SGP - HYDRO ALUNORTE

Loss Management System
Motivation, conception and recent results

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HYDRO

LYNX Process

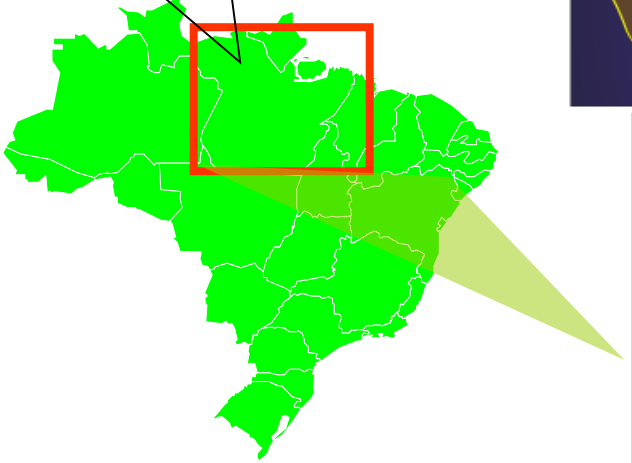
Agenda

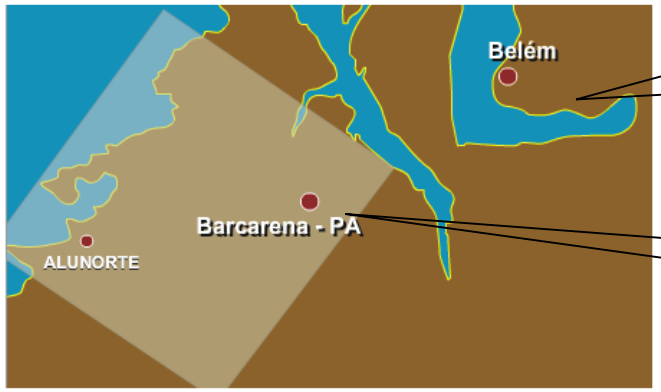
- About Hydro and PI System
- Project Motivation
- Used Architecture and Technologies
- Generation and Characterization of Loss Events
- Reports Searching Results
- Conclusion and Future Vision

About HYDRO and PI System

About HYDRO - Alunorte

Pará
Total area:1.247.689,515 km²
Population: 7.431.020





Belém
Total area: 1.819 Km²
Population: 2.105.621
(Metropolitan Area)

Barcarena
Total area:1.310Km²
Population: 92.567

About HYDRO - Alunorte

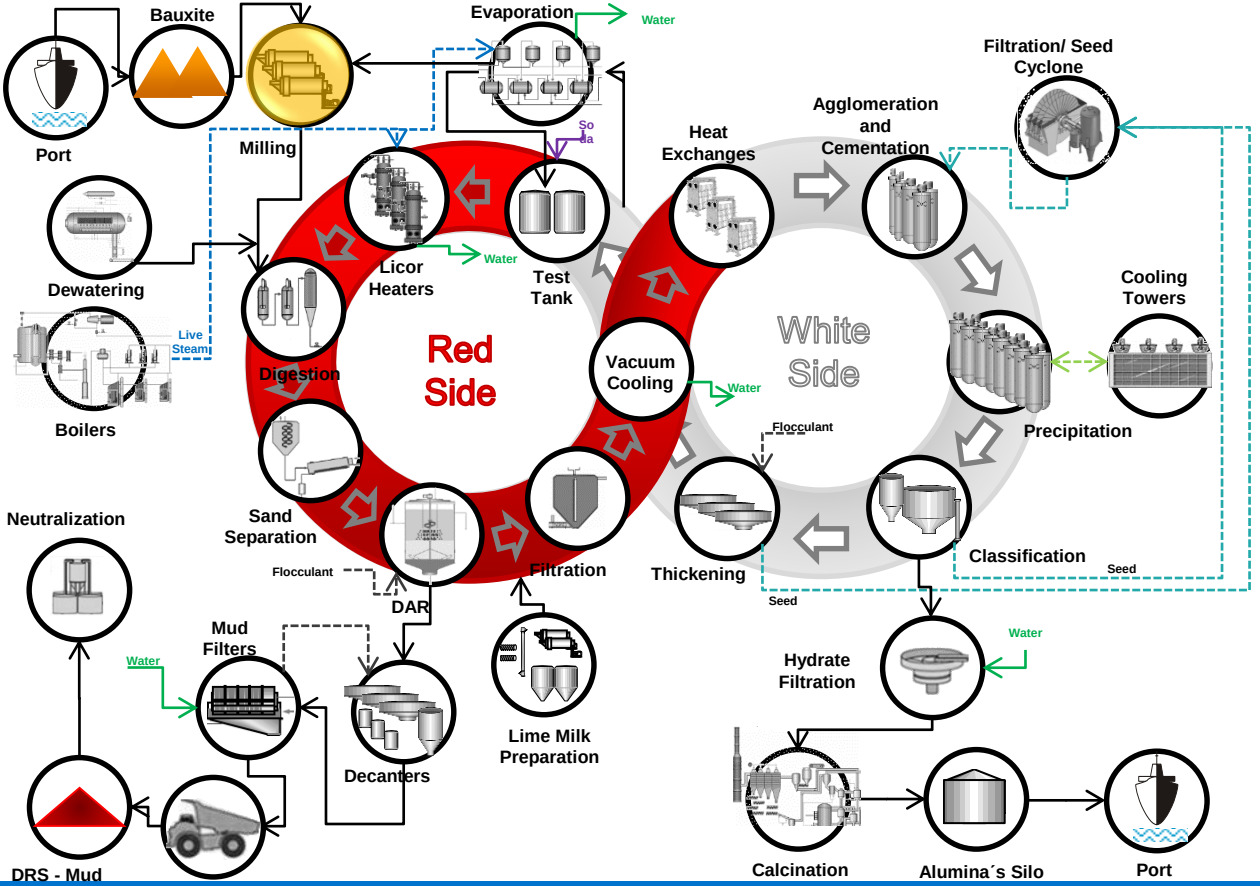
- Start up in 1995, with the design capacity of 1.1Mtpy of alumina.
- Nowadays, Hydro Alunorte exports its products to 10 countries, from the Middle East, North America and Europe.
- Around 4.400 total employees, direct and temporary contractors.

About HYDRO - Alunorte

The current capacity is 6.30Mtpy, after the expansion 3 completion.

In 2016 we have achieved 6.34Mtpy of alumina.

About HYDRO - Alunorte



PI System HYDRO - Alunorte

PI System has been installed in HYDRO - Alunorte since 2000, totaling 17 years of historical data and several applications based on its data. Currently HYDRO is licensed and uses all the available tools on the PI Server.

PI Server 2015
28.465 points

Asset Framework 2016
More than 40.000 elements

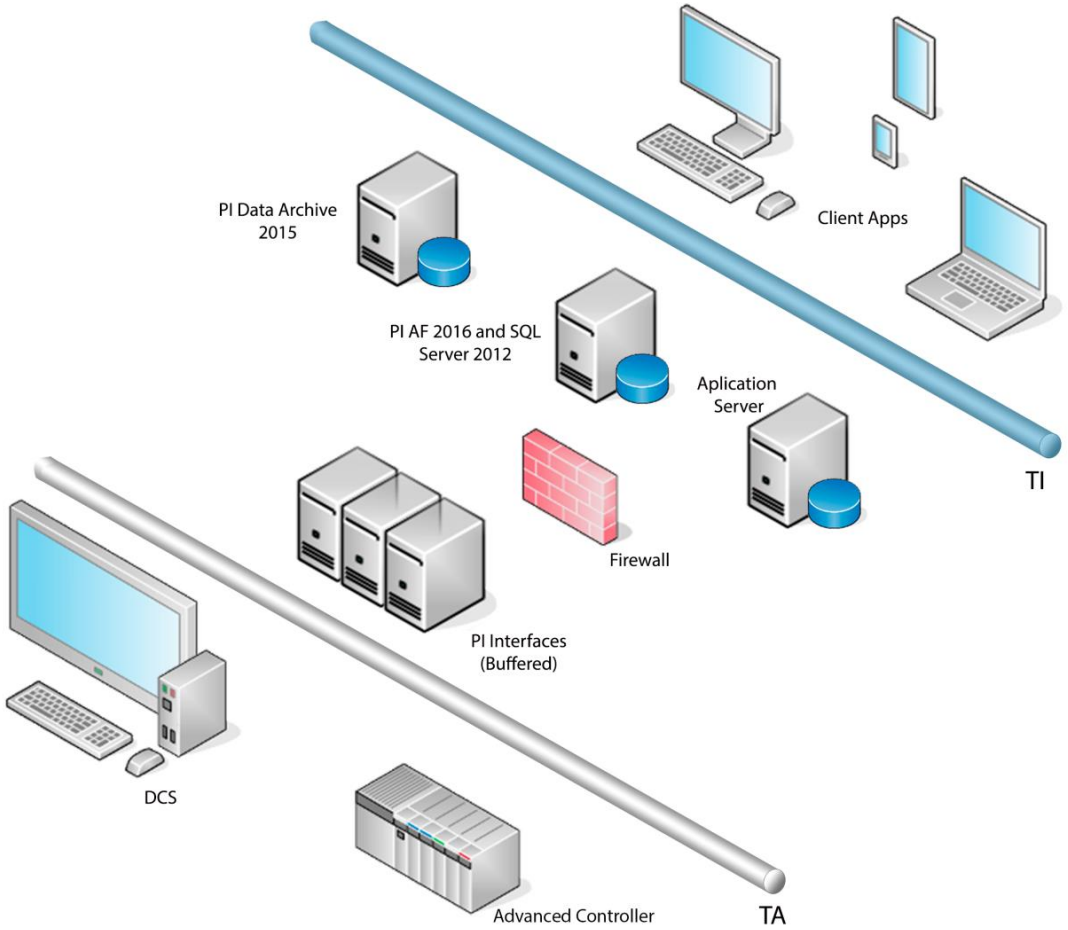
Project Motivation

Project Motivation

- The control of loss of production in HYDRO Alunorte has been controlled for a long time. However, until this project, it was done manually and spending many engineering hours in the consolidation of information.
- Although using the PI Server flow tags, the loss times were manually recorded, the calculations were performed in MS Excel and the reports were mounted one by one based on the information collected.
- With the emergence of AF SDK, doors were opened, so new applications automating the entire process were created, and so the idea and need for the Loss Management System (GSP) was born.

Used Architecture and Technologies

Architecture



Used Technologies

HYDRO - Alunorte was concerned with using the latest technologies with the latest available versions of each platform at the time the system was designed.

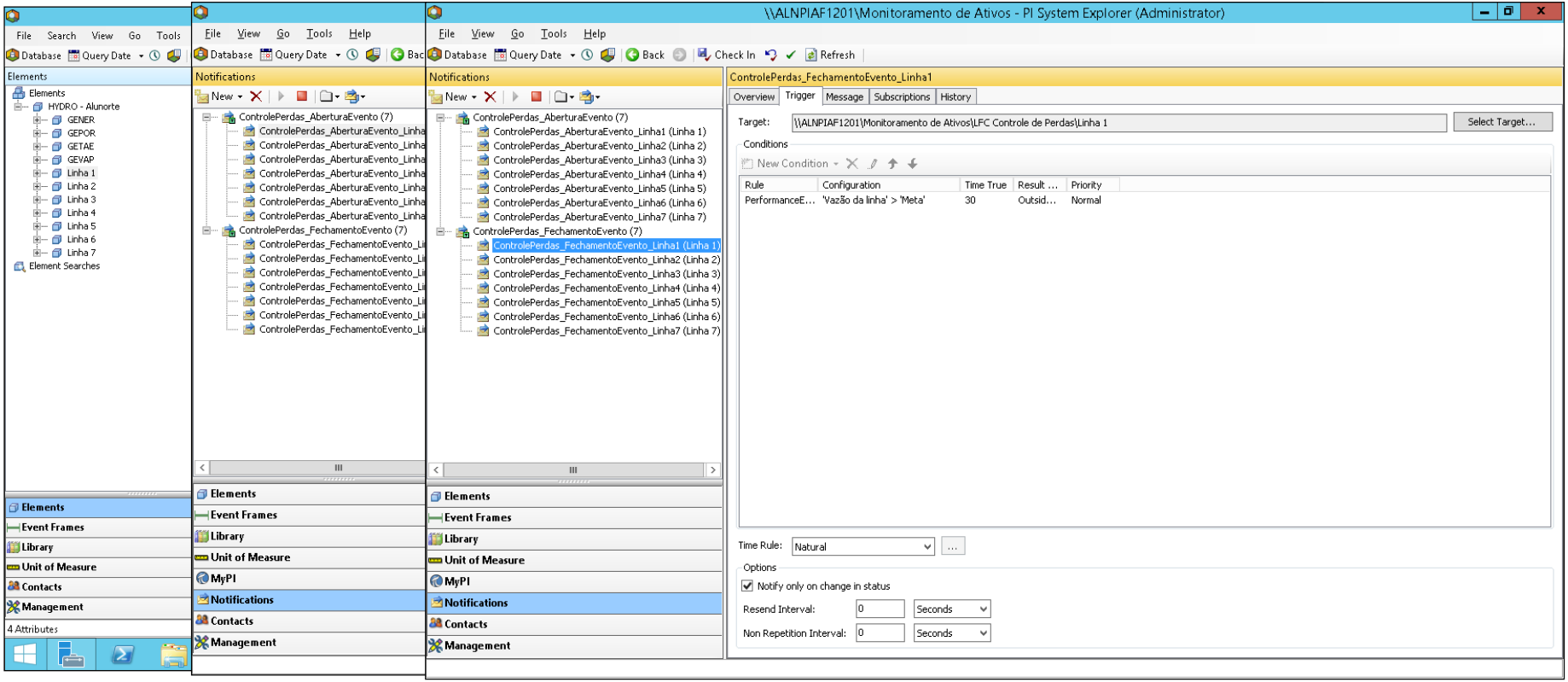
It is a concern of the company to keep abreast of all tools that directly and indirectly affect the performance of the PI System.

Used Technologies

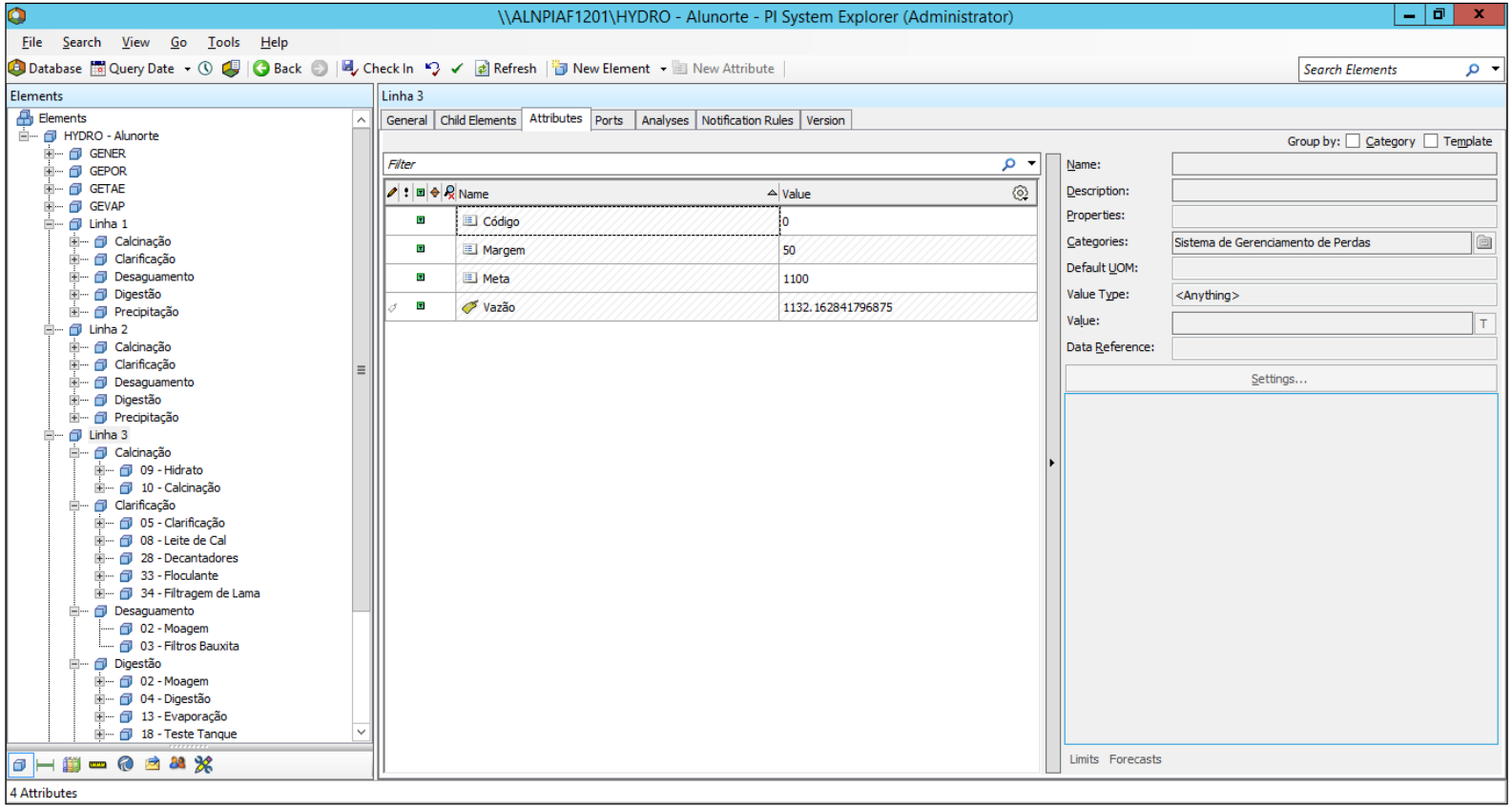
For the design of this system, the following technologies were used:

- The web system was developed using C #, Javascript and HTML5;
- The relational database used to store all system information is SQL Server 2012;
- The tags that monitor the flow of each production line, responsible for generating loss events, are registered in the PI Server 2015;
- The generation of loss events is done through a webservice that is triggered by Notifications;
- The entire hierarchical structure of lines, areas, subareas and equipment of the system is registered in AF 2016, totaling more than 40 thousand elements that are requested by the system through AF SDK.

Used Technologies



Used Technologies



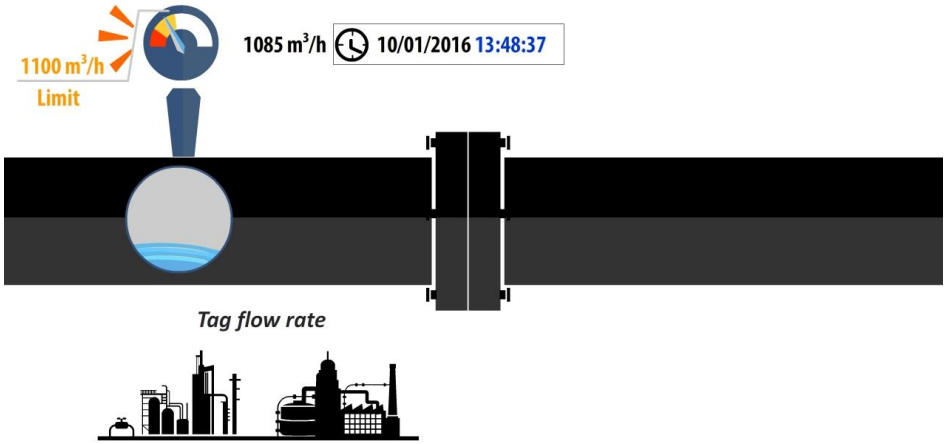
Generation and Characterization of Loss Events

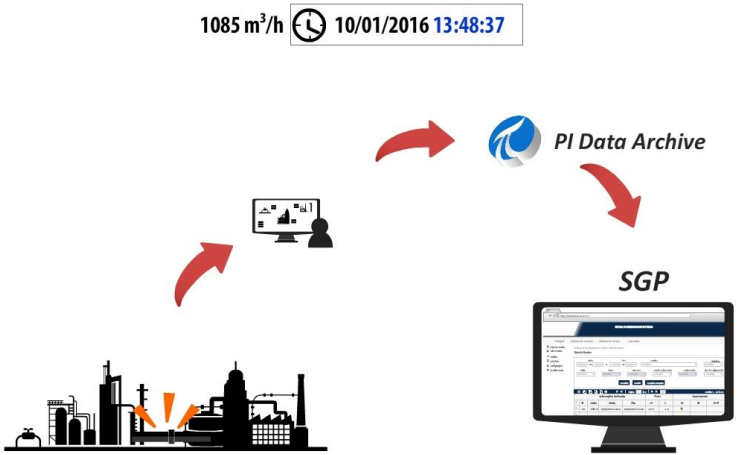
Generation of Loss Events

- Notifications monitors the flow tags of each HYDRO - Alunorte line. Each line has a production target given in m^3 / h, recorded in AF.

- Whenever the flow of this tag falls below the target for the time set in the Notification True Time, Notifications triggers a webservice that starts the loss calculation of event.

Flowchart of generation of loss events





Calculation of Loss by Event

- The webservice, after receiving the flow rate tag, start time and end time of the Notifications event, calculates the loss using AF SDK methods and then sends them to the web system.

- AF Time Weighted Loss Totalizer SDK:

```
AFValue totalPerdaList = piPoint.Summary(timeRange, AFSummaryTypes.Total, AFCalculationBasis.TimeWeighted, AFTimestampCalculation.Auto)[AFSummaryTypes.Total];
```

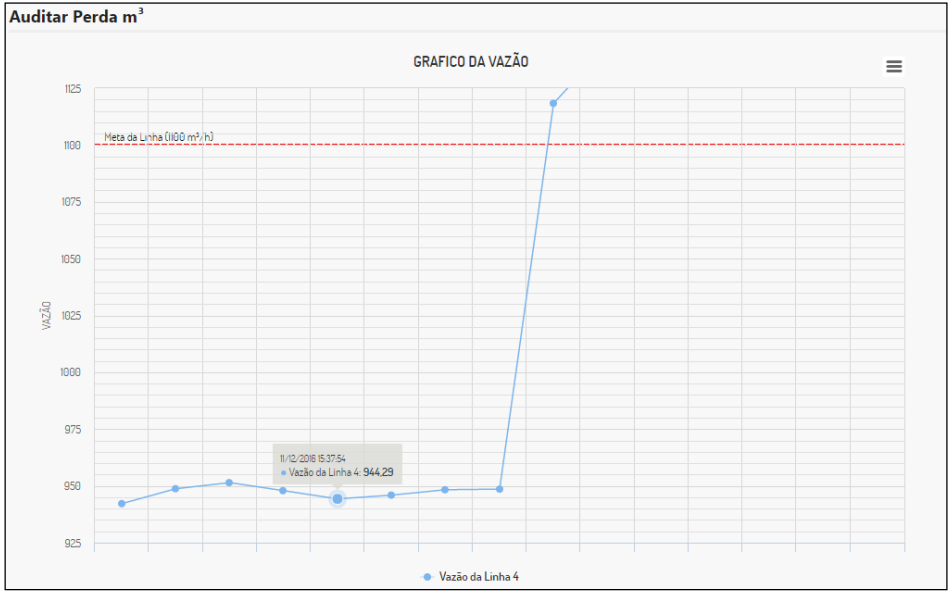
Generation of Loss Events

- After the loss event is detected through the rules set in Notifications it is opened in the SGP for handling, with the loss in m³:

☐	2277	Linha 5	08/12/2016 09:00:02	08/12/2016 09:40:04	23,79	2,32	P		

Generation of Loss Events

If the user, have any doubt about any event data generated by the system, he can use the loss audit to check the PI Server data used to generate and calculate the loss.



Período	
Início	**Fim**
11/12/2016 15:37:30	11/12/2016 15:38:46

Perda m³ = (Meta da linha * Duração do evento em horas) - (Vazão do período totalizada * Fator de conversão)

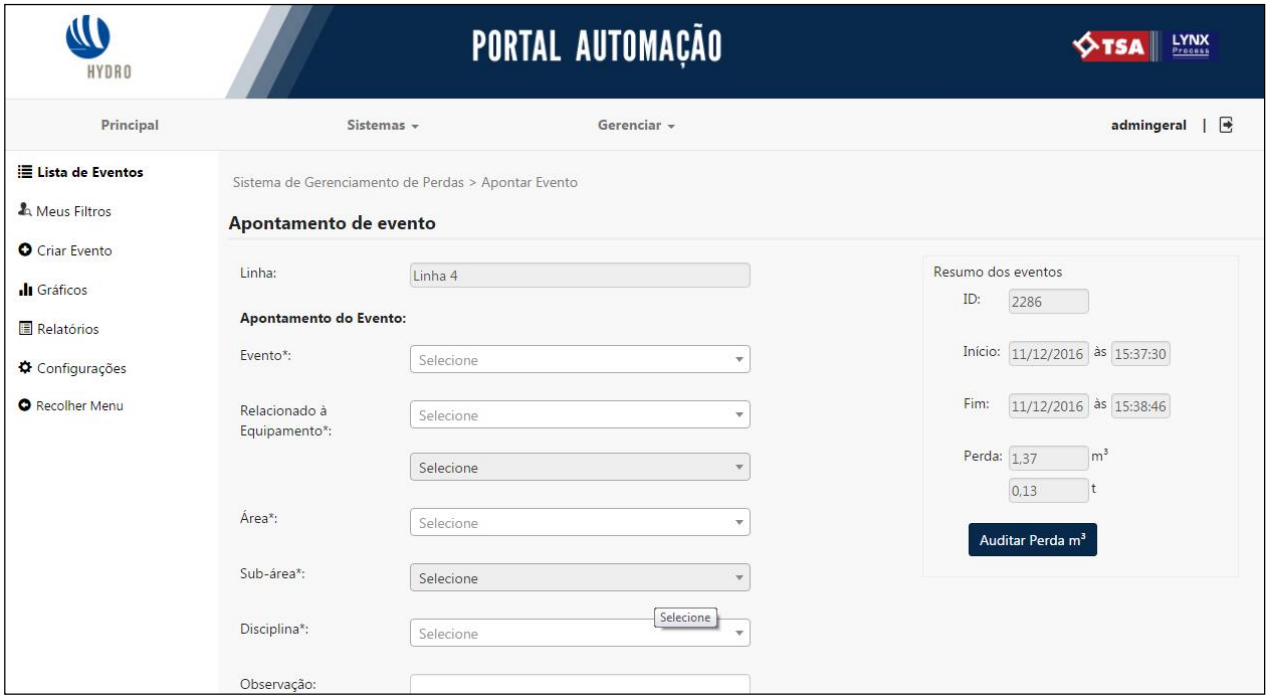
1,37 m³ = (1100 * 0,02) - (0,91 * 24)

Parâmetros	Valores
Meta da Linha	1100 m³/h
Duração do evento (horas)	0,02 h
Vazão do período totalizada	0,91 m³
Fator de conversão	24 horas

Resultados	Valores
Meta do Período	23,22 m³
Vazão Total do Período	21,84 m³
Total de Perda	1,37 m³

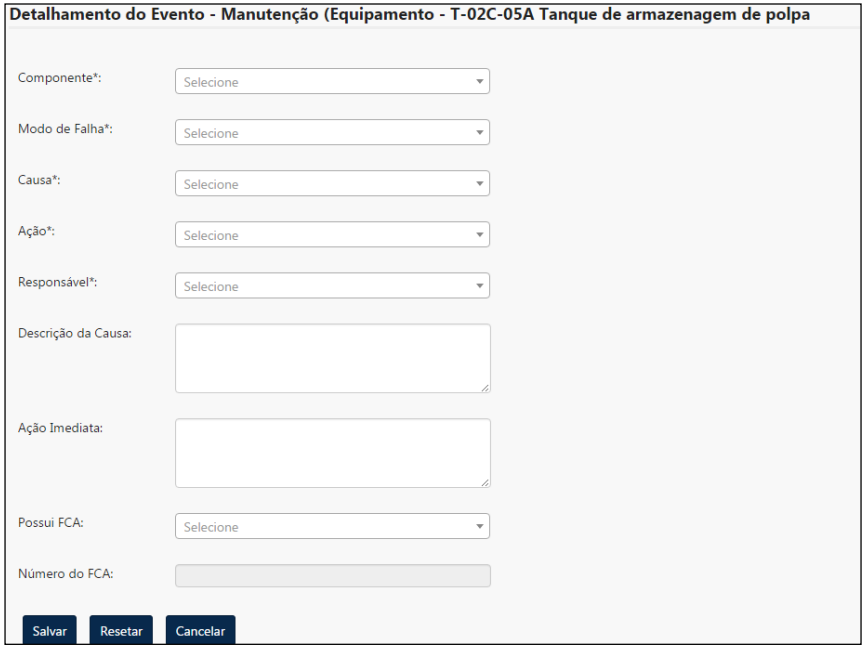
Characterization and Detailing of Loss Events

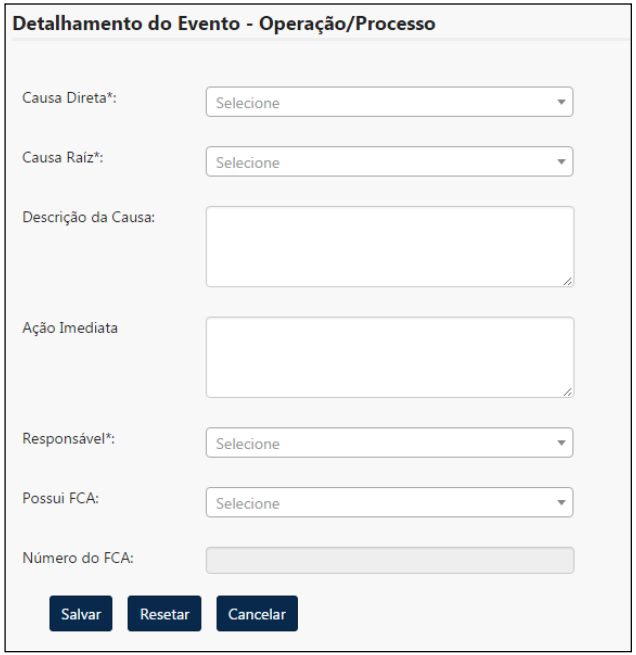
The detailing and characterization of the event are done through the web system using the information of the AF as a basis.



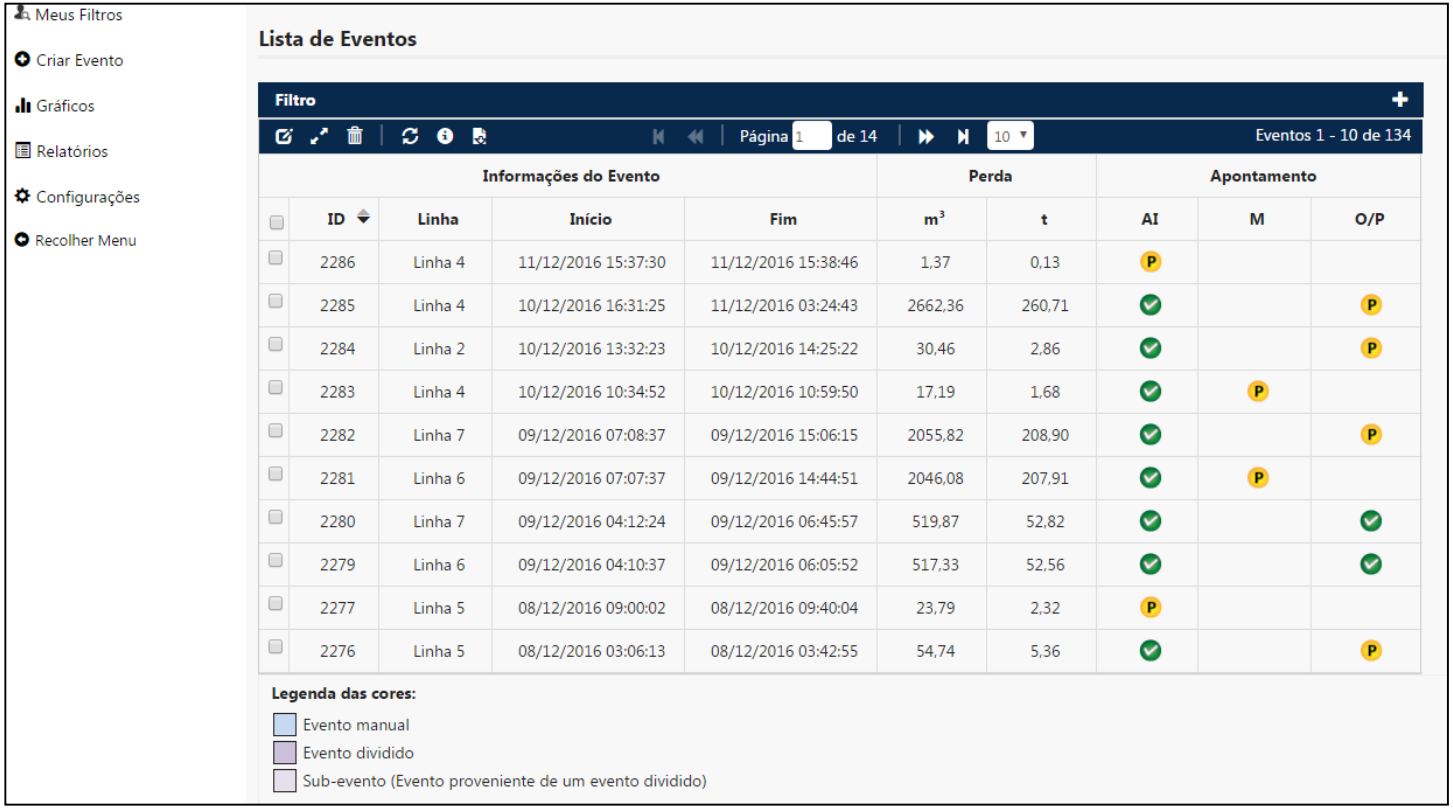
Characterization and Detailing of Loss Events

The events receive an initial detail, and than go to characterization of the specialized team, maintenance or process.





Characterization and Detailing of Loss Events



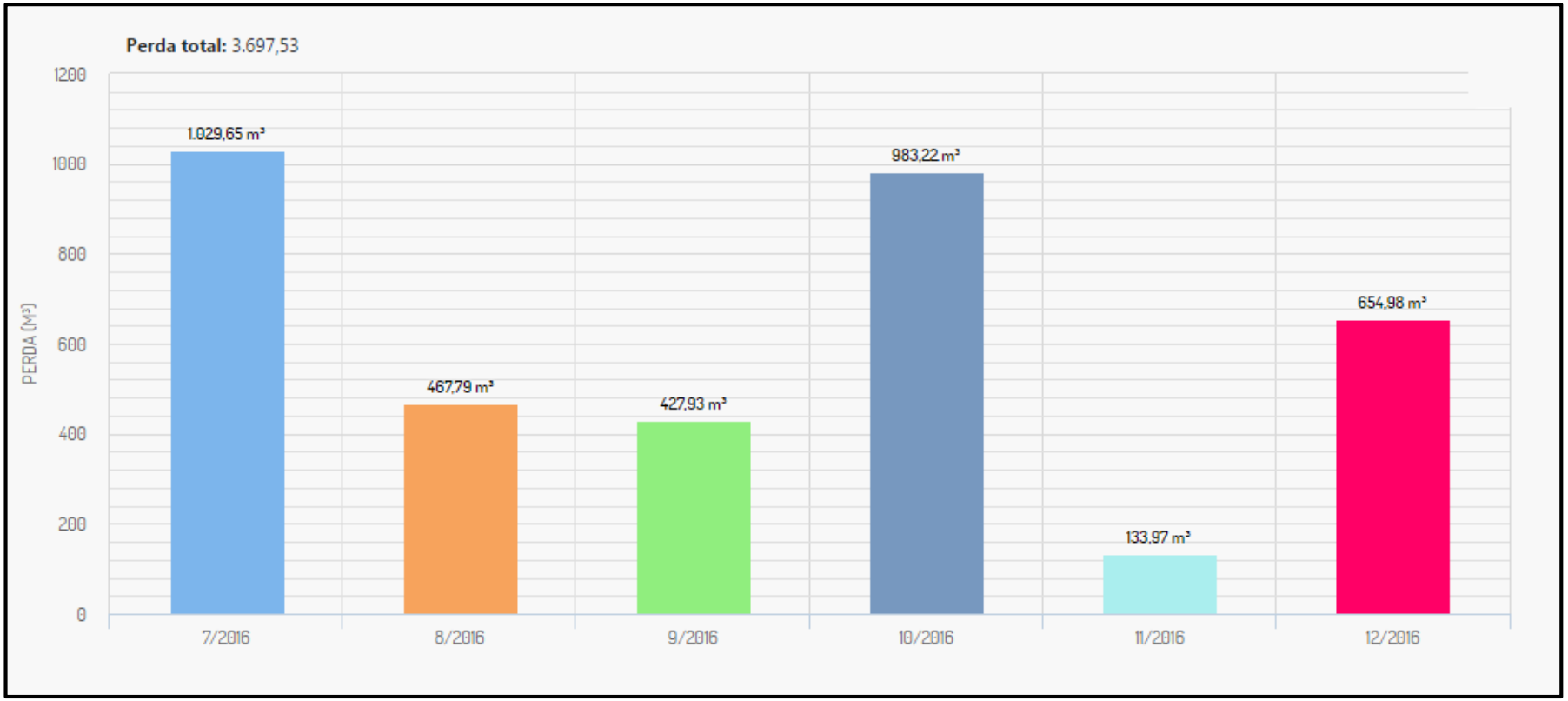
Reports Searchinig Results

Graphics of Loss

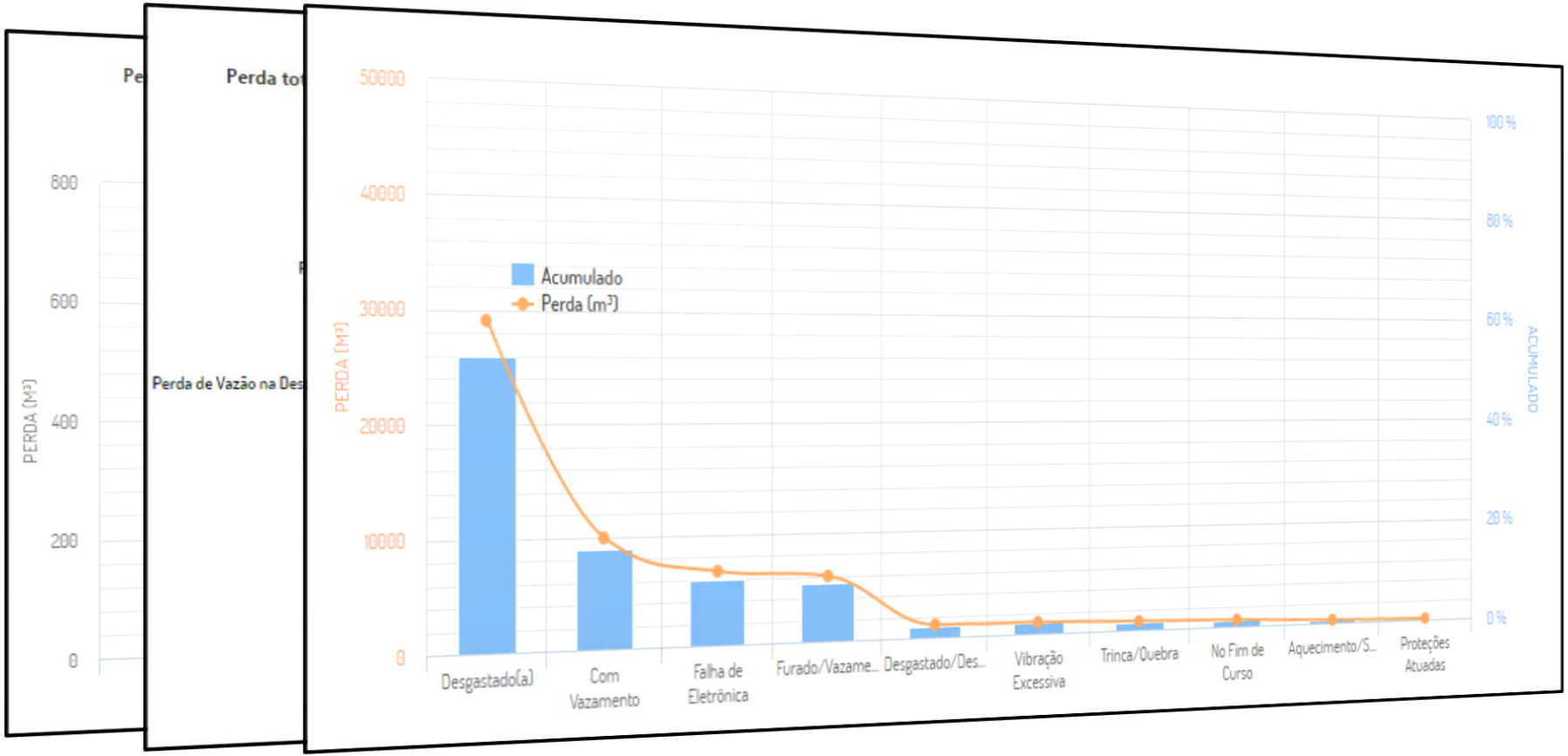
To analyze the events generated and the main reasons for losses in the 7 lines of HYDRO - Alunorte, charts were created with several different views.

These graphs allow the analysis and monitoring of the data by the board, in the near future, to act objectively and assertively in the main causes of production losses.

Graphics of Loss



Graphics of Loss



Results

- After only six months of the implementation of the system, results can already be observed. Higher reliability of information on the causes of production losses and immediate availability of data.

- More than 1.000 generated events

- More than 40.000 elements in AF

- Hundreds of engineering hours saved

Conclusion and Vision for the Future

Leveraging the PI System in Production Loss Control

COMPANY and GOAL

HYDRO Alunorte is the world's largest alumina refinery and needs maximum efficiency in data generation and analysis.

HYDRO

CHALLENGE

Reduce spent engineering hours in information consolidation and map the main causes of loss of production.

SOLUTION

The PI System was used to monitor the production loss in real time and generate events for direct engineering performance.

RESULTS

High data availability has been achieved new levels of efficiency through rapid reconciliation of data, in addition, hundreds of engineering hours has been saved.

Conclusion

Since the idea of the system was born, much can already be observed in the treatment culture of loss. The concept of loss event handling has been improved, the information has become more accurate and reliable, and a significant increase in process efficiency.

This system opened doors and started a new phase in the Alunorte HYDRO treatment for the PI System and its versatility.

Vision for the Future

The next steps for the system involve the mapping of the main causes of production loss and mainly in the reduction of the impacts of these causes, resulting in a significant increase of production of the plant.

Strategies for involving other process variables and other PI Server tools are already being developed in order to maximize the results that the PI System has to offer.

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

http://bit.ly/uc2017-app

Thank you!

HYDRO Alunorte

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