Dams Safety and Hydraulic Structure

©2019 OSIsoft, LLC

OVERVIEW

Leading environmental private company in Brazil

Since 2017, BRK is **BROOKFIELD**'s sanitation platform in Brazil

Leading environmental private company in Brazil in **WATER & WASTEWATER**

Geographically **DIVERSIFIED** portfolio with **23 SPES**, mitigating revenue concentration & hydrological risks

Diversified **CONTRACTUAL** models

15 mm inhabitants

12 states

185 municipalities

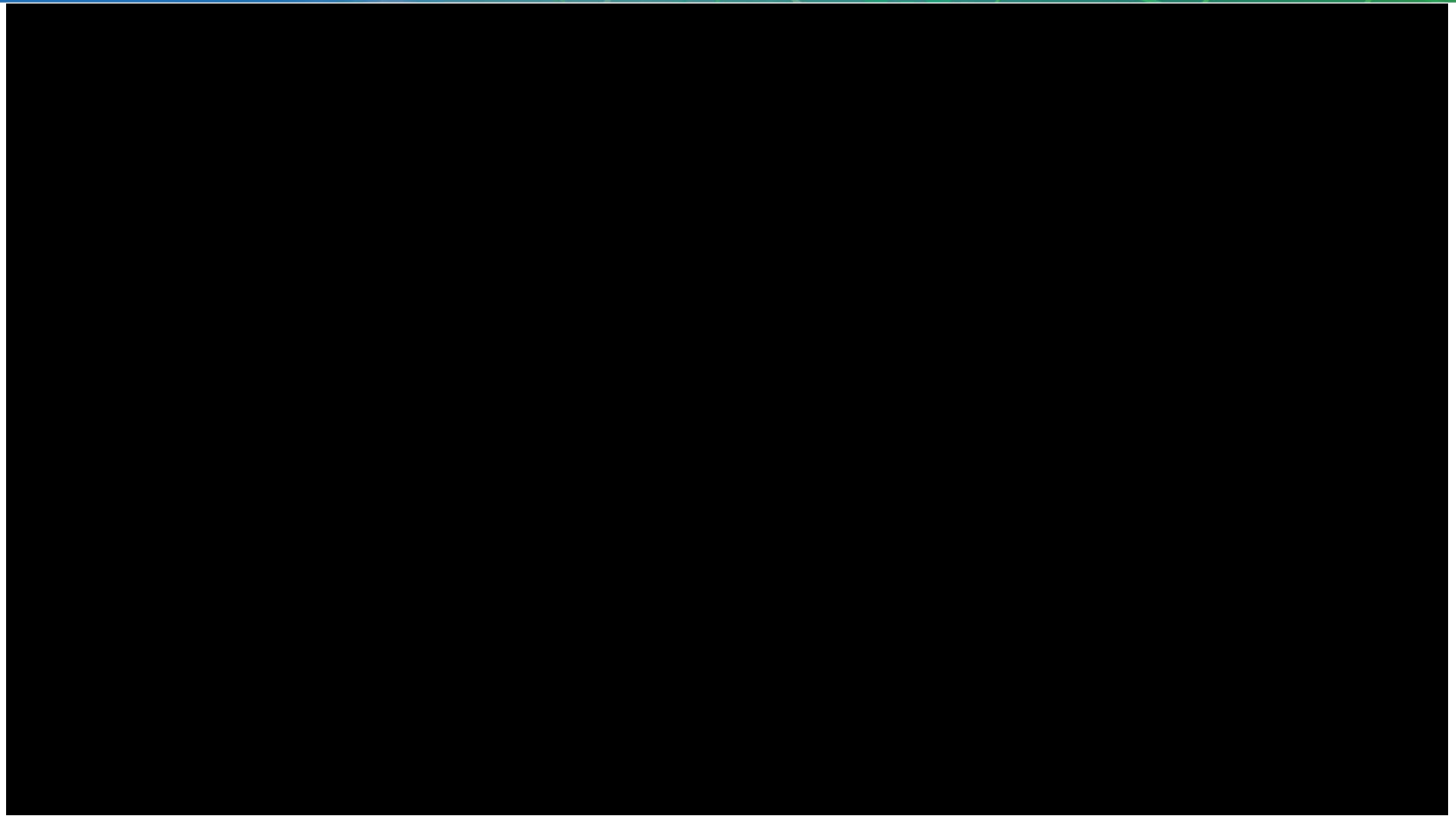
5.888 Employees/1

R$ 2.1 Bn
Net Operating Revenue/2 2018
CAGR 2010-2018: 33%

R$ 0.8 Bn
EBITDA/2 2018
CAGR 2010-2018: 34%

Note: Base Dec/2018
/1 Include interns
/2 100% SPEs + 50% AP5

©2019 OSIsoft, LLC



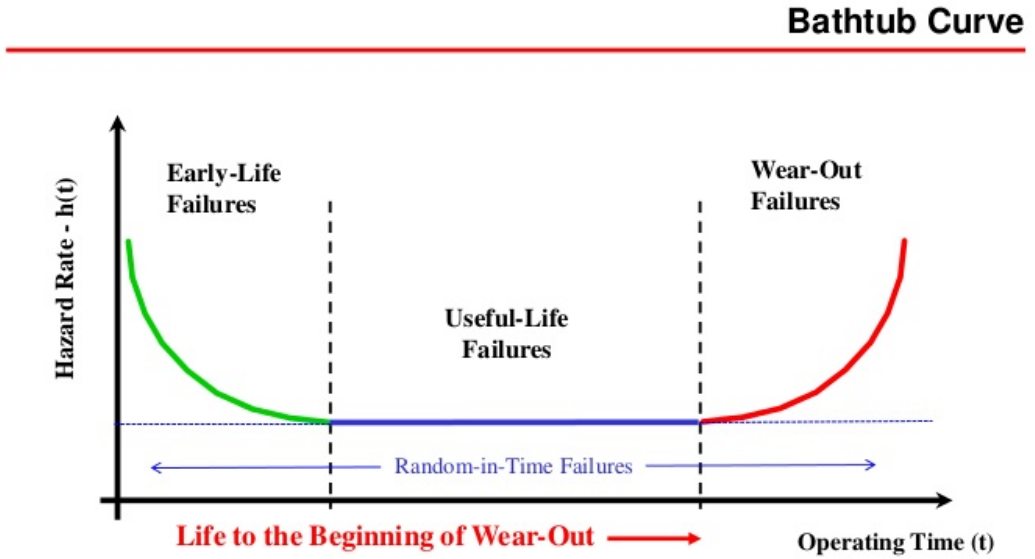
©2019 OSIsoft, LLC

©2019 OSIsoft, LLC

BRK has 32 dams for raw water storage and 85 sewage treatment ponds, spread from north to south of Brazil.

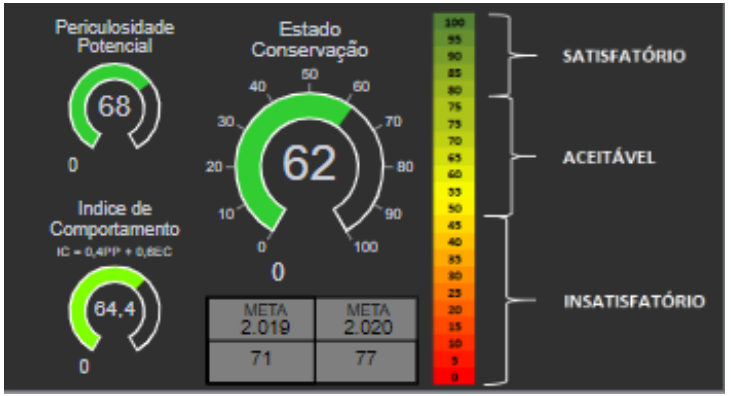
©2019 OSIsoft, LLC

We received structures with advanced age of operation.
New structures have a high rate of damage.
Throughout useful-live the risk is less.
Valuable risk grows near the end of useful life of the structure.



©2019 OSIsoft, LLC

Every year, a qualitative risk assessment is performed, in which notes for the State of Conservation (cracks, infiltrations, maintenance failures, etc.) and Potential Hazard (height, volume, population downstream, etc.) are given, resulting in Behavior Index, which ranges from 0 to 100. This index assist senior management in decision-making regarding investments and intervention priority.



CLASSIFICATION BANDS	BEHAVIOR INDEX	TOTAL
	SATISFACTORY	>= 80
	ACCEPTABLE	80 < BI < 50
	UNSATISFACTORY	<= 50

©2019 OSIsoft, LLC

After intense rains, an overtopping occurred due to sudden elevation in the reservoir level, putting at risk the stability of the structures, which could lead to its rupture.

Overtopping occured in 02/09/2018

©2019 OSIsoft, LLC

In order to improve the levels of security and monitoring of these structures, there was a need to implement a system to provide information for operational areas and made available to Corporate Engineering with headquarters in São Paulo.

©2019 OSIsoft, LLC

The PI System provided quick access to the following information:

- Cadastral data of all structures (height, capacity, year of construction, data of the person in charge, etc.)
- Control of maximum and minimum operating levels
- Control of Attention, Alert and Emergency Levels
- Database generation and graphics production
- Storing rainfall data
- Displays the Criticality Index information
- Inserting data using mobile, tablet and computer

©2019 OSIsoft, LLC

OSIsoft Products

Data Input

PI Manual Logger

PI DataLink

Treatment

PI Data Archive

PI AF Server

Visualization

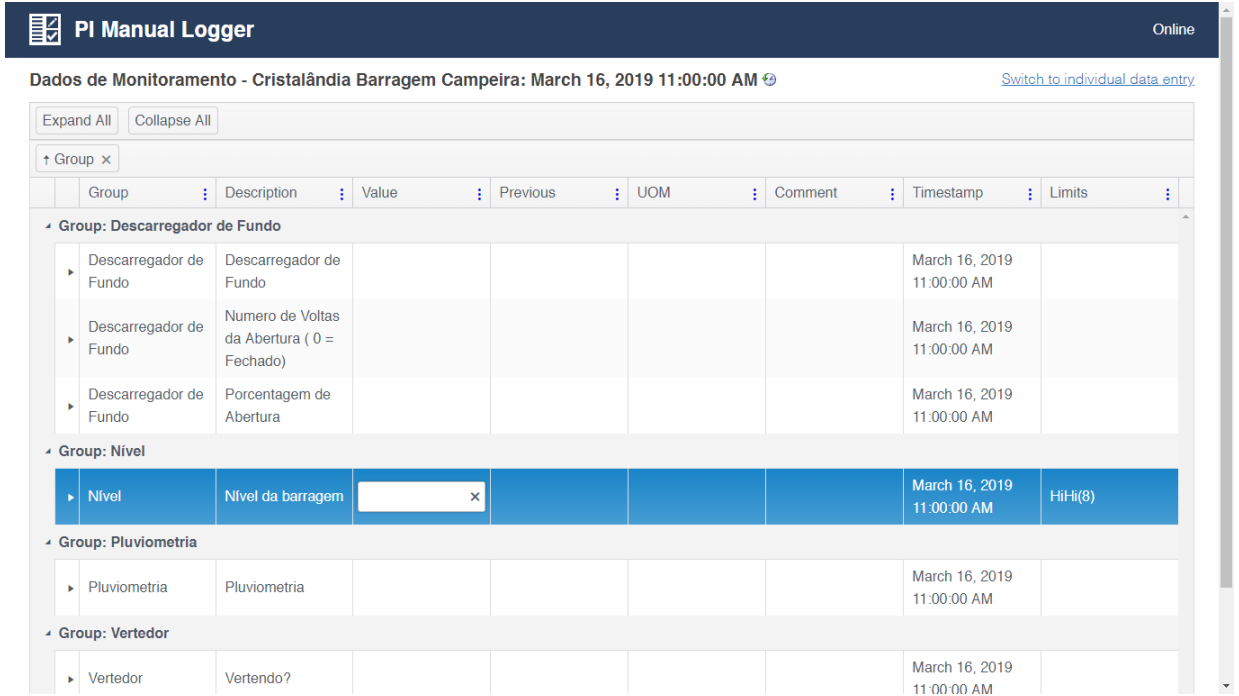
PI Notifications

PI Vision

©2019 OSIsoft, LLC

iePI Manual Logger

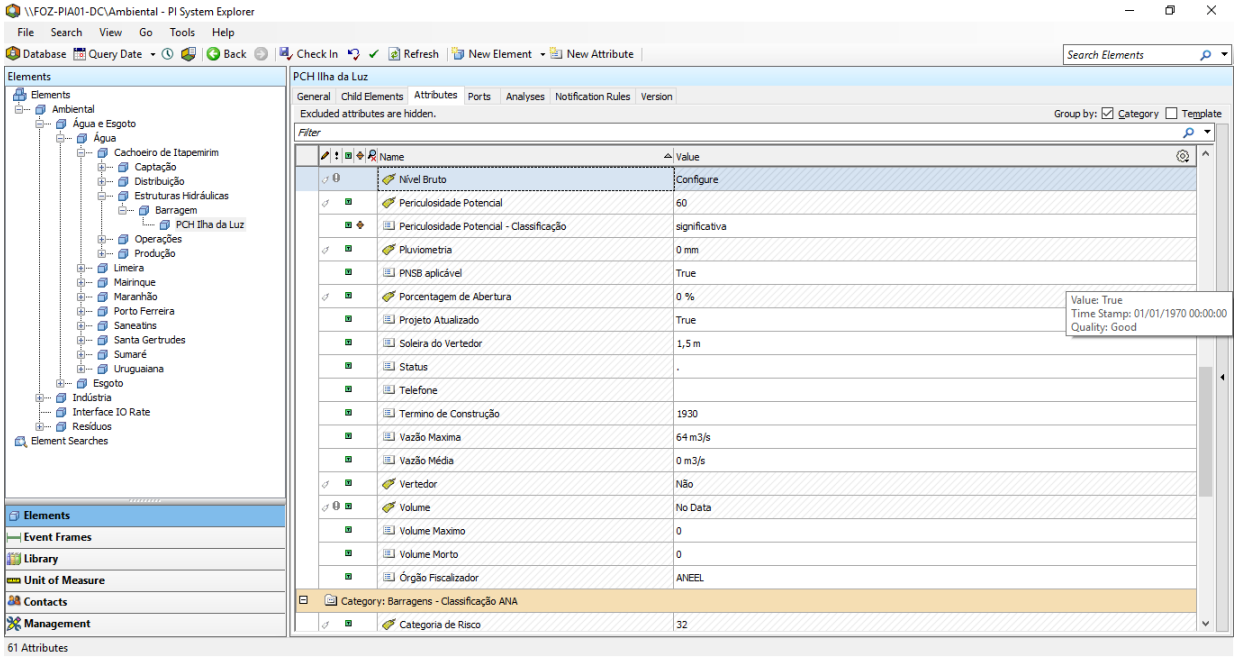
- Manual input of most important structure data
- Inserting data using mobile, tablet and computer



©2019 OSIsoft, LLC

PI AF

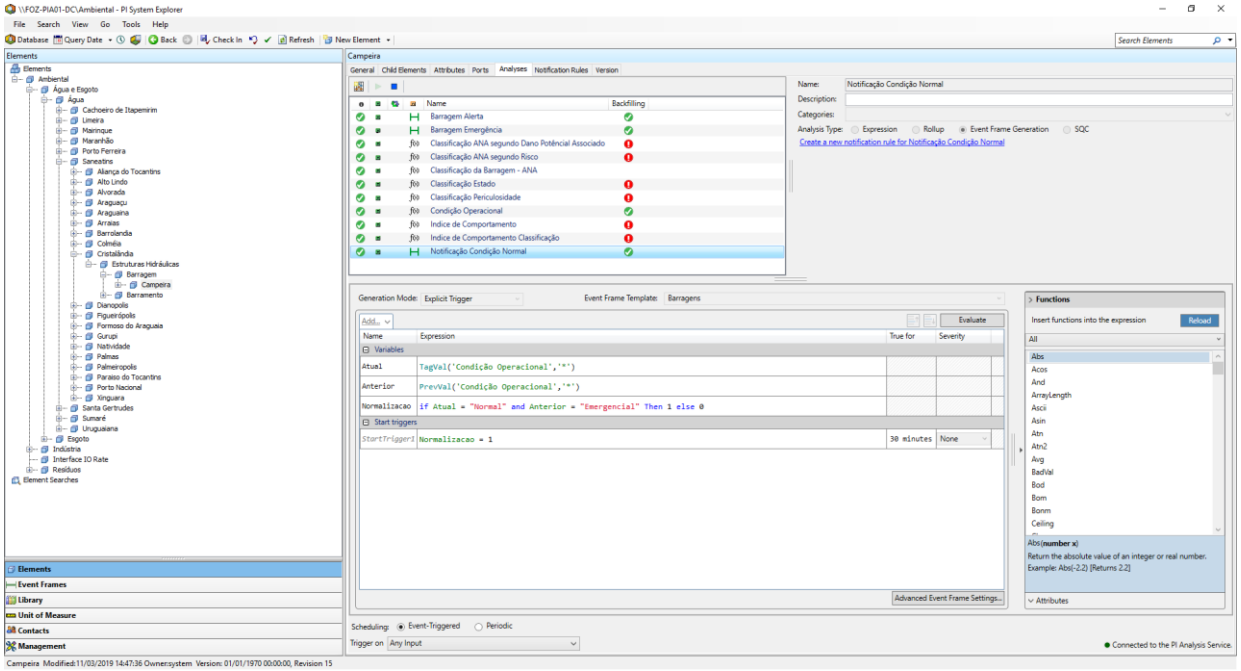
- Cadastral data of all structures (height, capacity, year of construction, data of the person in charge etc)



©2019 OSIsoft, LLC

PI AF - Analyses

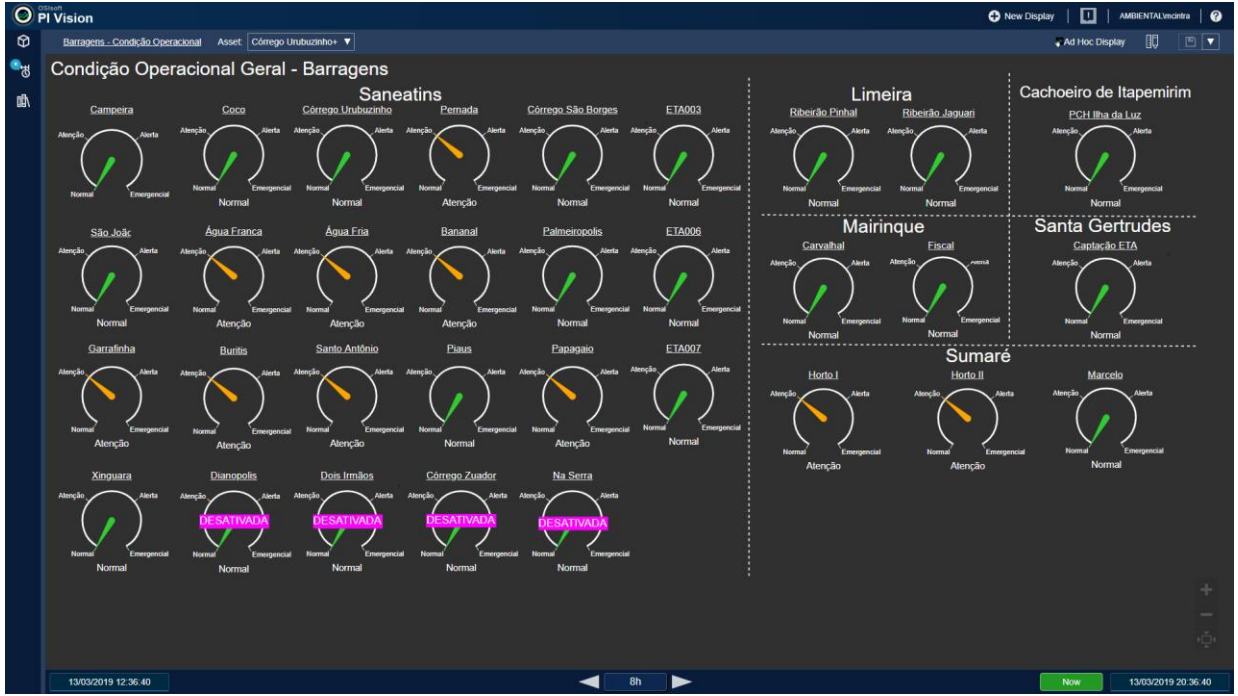
- The system compares the level with defined ranges and set the operational condition.
- Calculate the Behavior Index



©2019 OSIsoft, LLC

PI Vision

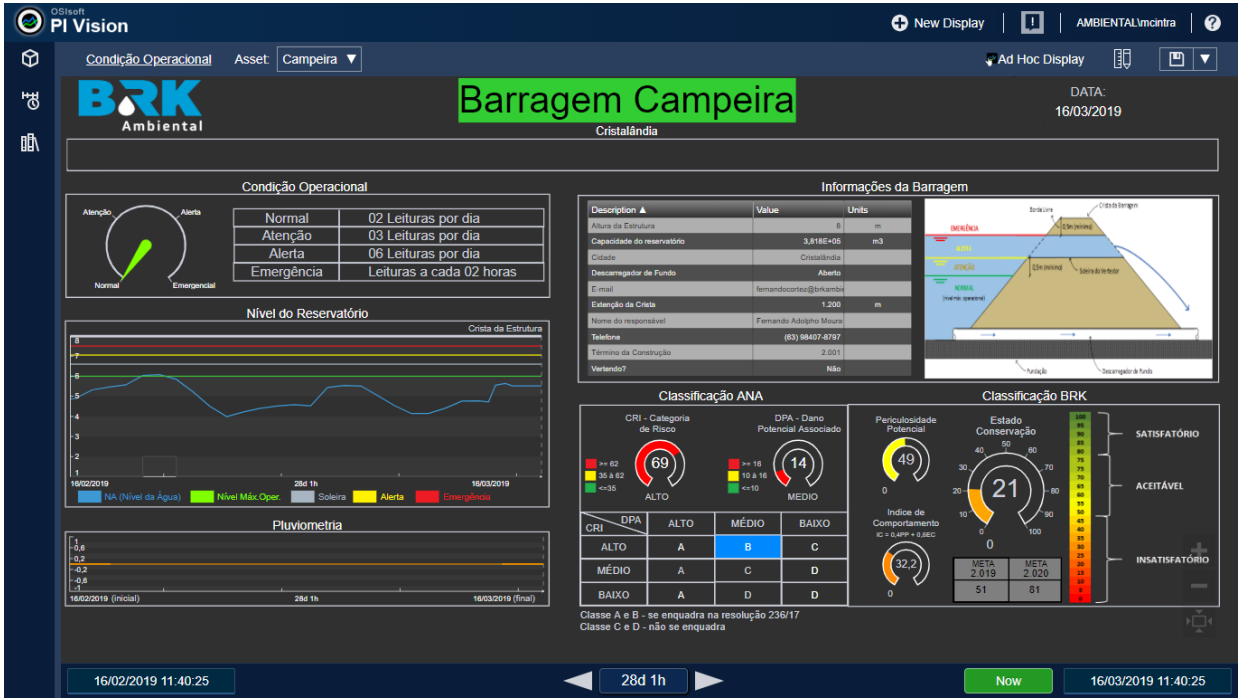
- Overview of the operational condition of all dams and hydraulic structures
- Displays the Criticality Index information



©2019 OSIsoft, LLC

PI Vision

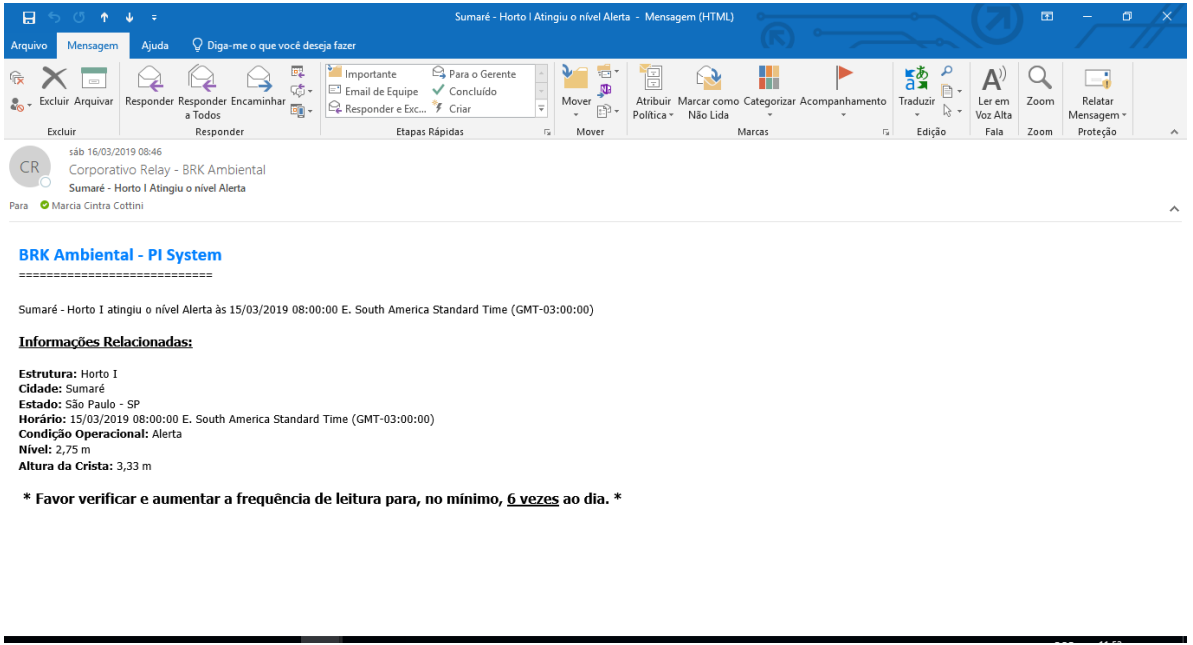
- It allows an analysis of the historical of the behavior of the structure supporting in the decision making.



©2019 OSIsoft, LLC

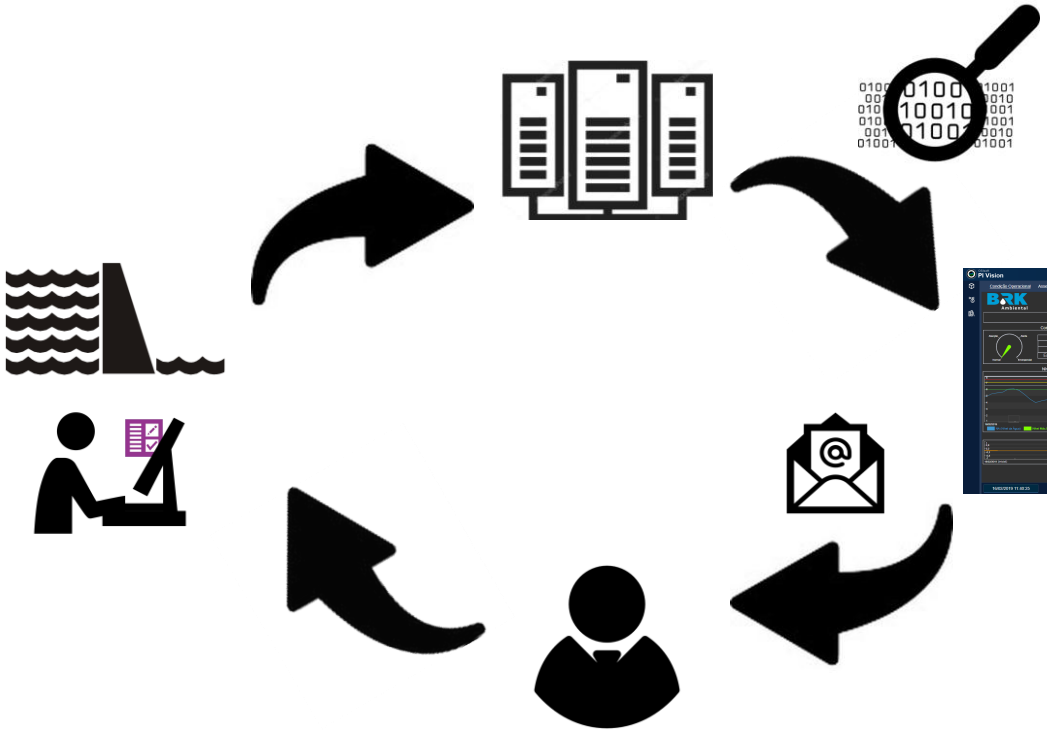
PI Notification

- The system compares the level with defined ranges and sends e-mail to responsible.
- When the emergency level is reached the directors receive the same communication and the crisis committee is activated.



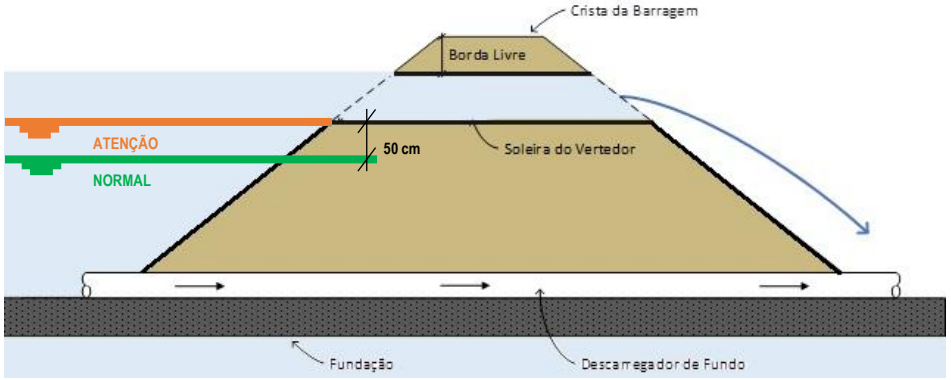
©2019 OSIsoft, LLC

Data Flow



©2019 OSIsoft, LLC

Operational Condition

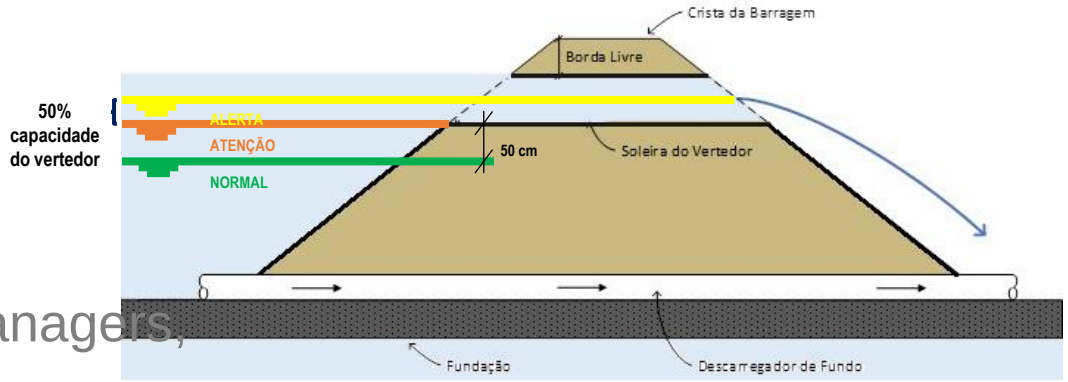


Attention

- email operational and corporate team
- increases reading frequency
- check weather forecast

©2019 OSIsoft, LLC

Operational Condition

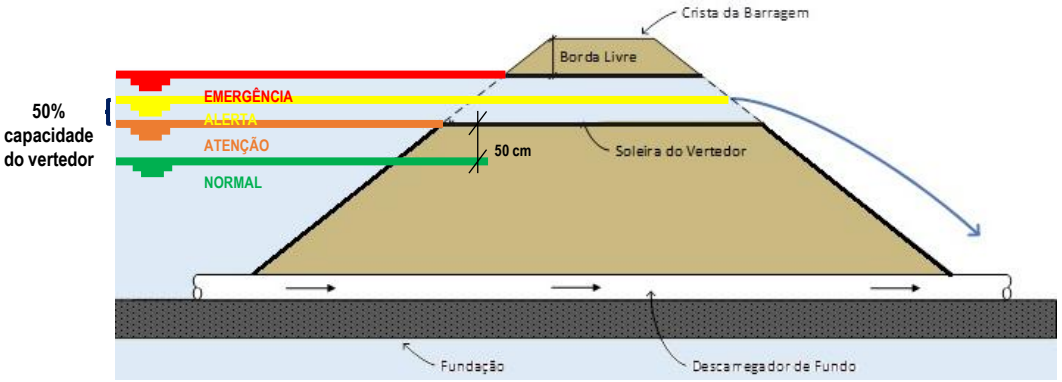


Alert

- email operational team, managers, directors and corporate
- increases reading frequency
- open depth discharge
- increases reading frequency
- check weather forecast

©2019 OSIsoft, LLC

Operational Condition

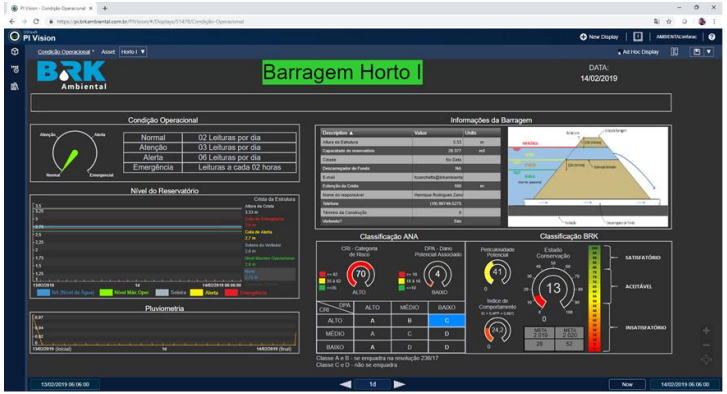


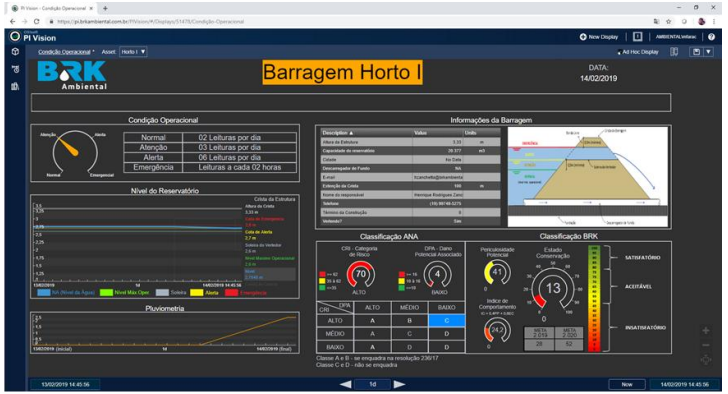
Emergency

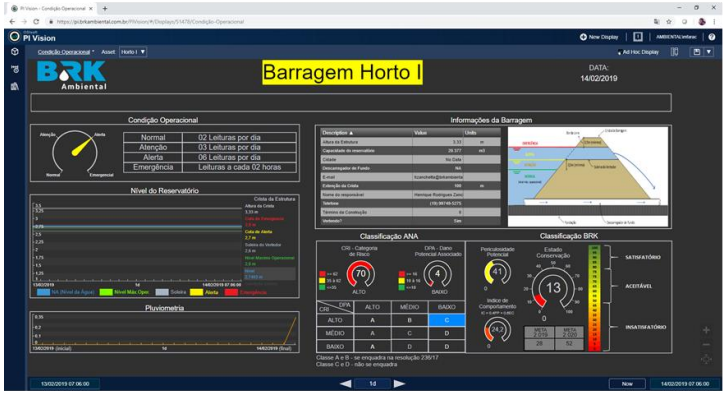
- email operational team, managers, directors and corporate
- increases reading frequency
- activates crisis committee: Warns the population lowers the level of the dam isolates the risk area

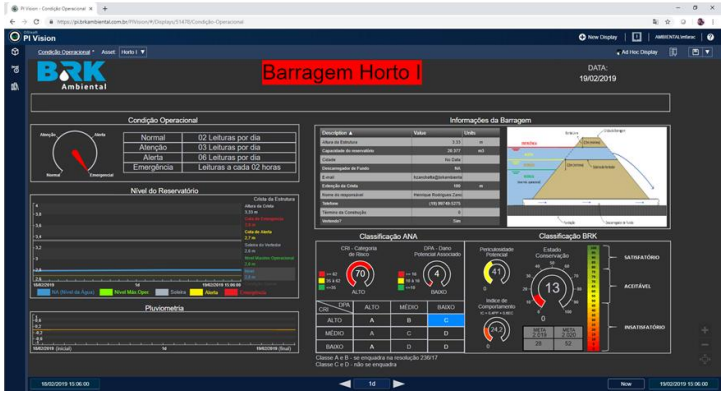
©2019 OSIsoft, LLC

Operational Condition









©2019 OSIsoft, LLC

DEMO

©2019 OSIsoft, LLC

©2019 OSIsoft, LLC

BEFORE	X	AFTER
Scattered information	**DECISION-MAKING**	Concentration of information in a single environment
Impossible retro-analysis	**OPERACIONAL PERFORMANCE**	Database generation Possible retro-analysis
A lot of data manipulation	**CONFIABILITY**	Greater operational confiability
Greater effort to consolidate data	**AGILITY**	Immediate access to information
High risk of failure	**RISK**	Low risk of failure
Excel spreadsheet	**INTERFACE**	Dashboards, e-mails, graphics, registration data

©2019 OSIsoft, LLC

“We are knowing the behavior of our structures. The PI system helps us to calibrate the theorics curves of behavior ”

Wagner Ferreira

©2019 OSIsoft, LLC

BRK Ambiental

Dams Safety and Hydraulic Structure

CHALLENGE

- Distribution geography of structures
- Long time to consolidate and make information available
- Inconsistency of data
- Decision making considering small database information
- 80% time formatting data and 20% analyzing

SOLUTION

- Through the PI Manual Logger the structures data are inputed periodically in a manual way, building a historical database.
- In PI Vision it is possible to monitor the operational condition of the structures.
- The PI Notification sends emails to alert those responsible the deviations of structures behavior.

RESULTS

- Agility of decision making to carry out interventions at risk situation.
- Increased reliability of data
- Decreased 8 times the time spent to collect and analyze the data.
- Greater operational reliability

©2019 OSIsoft, LLC

Speakers

- Marcia Cintra
- IT Analyst
- BRK Ambiental
- mcintra@brkambiental.com.br

Wagner Ferreira

Engineer

BRK Ambiental

wagnerferreira@brkambiental.com.br

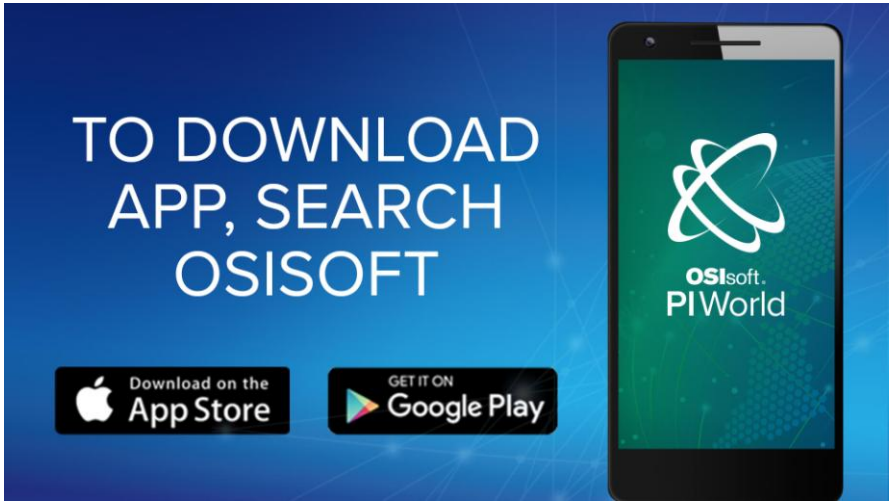
©2019 OSIsoft, LLC

Questions?

Please wait for the **microphone**

State your **name & company**

Please remember



©2019 OSIsoft, LLC

©2019 OSIsoft, LLC