

The background of the image is a deep purple with a network of glowing, intersecting lines in shades of cyan and magenta, creating a diamond-like pattern. The text is centered in the middle of the image.

AVEVAWORLD

ACCELERATE INDUSTRIAL INTELLIGENCE



Unlocking Operational Intelligence: How Vale's Integrated Operations Centers Drive Digital Transform

AVEVA WORLD CONFERENCE 2026

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Who Am I?



Luciane Moreira

✉ luciane.moreira@vale.com

💻 Technology Specialist



What we will see TODAY

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to VALE

2

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Centers

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AVEVA Predictive Case

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Results Achieved

1 Introduction to VALE

We are VALE



VALE

Our history is built every day

In each dialogue with the community, project carried out, challenge overcome and for the focus on a more sustainable mining.

We learn from the past to build together a better tomorrow.



We count on the collaboration of about **120 thousand** direct employees and contractors around the world



We produce 54% of our own energy consumption

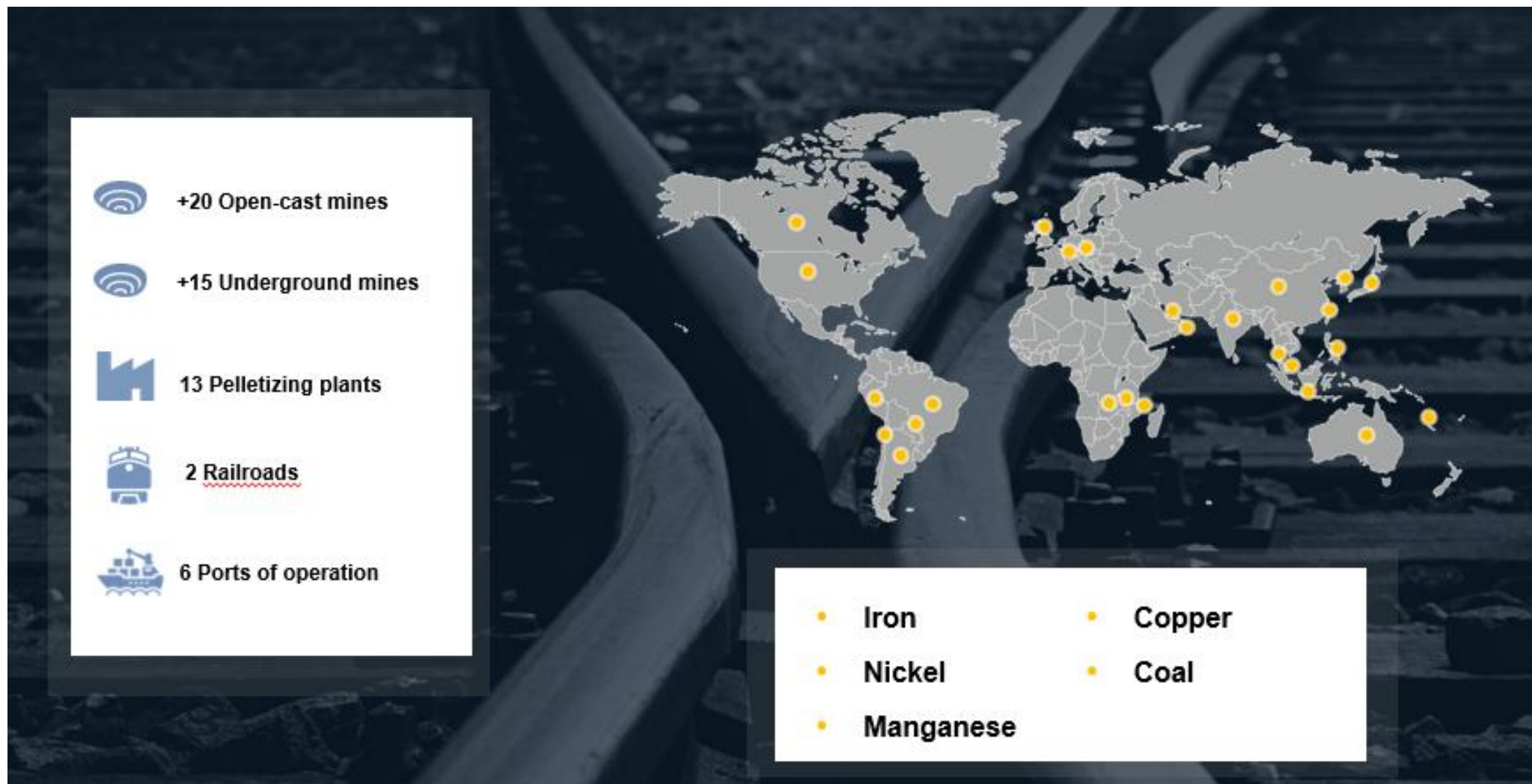


We protect more than 1 Million Hectares of natural areas, around 12 times the total area of NY



More than 1 million people go through our railroads every year

Our presence in operations



Purpose

We exist to improve life and transform the future.

Together.

Ambition

To lead value generation in mining, in an ethical and sustainable manner, and be among the top 3 mining companies in market value.

Values

Life matters most

Act with integrity

Value the people who build our company

Results oriented

Respect our planet and society

Behaviors

Obsession with safety and risk management

Act and lead with humbleness and respect

Deliver superior results through planning and discipline

Keep an external outlook with an entrepreneurial vision

Foster dialogue with society

Our Culture

2 VALE's PIMS

AVEVA PI System's Journey in VALE's industrial process

1998

Start the journey – Phase 1

2020

Phase 2

2023

We are 100% PI System

2025

Technological upgrade + DRP

2026

New Journey – AVEVA Predictive Analytics



Drivers of the Digital Transformation Journey

Regional
PIMS in the
Operational
Domain

- Multiple PIMS instances from different vendors;
- Fragmented and non-standardized Product Lifecycle Governance and Management;
- User access limited to local sites;

Drivers of the Transformation Journey

Drivers of the Transformation Journey

- **Business:** Democratization of PIMS usage, replication and standardization of solutions more agilely;
- **Processes:** Clearer, well-defined, and standardized processes;
- **People:** Greater user engagement and sense of ownership;
- **Technology:** Cyber resilience, optimization of computational resource usage, easier technology updates, greater standardization, enabling innovation;

AVEVA PI
System
Global
Corporate
Domain

- AVEVA PI System deployed across 100% of Vale's operations;
- Standardized Product Lifecycle Governance and Management, aligned with best practices of Vale's Technology and Innovation Department;
- User access at a corporate level;;

(1) Initiated with Vale's IT/OT Convergence Program



Implemented since 1999, Vale's PIMS is at the forefront in mining industry.

Vale is recognized as a **national reference in PIMS governance**¹

Classified as a **high-impact product**, PIMS integrates real-time operational data from all regions,

With a modern and resilient architecture, we **allow agile decision-making** and enable a strong environmental management.

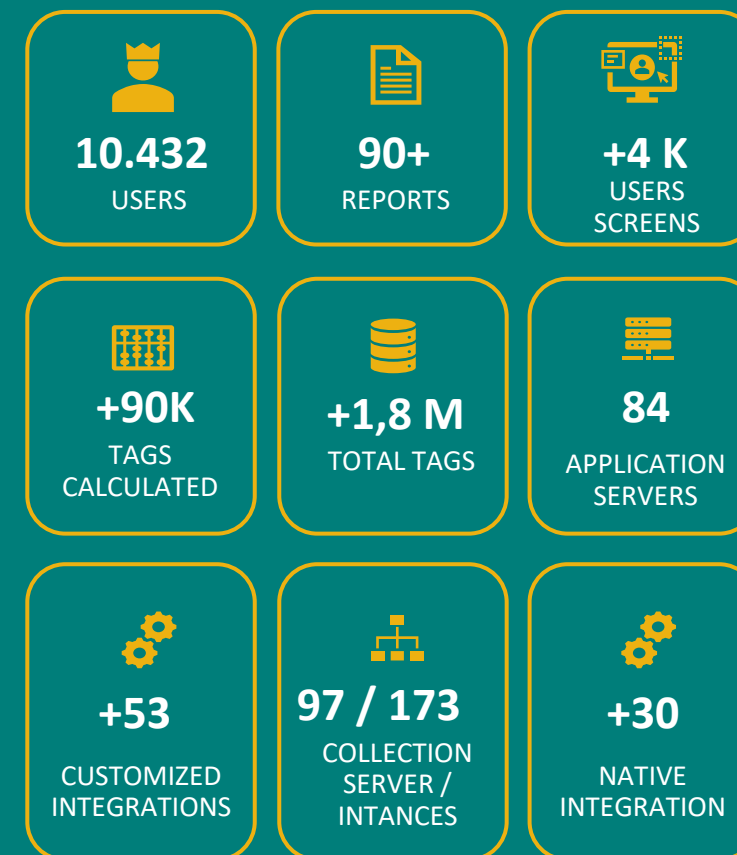
We have the **first large-scale DRP environment** validated by AVEVA

¹ AVEVA DAY/24.

+80 Sites
+20 DR protected operations
+25 TB archived

Our Numbers

Instances – Vitoria, Sul/Sudeste (MG), Oman, Malaysia, Canada e UK.



VALE

Unlocking Operational Intelligence

Challenge:

- Infrastructure upgrade to enable new solutions
- Enable the model plant program
- Enable new work formats and process standards
- Innovate through failure identification and breakdown reduction
- Ensure system sustainability
- Lack of robust monitoring using predictive analytics

Solution:

- Standardize the use of the PI System as a time-series tool
- Update/Revitalize the entire system
- Deploy rollout-enabling use cases for control rooms
- PoC with AVEVA Predictive

Results:



3 Integrated Operations Centers

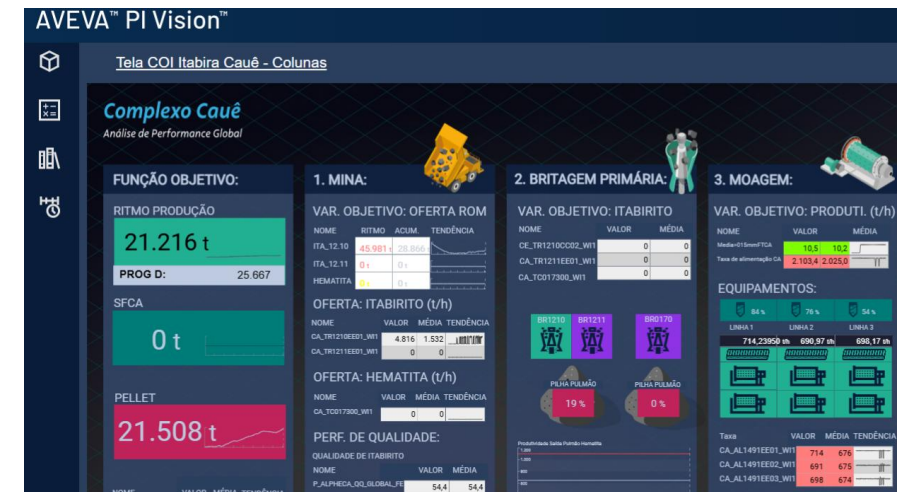
Operations Center Dashboard

Focus on Process Standard

The **Operations Center Dashboard** is a solution that involved the development of screens in PIMS–PI Vision for the redesign and sustainment of the Integrated Operations Center (COI), as part of the initiative of a Model Plant Program implemented at the Conceição unit in Itabira. The implemented solution introduces the concept of the “New Way of Operating”, consisting of structured analysis in accordance with the operational process standard, and integrates data from other systems such as LIMS and MES to enable a comprehensive interpretation of an entire cycle.



This integration of tactical and strategic control, in general terms, provides an environment to support the plant's RG performance indicators, such as DF, UF, throughput, and metallurgical recovery. It also drives increased and stable production, as well as improved quality of the premium / Split (RD) product.



• SOLUTION APPLIED TO:
MINE, PLANT, PORT, PELLETIZING



• ROLLOUT COMPLEXITY:
MEDIUM

Democratization of Information through QR Code

Focus on Process Standard

The **Process Information Portal** is a solution that involved developing a portal containing process information and revitalizing operational boards installed at the entrances of operations such as Crushing, Screening, and Filtering, with QR Codes for access. In addition to process information, the portal provides data on PPE, operational risks, and online process information coming from PI Vision.

Conheça!

NOVO PORTAL DE INFORMAÇÕES DE PROCESSO

Participe da transformação

12:05

globalvale.sharepoint.com

Complexo Itabira

Seja bem-vindo(a)!

Operações

- Britagem Primária
- Britagem
- Moagem

Tratamento de Minério Conceição II

MAPA DO PROCESSO: BRITAGEM PRIMÁRIA

IDENTIFICAÇÃO

Este mapa do processo é uma ferramenta essencial para a compreensão da sequência de operações e dos pontos de controle da Britagem Primária.

PARÂMETROS CRÍTICOS

- Teor médio de ferro: 62,58%
- Teor médio de sílica: 37,20%
- Densidade aparente da polpa: 2,00 t/m³

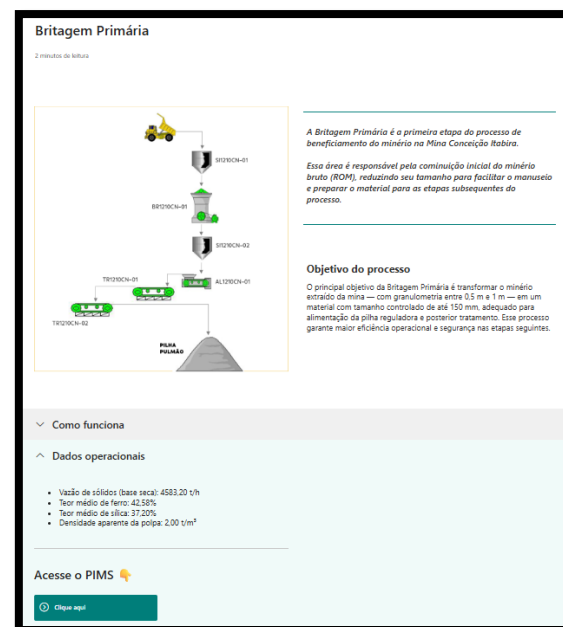
OBJETIVO DO PROCESSO

O principal objetivo da Britagem Primária é transformar o minério entrado da mina — com granulometria entre 0,5 m e 1 m — em um material com tamanho controlado de até 150 mm, adequado para alimentação da pila reguladora e posterior tratamento. Esse processo garante maior eficiência operacional e segurança nas etapas seguintes.





The solution delivers productivity gains by enabling operators to use a single device for multiple operational tasks, including inspections, non-conformity reporting, and the creation of maintenance work orders, among others. Well-executed basics.



Plant Health

Focus on Business Value

The **DEP – Plant Health Dashboard** is a solution that contains the entire calculation framework for performance scores of process stages and sub-stages within Vale's Ferrous Plant operations across Brazil, based on criteria defined in collaboration with the business areas. The solution also includes a Control Chart view, which enables the evaluation of deviations in key variables associated with these sub-stages, within the established specification limits..



The structuring of processes and subprocesses according to the definition of the business areas enables agile navigation to assess Vale's process performance and supports assertive decision-making. The screens with the Control Charts allow a more detailed verification of deviations.



- SOLUTION APPLIED TO:
CMA, PLANT



- ROLLOUT COMPLEXITY:
MEDIUM

Engineering Seismography Monitoring

Focus on Business Value

Engineering seismography monitoring for geotechnical structures in the South and Southeast corridors, enabling the creation of rules to trigger alarms for abnormal seismic behavior and, consequently, facilitate analysis by the responsible teams and/or the suspension of activities. The solution also enables the automatic sending of emails when an abnormal condition is detected, as well as periodic reports of triggers and activations, based on the rules defined by the business-area specialists.



Those responsible for activities on the monitored structures (Decharacterization and CMGs) have online monitoring of the structures' vibration conditions, allowing them to interrupt an activity or use the information for operational studies and activities on these structures, ensuring their stability.



- SOLUTION APPLIED TO:
GEOTECHNICS SOUTH AND SOUTHEAST CORRIDORS



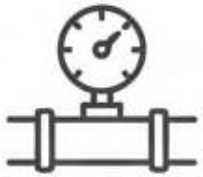
- ROLLOUT COMPLEXITY:
MEDIUM

4 AVEVA Predictive Analytics Case

The Current Challenge in the CMAs



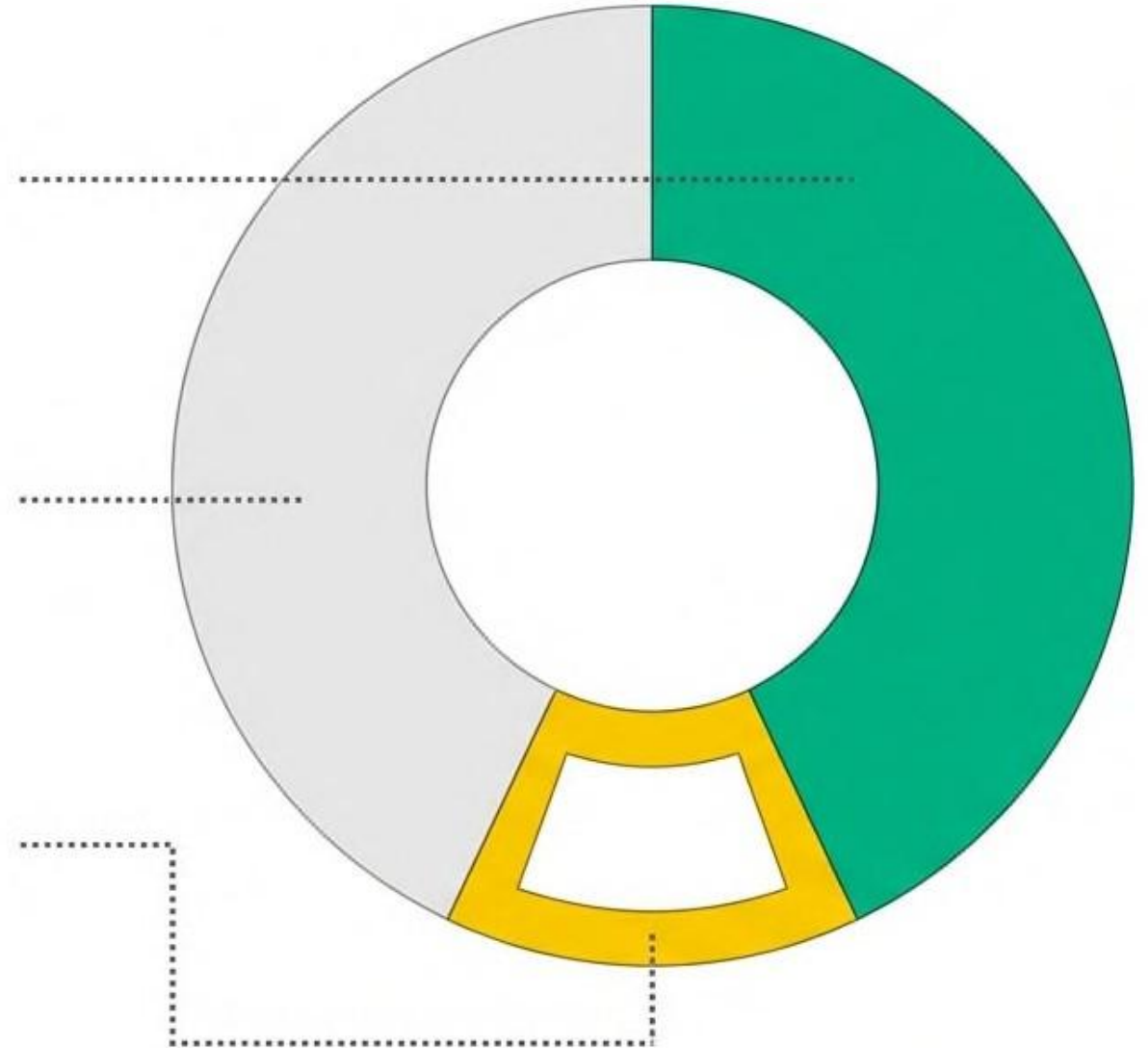
Current Focus: Robust monitoring based on Predictive methods (Vibration and Temperature), Sensory Inspection (field inspections), and Oil Analysis.



The Blind Spot: Low usage of process variables already available in the AVEVA PI System (Flow, Pressure, Current) for decision-making.



Opportunity: Critical failure modes operating without monitoring by the CMA (e.g., Crusher Lubrication Systems).



The PoC – Scope and Solution



Solution

Machine Learning algorithms analyzing historical and real-time data to anticipate anomalies



Scope

04 critical families:
Crushers, Slurry Pumps, Ball Mills, and Belt Conveyors



Timeline

Lean execution:
July/25 to
October/25



Team

Multidisciplinary squad (CMA Itabira, IT, Engineering, Operations) trained in partnership with Aveva

Success Case 1: Ball Mill (Safety Focus)



**AVEVA Simulation:
Anomaly Detection
15 Days in Advance**



**HIGH RISK
AVOIDED.**

Structural Collapse of the
Equipment Prevented.

Maximum Potential: Preservation
of Lives and Operational Safety.

Success Case 2: Crushers (Financial and Productivity Focus)

Historical Data-Based Analyses for the Playbook: Primary Crusher 1 (Jun/2025)

Context: Lubrication pump failure. Corrective shutdown of the Hematite line for 14 days.



AVEVA Data Playback:

Detection 8 days in advance.

- Avoided Potential:
- **169kt | ~USD 1,45 MM**

Real Action: Primary Crusher 2 (Jul/2025)

Context: Actual oil flow alarm. Lubrication pump replacement safely planned for 09/03.

AVEVA Monitoring: Predictability achieved above 40 days.

Avoided Loss:

13 kt | ~USD 0,18 Million

Lessons Learned and Next Steps



People

- Continuous engagement of local teams
- Definition of roles and responsibilities
- Exclusive focus on generating business value



Process

- Clear definition of variables in the models (flow, pressure, etc.)
- Assurance of the health of existing instrumentation
- Rigorous mapping of failure modes to be monitored



Technology

- Governance for manual retraining of the models
- Continuous user feedback on errors and correct outputs
- Importance of manually creating customized prescriptions

5 Results Achieved

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Solution:

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- Update/Revitalize the entire system
- Deploy rollout-enabling use cases for control rooms
- PoC with AVEVA™ Predictive Analytics

Results:

- System updated and enabled for new technologies
- Solutions being replicated to other operational units
- Losses avoided in the operation



Thank You!



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