Intelligent Pump Monitoring System

Hydro Alunorte

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October/2020

Control Board

Intelligent Pump Monitoring System

OBJETIVES OF THIS DOCUMENT

- Share an overview about the application of OSIsoft solution to Pump Monitoring in Hydro Alunorte.

WHAT YOU WILL SEE AT THIS DOCUMENT

- Team members;
- Present Hydro;
- The problem and its importance;
- Before the solution;
- Challenge;
- Solution;
- Final results;
- Benefits;
- Next Steps.

Team Members

Intelligent Pump Monitoring System

Gilberto Nobumasa

Mechanical
Engineer

João Paulo Rezende de Freitas

Automation
Engineer

Roberto Moraes

Fog Systems
and Integrators
Analyst

Lucas Matheus Lima Leite

Mechanical
Engineer

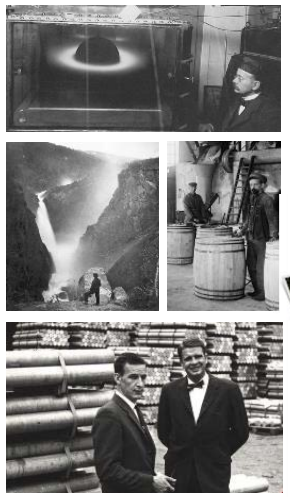
Pedro Angelo Ribeiro Costa

Electrical
Engineer

Global Aluminum Integrated Chain Company

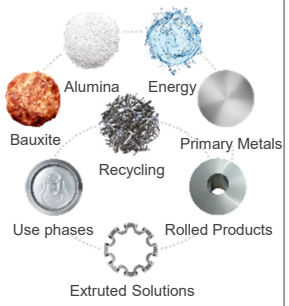
Intelligent Pump Monitoring System

More than 110 years of responsibility and Industrial development



Aluminum is the metal of the future

Covering the entire aluminum value chain



5 business units

Bauxite & Alumina

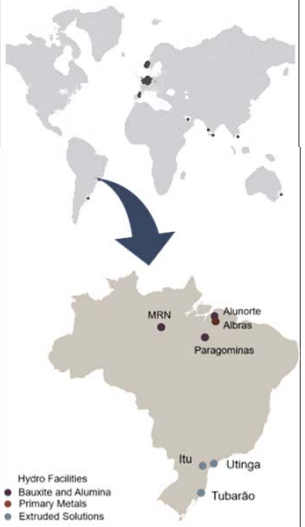
Primary Metals

Energy

Rolled Products

Extruded Solutions

36,200 employees around the world, with presence in 40 countries



Strategic Alignment

Profitability

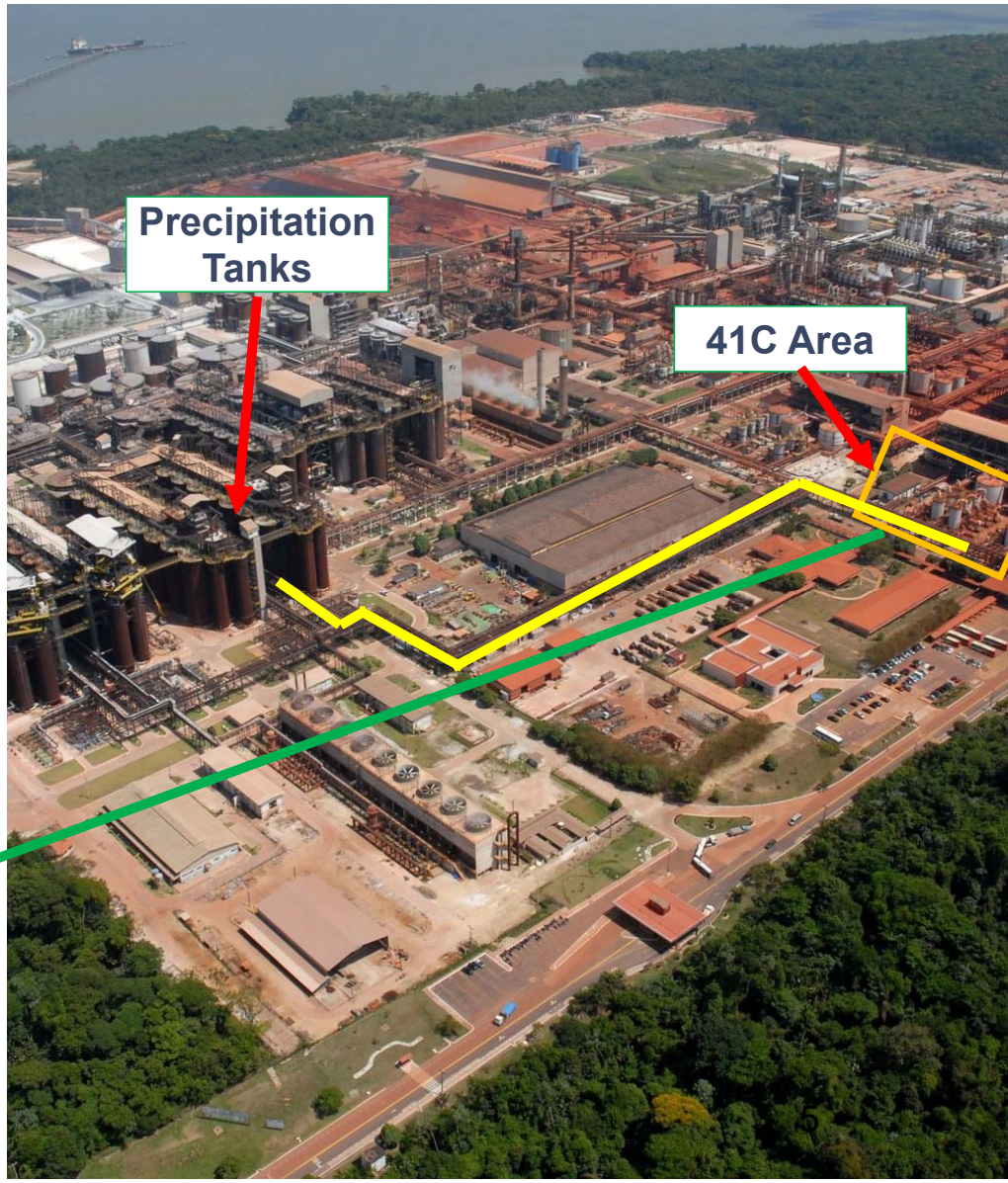
Sustainability

The problem and its importance

Intelligent Pump Monitoring System

- High cost of pump maintenance due to cavitation;
- Exposure of people to pump maintenance activities;
- Yield Loss.

P-41C-01A P-41C-01C P-41C-01B

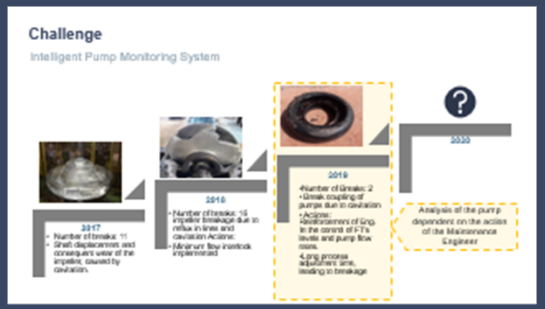


Content Menu

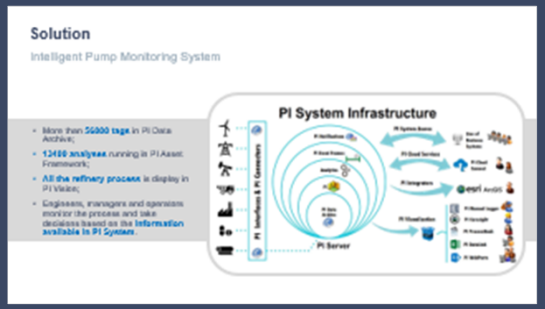
Intelligent Pump Monitoring System

1 Before the solution

2 Our challenge

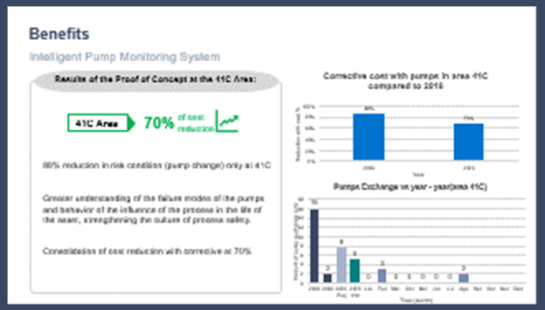


3 Solution

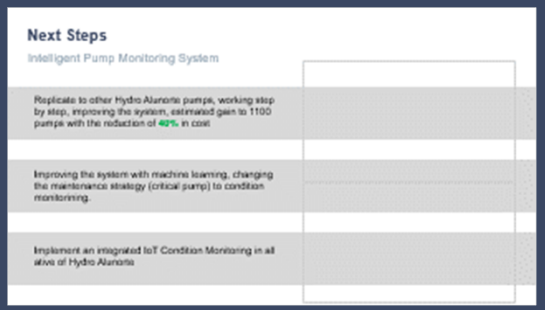


4 Process improvement

5 Benefits



6 Next steps



Before the solution

Intelligent Pump Monitoring System

1 Pump Cavitation at the field

After 5h

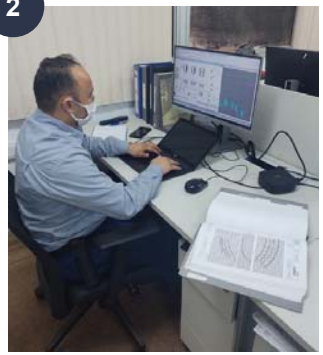
4

After 5h

3

After 24h

2



After 48h

82 h

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Intelligent Pump Monitoring System

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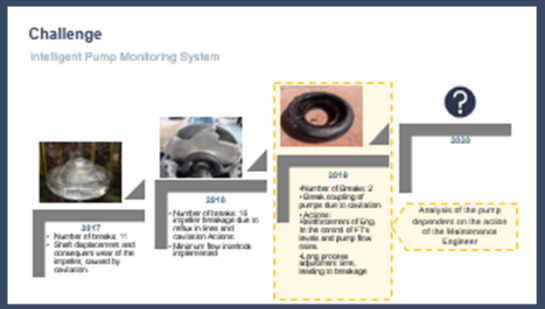

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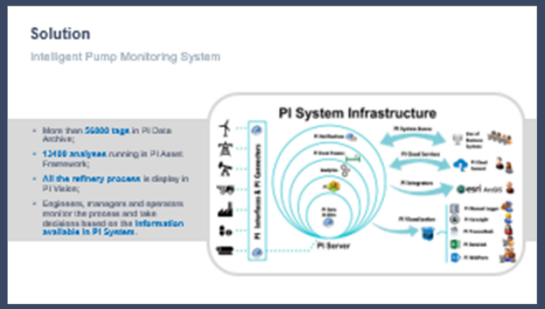
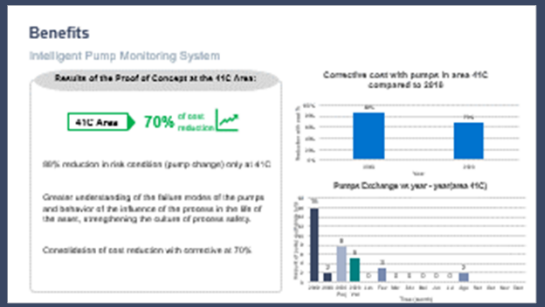


4 Final results

5 Benefits



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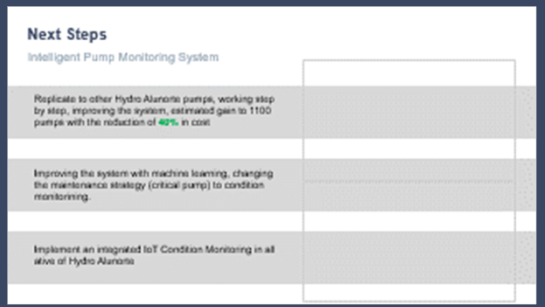


Challenge

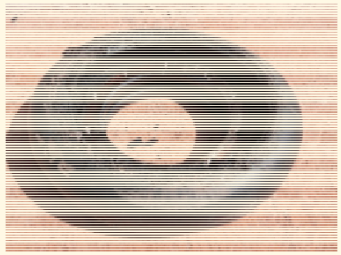
Intelligent Pump Monitoring System

2017

- Number of breaks: 11
- Shaft displacement and consequent wear of the impeller, caused by cavitation.

2018

- Number of breaks: 16 impeller breakage due to reflux in lines and cavitation Actions:
- Minimum flow interlock implemented



2019

- Number of Breaks: 2
- Break coupling of pumps due to cavitation
- Actions: Reinforcement of Eng. In the control of FT's levels and pump flow rates.
- Long process adjustment time, leading to breakage

2020

Analysis of the pump dependent on the action of the Maintenance Engineer

Menu

Intelligent Pump Monitoring System

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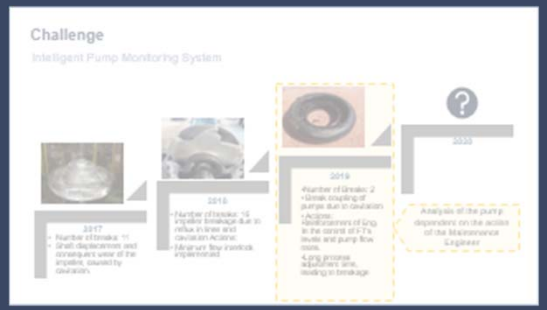
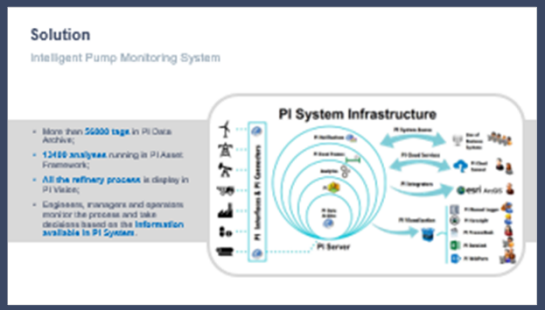
2 Our challenge



3 Solution



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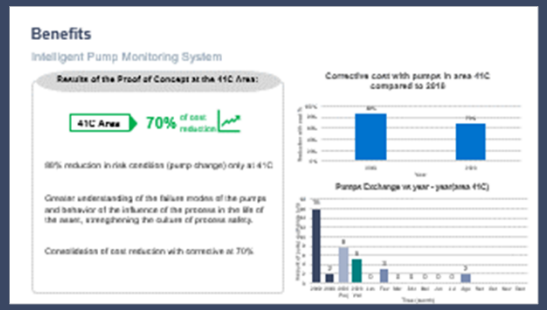

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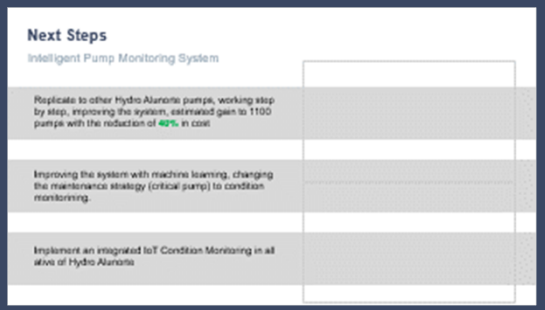
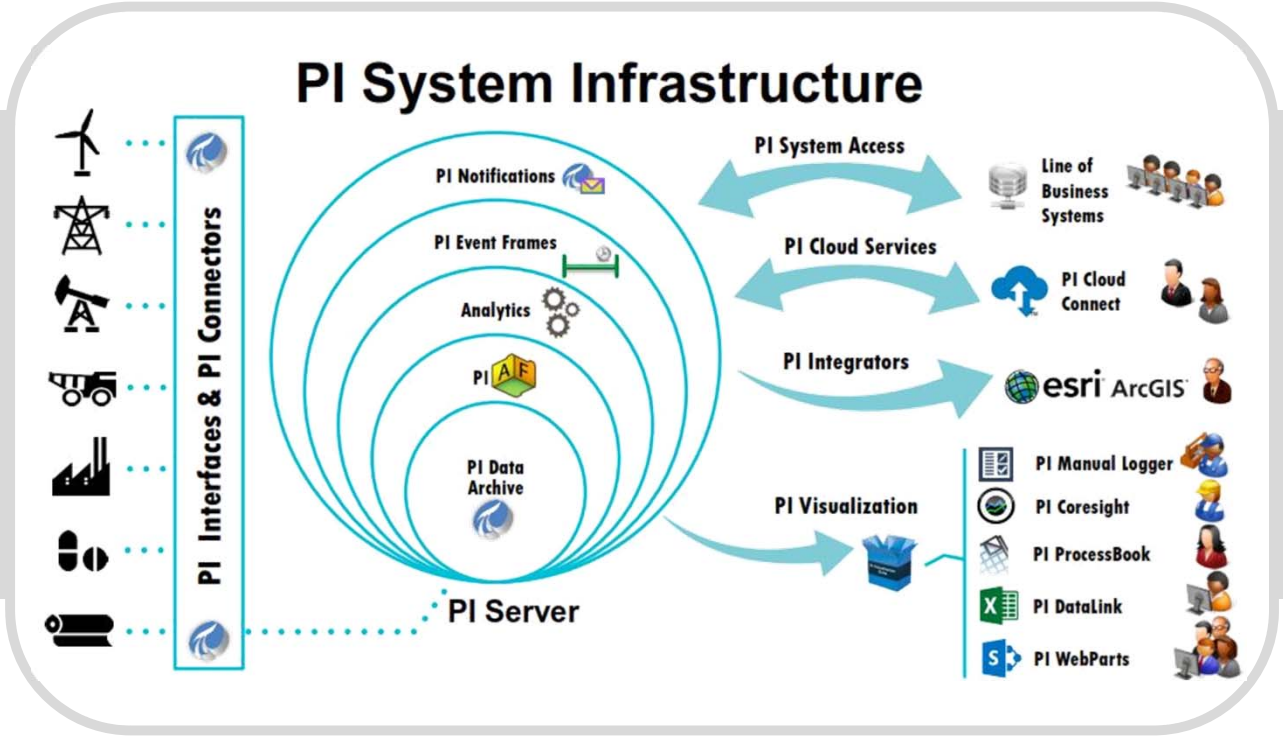


Solution

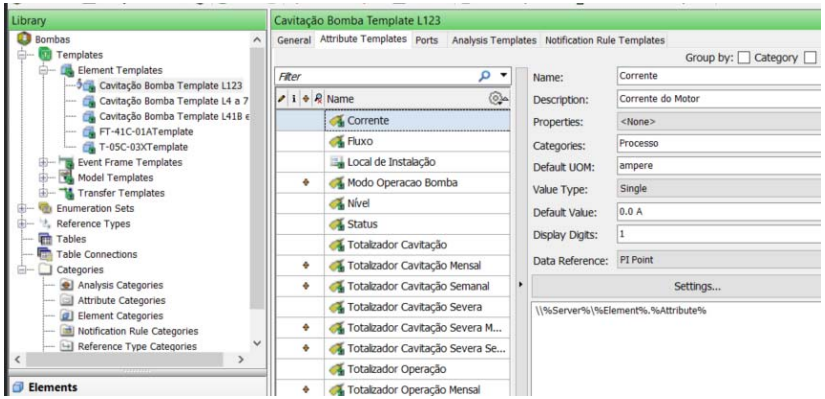
Intelligent Pump Monitoring System

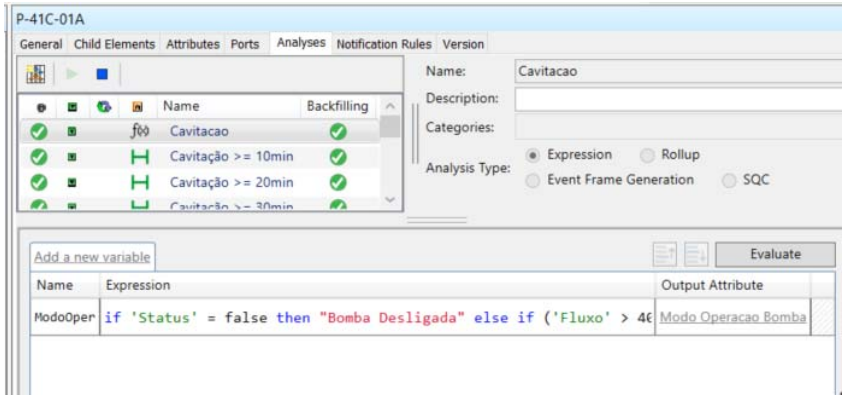
- More than **56000 tags** in PI Data Archive;
- **13400 analyses** running in PI Asset Framework;
- **All the refinery process** is display in PI Vision;
- Engineers, managers and operators monitor the process and take decisions based on the **information available in PI System**.

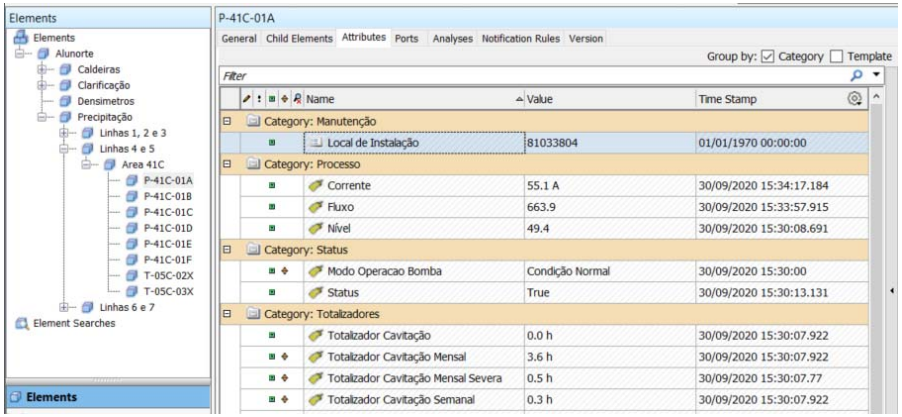


Solution

Intelligent Pump Monitoring System







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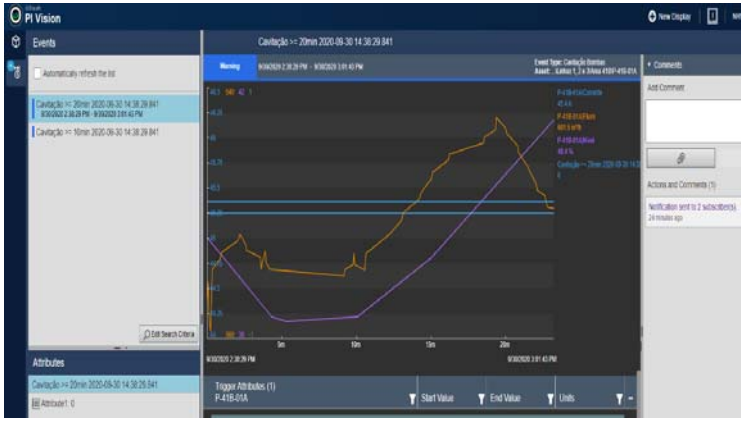
Intelligent Pump Monitoring System



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Intelligent Pump Monitoring System

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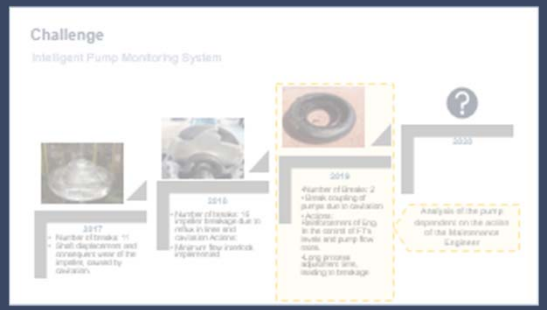
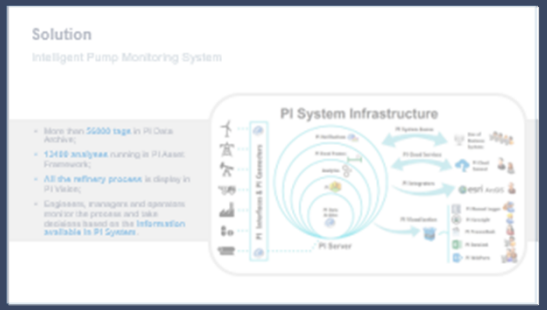
2 **Our challenge**

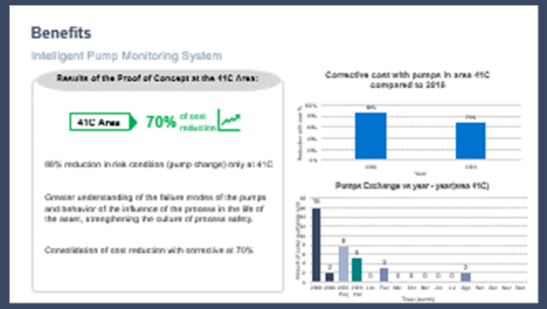


3 **Solution**

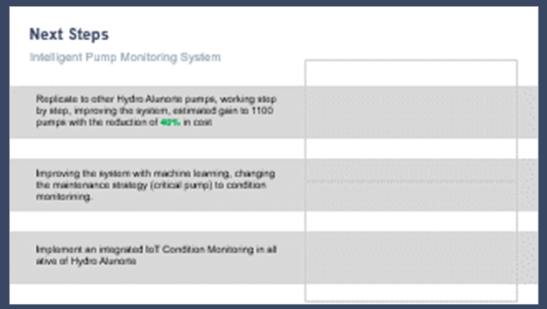


4 **Final results**

5 **Benefits**



6 **Next steps**



Final Results

Intelligent Pump Monitoring System

New Process

Previous Process

3

After 5h

2 4

After 10min

40min

1 1 Pump Cavitation at the field 5 3

After 5h

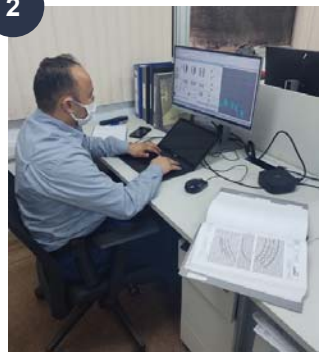
Until 30min

or

Escalation for the managers level

After 48h

2



After 24h

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Intelligent Pump Monitoring System

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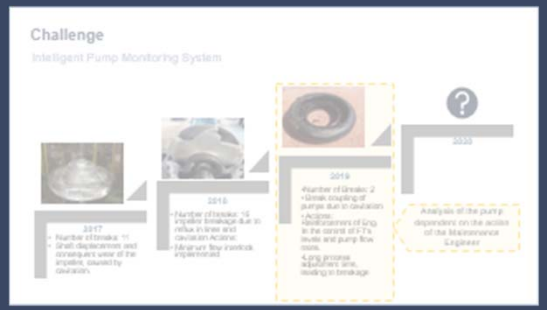

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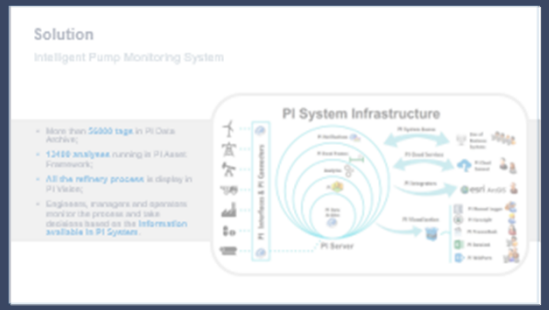

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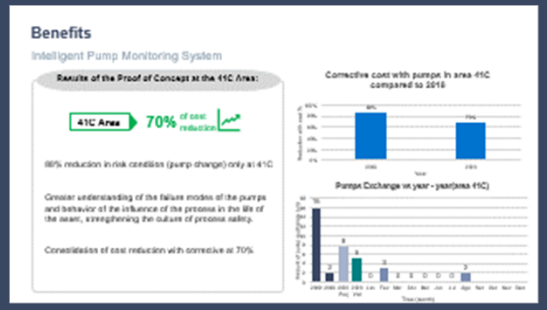
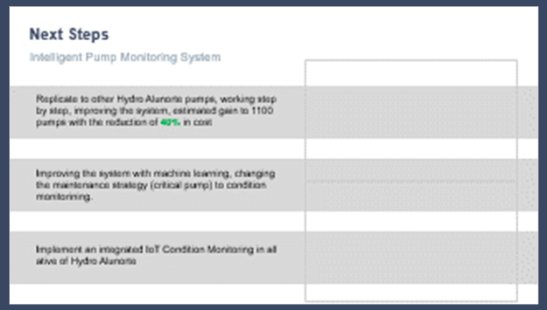


6 **Next steps**



Benefits

Intelligent Pump Monitoring System

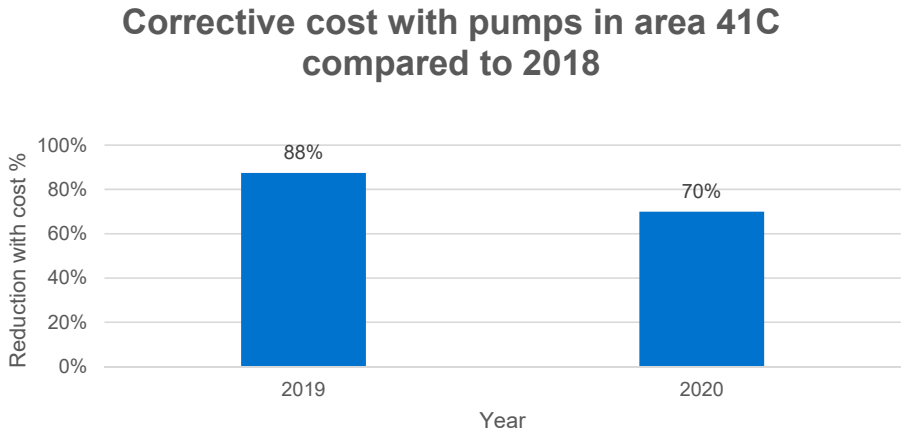
Results of the Proof of Concept at the 41C Area:

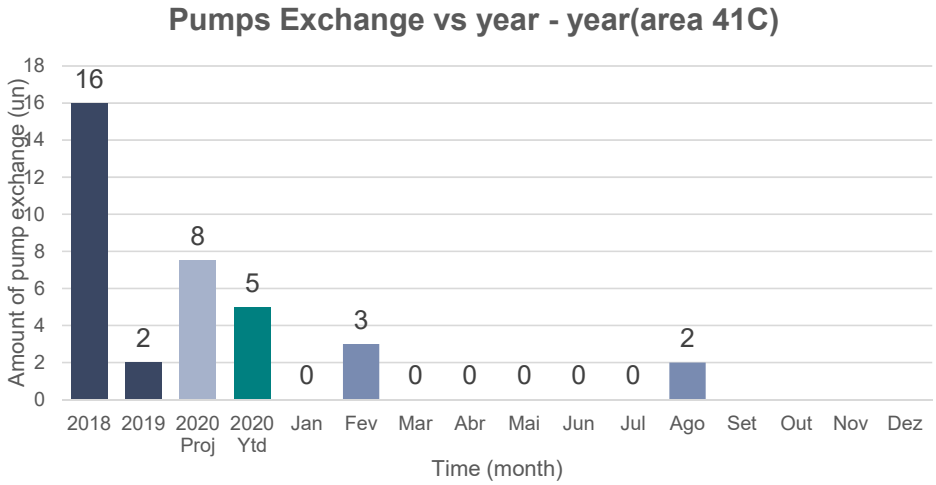
41C Area ▶ **70%** of cost reduction

88% reduction in risk condition (pump change) only at 41C

Greater understanding of the failure modes of the pumps and behavior of the influence of the process in the life of the asset, strengthening the culture of process safety.

Consolidation of cost reduction with corrective at 70%





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Intelligent Pump Monitoring System

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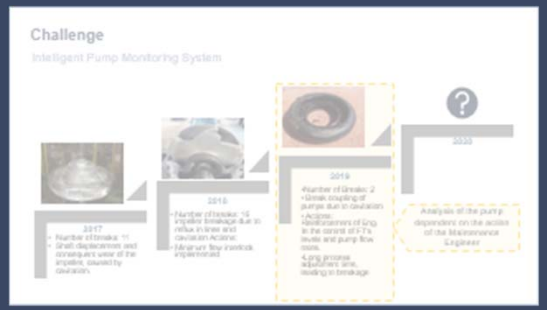

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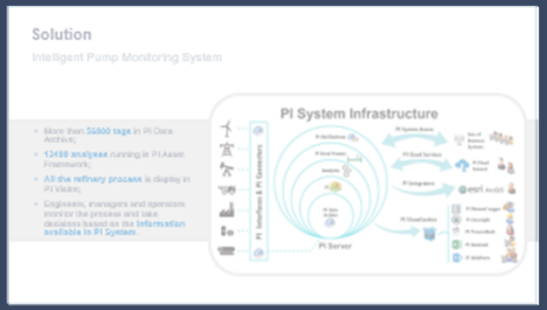

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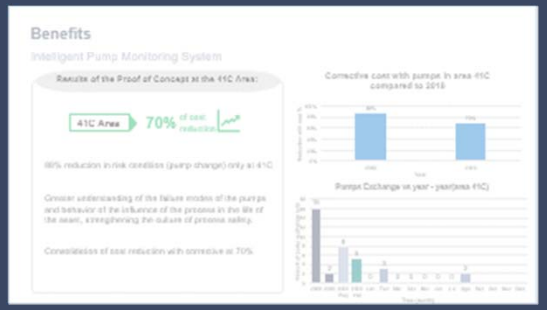
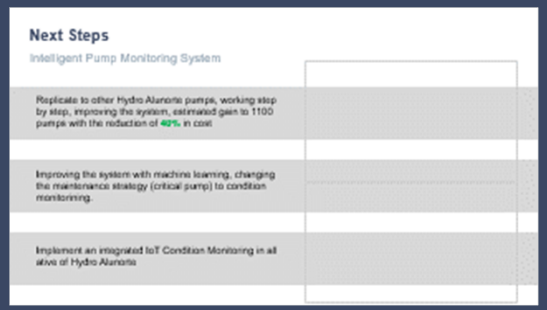


6 **Next steps**



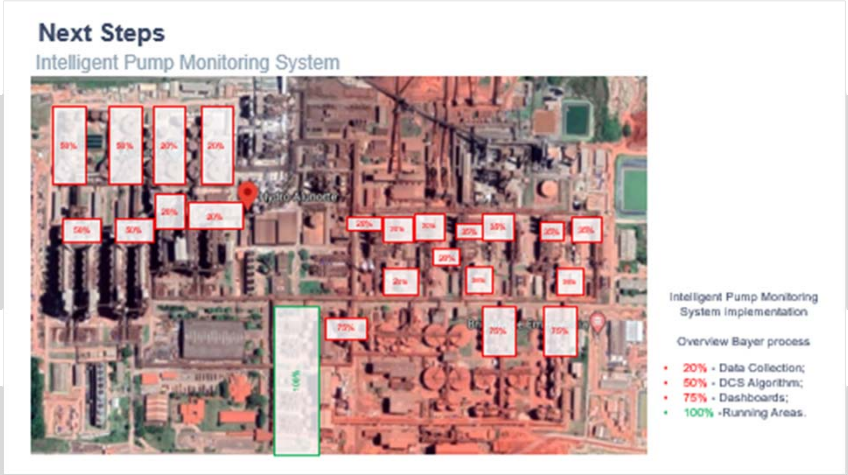
Next Steps

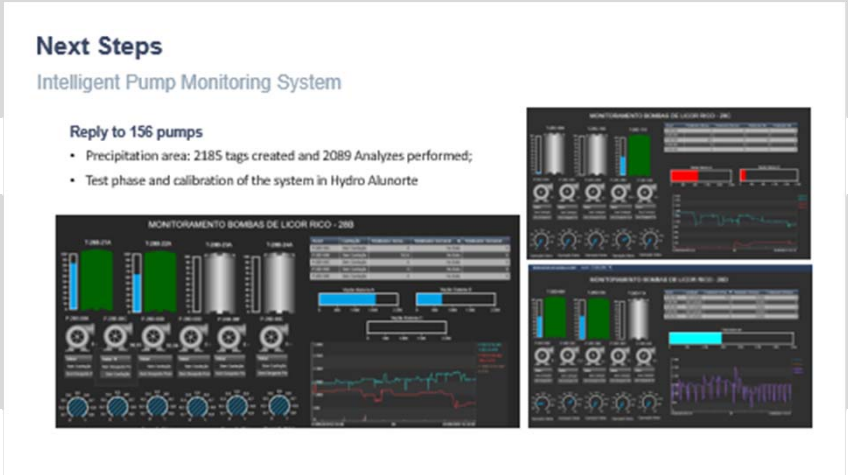
Intelligent Pump Monitoring System

Replicate to other Hydro Alunorte pumps, working step by step, improving the system, estimated gain to 1100 pumps with the reduction of **40%** in cost

Improving the system with machine learning, changing the maintenance strategy (critical pump) to condition monitorining.

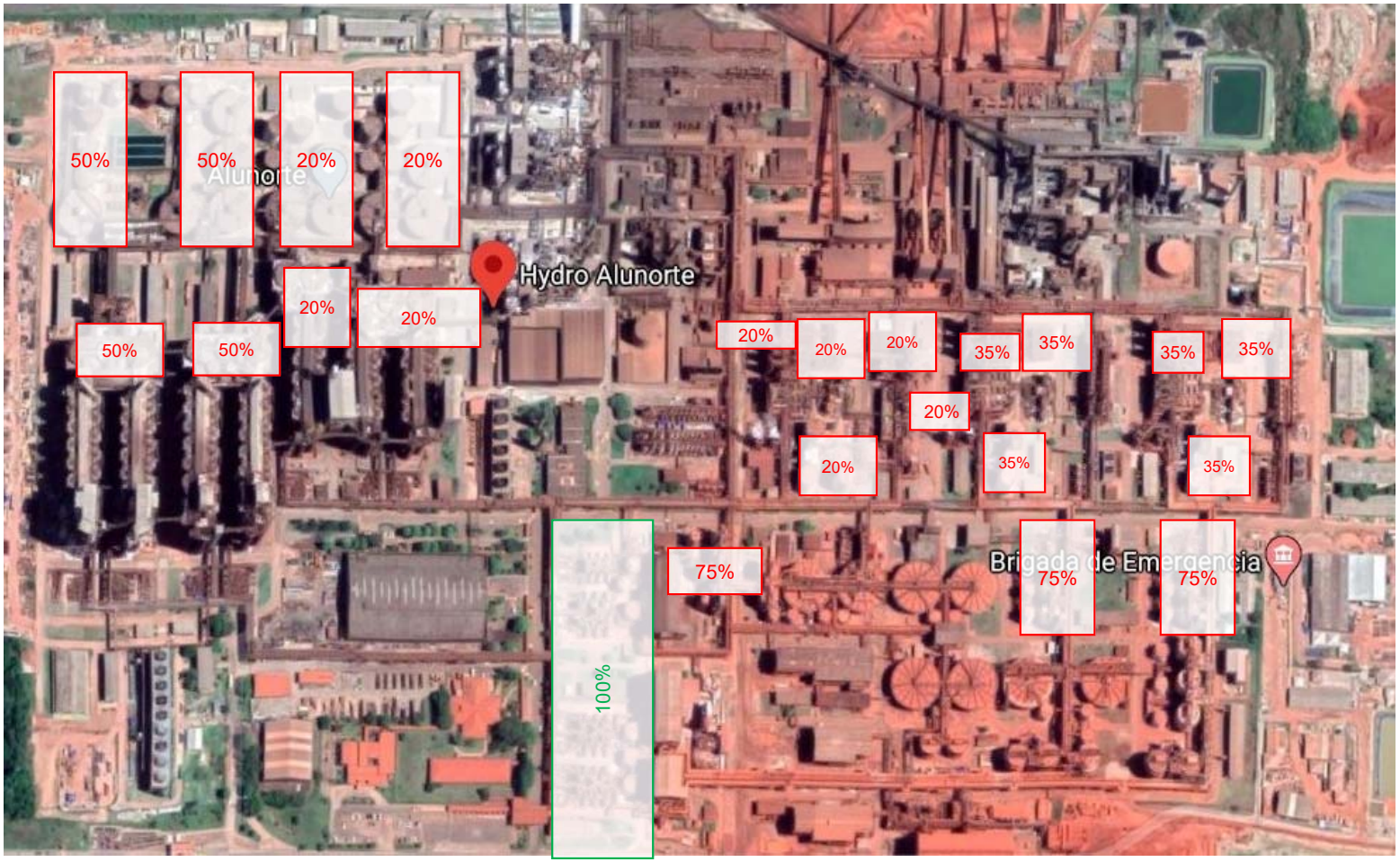
Implement an integrated IoT Condition Monitoring in all ative of Hydro Alunorte





Next Steps

Intelligent Pump Monitoring System



Intelligent Pump Monitoring System implementation

Overview Bayer process

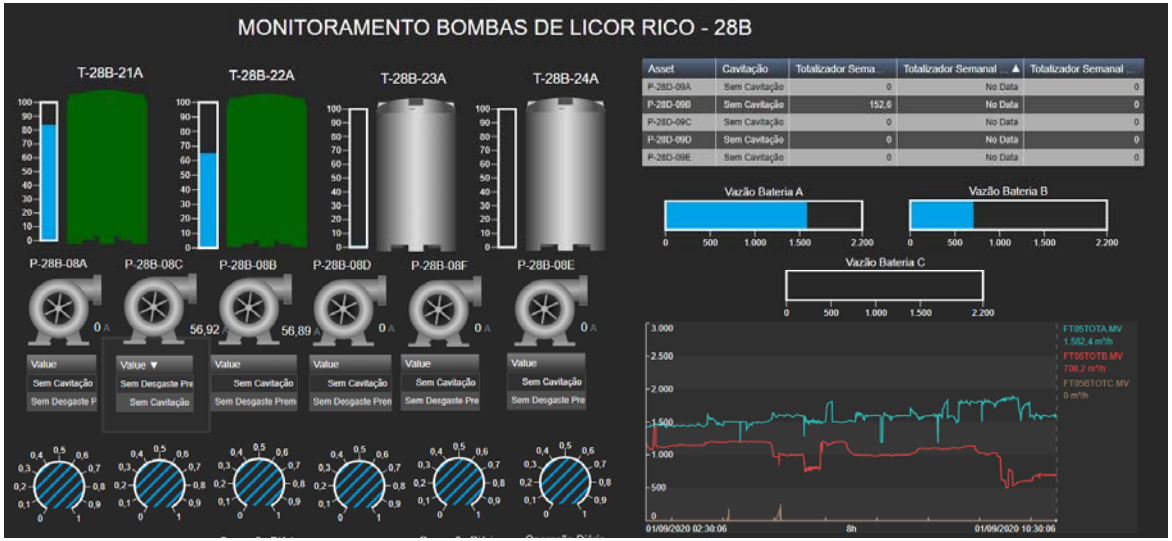
- 20% - Data Collection;
- 50% - DCS Algorithm;
- 75% - Dashboards;
- 100% -Running Areas.

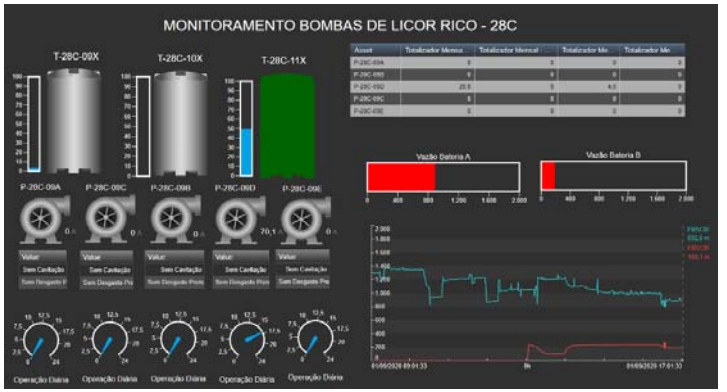
Next Steps

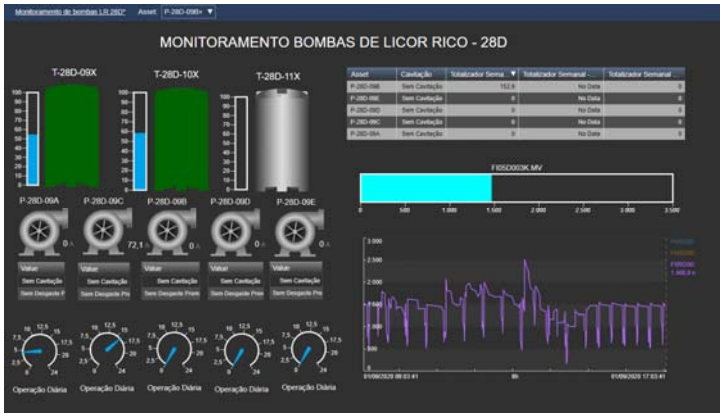
Intelligent Pump Monitoring System

Reply to 156 pumps

- Precipitation area: 2185 tags created and 2089 Analyzes performed;
- Test phase and calibration of the system in Hydro Alunorte







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Thank you