

MAY 18TH 2022

Increasing reliability of Pulp and Paper Operations with AVEVA Predictive Analytics and AVEVA PI System

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AVEVA

KLABIN

A Brazilian company with 123 years of history.



Leader in Brazil in the production of cardstock, corrugated cardboard packaging and industrial bags. It also provides the market with the best solution in hardwood, softwood and fluff pulp.



24
factories

23 in Brazil
and 1 in Argentina



Business
offices in

10 **Brazilian
states**

+ North America and Europe



Annual production
capacity:

2.1 million tons of
paper

1.6 million tons of
market pulp



25 thousand+

direct and indirect
staff members

Acknowledged as one of
the most humanized
companies in Brazil



Business Areas

Sustainable management to supply raw material to our paper mills, including:

- Planning,
- Plantation,
- Harvesting.

Forest

Klabin gets a head start in the market by offering solutions in fibers hard, soft and fluff with a single local supplier.

Pulp

Uses cutting edge technology to produce paperboard for liquids and for the food, personal and home care, consumer appliances and other segments, as well as kraft and recycled - used to produce corrugated board boxes.

Paper

Transforms kraftliner into corrugated board for the food, beverage, groceries and farm products, electronics, health and personal care segments.

Transforms sack kraft into industrial bags for the domestic market and for countries in Latin America, Africa and Europe, and the United States.

Conversion



forestry



WORLDWIDE REFERENCE IN PRODUCTIVITY AND
RESPONSIBLE MANAGEMENT



Pine
(softwood)



Eucalyptus
(hardwood)

Fiber mix





Management as a
MOSAIC





Forms ecological corridors

Preserves river springs

Protects fauna and flora

Klabin's forestry management protects natural resources, potentializes production and contributes to preserving biodiversity.

Forestry



Forestry Logistics Center

24/7

24h a day, 7 days a week



585 thousand
hectares of total forest area



Mean radius of

82 km

between the forests and pulp
and paper mills



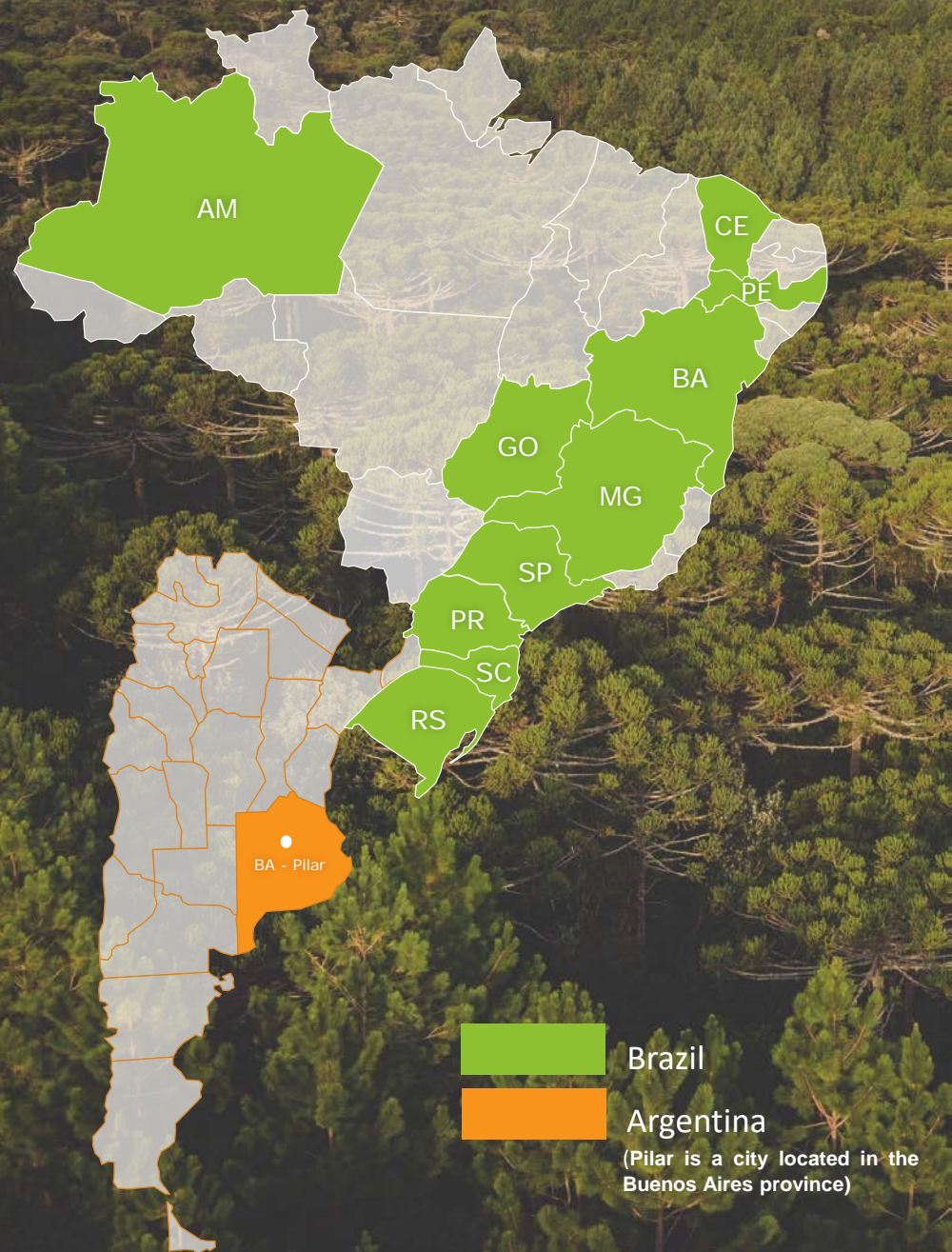
Klabin plants an average

100 trees
a minute





Factories



Pulp - hardwood, softwood and fluff

PR Ortigueira



Recycled papers

PE Goiana

SP Franco da Rocha,
Paulínia e Piracicaba



Packaging papers

SP Angatuba

PR Telêmaco Borba

SC Correia Pinto
Otacílio Costa



Sack kraft packaging

PE Goiana

SC Lages I e II

BA Pilar



Corrugated cardboard packaging

AM Manaus I e II

PE Goiana

BA Feira de Santana

MG Betim

SP Jundiáí TP, Jundiáí DI, Paulínia,
Piracicaba e Suzano

PR Rio Negro

SC Itajaí

RS São Leopoldo

CE Horizonte

GO Rio Verde



Forestry

SP Alto do Paranapanema

PR Planalto Guarapuava
Campos Gerais
Vale do Corisco

SC Alto Vale do Itajaí
Planalto Catarinense



Monte Alegre Mill

The Monte Alegre Mill in Telêmaco Borba - Paraná has a production capacity estimated of 1 million tons of packing paper (board paper and kraft paper).

Has approximately
80K AVEVA PI
System Points



Puma Mill

The Puma Unit in Ortigueira - Paraná has a production capacity of 1.1 million tons of hardwood pulp (eucalyptus) and 400,000 tons of softwood pulp (pine), a portion of which is converted into fluff pulp.

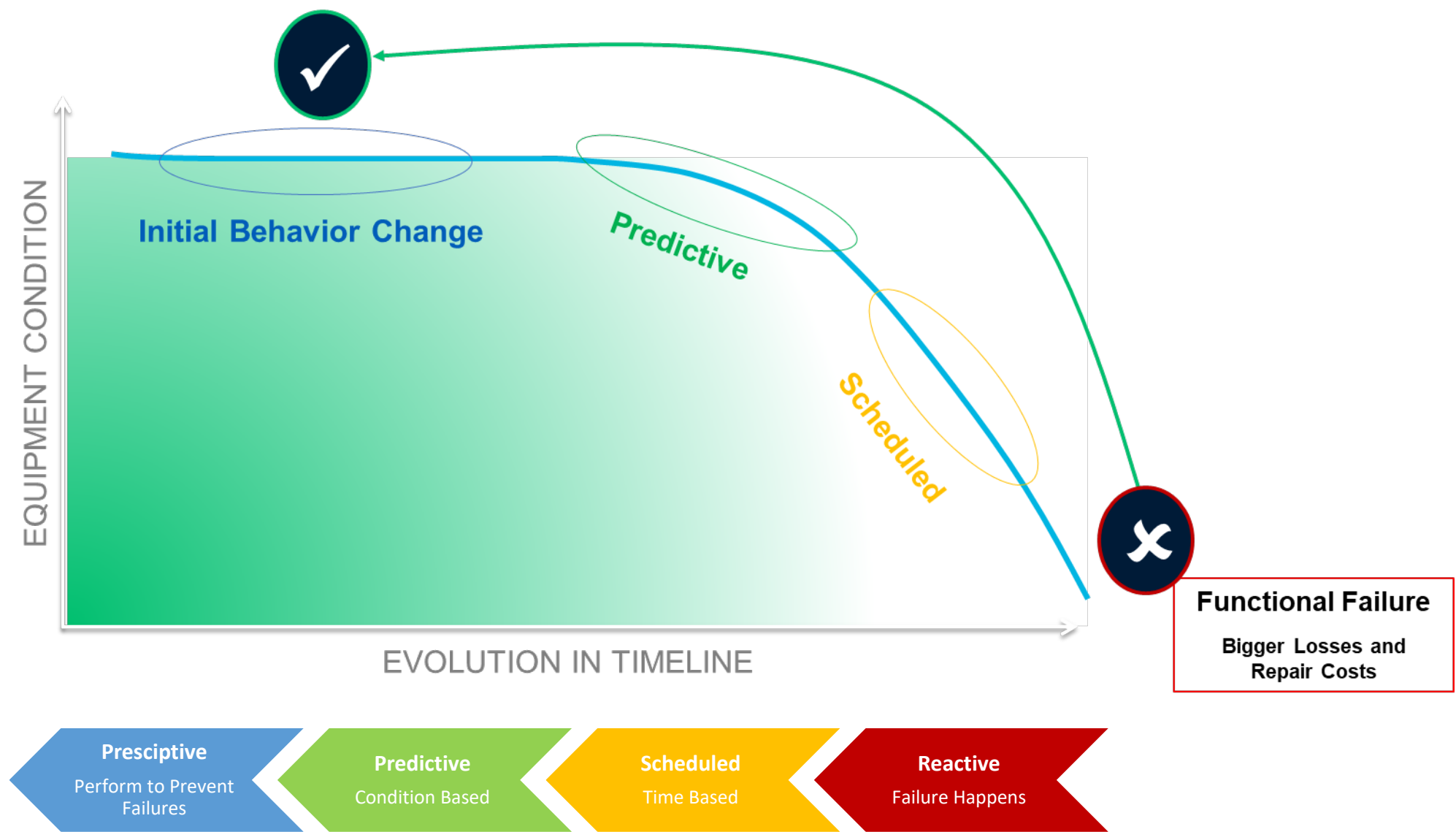
Has approximately
250K AVEVA PI
System Points



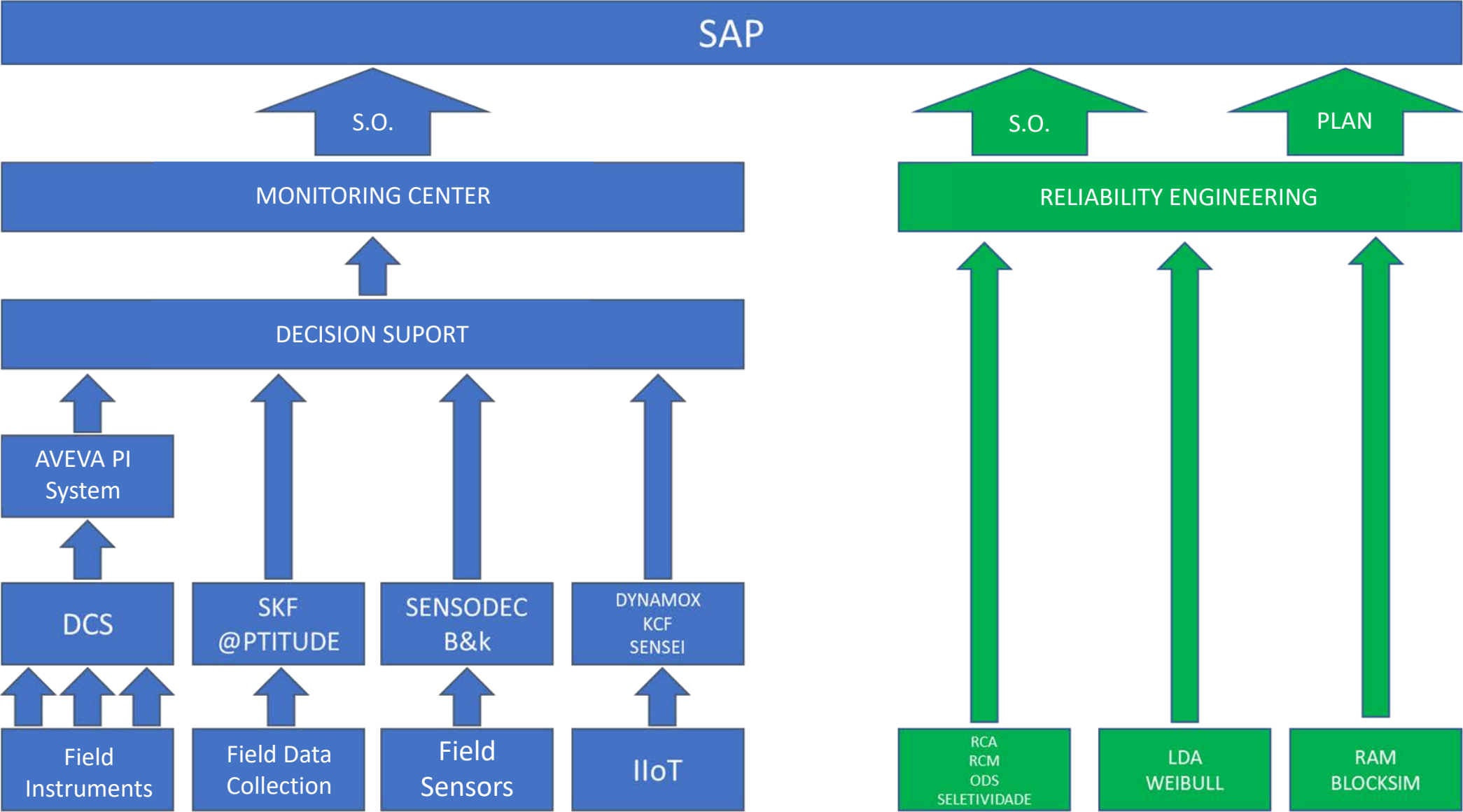
The Road So Far



Project Motivation



Strategic Plan of Klabin's MA Maintenance Engineer



Centro de Confiabilidade e Gestão de Ativos

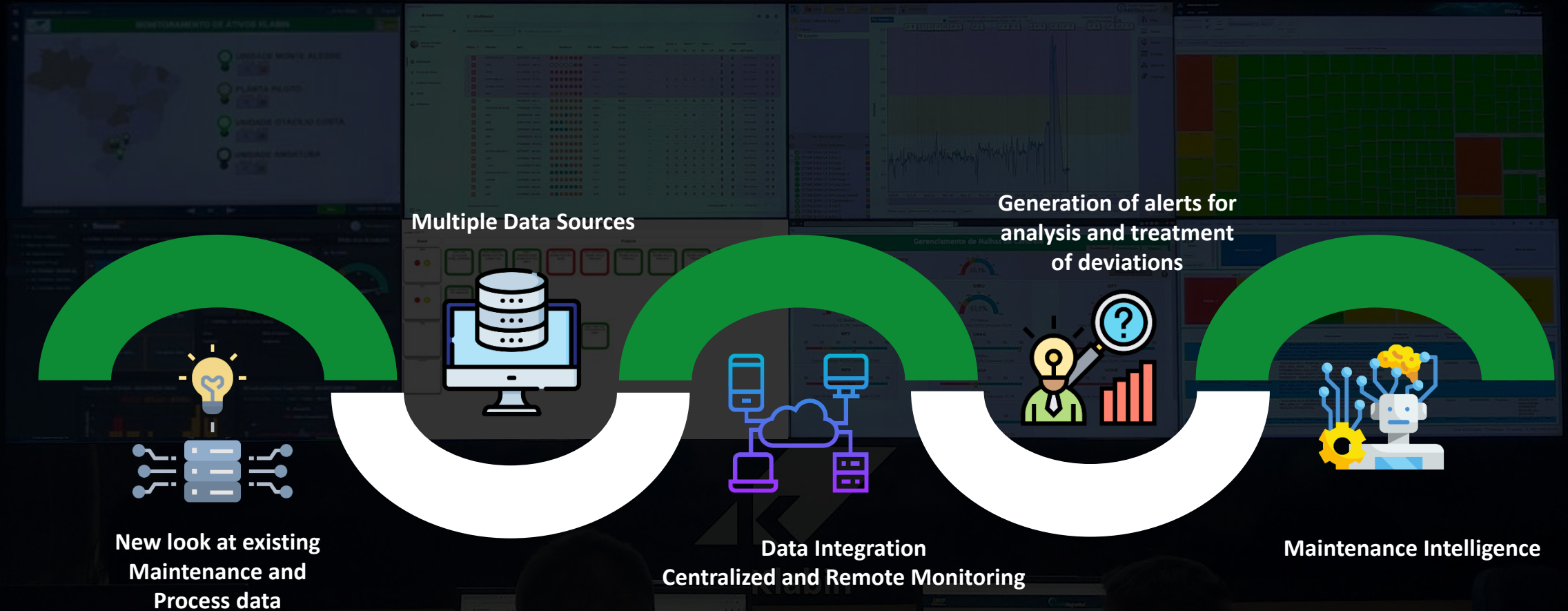


Reliability and Asset Management Center



Klabin

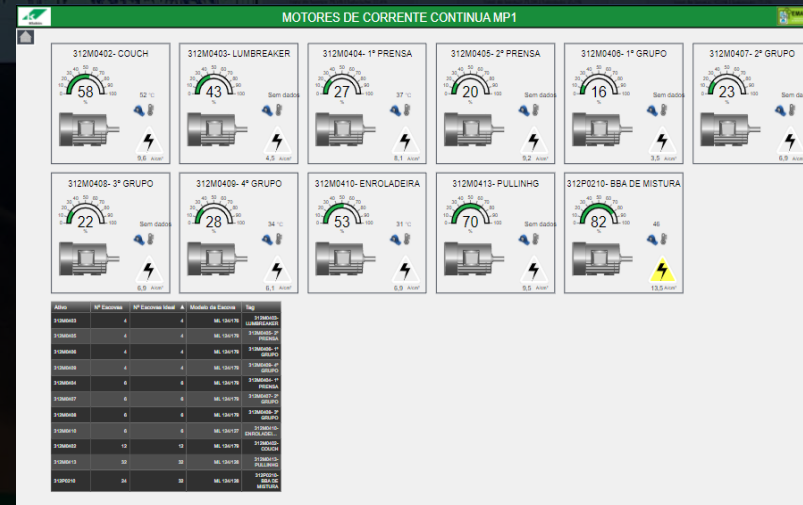
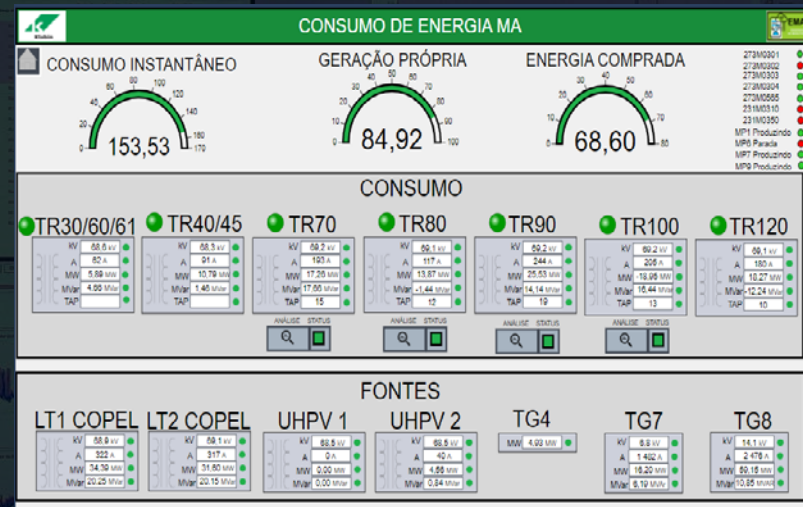
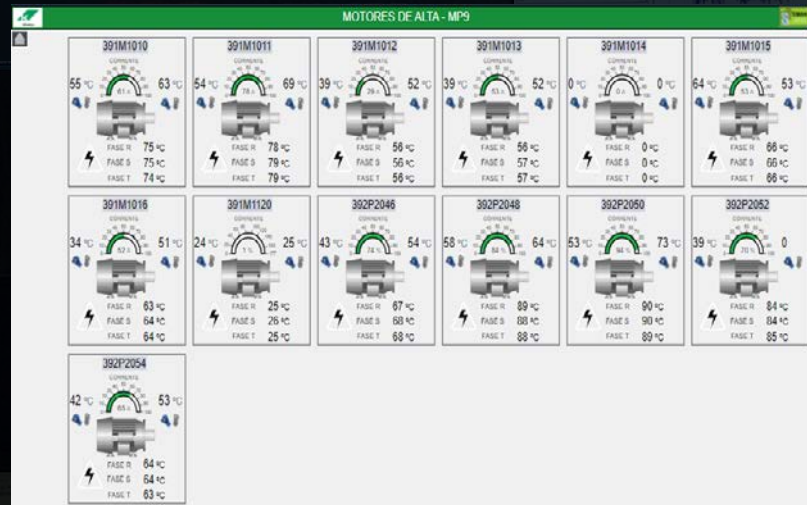
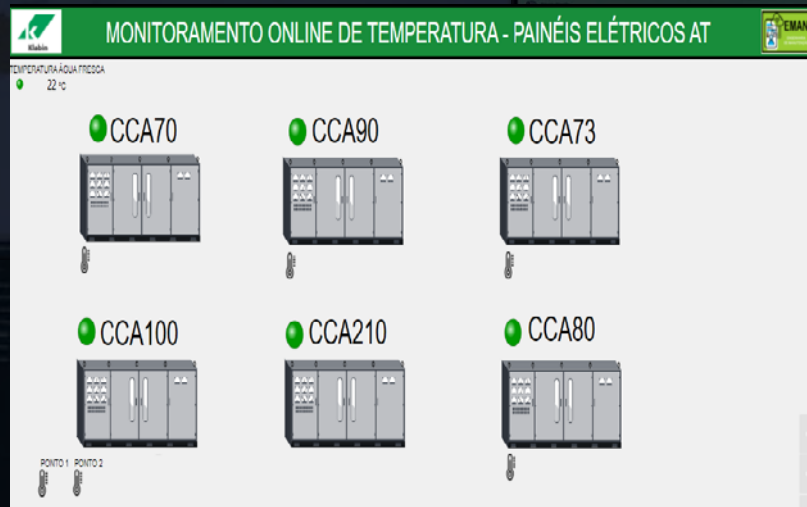
Centro de Confiabilidade e Gestão de Ativos



AVEVA PI System Applications

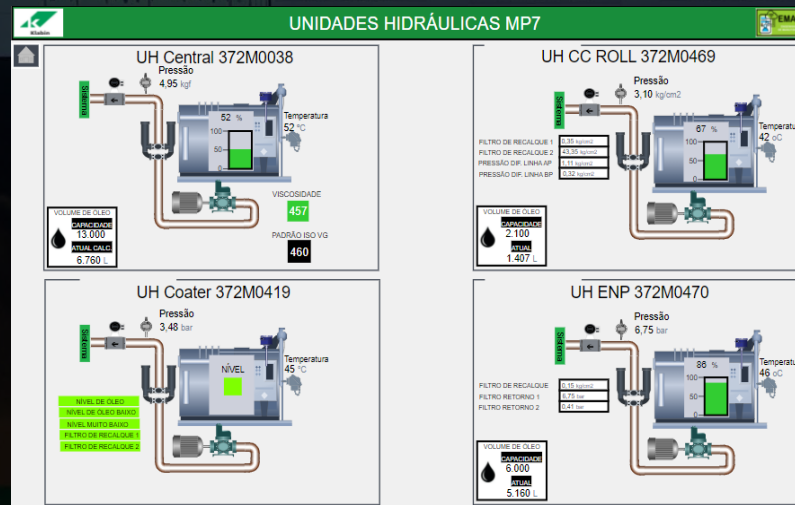
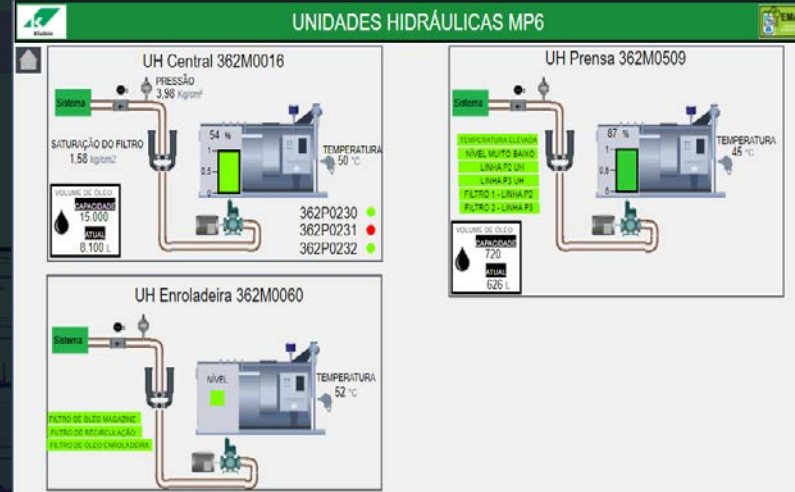
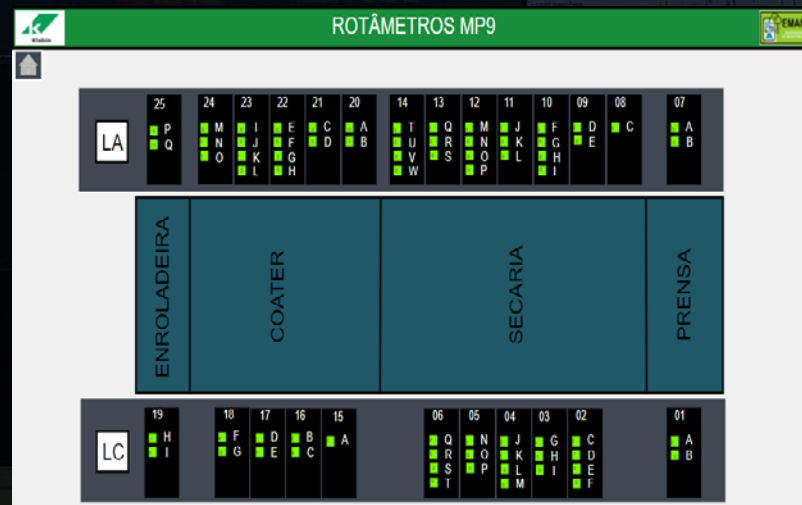
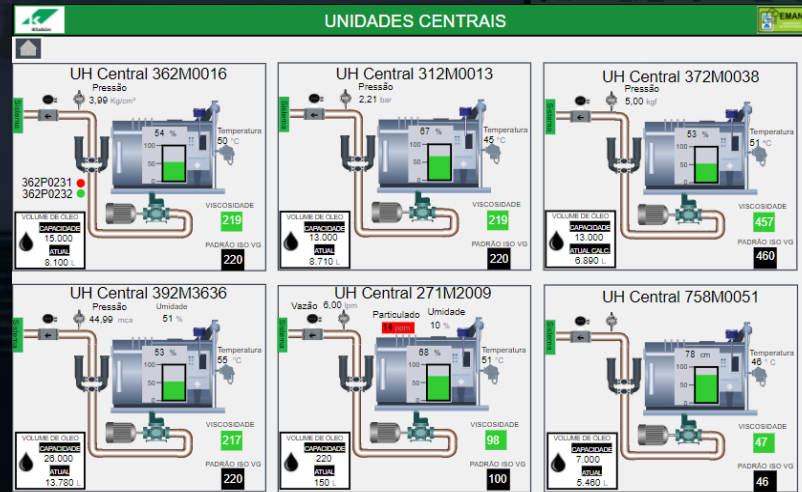


AVEVA PI System Applications



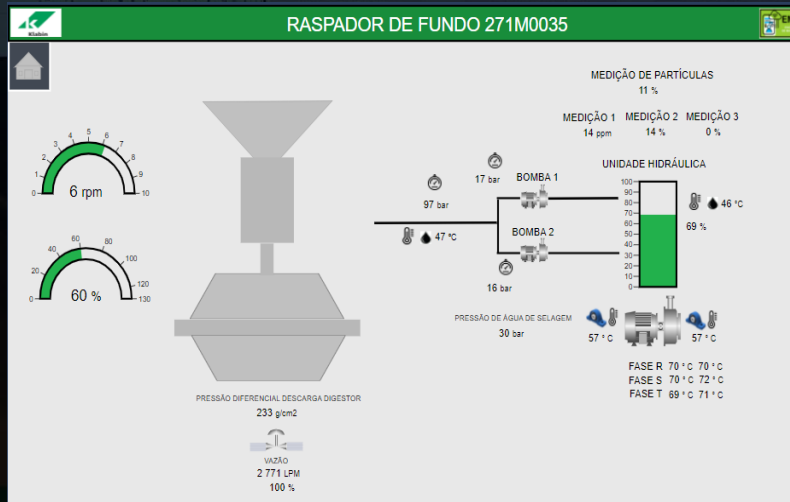
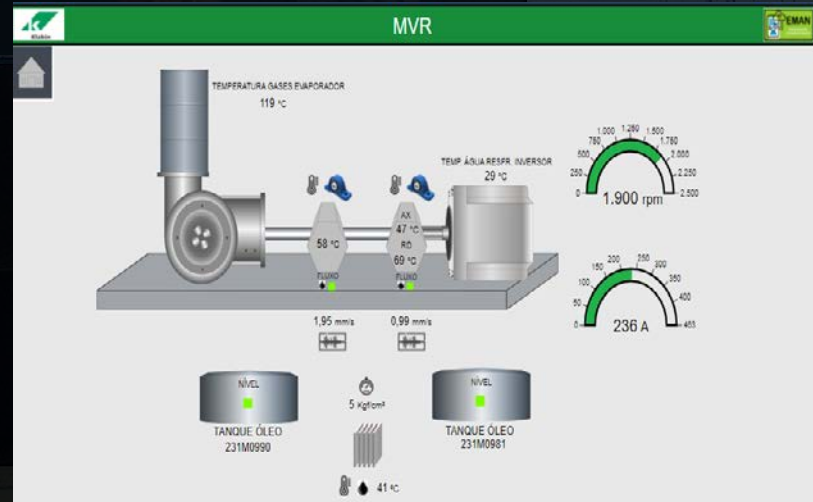
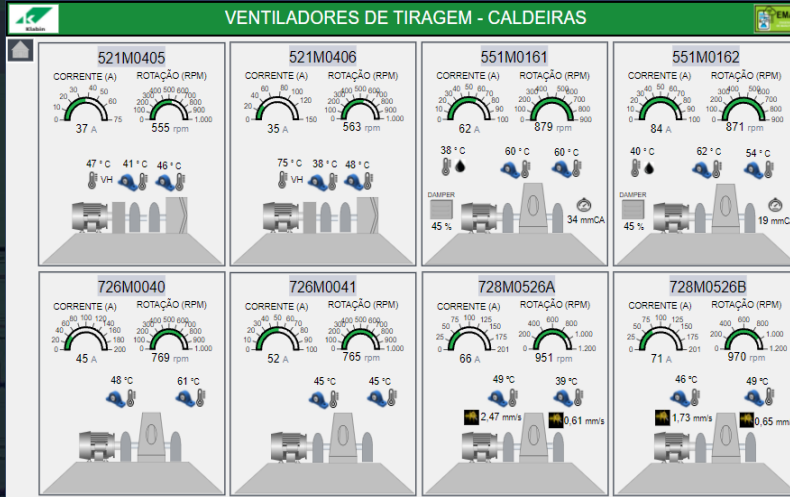
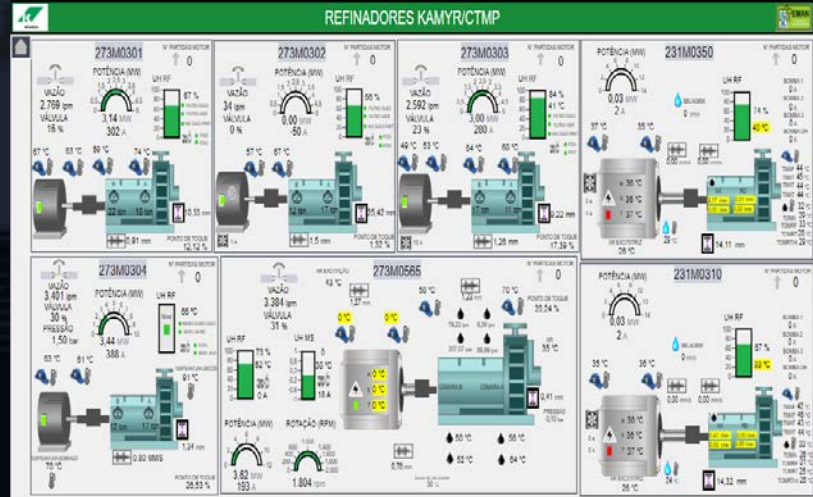
- ✓ Energy Consumption
- ✓ High Voltage Electrical Motors
- ✓ DC Motors
- ✓ HV Panels

AVEVA PI System Applications

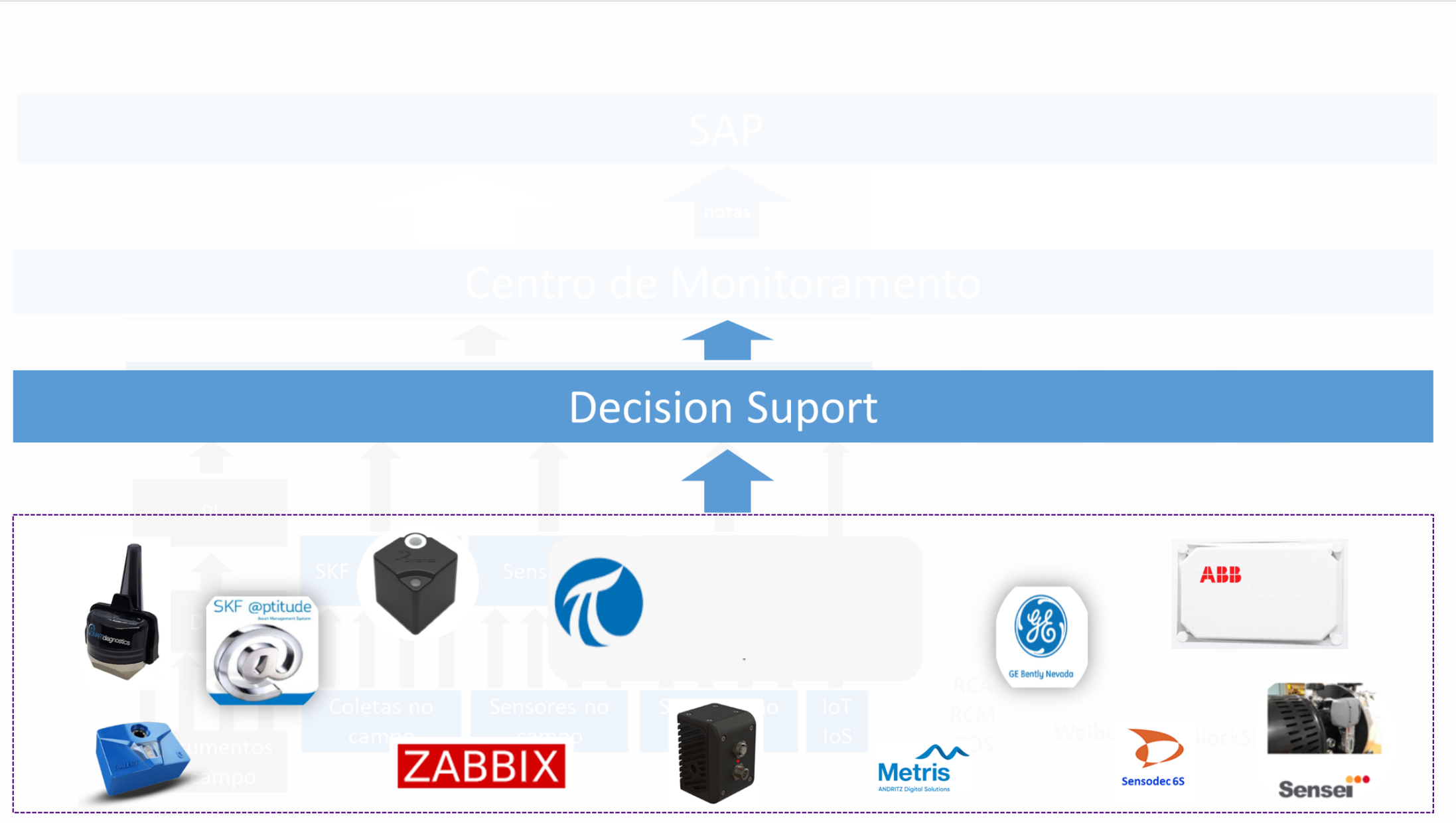


- ✓ Hydraulic Power Units
- ✓ Rotameters

AVEVA PI System Applications



- ✓ Refiners
- ✓ Boiler Fans



Maintenance Machine Learning

Goals

- ✓ Connect and integrate data sources (Field Sensors, IoTs)
- ✓ Optimize Analysis with Multivariable analysis
- ✓ Avoid Failures and Unscheduled Downtime

AVEVA Predictive Analytics

Version: 2018 R2

Reading configuration...

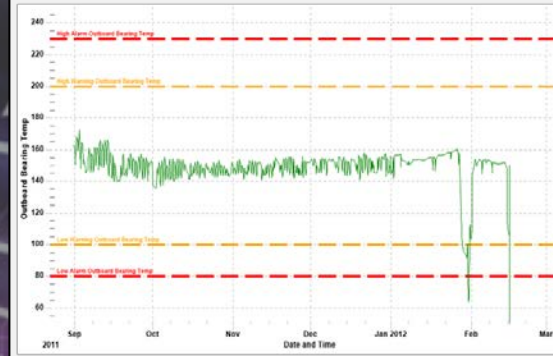


aveva.com

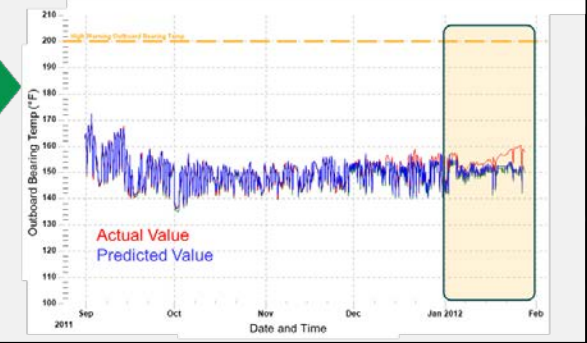
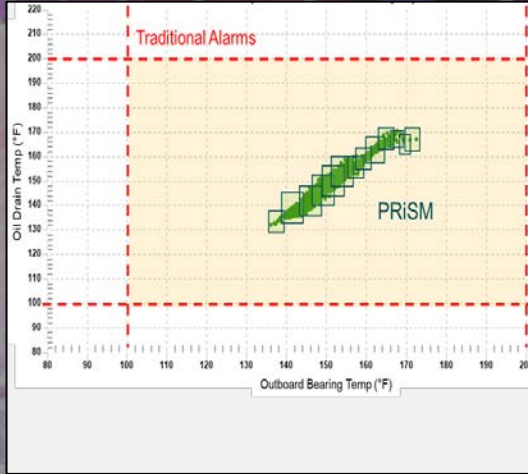
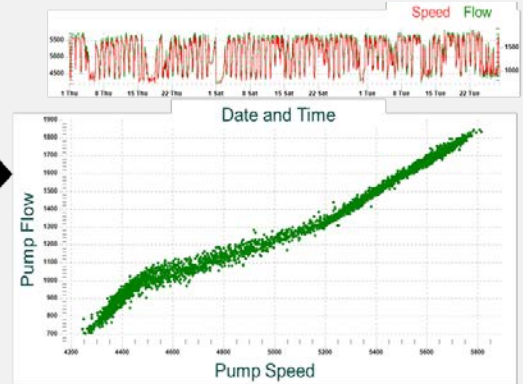
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Traditional Alarms



Sensor and Data Correlation

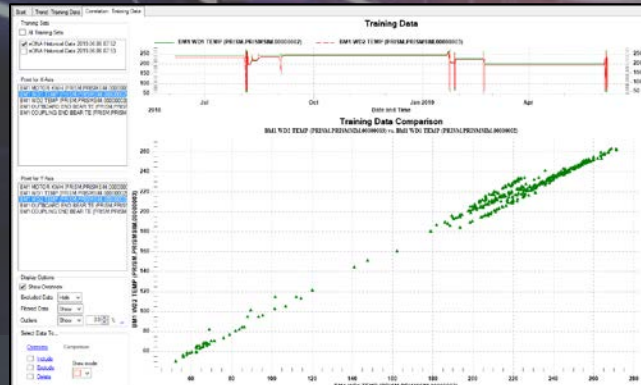
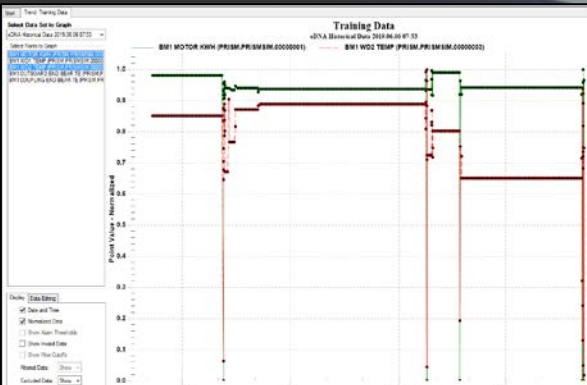


Current condition sampling and analysis based on predictive models

Identification of anomalies in initial state

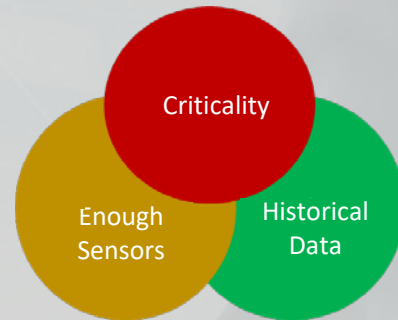
Early Warnings

Creating prediction models using Algorithms and Data Correlation



Pilot Project

10
Assets



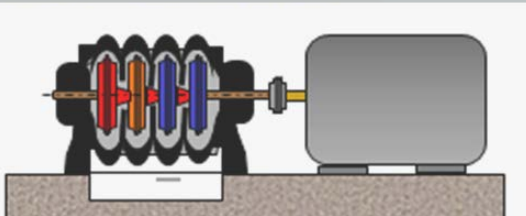
4 Month

IMPLEMENTATION

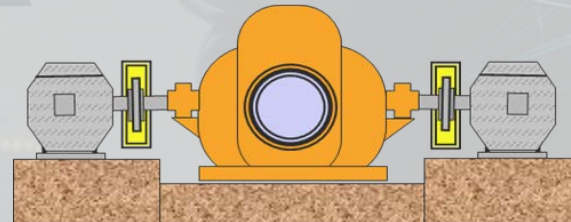
Kick-off in March/2019

Go Live in July/2019

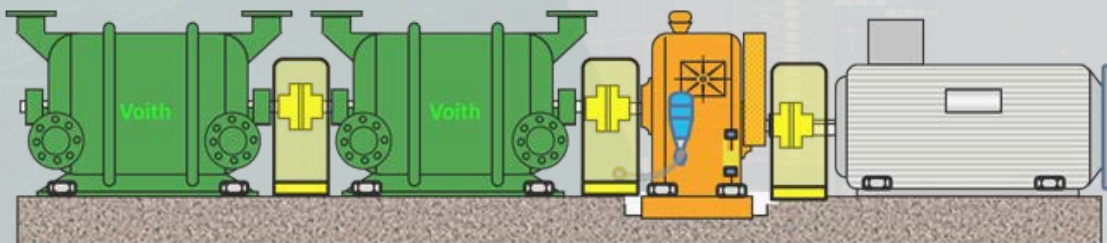
2 Turbo-Generators



3 Mixing Pumps



5 Vacuum Pumps



Pulp and Paper



Klabin



**First AVEVA Predictive
Analytics Application in
Pulp & Paper Worldwide**

Results, Progress and Perspectives



5 CASES / CATCHES
In the firsts months
of operation



+30 Predictive Models
For Initial Expansion

- ✓ Process Models (Focus on Quality Deviations)
- ✓ Refiners
- ✓ Electric motors
- ✓ Discharge Device System
- ✓ Air compressors



**Big Values
Estimated**

(Potential Failure Catches and Opportunities
generated by the tool)



**Migrate the
Platform to Cloud**



Multi-Site Expansion

Centro de Confiabilidade e Gestão de Ativos










Generation of alerts for analysis
and treatment of deviations








BENEFÍCIOS









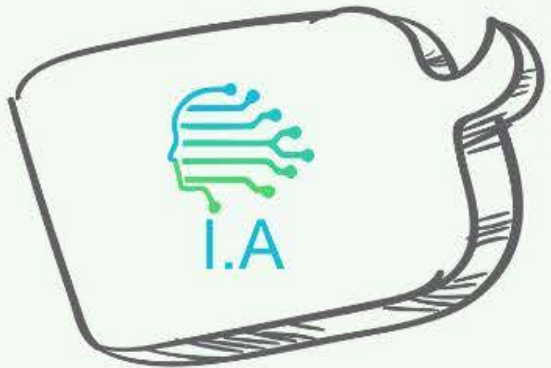
PRODUÇÃO DIÁRIA



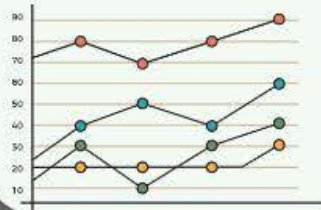







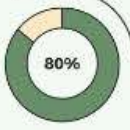
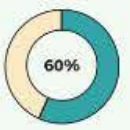
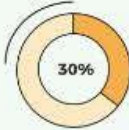

RASTREABILIDADE DA PRODUÇÃO



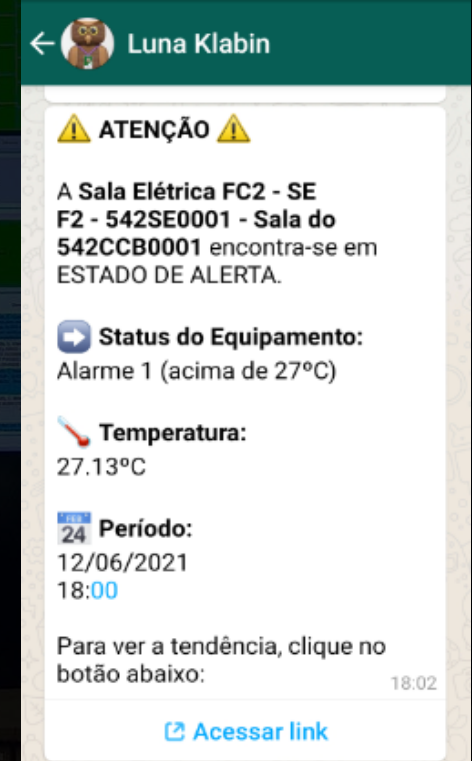
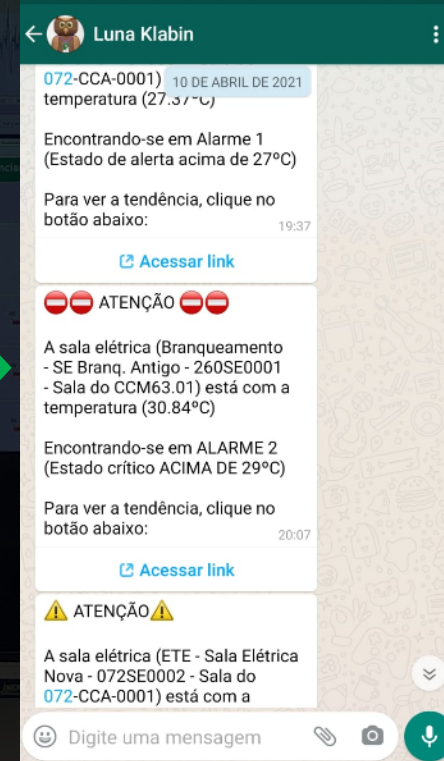
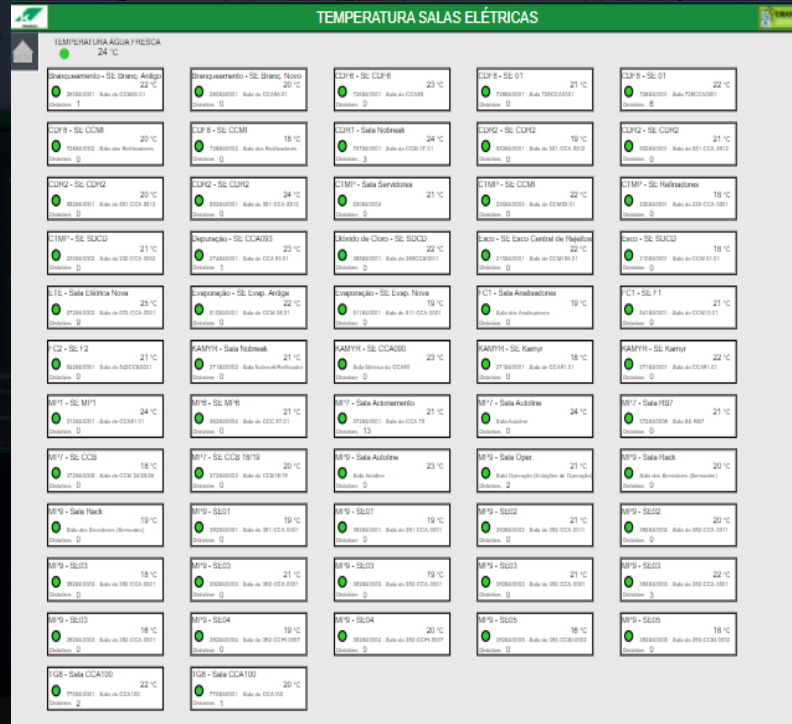
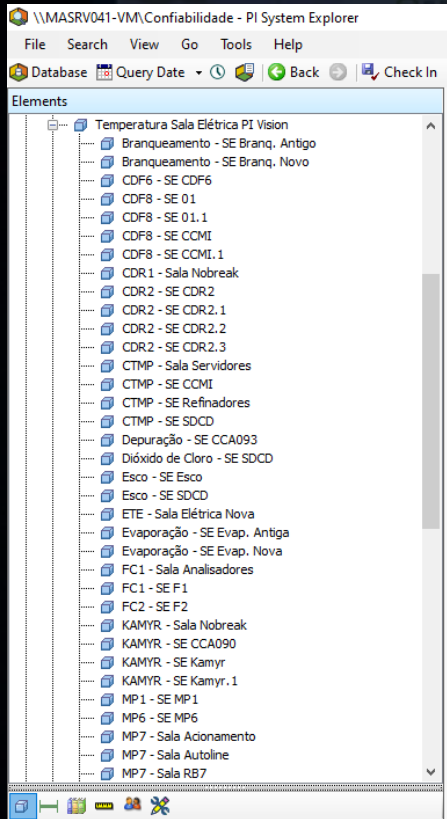
CONFIABILIDADE DA PLANTA STATUS EM REAL TIME DOS EQUIPAMENTOS







First Development



Main Goals

- Quick and assertive actions
- Notifications at different levels of hierarchy
- Decreased time of deviation
- Increased Availability
- Reduction in the number of deviations/alarms
- Notifications at non-administrative times
- Easy access via the AVEVA PI Vision link inserted in the message

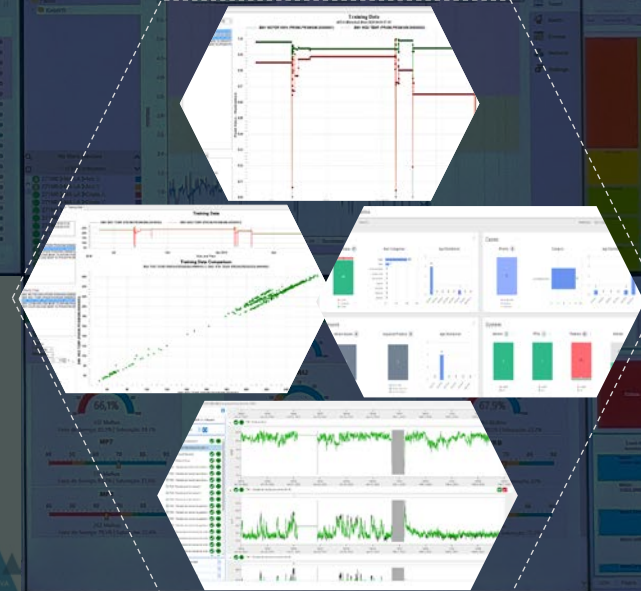
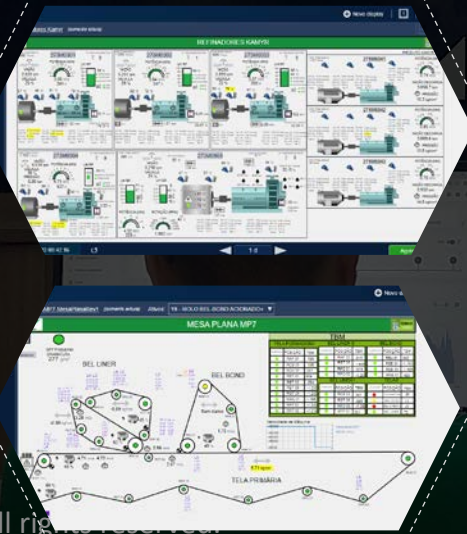


RELIABILITY AND ASSET MANAGEMENT CENTER



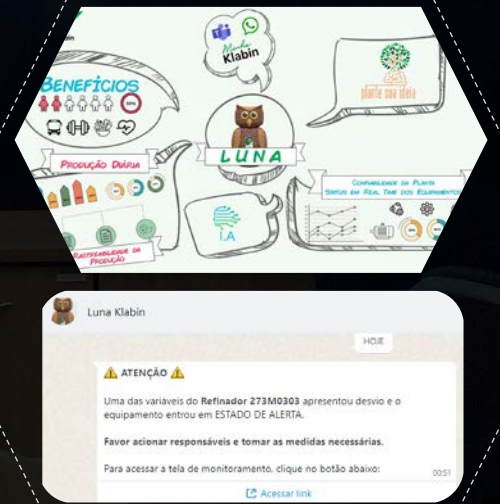
**IIoT SENSORS WITH
AUTOMATIC COLLECTION
OF ASSET HEALTH DATA
WITH CLOUD
PROCESSING**

**CENTRALIZED
MONITORING SCREENS
WITH PROCESS DATA +
ASSET HEALTH**



**ACTIVE NOTIFICATION
ROBOT ABOUT EQUIPMENT
AND PROCESS BEHAVIOR
DEVIATIONS**

**MACHINE LEARNING TOOL
FOR CORRELATION OF
PROCESS DATA AND ASSET
HEALTH USING ARTIFICIAL
INTELLIGENCE**



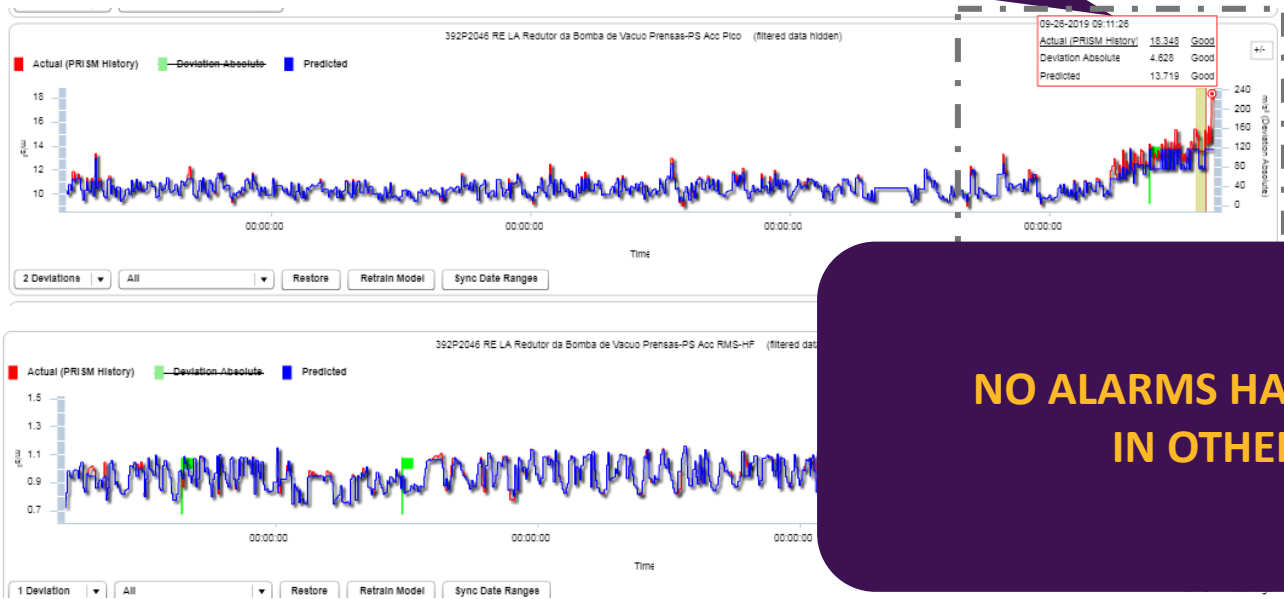
Cases

Case of Avoided Failure #1

- ✓ Variables come from the online vibration system (Sensodec).
- ✓ The measured values are “input” for Machine Learning (APA).
- ✓ Expected Value (blue line) ≠ Actual value (red line)

1. Early warnings from AVEVA Predictive Analytics triggered detailed investigation
2. Spectral Analysis in Expert System
3. Oil Analysis

DETECTED START OF DEFECT IN THE GEARBOX!



**NO ALARMS HAVE BEEN TRIPPED
IN OTHER SYSTEMS**

qui 26/09/2019 13:29
Thiago Geraldo Bueno
RES: Desvios Prism - 26/09 - MP9

Para: Raphael Lucas Elbi Silva

Cc: KPMA - FAB - Confiabilidade; Francisco Benicio de Almeida; Rodolpho Conti Mazzo

Boa tarde.
Retorno de informação
Comparando no gráfico de cascata abaixo nota-se uma mudança nos espectros atuais apresentando sintoma de folga mecânica no eixo de entrada do RE. Foi solicitado também uma análise do óleo, laudo da coleta realizada do dia 25/09 não contempla partículas metálicas no óleo, solicitando apoio da lubrificação para ativar...

SENSODEC 6S - WATERFALL TOOL

Att:
Thiago Geraldo Bueno

Klabin
LAUDOS DO LUBRIFICANTE

NORMAL

ÁREA: GPP (MP9)
TAG: PR2 P 2046
COMPARTIMENTO: RE2752
LUBRIFICANTE: SHC 630

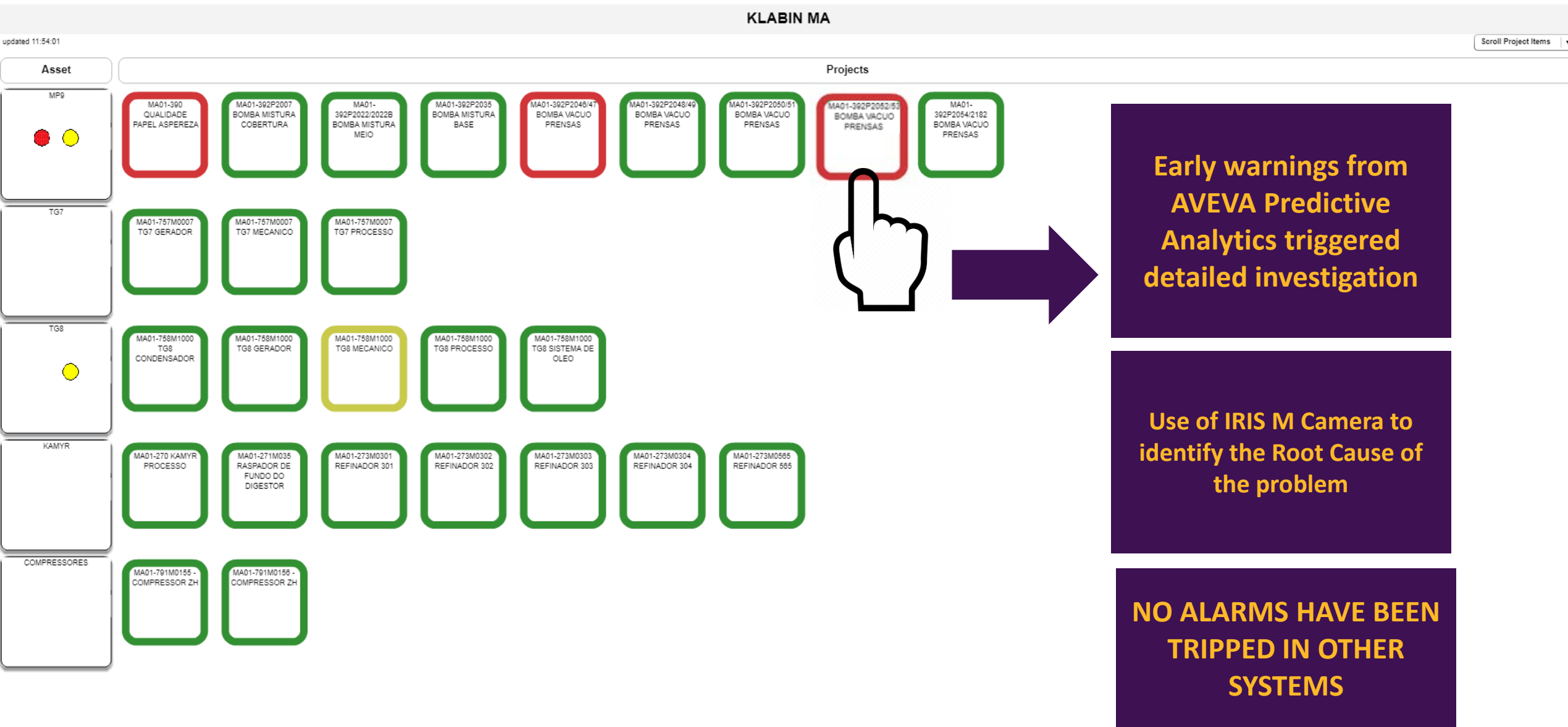
COMENTÁRIOS:
LUBRIFICANTE DENTRO DOS PARÂMETROS NORMAS DE TRABALHO.

ENSÃO REALIZADO:
DESEJÁVEL (Cód. No: 15,12,10):

RE A. S. CLASSE: 8
ISO VG: 236-49 CST
UMIDADE RELATIVA: 0,02%

RE A. S. CLASSE: 8
ISO VG: 220 CST
UMIDADE RELATIVA: 0,02%

Case of Avoided Failure #2



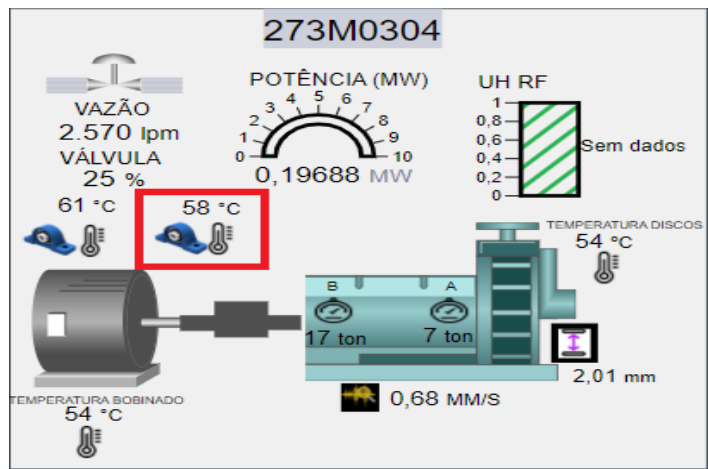
392P2052

Conjunto acionamento bomba de vácuo.

Case of Avoided Failure #3

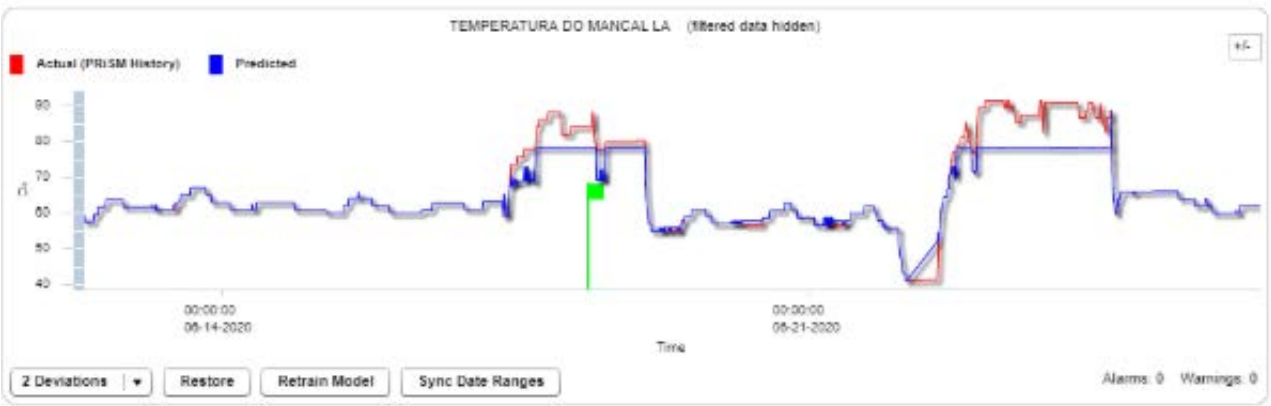
- AVEVA PI Vision

Visual alarms on AVEVA PI Vision for motor-coupled bearing temperature



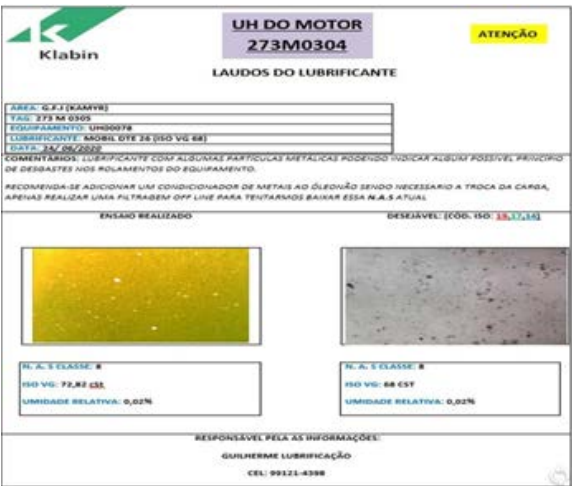
- AVEVA Predictive Analytics

Refiner predictive model generated alarms, clearly indicating deviation from predictive line (blue) to actual value measurement (red)



- Oil Analysis

-Metal particles identified

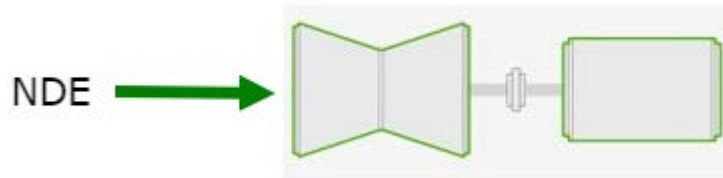
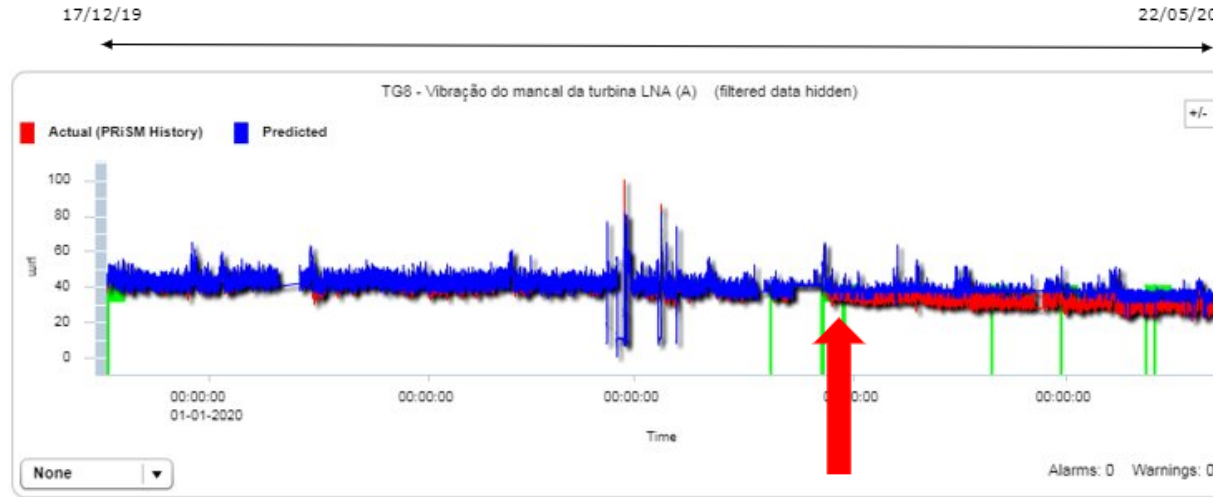


150 a 200
Pulp Tons/day

Case of Avoided Failure #4

- TG8 Sleeve Bearing

Analysis trigger situation



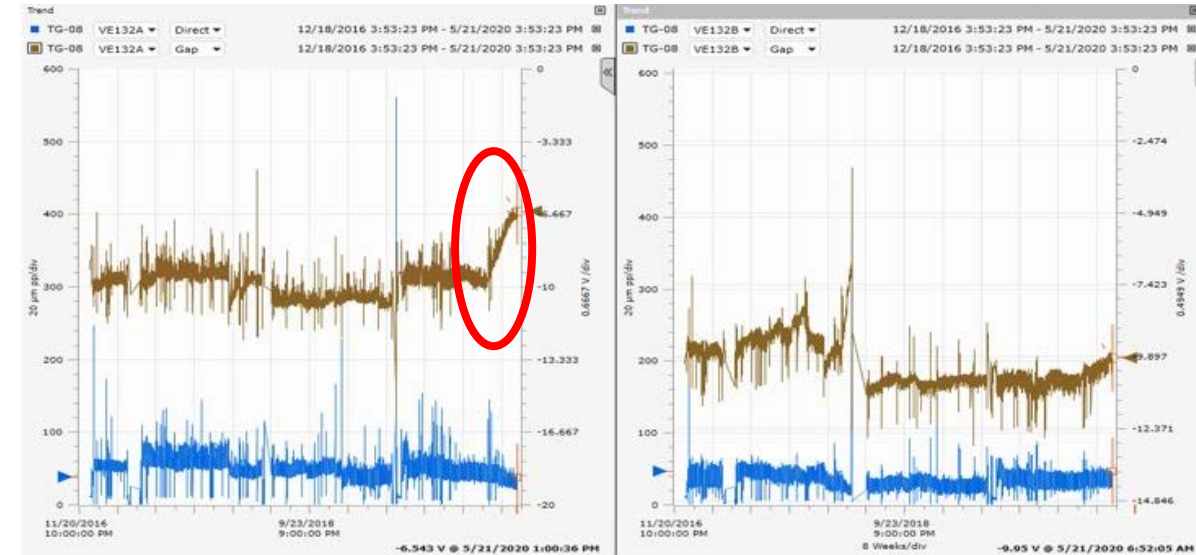
start of alarms

✓ A different behavior of the center line of the turbine shaft and the generator was noticed. What corroborates the displacement of the center lines of the axles is the voltage of the proximity sensors that present values above the verified historically.

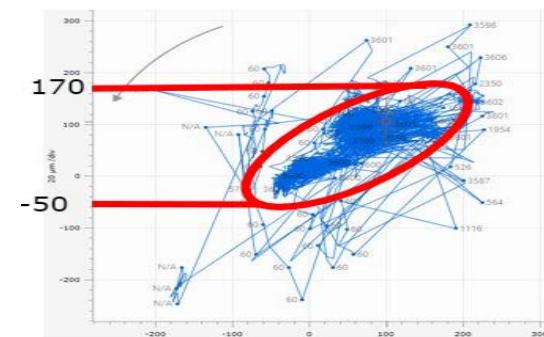
✓ Joint studies with the manufacturer and specialists for diagnosis.

- System One

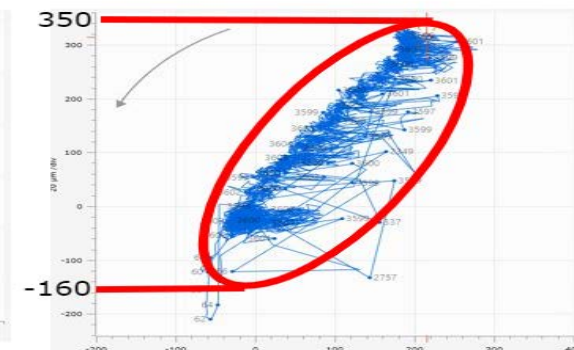
GAP position change



stable behavior



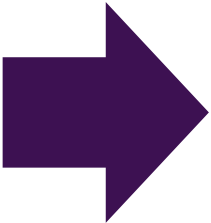
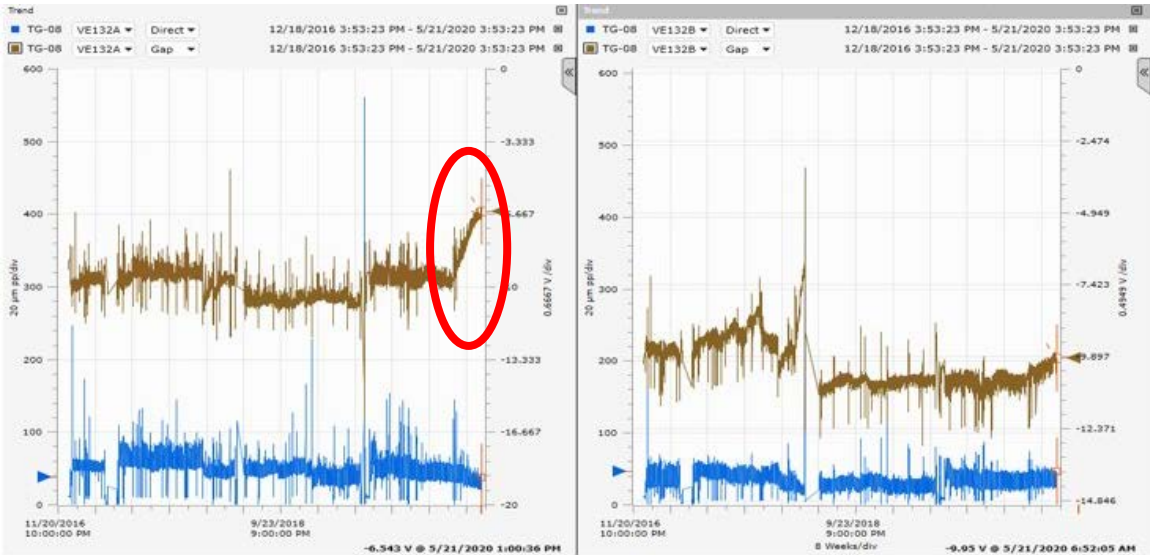
unstable behavior



Case of Avoided Failure #4

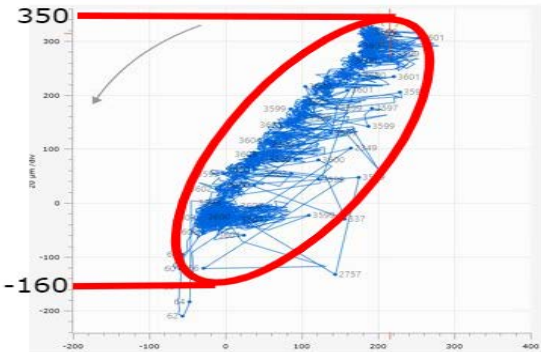
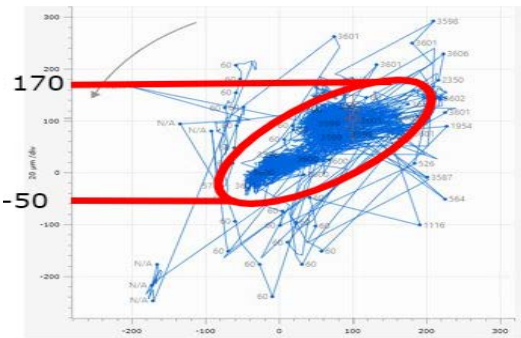
- System One

GAP position change



stable behavior

unstable behavior

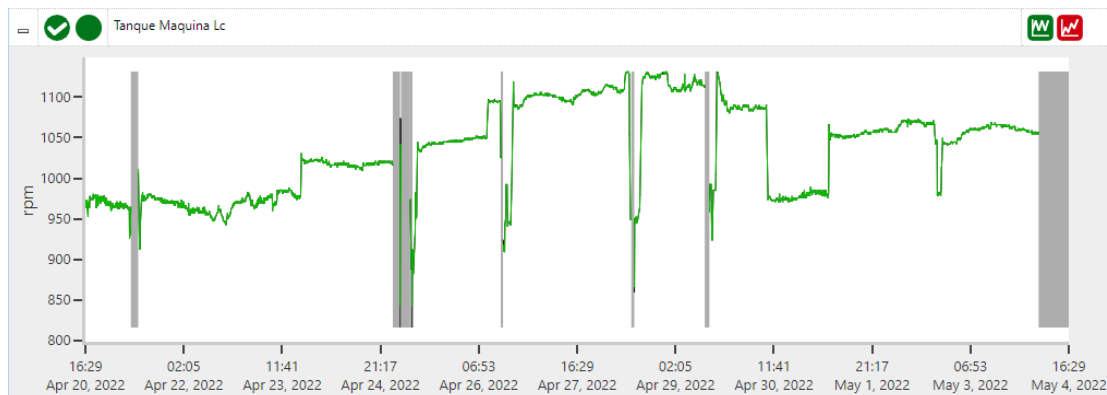
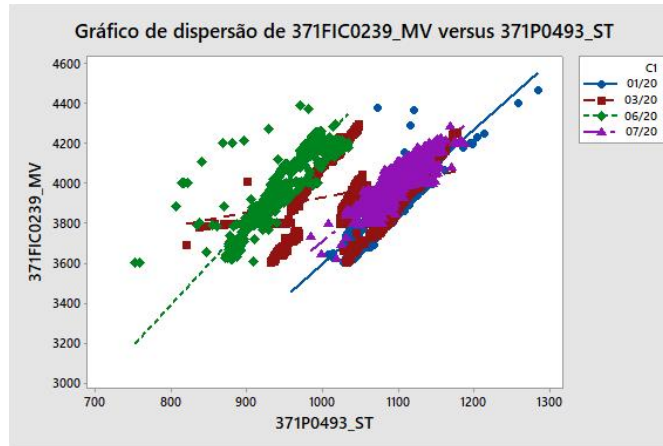
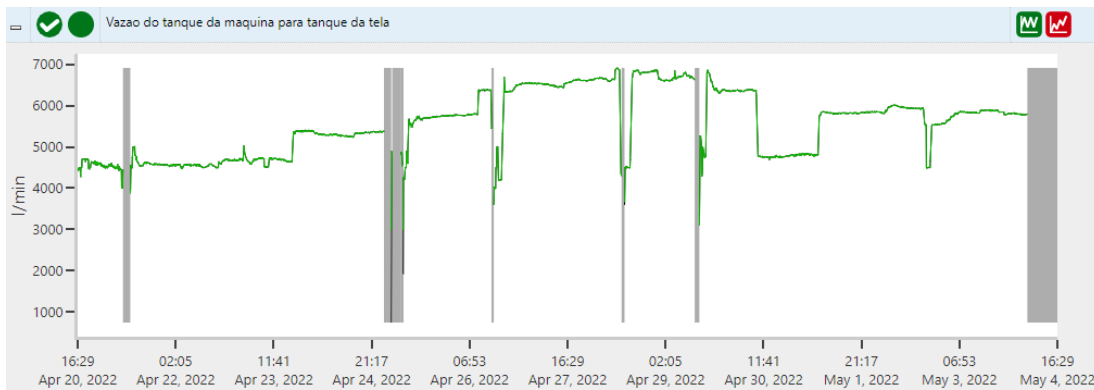


- ✓ Condition found in the inspection performed at General Shutdown
- ✓ Condition could evolve into a major failure if not identified and treated.

Case of Avoided Failure #5

Models to identify incrustation in flow meters

- This deviation causes several problems in the final quality of the paper.
- The main intent is to use pump speed and mass flowmeter data for early identification of deviation in both variables.
- Assurance of reliable measurements.



CASES OF AVOIDED FAILURES

- ✓ TurboGenerators
- ✓ Refiners
- ✓ Pumps
- ✓ Electric Motors (HV e LV)
- ✓ Boiler Fans
- ✓ Paper Machine Rolls
- ✓ Electric Rooms
- ✓ Pulp Screens
- ✓ Decanter Centrifuges
- ✓ Gearboxes

Potential Estimated

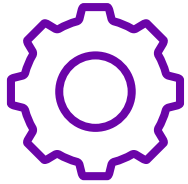
Saving 2021

~10% Of Maintenance
Annual Budget

+ 30K Ton Paper

Potential losses due to production reduction or stoppage

World-class Upstream Operations



Challenge

Increase operational reliability and reduce downtime;
Reduce costs for corrective maintenance and increase productivity;
Meaningful return on investment.



Solution

Potentiating AVEVA PI System technology including PI AF and PI Vision.
Deployed AVEVA Predictive Analytics as an advanced foundation for Process Monitoring, Condition Based Maintenance & Advanced Analytics.



Benefits

Quick implementation and a user-friendly interface.
Scalability without relying on a supplier;
Meaningful return on investment by reducing maintenance costs, avoiding unexpected breakdowns and increasing production.

“Any successful person knows that they are an important piece, but they know that they will not achieve anything alone.”

Bernardinho, brazilian volleyball coach and former player



Edemilson Bueno de Camargo

Maintenance Coordinator

- Klabin SA
- ebcamargo@klabin.com.br



Pedro Henrique Cantelli Gonçalves

Reliability Engineer

- Klabin SA
- phcgoncalves@Klabin.com.br

Questions?

Please wait for the microphone

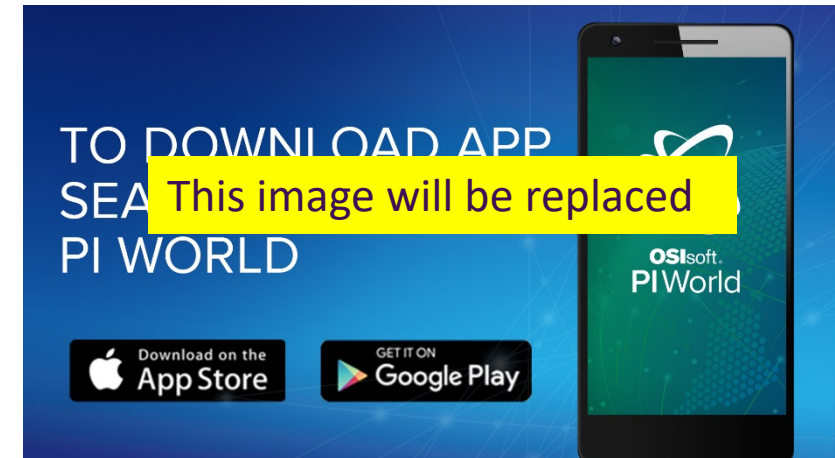
- State your name and company



Please remember to...


Complete the survey!


- Navigate to this session in the mobile agenda for the survey



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The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

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ABOUT AVEVA

AVEVA is a global leader in industrial software, driving digital transformation and sustainability. By connecting the power of information and artificial intelligence with human insight, AVEVA enables teams to use their data to unlock new value. We call this Performance Intelligence. AVEVA's comprehensive portfolio enables more than 20,000 industrial enterprises to engineer smarter, operate better and drive sustainable efficiency. AVEVA supports customers through a trusted ecosystem that includes 5,500 partners and 5,700 certified developers around the world. The company is headquartered in Cambridge, UK, with over 6,500 employees and 90 offices in over 40 countries.

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