



AVEVAWORLD
PARIS

Innovative lithium extraction with AVEVA PI System and AVEVA Production Management

16/10/2024



Agenda

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Introduction

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Issues and lessons
learned

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Results and benefits

Our presenters



Bernard Lafrance

Senior Industrial IT engineer

Bernard.Lafrance@bba.ca

Bernard has extensive experience in industrial computing. Over the years, he has built a robust expertise in MES (Manufacturing Execution Systems), data historians, quality systems, and system integration.

Areas of expertise :

- MES Platforms
- Historians and Databases
- System Integration
- Dashboards and Data Visualization
- Quality Systems (LIMS)

23+

years of experience



Pierre-Mael Fontaine

**Plant Control System
Product Line Manager**

pierre-mael.fontaine@eramet.com

Pierre-Mael, in Eramet group for 13 years. Industrial IT developer, data engineer and manager. Deployed Historian, MES, APS and custom apps in different workshops.

Areas of expertise :

- Project management
- Industrial architecture
- Historians and Databases
- Data analysis

16+

years of experience

40+ years of innovation

190 partners

1,500+ employees

20 offices across Canada and abroad

Our multidisciplinary team continues to expand across Canada. By setting up shop near client operations, we can maintain lasting relationships with those clients by remaining mobile and available.

Serving the energy and natural resources industry



Terrace
Vancouver
Trail
Calgary
Edmonton
Santiago, Chile
Utah, USA

Sudbury
Toronto
Rouyn-Noranda
Val-d'Or
Mont-Tremblant
Concord

Montréal
Mont-Saint-Hilaire
Québec
Boisbriand
Labrador City
Sept-Îles
Saguenay



Introduction

01



Eramet's strategic roadmap based on 2 pillars with strong CSR commitments



Growth in metals needed for global economic development

Continued global growth should sustain demand for :

MANGANESE
(carbon steels for consumer goods)

NICKEL
(stainless steels for consumer goods)

MINERAL SANDS
(pigments for paints, ceramics)



Growth in the metals needed for the energy transition

These markets are growing exponentially, driven by electrification (electric vehicles) and the decarbonization of the global economy.

LITHIUM
In 2024, Eramet will become Europe's leading producer of battery-grade lithium, with the start-up of production at the **Centenario-Ratones** site in Argentina.

BATTERY RECYCLING
Through the **ReLieVe** project, carried out in partnership with Suez, Eramet aims to become a major player in lithium-ion battery recycling in Europe.



Set an example by deploying a responsible approach

**COMMITMENT TO
PEOPLE**

**COMMITMENT TO
RESPONSIBLE ECONOMY**

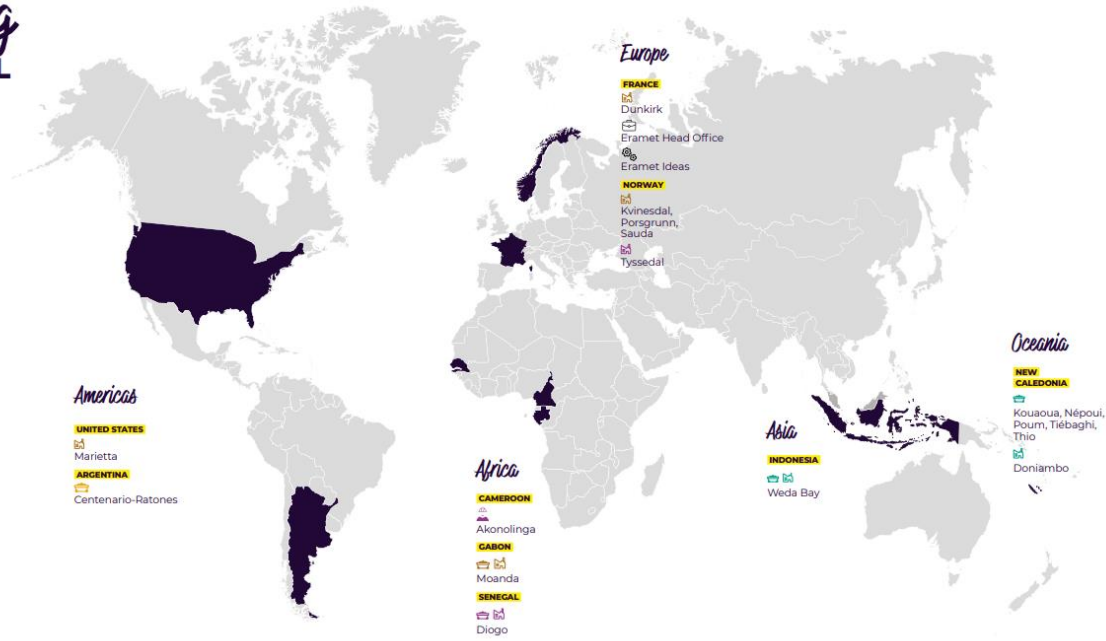
**COMMITMENT TO
THE PLANET**

Growth enablers: Exploration, Innovation and Digital transformation

Eramet - 2023 Figures

MAP OF OUR *mining* AND METALLURGICAL SITES

- PROJECT
- MINING SITE
- TRANSFORMATION
- RESEARCH & DEVELOPMENT
- HEAD OFFICE
- Manganese
- Nickel
- Mineral sands
- Lithium



Initiative for Responsible Mining Assurance (IRMA)

3,8^{Md€}

BN ADJUSTED
TURNOVER

52%

MN

41%

NI

7%

MINERAL SANDS

10 700

EMPLOYEES

1,2

REHABILITATION
RATE OF CLEARED
SURFACE AREA

1,1¹

ACCIDENT
FREQUENCY RATE FR2

-40%

REDUCTION IN
TCO₂/TON OUTGOING
PRODUCT VS 2018

Eramet – Top-notch sustainability standards



PEOPLE

We look for people aligned with our values and accompany their personal and professional development.



LOCAL DEVELOPMENT

Local employment: 82% Salta & 95% Argentina*.

Development of our local value chain: 263 local suppliers (Salta).

100% Sustainable Projects with an ESG approach target to direct and indirect communities (Puesteros, SRPG, SAC and Salta Province).



ALLIANCES

We work with expert organizations to ensure the sustainability of projects.



HUMAN RIGHTS

Respectful & diverse work environment with our communities, both internal and external.

Committed to the development of a solid due diligence process.



PLANET

Participating in the challenges of the ecological and energy transition.

Strong water recycling rate limiting freshwater consumption.

Significantly lower incidence on hydric balance vs. conventional process.

Robust environmental programme:

- Efficient use of resources
- Participatory Environmental Monitoring
- Photovoltaic generation plant



Genesis of the project

Lithium is a key resource for the **energy transition**

New Lithium mine with disruptive process : better efficiency, lower water resources and less energy required → **need to validate in real condition**

Pilot plant created in 2020

- BBA set up the information system
- Plant is run without SCADA, with AVEVA PI Vision

Curious? <https://centenario.virtual.eramet.com/en/>



Lithium a world-class deposit in Argentina

Resources & activities

- Extraction of the lithium contained in the brines of the Centenario salar and conversion into battery-grade lithium carbonate, at an altitude of 4,000 m in the province of Salta
- Production to start in Argentina in **November 2024**
- Estimated reserves **> 40 years**, positioned in the **1st quartile** of the lithium industry's cost curve
- Compliance with the most stringent standards for **responsible mining** (IRMA standard), including all environmental, social and governance aspects

An innovative process developed by Eramet

- **10 years** of R&D, **5 years** of continuous management
- **90%** efficiency
- Processing time of **one week**, compared with 18 months for the conventional evaporation process
- **60%** of the water used in the process is recycled.



24 Kt LCE*

ANNUAL PRODUCTION TARGET 2026

15 Mt LCE*

OF DRAINABLE RESOURCES ON SITE

THE BRINE PASSES THROUGH COLUMNS WHERE LITHIUM IS CAPTURED BY AN ALUMINUM-BASED LITHIUM SORBENT ACTING LIKE A "SPONGE" DEVELOPED BY ERAMET AND IFPEN. IT IS COVERED BY 12 PATENTS.

Business challenges

02



Eramet – Business challenges (Level 3)

Remote location with complicated access
No existing telecommunication

Greenfield and new process :

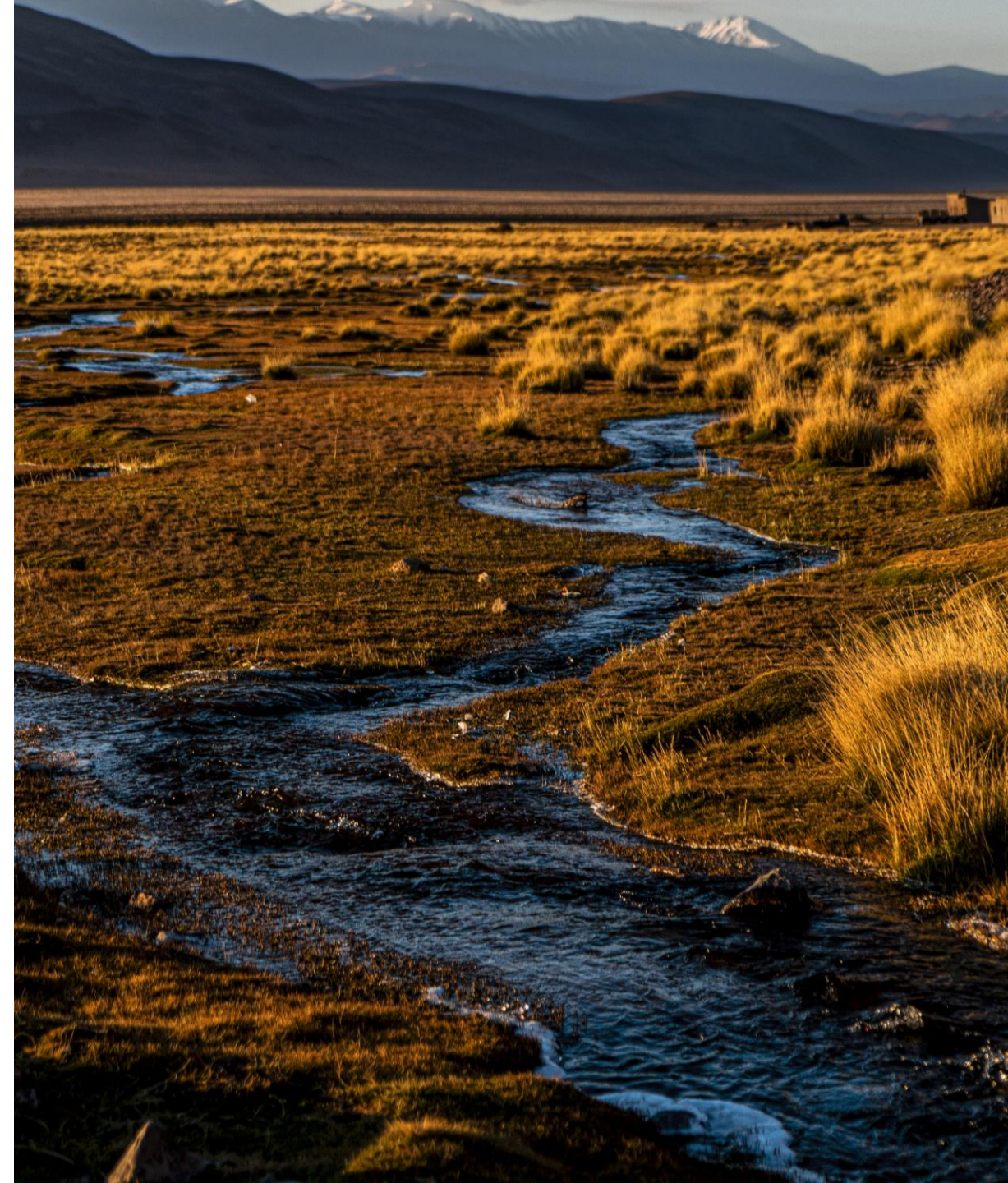
- Resilient solution
- Operate efficiently
- Track all the activities
- Provide auditable reports for environment

Avoid paper, digital forms and reports

Network limitation in a tough area

Cybersecurity **is mandatory**

Use latest technologies (OPC UA, HMTL5, etc)



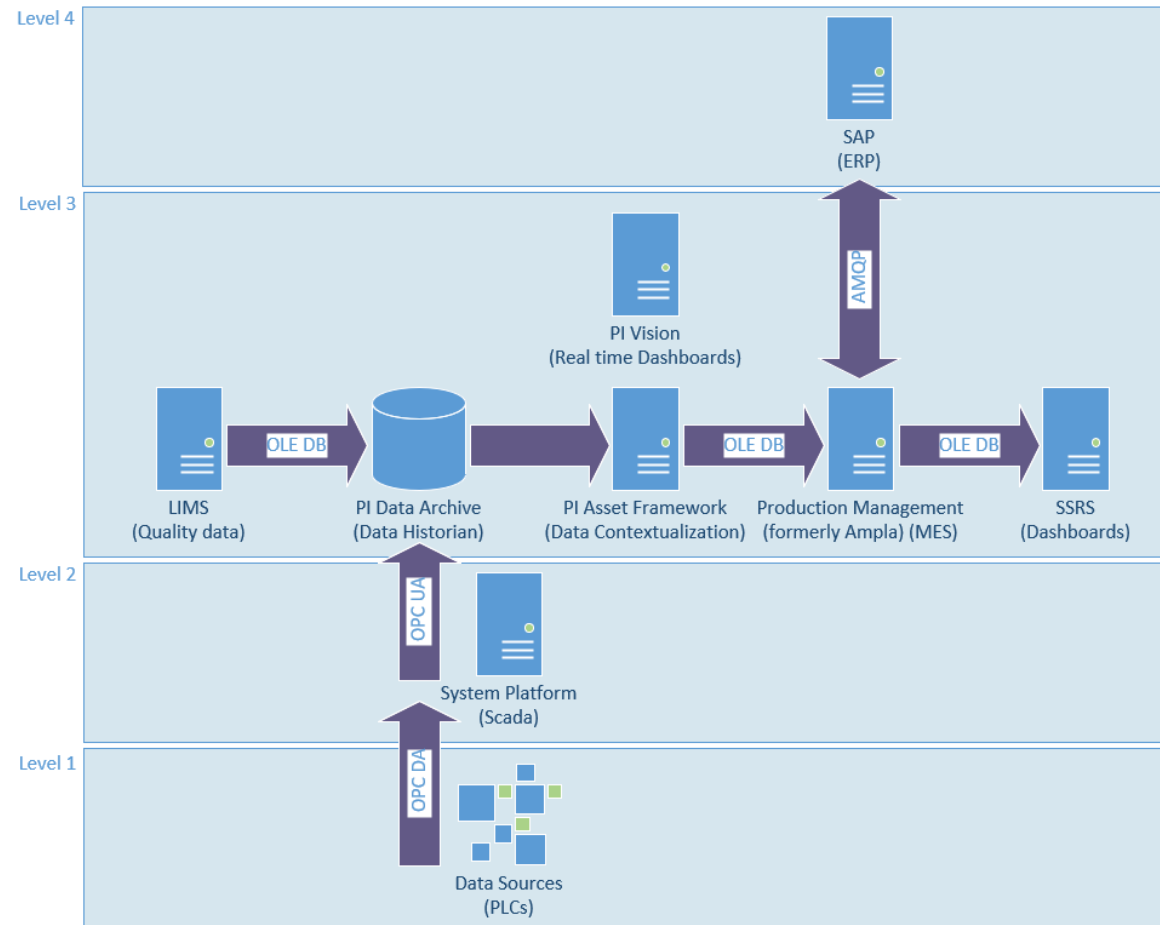
Solution details

03



Solution Details

Solution architecture

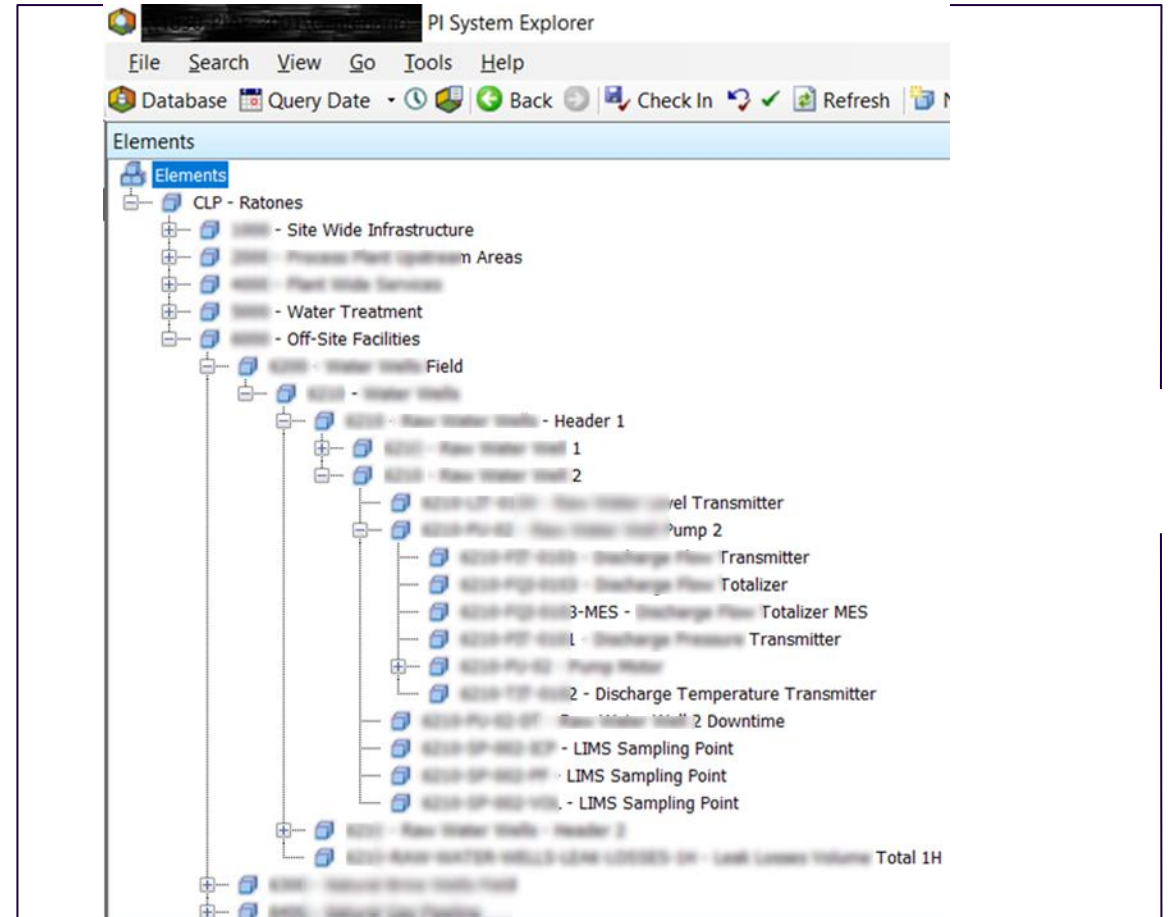


Solution Details

AVEVA PI Server's asset framework configuration design

The PI AF hierarchy configuration is based on the SCADA configuration as well as the P&IDs

Scripts have been developed to **automatically generate** the initial version of the PI AF hierarchy from an export of the SCADA tags configuration



Solution Details

AVEVA PI Server's asset framework configuration design

Configuration of AF Element Templates for process data is aligned with SCADA object templates

The screenshot displays the AVEVA PI Server configuration interface. The left pane shows a tree view of the 'Library' structure under 'Centenario', with 'Element Templates' expanded to show various templates including 'BBA_AI'. The main pane is titled 'BBA_AI' and shows the configuration for this template. The 'Attribute Templates' tab is active, displaying a table of attributes for the 'Template: BBA_AI'.

Name	Description	Default ...	Settings...
Template: Instrument			
Area	Process Area (First Part of Tag)		Left(%Element%,4);
ISA	ISA Instrument Code (Middle part of Tag)		
Loop	Loop Number (Last Part of Tag)		
Source	Source System (H = HMI, C = Communication)	H	
Template: BBA_AI			
Status.PV	Process Value	0	\\%Server%\%@Source%\%@Area%\%@ISA%\%@Loop%.%Attribute%

Solution Details

AVEVA PI Server's asset framework configuration design

Configuration of AF Element Templates for quality data is aligned with LIMS configuration

The screenshot displays the AVEVA PI Server configuration interface. On the left, a tree view under 'Library' shows the 'LIMS' folder expanded, with 'LIMSResults' selected. The main window shows the configuration for 'LIMSResults' with tabs for 'General', 'Attribute Templates', 'Ports', 'Analysis Templates', and 'Notification Rule Templates'. The 'Attribute Templates' tab is active, showing a table of templates.

Filter	Name	Description	Default ...	Settings...
Template: LIMS				
	Area	Process Area (First Part of Tag)		Left(%Element%,4);
	Sample Type	Sample type (punctual, composite)		\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=String;compdev=0;compde...
	SPNumber	Sampling Point Number		Mid(%Element%,9,3);
	Test Type	Test type	Overrida	
Template: LIMSResult_...				
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
	Li	Lithium	0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
			0 ppm	\\%Server%\%@Area%_SP_%@SPNumber%_%@Test Type%.%Attribute%;pointtype=Float64;compdev=0;comp...
	Test Type	Test type	ICP	

Solution Details

AVEVA PI Server's asset framework configuration design

AF Element Templates are also configured for more complex calculations, such as mass balance calculations

The screenshot displays the configuration for the 'EquipmentGroup_MassBalance_LiMass1H' template. The main configuration table is as follows:

Name	Description	Default	Settings...
Template: EquipmentGroup			
Area	Process Area (First Part of Tag)		Left(%Element%,4);
Name	Equipment Group name		"%Element%";
Template: EquipmentGroup_MassBalance			
Unit Factor L/m3	Unit Factor L/m3	0	SELECT [Constant Value] FROM Constants WHERE [Constant Name] = '...
Unit Factor Tn/mg	Unit Factor Tn/mg	0	SELECT [Constant Value] FROM Constants WHERE [Constant Name] = '...
Template: EquipmentGroup_MassBalance_LiMass1H			
Area Brine Filtration	Area of the CSD Stripping Feed	2120	
Flow A	Flow Indicator A (Expecting FIT with ...	0 m3/s	\\%Server%\H%Area Brine Filtration%_FIT_%@Flow A Indicator Loop...
Flow A Indicator Loop	Loop Number of the Flow A	0	
Flow B	Flow Indicator B (Expecting FIT with ...	0 m3/s	\\%Server%\H%Area Brine Filtration%_FIT_%@Flow B Indicator Loop...
Flow B Indicator Loop	Loop Number of the Flow B	0	
Flow C	Flow Indicator C (Expecting FIT with ...	0 m3/s	\\%Server%\H%Area Brine Filtration%_FIT_%@Flow C Indicator Loop...
Flow C Indicator Loop	Loop Number of the Flow C	0	
Lithium	Lithium Value (From LIMS)	0 mg/l	\\%Server%\%Area%_SP_%@Sampling Point Number%_ICP.LI
Lithium Mass 1H	Total of Lithium Mass for Previous Hour	0 t	\\%Server%\%Area%_SP_%@Sampling Point Number%_LIMass1H;pointtype=Float32;compdev=0;...
Lithium Mass Flow	Current Flow of Lithium Mass	0 t/h	\\%Server%\%Area%_SP_%@Sampling Point Number%_LIMassFlow;pointtype=Float32;compdev=0;...
Sampling Point Number	Number of the LIMS Sampling Point	0	

Solution Details

AVEVA PI Server's asset framework configuration design

AF Element and Event Frame templates are configured in PI AF to capture downtime events

The image displays two screenshots of the AVEVA PI AF software interface, illustrating the configuration of templates for capturing downtime events.

Top Screenshot: Equipment_Downtime Template Configuration

The interface shows the 'Equipment_Downtime' template configuration. The left pane displays a tree view of templates, with 'Equipment_Downtime' selected. The main pane shows a table of attributes for this template.

Attribute	Description	Default	Settings
Template: Equipment			
Area	Process Area (First Part of Tag)		Left(%Element%,4);
Name	Equipment name		"%Element%";
Template: Equipment_Downtime			
Downtime Cause Location	MES Downtime cause location	Override	
Downtime CauseID	MES Downtime CauseID	Override	
Downtime ClassificationID	MES Downtime ClassificationID	Override	
Downtime Code	Downtime Code from the PLC (0 = ...)	Override	{%Server%};ReadOnly=False
Downtime Location	MES Reporting Point full name	Override	
Downtime Source	MES Downtime source (process cell, ...)	Override	
Template: Equipment_Downtime_Wells			
Downtime Cause Location	MES Downtime cause location	0	{%Server%};_PU_0%{
Downtime CauseID	MES Downtime CauseID	0	{%Server%};_PU_0%{
Downtime ClassificationID	MES Downtime ClassificationID	0	{%Server%};_PU_0%{
Downtime Location	MES Reporting Point full name	Eramine...	
Raw Water Well Number	Well Number	0	Right("%Element%", 1);
Template: Equipment_Downtime_62			
Downtime Code	Downtime Code from the PLC (0 = ...)	{%Server%};	_PU_01_DT.Value;ReadOnly=False
Downtime Source	Downtime source for MES (process c...		Raw W...

Bottom Screenshot: EF_Downtime Template Configuration

The interface shows the 'EF_Downtime' template configuration. The left pane displays a tree view of templates, with 'EF_Downtime' selected. The main pane shows a table of attributes for this template.

Attribute	Description	Default	Settings
Template: EF_Downtime			
Downtime Cause Location	MES Cause Location		.Elements[.]Downtime Cause Location;TimeRangeMethod=StartTime
Downtime CauseID	MES CauseID	0	.Elements[.]Downtime CauseID;TimeRangeMethod=StartTime
Downtime ClassificationID	MES ClassificationID	0	.Elements[.]Downtime ClassificationID;TimeRangeMethod=StartTime
Downtime Code	Downtime Code from the PLC (0 = No downtime)	0	.Elements[.]Downtime Code;TimeRangeMethod=StartTime
Downtime Location	MES Reporting Point full name		.Elements[.]Downtime Location'
Downtime Source	MES Downtime Source (process cell, equipment, etc.)		.Elements[.]Downtime Source'

The bottom screenshot also shows the 'Advanced Event Frame Settings' dialog box, which is used to configure the event frame generation. The dialog includes fields for 'Name', 'Description', 'Categories', 'Analysis Type', and 'Scheduling'. The 'Scheduling' section is set to 'Event-Triggered'.

Solution Details

AVEVA PI Server's asset framework configuration design

Downtime events are automatically classified in PI AF using reason codes received from the PLC and mapping tables configured in PI AF

The screenshot displays the AVEVA PI System Explorer interface. On the left, a tree view shows the asset hierarchy under 'Elements', including 'CLP - Ratones', 'Site Wide Infrastructure', 'Plant Areas', 'Plant Wide Services', 'Water Treatment', 'Off-Site Facilities', and 'Field'. The main pane shows the configuration for a 'Downtime' element, with a table defining its attributes:

Name	Value	Settings...
Well Number	1	Right("%..\Element%", 1);
Area		Left("%Element%", 4);
Name		"%Element%";

Below this, a 'Library' pane lists various tables, with 'MES Downtime Relationship Matrix' selected. A detailed view of this table is shown on the right, with the following data:

DowntimeCode	CauseLocation	CauseID	ClassificationID
1034	Eramine.CLP - Ratones. - Header 1. - 1	5022	6
1018	Eramine.CLP - Ratones. - Header 1. - 1	5008	6
1019	Eramine.CLP - Ratones. - Header 1. - 1	5009	6
1020	Eramine.CLP - Ratones. - Header 1. - 1	5006	6
1021	Eramine.CLP - Ratones. - Header 1. - 1	5011	6
1022	Eramine.CLP - Ratones. - Header 1. - 1	5013	6
1023	Eramine.CLP - Ratones. - Header 1. - 1	5010	6
1024	Eramine.CLP - Ratones. - Header 1. - 1	5012	6
1033	Eramine.CLP - Ratones. - Header 1. - 1	5014	6
1035	Eramine.CLP - Ratones. - Header 1. - 1	5003	6
1049	Eramine.CLP - Ratones. - Header 1. - 1	5000	2
1064	Eramine.CLP - Ratones. - Header 1. - 1	5017	2
1099	Eramine.CLP - Ratones. - Header 1. - 1	5018	6
1098	Eramine.CLP - Ratones. - Header 1. - 1	5041	2

Solution Details

AVEVA PI Server's asset framework configuration design

Downtime events captured in PI AF are transferred to the MES using PI Notifications and the MES Web API

The screenshot displays the AVEVA PI System Explorer interface. The main window shows the configuration for a Notification Rule Template named 'Downtime Start'. The 'Criteria' section lists two conditions: 'Downtime End' and 'Downtime Start', both using the 'EF_Downtime' template. The 'Trigger' section indicates that a notification will be triggered when an event frame is created that satisfies all criteria. The 'Subscriptions' section shows one subscriber, 'Production Management Web API', which is configured to send an 'Event start' notification. The 'Web Service Configuration' section shows the REST endpoint 'https://[redacted]/api/v1/data/SubmitRecord' and a JSON body with fields for 'Location', 'Start Time', 'Downtime Code', 'Source', 'Cause Location', and 'Cause'. The 'Content' section shows the selected format for the notification, including 'Event Details Hyperlink', 'Event Frame Properties', and 'Event Frame Attributes: EF_Downtime'.

Solution Details

MES software evaluation and selection process

MES requirements were defined in collaboration with Eramet

Multiple MES solutions were evaluated against these requirements.

AVEVA Production Management (APM) was selected because:

- APM is a **low-code solution** designed to monitor and optimize continuous processes that are deployed at over 400 sites
- APM is an **integrated solution** with multiple built-in connectors to easily connect to various data sources and external systems
- APM is a **modular solution** which is easily scalable
- APM is **easy and fast to configure**
- APM is **easy to maintain**

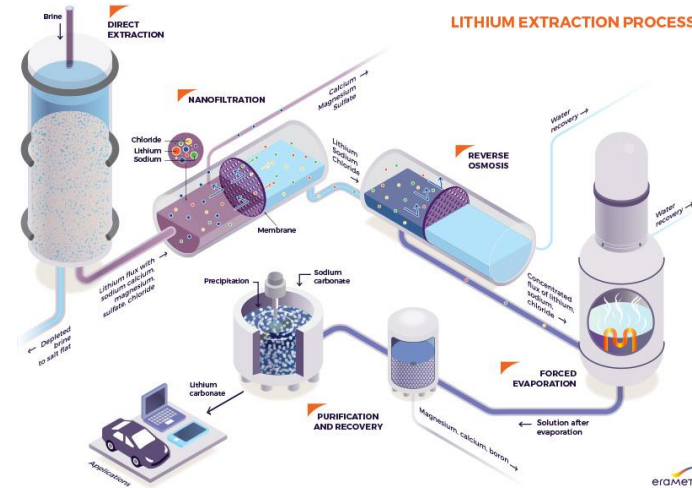
Solution Details

Using APM to track a non-conventional mining process

.Although APM has been designed to track conventional mining processes...

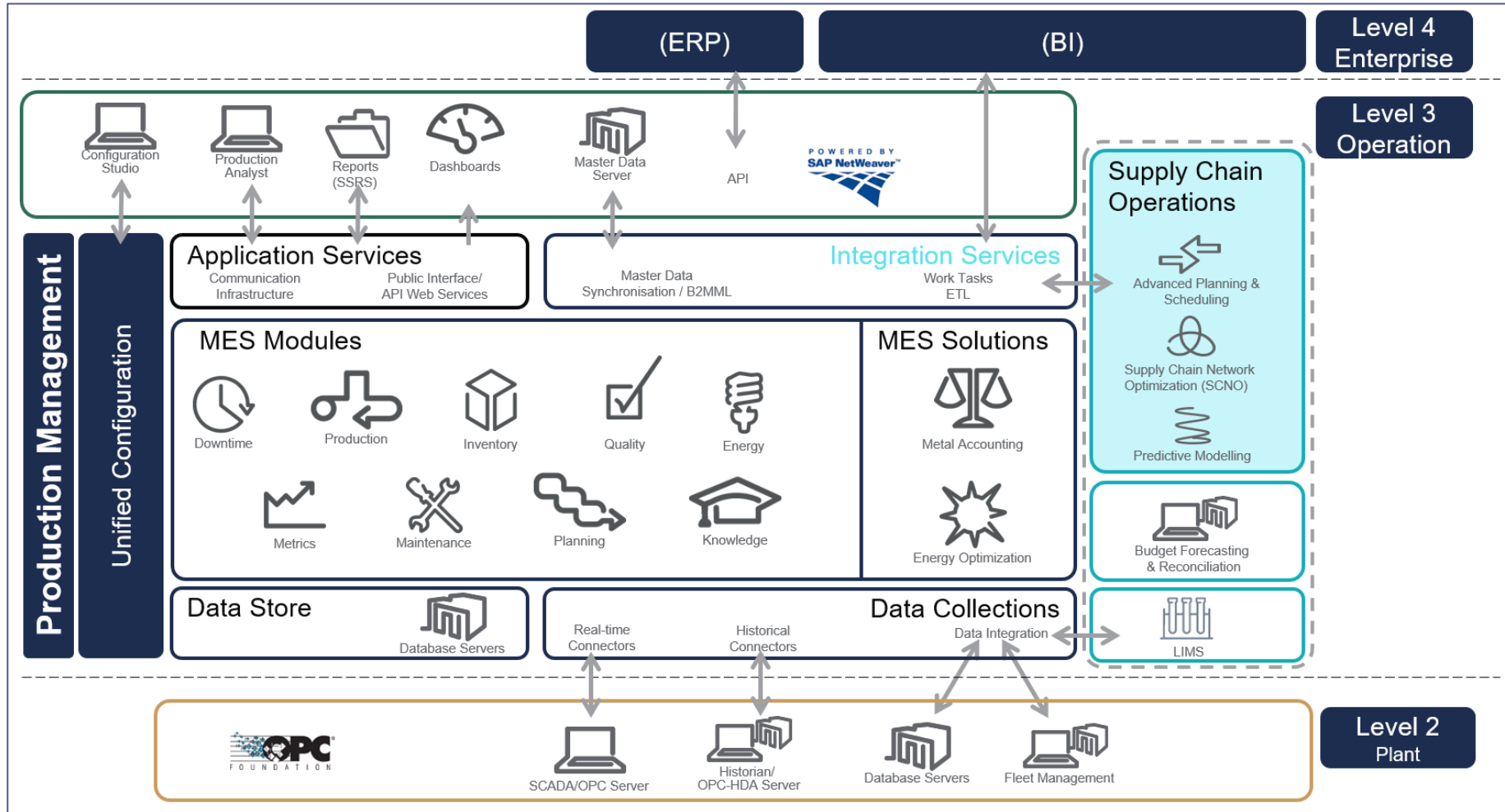


... APM has all the features required to track process downtime, consumables, semi-finished and finished products, inventory, quality and to calculate KPIs.



Solution Details

APM Architecture



Solution Details

APM configuration design

In APM, Reporting Points are configuration items that are used to capture data

APM licensing model is based mainly on the number of Reporting Points used in the configuration of the solution.

In order to minimize licensing costs, APM configuration was designed to minimize the number of Reporting Points used in the solution:

- We used a **single Reporting Point** to capture data for multiple equipments (downtime, consumption and production data) and sample points (quality data)
- We used **OLE DB integrations in combination with PI SQL Client** to capture production and quality data from PI AF instead of using the standard OPC HDA connector to capture data from PI Data Archive, because it offered more flexibility
- **Downtime data** was captured in PI AF Event Frames and then transferred to APM using PI Notifications and APM Web API

Solution Details

APM configuration design

Downtime Reporting Points are configured to capture Downtime data retrieved from PI AF

AVEVA Production Management 2020 U2 Studio

Project Explorer: Eramine > CLP - Ratones > Downtime Dashboard

Properties: Behavior (Action: Store, CalculationType: None, CaptureDataWhen: EventStateOn, CaptureValueForManualRecords: False, DataType: String, DisplayFormat: [expanded], FieldType: Other, Filterable: True, HasBudget: False, HasTarget: False, HasTrendDirection: False, HistoricalFieldExpression: [expanded], IsIndexed: False, RefreshOnManualEntry: False, RefreshValueOnCapture: True, StringType: PlainText), Units, Definition (FullName: Eramine CLP - Ratones, Source: [expanded]), Design (FullName: Eramine CLP - Ratones, Source: [expanded]), Details Display (AllowEdit: True, AllowedValuesLookupList: System Configuration LookupList, AllowedValuesType: LookupList, Category: Standard, IsMandatory: False, MaximumEditLength: 200, ShowInDetails: True, SubCategory: Field Data, VisibleRows: 1), Diagnostics (LastStartTime: 9/5/2024 12:38 PM, TraceLevel: Error), Display

Navigation: Location -> Eramine > CLP - Ratones > - Off-Site Facilities > Field

Downtime - Eramine CLP - Ratones - Off-Site Facilities - Field - Downtime

Filtered to only show records where Deleted is False and Sample Period is Last Month

Start Time	End Time	Duration	Cause Location	Cause	Classification	Source	Downtime Code	Shift	Crew
8/25/2024 2:03:08 AM	8/25/2024 5:46:32 PM	04:56:52 (15:43:24)	Eramine CL...	stopped manually	Accidents-Operational Failures...		621003099	Night Shift	Crew B
8/25/2024 2:03:08 AM	8/25/2024 5:46:32 PM	04:56:52 (15:43:24)	Eramine CL...	stopped manually	Accidents-Operational Failures...		621001099	Night Shift	Crew B
8/25/2024 2:03:08 AM	8/25/2024 5:46:32 PM	04:56:52 (15:43:24)	Eramine CL...	stopped manually	Accidents-Operational Failures...		621005099	Night Shift	Crew B
8/25/2024 2:03:08 AM	8/25/2024 5:46:32 PM	04:56:52 (15:43:24)	Eramine CL...	stopped manually	Accidents-Operational Failures...		621002099	Night Shift	Crew B
8/25/2024 2:03:08 AM	8/25/2024 5:46:32 PM	04:56:52 (15:43:24)	Eramine CL...	stopped manually	Accidents-Operational Failures...		621004099	Night Shift	Crew B
8/24/2024 10:55:45 PM	8/25/2024 2:03:08 AM	03:07:23	Eramine CL...	stopped manually	Accidents-Operational Failures...		621004099	Night Shift	Crew B
8/24/2024 10:55:45 PM	8/25/2024 2:03:08 AM	03:07:23	Eramine CL...	stopped manually	Accidents-Operational Failures...		621002099	Night Shift	Crew B
8/24/2024 10:55:45 PM	8/25/2024 2:03:08 AM	03:07:23	Eramine CL...	stopped manually	Accidents-Operational Failures...		621001099	Night Shift	Crew B
8/24/2024 10:55:45 PM	8/25/2024 2:03:08 AM	03:07:23	Eramine CL...	stopped manually	Accidents-Operational Failures...		621005099	Night Shift	Crew B

Count: 2485 | 155:00:00.00 (159...)

Statistics of Cause

- Occurrences: 0.72% (Pie chart: 99.28% Motor Starter Communication Loss Fault, 0.72% stopped manually)
- Duration in hh:mm:ss: 0.81% (Pie chart: 99.19% Motor Starter Communication Loss Fault, 0.81% stopped manually)

Select chart: Gantt chart, Pareto chart, Pie chart, No chart

Options: Aggregate: Duration, Group by: Cause, Display: Use Equipment Id, Filter Period Only

Solution Details

APM configuration design

Production Reporting Points are configured to capture production and consumption data retrieved from PI AF

The screenshot displays the AVEVA Production Management 2020 U2 Studio interface. On the left, the Project Explorer shows a tree view of the system hierarchy, including 'Eramine', 'CLP - Ratones', and 'Production'. The Properties window on the right shows the configuration for the selected 'Production' reporting point, with fields for Behavior, Design, Details Display, Diagnostics, and Display.

The central pane shows a data table for 'Production - Eramine.CLP - Ratones - Plant Wide Services'. The table is filtered to show records where Deleted is False and Sample Period is Last Month. The data includes columns for Sample Period, Source, Production, Natural Gas Consumption, Diesel Consumption, Oil Consumption, Running Hours, Maximum Demand, Shift, and Crew.

Sample Period	Source	Production	Natural Gas Consumption	Diesel Consumption	Oil Consumption	Running Hours	Maximum Demand	Shift	Crew
8/25/2024 7:00:00 AM	Genset 1	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 7:00:00 AM	Genset 2	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 7:00:00 AM	Genset 3	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 7:00:00 AM	Genset 4	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 7:00:00 AM	Total	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 6:00:00 AM	Genset 1	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 6:00:00 AM	Genset 2	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 6:00:00 AM	Genset 3	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 6:00:00 AM	Genset 4	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 6:00:00 AM	Total	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 5:00:00 AM	Genset 1	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 5:00:00 AM	Genset 2	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 5:00:00 AM	Genset 3	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 5:00:00 AM	Genset 4	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 5:00:00 AM	Total	0	0	0	0	0	0	Night Shift	Crew B
8/25/2024 4:00:00 AM	Genset 1	0	0	0	0	0	0	Night Shift	Crew B
Count:		3720							

Below the table, an 'Accumulation Chart : Production' is displayed, showing a flat line at zero production over the sample period from 7/28/2024 to 8/25/2024. The chart includes a legend for 'Production' and a 'Select chart' dropdown menu with options like Summary chart, Rate chart, Accumulator chart, Pareto chart, Pie chart, and No chart. The 'Options' section is also visible, showing settings for 'Fields to Chart: Production', 'Show Target: True', 'Show Budget: True', 'Time Field: Sample Period', and 'Projected Fields: Actual, Target'.

Solution Details

APM configuration design

Quality Reporting Points are configured to capture quality data retrieved from the LIMS

The screenshot displays the AVEVA Production Management 2020 U2 Studio interface. On the left, the Project Explorer shows a tree view of the system configuration, including 'Eramine', 'CLP - Ratones', and various dashboards and metrics. The Properties panel on the right shows the configuration for a Quality Reporting Point, with sections for Definition, Design, Details Display, Diagnostics, Display, Misc, Relationship, and Runtime. The Display section is expanded, showing fields like 'ColumnName', 'DisplayOrder', and 'SummaryType'. The main window shows a data table with columns for Sample Period, Source, Source Description, Sample Type, Test Type, and various chemical parameters (Conductivity, Density, Fe, K, Li, Mg). Below the table, an XBar chart for Lithium (Li) is displayed, showing data points over time with control limits (UCL, LCL) and sigma levels (1, 2, 3). The chart title is 'XBar Chart : Li' and the x-axis is labeled 'Sample Period'.

Sample Period	Source	Source Description	Sample Type	Test Type	Conductivity	Density	Fe	K	Li	Mg
7/18/2024 6:30:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 7:00:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:42:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:42:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:34:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:34:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:30:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:30:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:29:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:29:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:22:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:22:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:20:00 AM	SP-007	Collection Tank	VOL	ICP						
7/18/2024 6:20:00 AM	CO-007	Collection Tank	VOL	ICP						
Count: 36										

Solution Details

APM configuration design

A Planning Reporting Point is configured to capture planning data received from the ERP

The screenshot displays the AVEVA Production Management 2020 U2 Studio interface. On the left, the Project Explorer shows a tree view of the configuration, including 'Planning' and 'Fields'. The Properties pane on the right shows the configuration for 'Eramine CLP - Ratones.Planning.Fields.Actual Quantity', with sections for Behavior, Design, Details Display, Diagnostics, and Display. The main window shows a Gantt chart for 'Planning - Eramine.CLP - Ratones Planning' with columns for Planned Start Time, Planned End Time, Planned Duration, Actual Start Time, Actual End Time, Actual Duration, ActivityId, State, Product, Required Quantity, and Comment. The Gantt chart shows activities for products 20491 and 20492. The bottom right corner features an Actions menu with options like Save Changes, Cancel Changes, and Display Product.

Solution Details

APM configuration design

Metrics Reporting Points are configured to calculate KPIs based on data captured by the other APM modules (downtime, production, quality)

The screenshot displays the AVEVA Production Management 2020 U2 Studio interface. The left pane shows a project tree for 'Eramine' with various modules like 'CLP - Ratones', 'MES-SAP - Activity Declaration', and 'Metrics'. The Properties panel on the right shows configuration for a 'Well raw' metric, including Behavior (Action, DivideByZeroValue, EmptyResultValue, etc.), Design (FullName, Name), Diagnostics (TraceLevel), Display (Description, DisplayOrder), Misc (ResolverName), and Runtime (RunState, StartupMode).

The central pane shows a data table for 'Well 1 Metrics' with columns for Start Time, End Time, Duration, Period, Pumped, Pressure, and Level. The data is filtered to show all records.

Start Time	End Time	Duration	Period	Pumped	Pressure	Level
8/25/2024 7:00:00 AM	9/25/2024 7:00:00 AM	44640	Month September	0.0	8.9	0.0
7/25/2024 7:00:00 AM	8/25/2024 7:00:00 AM	44640	Month August	5.8	8.2	0.0
6/25/2024 7:00:00 AM	7/25/2024 7:00:00 AM	43200	Month July	11.0	8.4	0.0
5/25/2024 7:00:00 AM	6/25/2024 7:00:00 AM	44640	Month June	0.0	7.5	41.2
4/25/2024 7:00:00 AM	5/25/2024 7:00:00 AM	43200	Month May	0.0	0.5	2.9
3/25/2024 7:00:00 AM	4/25/2024 7:00:00 AM	44640	Month April	0.0	4.2	16.9

Below the table, a line chart titled 'Line Chart : Pumped' shows the 'Pumped' volume over time from 3/31/2024 to 8/15/2024. The chart shows a steady increase in volume over the period.

Statistical data for the 'Pumped' metric:

Central tendency	Value
Mean	2.7990
Range	11.0000
Std. Deviation	4.6382
Variance	21.5131
Standard Error	1.8935
Skewness	1.4753
Kurtosis	1.0845

Additional options for the chart include Z-Scores, Error Bars, and Central tendency (Median, Range, Lower Quartile).

Solution Details

APM configuration design

Dashboards are configured using SSRS and embedded in the APM's client

The screenshot displays the AVEVA Production Management 2020 U2 Studio interface. On the left, the Project Explorer shows a tree view of the system configuration, with 'Water Management Dashboard' selected. The Properties window on the right shows the configuration for this dashboard, including its name, description, and runtime settings. The main area shows a preview of the 'Water Management Dashboard' report, which includes sections for General Information, Raw Water Wells, Water Treatment, and Water Production. The dashboard features various charts, tables, and gauges, providing a comprehensive overview of water management metrics.

Properties Window:

- Design:** Name: Eramine CLP - Ratones - Water Management Dashboard; Full Name: _Water Management Dashboard
- Diagnostics:** TraceLevel: Error
- Display:** Description: ; DisplayOrder: 0.0; DisplayOrderGroup: 0; DisplayOrderIndex: 0
- Document:** AppendSessionId: False; IISServer: ; Modules: Downtime, Knowledge, Metrics, Production, Quality; RelativeURL: http://localhost/reportsserver/?/Eramet Reports/_Water&Language=es-AR; URL: http://localhost/reportsserver/?/Eramet Reports/_Water&Language=es-AR
- Runtime:** RunState: Running; StartupMode: Auto

Water Management Dashboard Preview:

General Information:

	Monthly - September	Daily - 9/5/2024	UOM
Leak Losses	-325	-13	m3
Raw Water Consumption	1,915	94	m3
Water Pumped	833	0	m3

Raw Water Wells:

Header	Monthly - September	Daily - 9/5/2024	UOM
Header 1	0	0	m3
Header 2	833	0	m3

Water Treatment:

	Monthly - September	Daily - 9/5/2024	UOM
Deionized Water	54,131	1,395	m3
High Purity Water	0	0	m3
Potable Water	1,495	38	m3
Ultrafiltration	21	0	m3

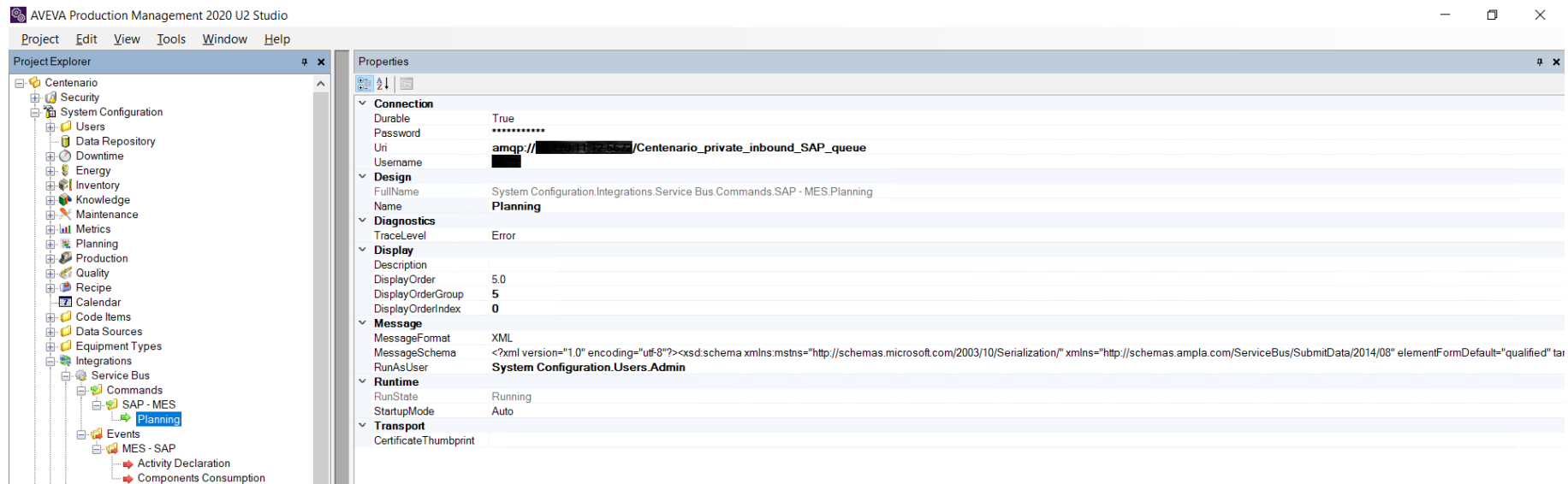
Solution Details

APM configuration design

APM Service Bus uses the Advanced Message Queuing Protocol (AMQP) to exchange messages with message brokers such as RabbitMQ and ActiveMQ

APM Service Bus is used to exchange data between APM and the ERP

- Planning data is transferred from the ERP to APM
- Production and consumption data is transferred from APM to the ERP



Issues and lessons learned

04

Issues and lessons learned

Working in 3 non-identical environments was a challenge (number of VMs, components, security configuration)

- It would have been easier if each environment was configured the same way

Managing the partial migration of the configuration between the different environments was a challenge (configuration was performed in phases)

- DevOps was used to track configuration changes to be migrated from one environment to the other

Change management was problematic as the configuration was done in parallel with the engineering

- Scripts were developed to identify changes between different versions of the configuration

Working with stakeholders localized in 3 different countries was a challenge

- We scheduled regular coordination meetings and a local resource was hired in Argentina to facilitate coordination with local stakeholders

Multiples issues with data collection from System Platform's OPC UA Server using AVEVA Adapter for OPC UA

- We will test the performance and reliability of AVEVA Historian 2023 replication to PI System

APM web client runs on Internet Explorer 11

- APM 2023 features a new web client which can be accessed using modern web browsers and mobile devices, but it doesn't support all the functionalities of the old web client yet

Results and benefits

05

Eramet starts a new disruptive plant fully digitalized

Challenge

- Very remote location in a harsh environment
- From Training center to industrial scale
- Start and control the production of a continuous process in a coherent information system

Solution

- **Implement redundant AVEVA PI System with AVEVA Production Management as MES as the control tower of the plant**

Results

- **Templates** makes deployment faster
- **High availability solution** able to switch seamlessly if a server room is down
- **Evolutive solution** to adjust quickly during the stabilization phase





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