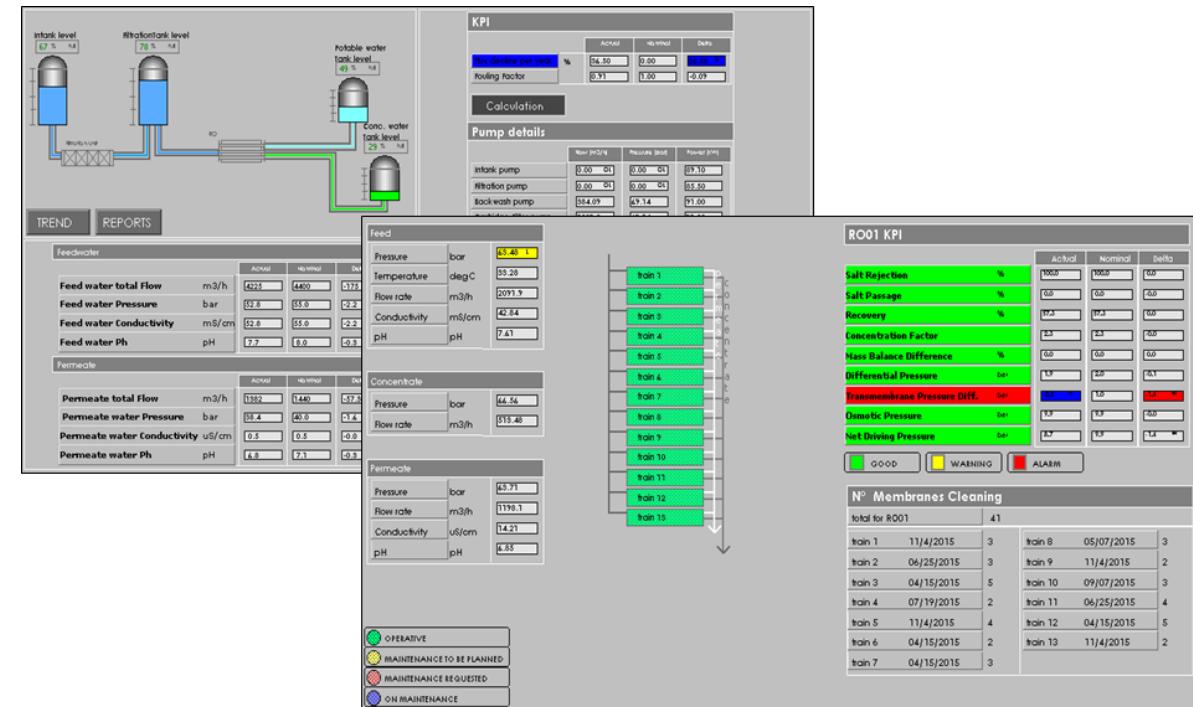
- Long-term production optimization

# Solutions for desalination plants and conveyance systems.

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.



# XI Jornadas Técnicas ABB en Chile

Rely 24/7 remote assistance

# Solutions for desalination plants and conveyance systems.

**Rely on 24/7 remote support** through ABB Ability™ Collaborative Operations to turning data into more profitable business decisions

## Ops support

Operations and Technical Support



## Analytics

Analytics and Visualization



Simulation

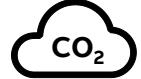


Customer Operations Center/HQ



## Optimization

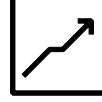
Emission Monitoring



Energy Optimization



Performance Optimization



Alarm Management



Customer assets Power plants



## Predictive maintenance

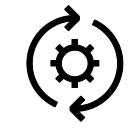
Condition Monitoring



Asset Health



Predictive Maintenance



## Cyber and safety

Cyber Security



Safety Management



## Control

Control Centers



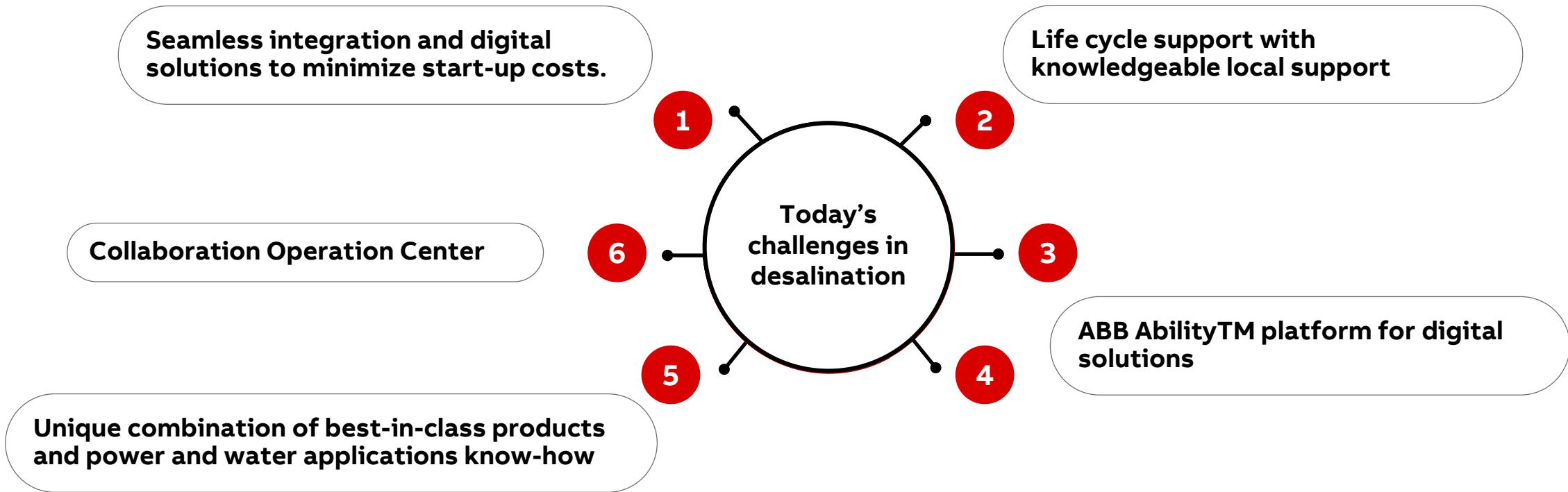
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# XI Jornadas Técnicas ABB en Chile

Summary

# Solutions for desalination plants and conveyance systems.

## Summary



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# XI Jornadas Técnicas ABB en Chile

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 m<sup>3</sup>/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

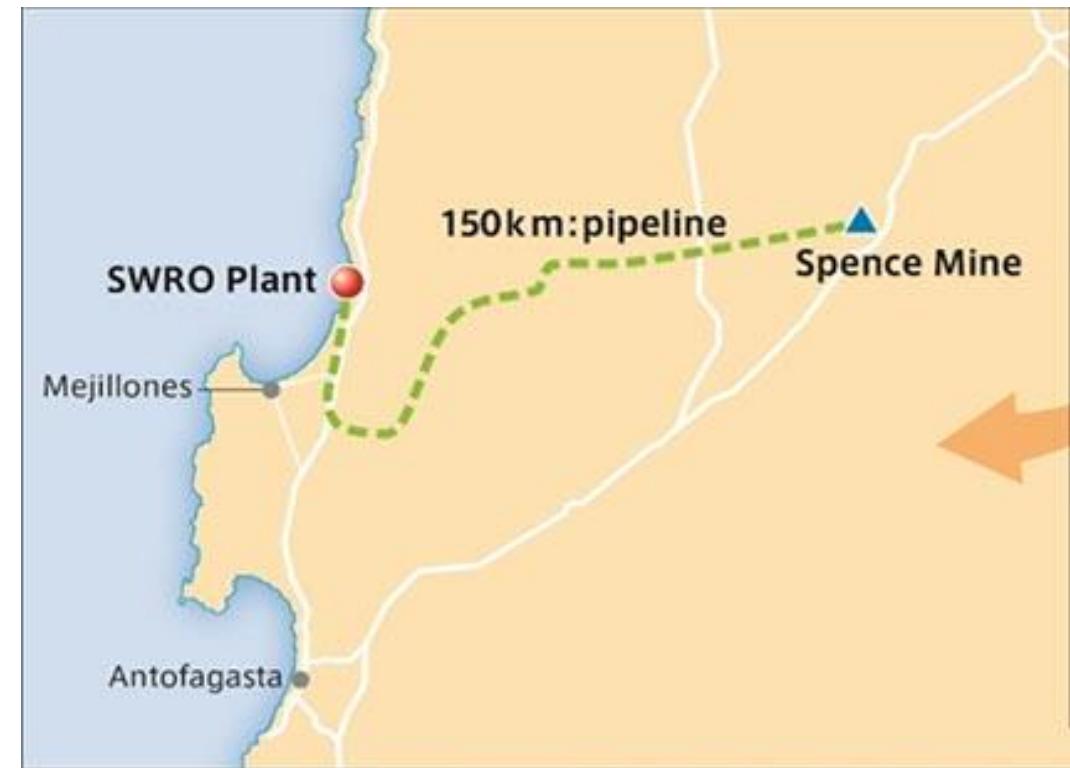
- R.O. Desalination plant, 86,400 m<sup>3</sup>/day
- 3 Pumping stations, 155 Km pipeline
- Customer's need: integrated DCS
- Project start: August 2018

### 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: ONGE, Office Nationale de l'Electricité et l'Eau

#### Business case

- R.O. Desalination plant, 17,300 m<sup>3</sup>/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 m<sup>3</sup>/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

### Barka, Oman

#### Customer

- Abeinsa EPC, Abengoa
- End Customer: ACWA Power

#### Business case

- R.O. Desalination plant, 45,000 m<sup>3</sup>/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 m<sup>3</sup>/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



ABB