NOVEMBER 2022

The Journey to Integrated Operations

Rodolfo Pino - Head of Advanced Analytics SQM

David Rojas - Data Scientist SQM

Luis Yacher - Managing Director of CONTAC

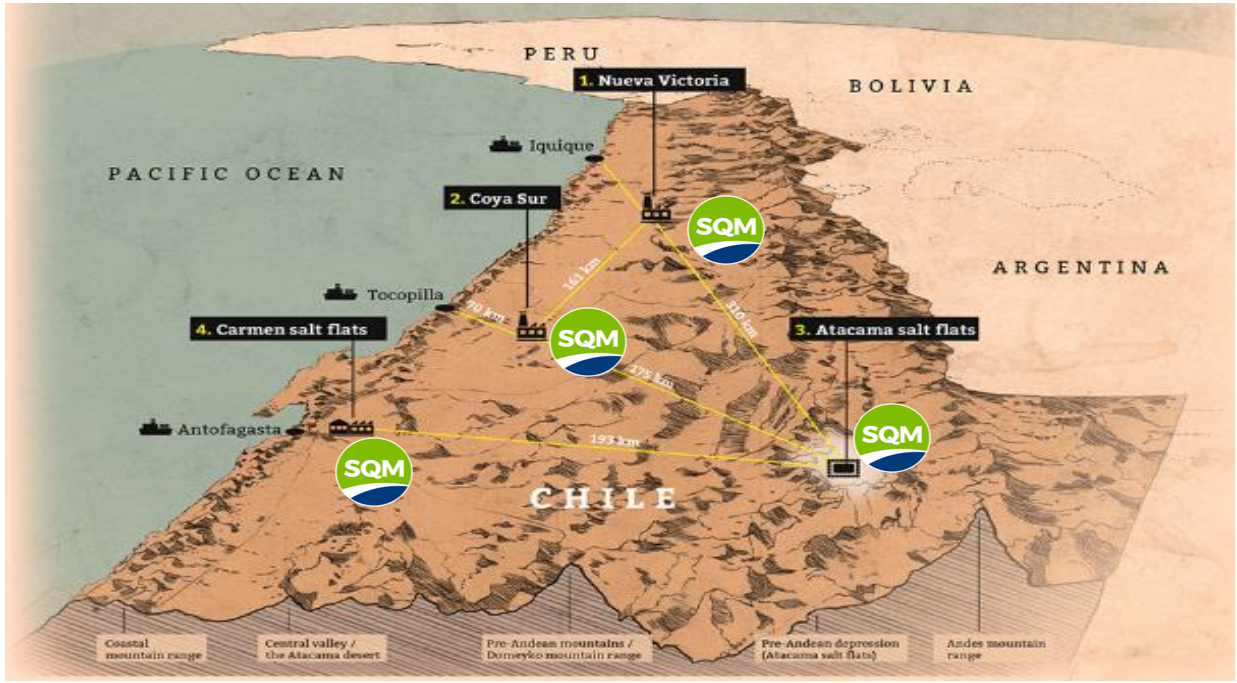
© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

SQM

Solutions for human progress

SQM is a mining company operating in northern Chile. It is present in strategic industries for sustainable development such as health, food industry, technology, and the clean energies that move the world.

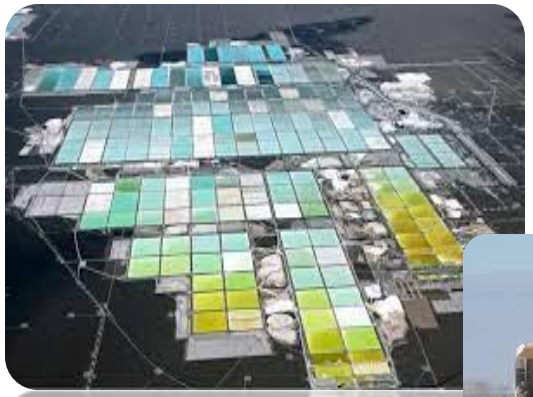
SUSTAINABLE DEVELOPMENT GOALS



Specialty plant nutrition	Lithium and derivatives	Iodine and Derivatives	Potassium	Industrial Chemicals

AVEVA

Lithium process from raw material to export all world



Salar de Atacama

The brines are in deposits below the surface of the Atacama salt flats. Once pumped out, the wind and sun evaporate the water and concentrate the salts, and lithium, sulfate, and potassium chloride are collected.

Chemical Plant

Lithium carbonate and Lithium hydroxide production processes.

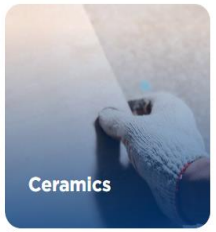
Located in Antofagasta, about 300 km. far from Salar de Atacama.

Tocopilla Port

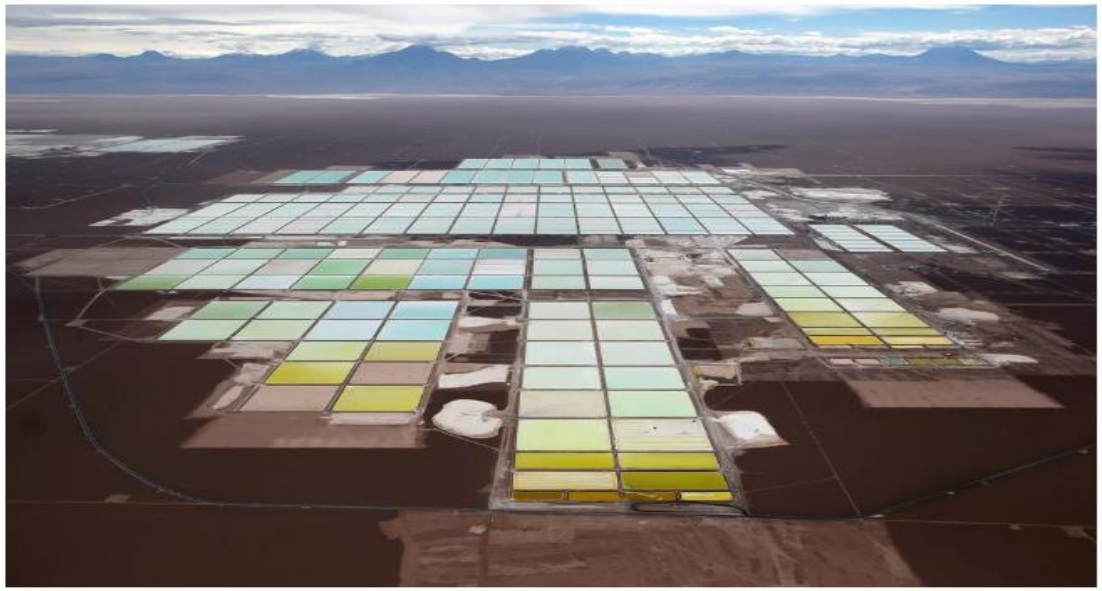
The refined product is shipped worldwide from the port of Tocopilla, north Antofagasta

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

Main Lithium applications



SQM LITHIUM IN NUMBERS



An aerial view shows the brine pools and processing areas of the Soquimich (SQM) lithium mine on the Atacama salt flat in the Atacama desert of northern Chile, January 10, 2013.REUTERS/Ivan Alvarado/File Photo

97.4%
of the energy used in the lithium production process is solar

300
environmental monitoring points we deploy from the core of the Salar de Atacama to our operation

5.256 $ MUS
is the total investment value that we deliver to the communities through the Corfo Contract

180.000
metric tons of Lithium Carbonate will be our production capacity in 2023

50%
reduction of brine we will experience in 2030

2030
will be the year in which the lithium production process will be carbon neutral

99%
of operation count the ports from where we export our products to the 5 continents

16.7%
of the staff are women; figure that doubles the national average of the Chilean mining industry

SQM Lithium market share	19%
Sales (Mton)	12.3

The Journey to Integrated Operations

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

Initial situation

In a very large facility (3x1.2 Km.) 6 control rooms managed the different processes

Plants

- Lithium Hydroxide Plant
  Processes to obtain LiOH
- Carbonate Plant
  Calcium and Magnesium Purification
- Carbonate
  Drying and compaction
- Carbonate Plant
  Carbonation Processes
- SX
  Solution Refining
- PRS Plant
  Industrial Water Processes
- Salar of Atacama
  Lithium Extraction Wells, Plant Sulfates

&

- Maintenance Team
- Reliability Team
- Process Eng. Team
- Data analytics Team

- Plant Managers
- Operation Manager

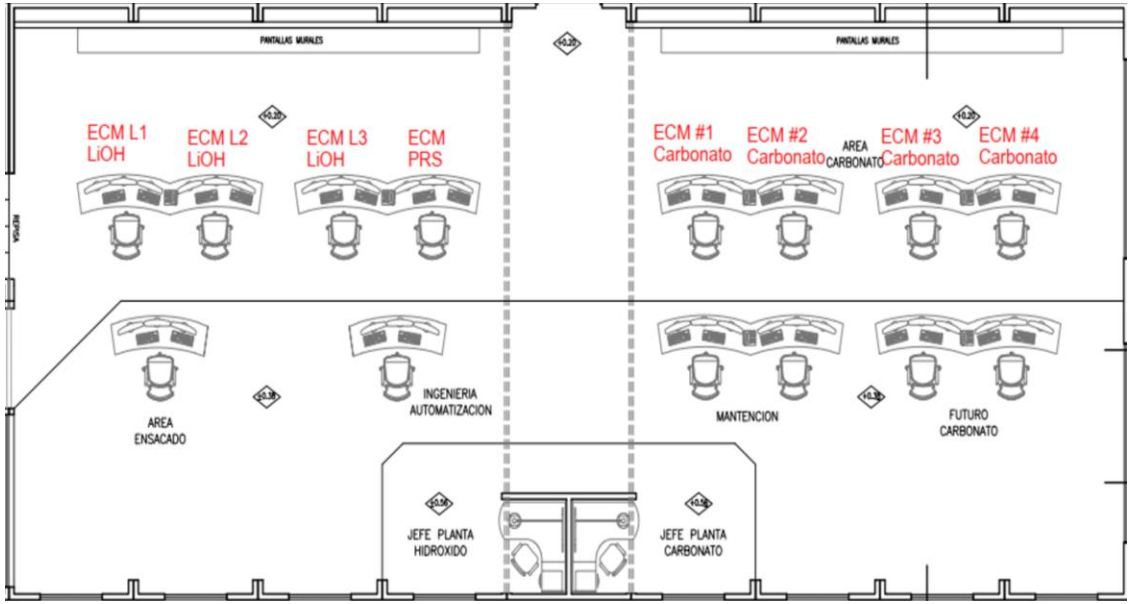
The IOC Project infrastructure

Operator Consoles centralization

Virtualization of Control System Servers

OT network upgrade

Standardization of operator consoles



Operation center designed for coordination and collaboration

Workspaces for the support activities: maintenance, process engineering, planning, process control & automation

Workspaces for Plant Managers

Located at the same building used by the Operation Managers and SME Teams

✓

Lithium Hydroxide Plant
Processes to obtain LiOH

Carbonate Plant
Carbonation Processes

Carbonate Plant
Calcium and Magnesium Purification

Carbonate
Drying and compaction

First Semester 2023

SX
Solution Refining

PRS Plant
Industrial Water Processes

In progress, December 2022

Salar of Atacama
Lithium Extraction Wells, Plant Sulfates

The IOC Project, Operational Data Infrastructure

Lithium Hydroxide Plant
Processes to obtain LiOH

Carbonate Plant
Calcium and Magnesium Purification

Carbonate
Drying and compaction

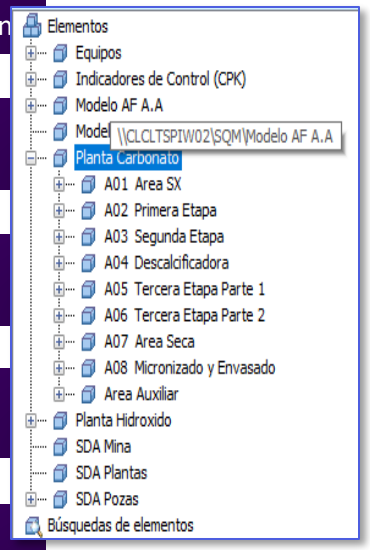
Carbonate Plant
Carbonation Processes

SX
Solution Refining

PRS Plant
Industrial Water Processes

Salar of Atacama
Lithium Extraction Wells, Plant Sulfates

AVEVA PI System



AVEVA PI Vision

IBM MAXIMO

In progress

Advanced Analytics tools

Azure

Google Cloud Platform

Power BI

$H_2O.ai$

H2O HYDROGEN TORCH

plotly | Dash

Integrated Operations, key concepts and goals…in 2 slides

Focus on

- Value chain optimization
- Real time Operation Management

Make overall OEE real

By enabling the close coordination of processes and support activities: programming, reliability, process engineering, LTO

Enabling each person of the organization a 360° awareness, as close to Real Time as possible

Of its scope of duties
How its actions may affect others
How others may affect its goals

Perceive its current situation
Understand its current situation
Project the impact of its actions

Integrated Operations, key concepts and goals …in 2 slides

- Information is delivered timely, in context and related to “action”
- Information focused on “value interfaces”, meaning the organizational links between operators and between operators and the support teams that are closely related with the overall optimization: short term programming, reliability and process engineering
- Information systems enable new organizational schemas, like re-locating and/or co-locating current duties/roles

Addressing the quick wins & short term road map

Workshop

A WorkShop was conducted at the plant site with the participation of Operators, Plant Managers, Process Engineers, Maintenance Team, Data Analitycs Team

81 value initiatives were collected

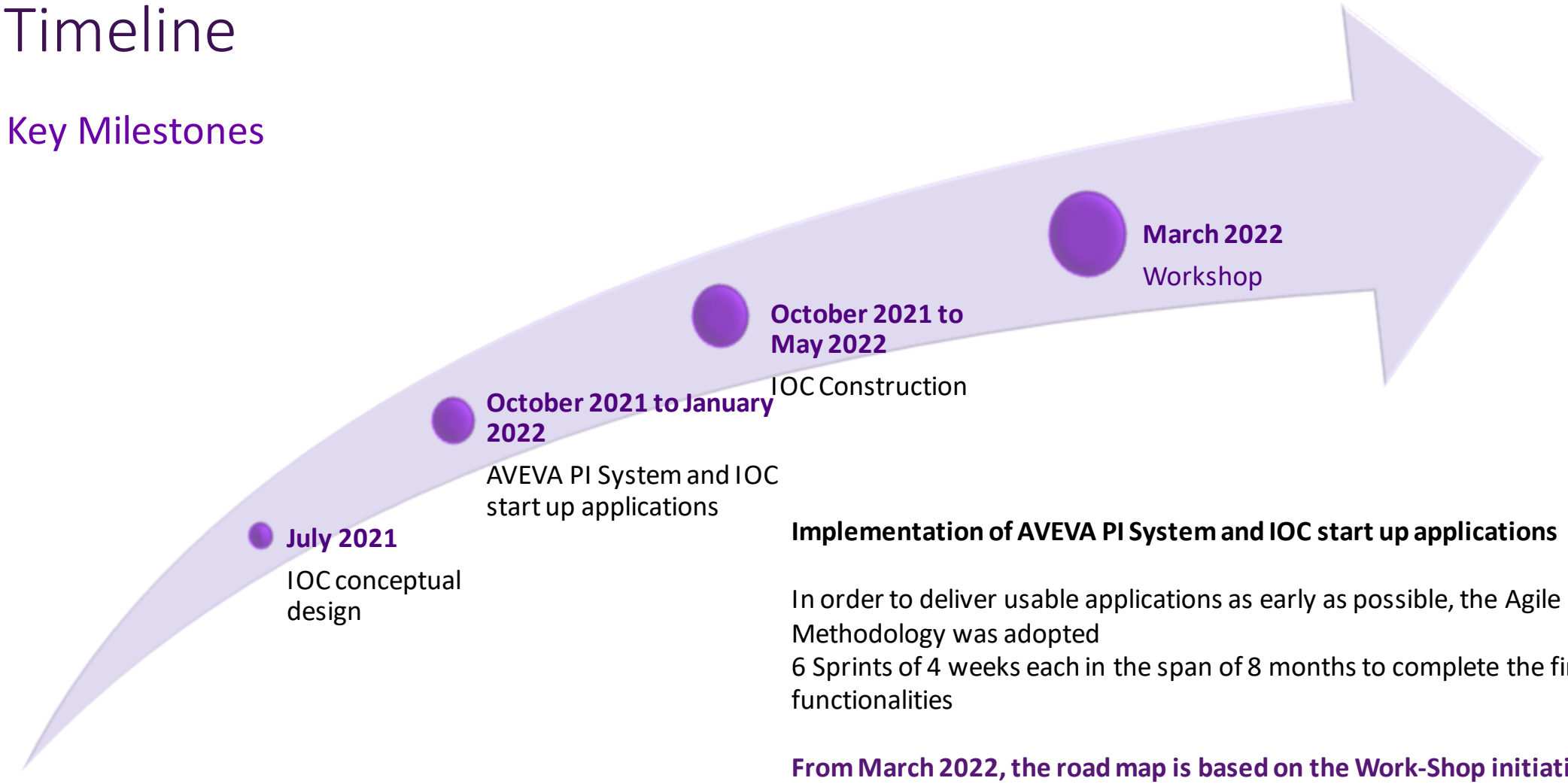
A second workshop was conducted, with the IOC key members, where the initiatives were priorized, considering its implementation difficulties and value impact

A short term road map was prepared, considering 50 of the original 81 ideas

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

Timeline

Key Milestones



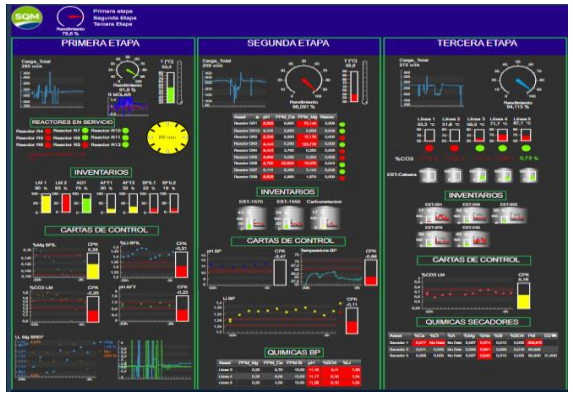
Implementation of AVEVA PI System and IOC start up applications

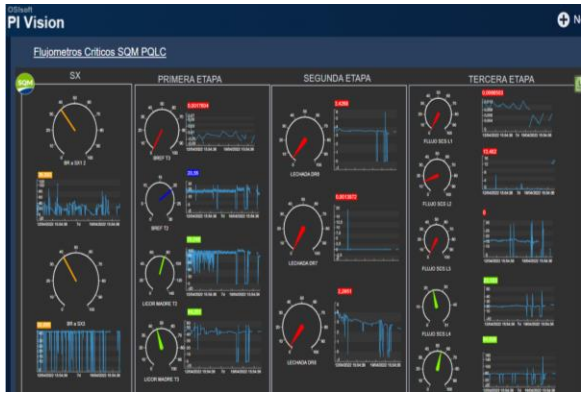
In order to deliver usable applications as early as possible, the Agile Scrum Methodology was adopted
6 Sprints of 4 weeks each in the span of 8 months to complete the first set of IOC functionalities

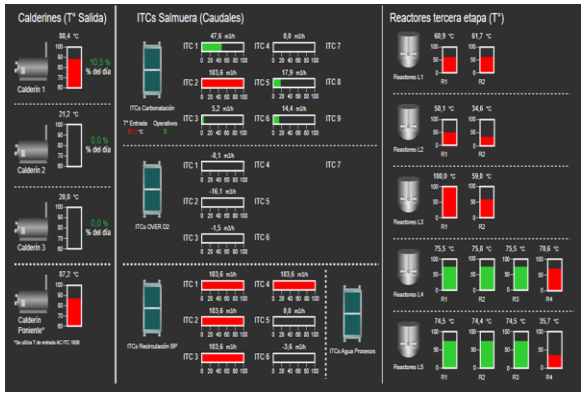
From March 2022, the road map is based on the Work-Shop initiatives. 20 from 81 are now completed and 10 are in progress, 51 are planned for 2023/2024

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

The Quick Wins & AVEAV PI System

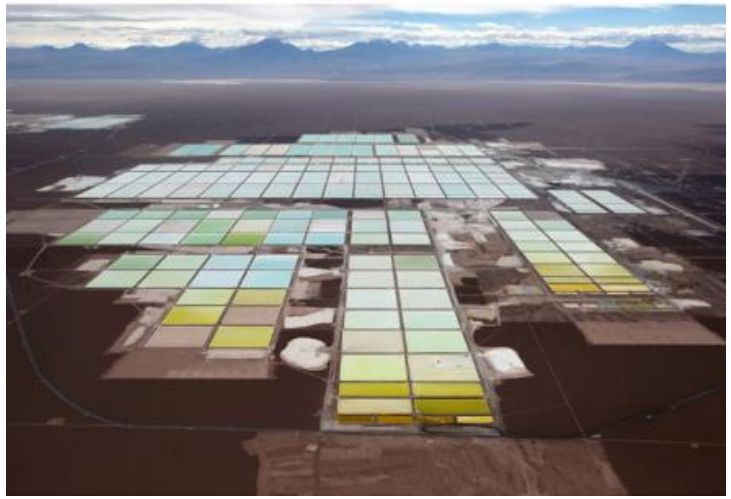






- Situational awareness dashboards
- Early warnings of process deviations
- Control charts for process monitoring
- Critical instrumentation monitoring
- Critical asset monitoring
- Integrated Reporting
- IBM Maximo Integration (in progress)

Advanced analytics online "advisor" for boilers & process reactors optimization

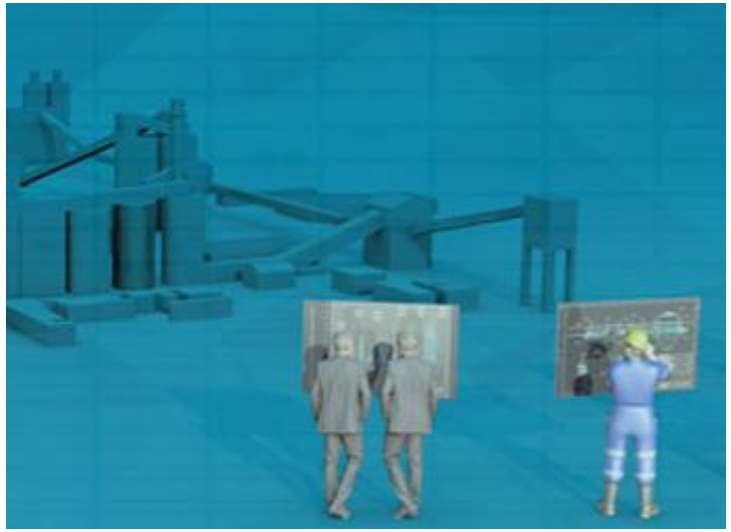


Rodolfo Pino & David Rojas

Head of Advanced Analytics & Business Analytics

SQM

rodolfo.pino@sqm.com & david.rojas@sqm.com



Luis Yacher

Managing Director

CONTAC

lyacher@contac.cl

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

AVEVA

linkedin.com/company/aveva

@avevagroup

ABOUT AVEVA

AVEVA is a global leader in industrial software, sparking ingenuity to drive responsible use of the world's resources. The company's secure industrial cloud platform and applications enable businesses to harness the power of their information and improve collaboration with customers, suppliers and partners.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. With operations around the globe, we are headquartered in Cambridge, UK and listed on the London Stock Exchange's FTSE 100.

Learn more at www.aveva.com

© 2022 AVEVA Group plc and its subsidiaries. All rights reserved.

AVEVA