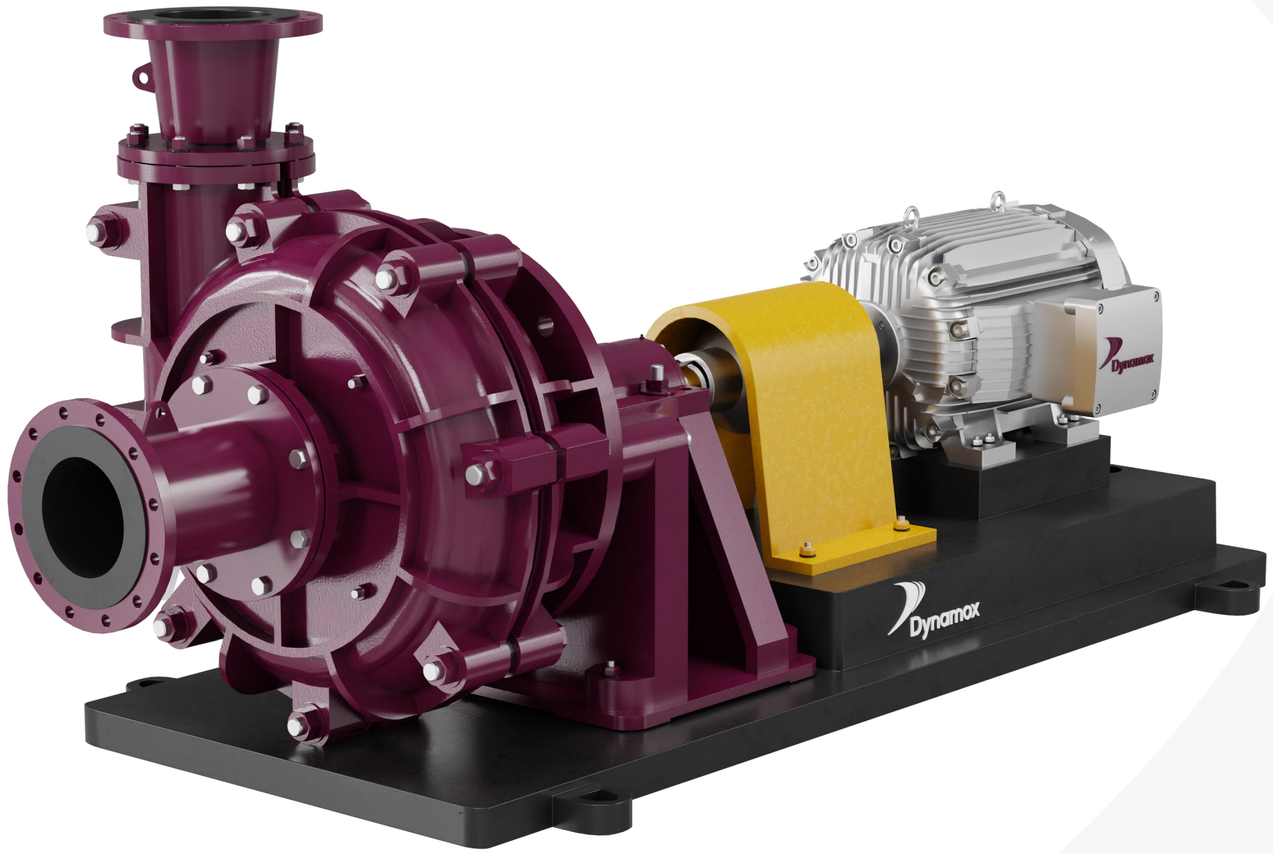


DYNAMOX PORTFOLIO:

PUMPS

About

The Dynamox solution works to continuously monitor the **condition** of pumps online in order to **prevent failures** and **increase the reliability** of these assets.

In this document, you will learn more about the solution and how it is fundamental to enhancing the **safety** and **availability** levels of your industrial plant.

Scan and download the Pumps Portfolio

03 Pumps

Learn more about this asset and how the Dynamox Solution helps monitor its condition.

11 DynaDetect

Automated detection and diagnosis tool supported by artificial intelligence algorithms.

14 DynaSens

A tool for making reliable and traceable records of inspection routines.

20 DynaNeo

Maintenance management support dashboard with a unified view of asset conditions and workflows.

23 DynaDash

Specialized dashboard for monitoring the condition of pumps.

24 Integrations

Data and alert integration service from the Dynamox Platform to third-party systems.

25 Success Stories

Stories of clients who have achieved impactful results using the Dynamox solution.

27 Benefits

Discover the benefits of the Dynamox Solution for managers, vibration analysts, and maintenance technicians.

Challenges in monitoring this asset

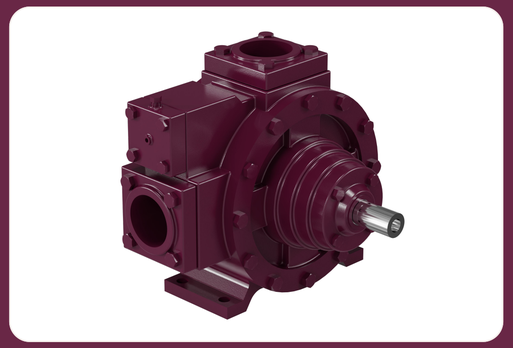
- **Different modes of operation:** Pumps undergo variations in pressure and load during operation, resulting in changes in vibration signals and frequencies that need to be monitored.
- **Space limitation for installation:** Many pumps are installed in hard-to-reach locations, making it difficult to place and maintain sensors and monitoring systems. Reduced space requires more compact solutions.
- **Operating environment:** Most pumps operate in harsh environments, such as areas with a lot of dust, high humidity or extreme temperatures. In these cases, it is necessary to use robust and resistant sensors that can withstand the harsh conditions without compromising the quality of the measurement and the reliability of the data collected.

Parallel-applied pump set.

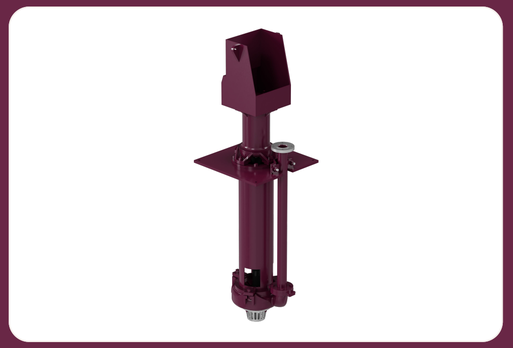
Check out how the Dynamox Solution works to identify faults in in the various components of this asset.

Main types of pumps

Piston pumps

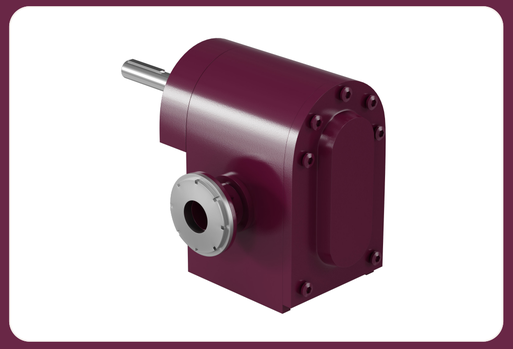


Vane pumps



Vertical pumps

Vacuum pumps



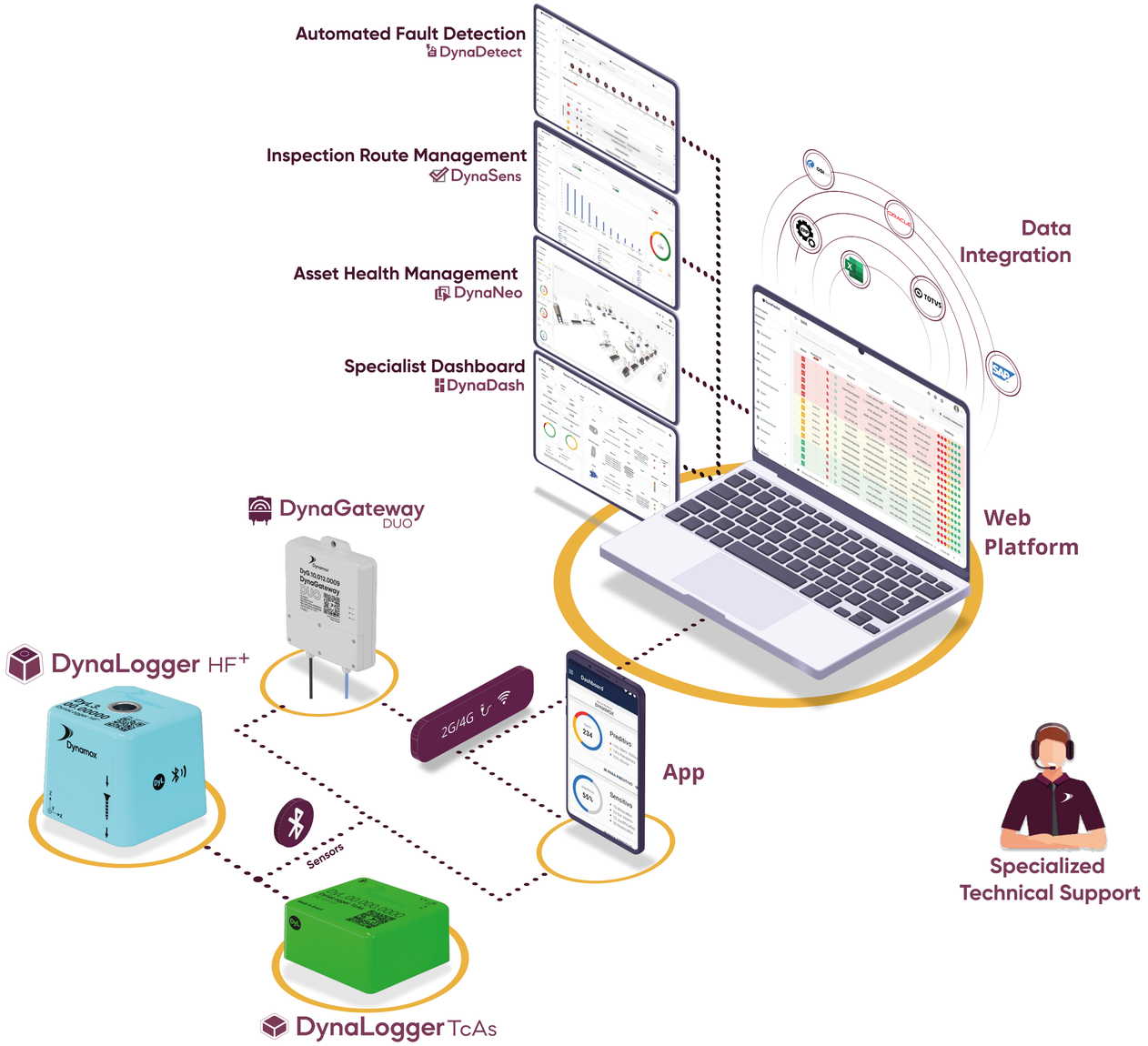
Gear pumps

Centrifuge:
water, pulp, etc.

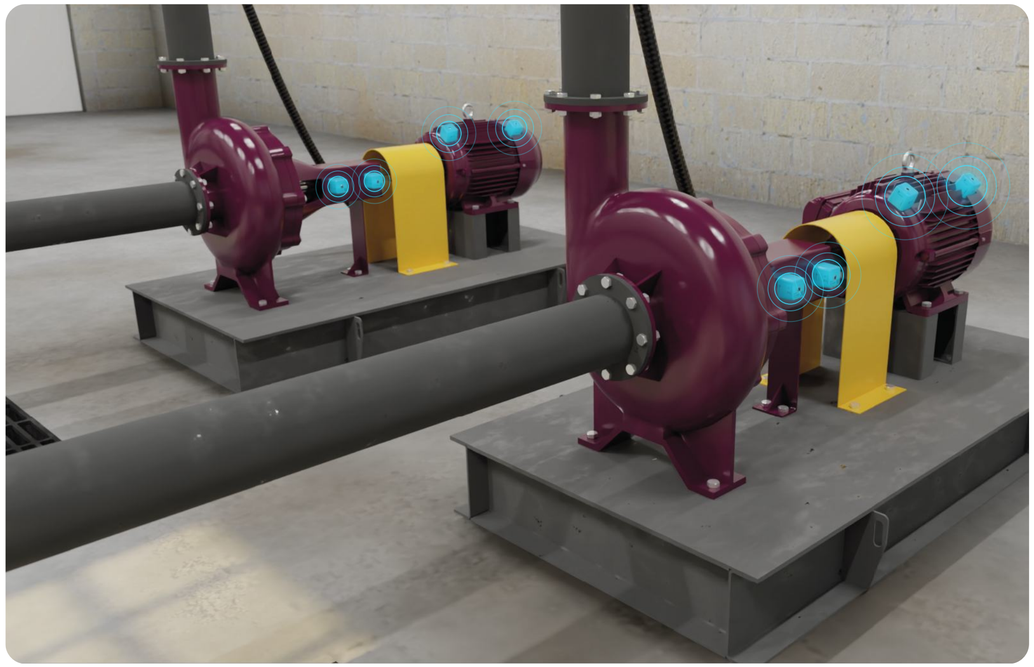
Dynamox Solution

Rely on the Dynamox ecosystem, composed of data intelligence tools, to monitor the health of industrial pumps.

DynaLogger HF +S	Early stage bearing failures, lubrication failures, cavitation, frequency inverters, rotor wear.
DynaLogger TcAs	Advanced-stage bearing failures, more severe lubrication failures, cavitation, rotor wear in pumps.



Dynamox Application



Vibration and temperature monitoring
Drive subsets, drums, rollers and others

Fault diagnosis tools
Including 3D spectral waterfalls

DynaSens
Digital checklists and routes for inspection routines.

DynaDetect
Automated fault detection supported by artificial intelligence

DynaDash
Specialist dashboard for condition monitoring

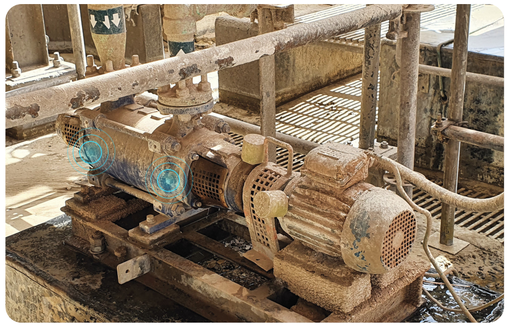
DynaNeo
Customizable dashboard for visual plant health management

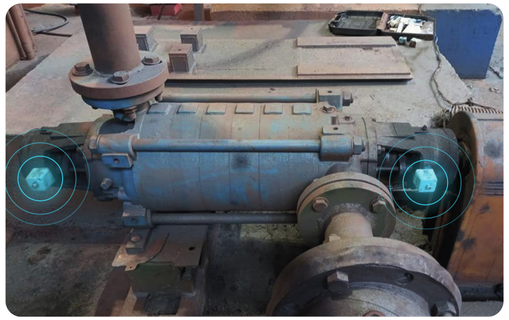
Integration
Customized data integration

Technical support
Personalized service

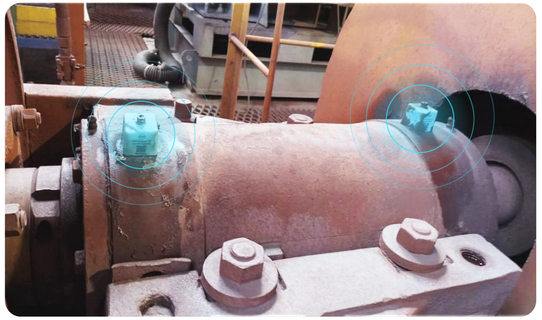
Field installation

Check out photos of sensors
and Gateways in pump installations.





Multi-stage pump bearings

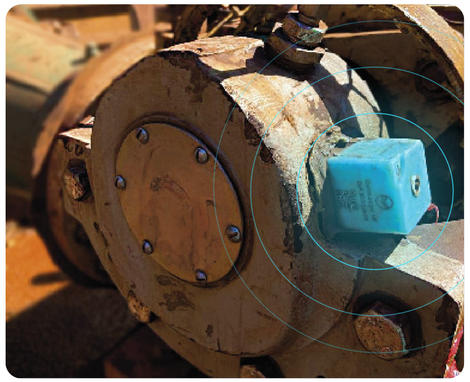


Centrifugal slurry pump cylinder

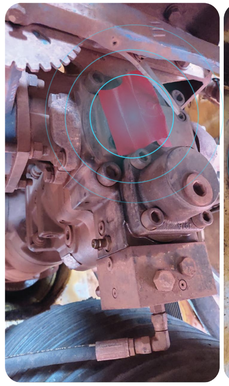
Motor pump installation

Vacuum pump set

Centrifugal Pump



Pump bearing



Lift and steering pump for off-road vehicles
(Monitoring done using Dynatrigger).

Applications in pumps with a high degree of contamination.

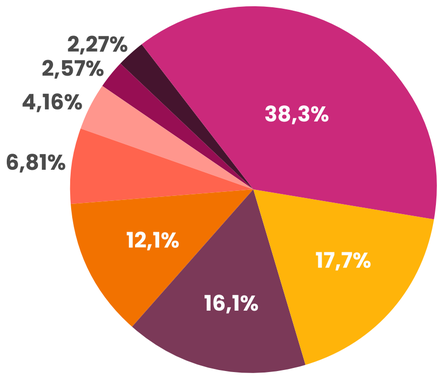
Gasket temperature monitoring
to indicate leaks.

Positive displacement pumps with monitoring inside the bearing.

Drive structure

Failure modes detectable with the Dynamox Solution

Most common faults in pumps:



Source: Dynamox predictive report data

Legend:

- Bearing Wear
- Beating
- Rotating Looseness
- Loss of Rigidity
- Misalignment
- Insufficient Lubrication
- Imbalance
- Others

		Vibration and temperature	Sensitive inspection	Current and voltage[2]
Electric motor	Space discharges	⊗	⊗	✓
	Bad contact	⊗	⊗	✓
	Short-circuit between coils	✓[1]	⊗	✓
	Low insulation	⊗	⊗	✓
	Electrical imbalance	✓[1]	⊗	✓
	Cracked/broken cage	✓[1]	✓	✓
	Overcurrent	✓	✓	✓
	Overheating	✓[1]	✓	⊗
	Bearing fault (Wear/Crack)	✓	✓	⊗
	Mechanical looseness	✓	✓	⊗
Frequency inverters	Panel heating	✓	✓	✓
	Electronic components burn out	✓[1]	✓	✓
	Motor heating	✓	✓[1]	✓
	Queima do motor (estator)	⊗	⊗	✓
Interconnecting element	Static element wear	✓[1]	✓	
	Looseness	✓	✓	
	Eccentricity	✓	⊗	
	Misalignment	✓	⊗	
	Imbalance	✓	⊗	
	Slip between pulleys	✓	✓	
	Friction	✓	✓[1]	

1 Partial coverage

2 Enging Solution | Predictive maintenance and fault detection for electrical assets. Learn more at www.enging.pt

		Vibration and temperature	Sensitive inspection
Gearbox	Bearing fault (wear/cracks)	✓	✓[1]
	Insufficient lubrication	✓	⊗
	Looseness in adjustments of housings, bushings, and shafts	✓	✓[1]
	Mechanical stress	✓	⊗
	Lack of parallelism between housings	✓	⊗
	Poor contact between gear teeth	✓	⊗
	Cracked/broken teeth	✓	⊗
	Pitted teeth	✓	⊗
	Shaft crack	✓	⊗
	Oil leak	⊗	✓

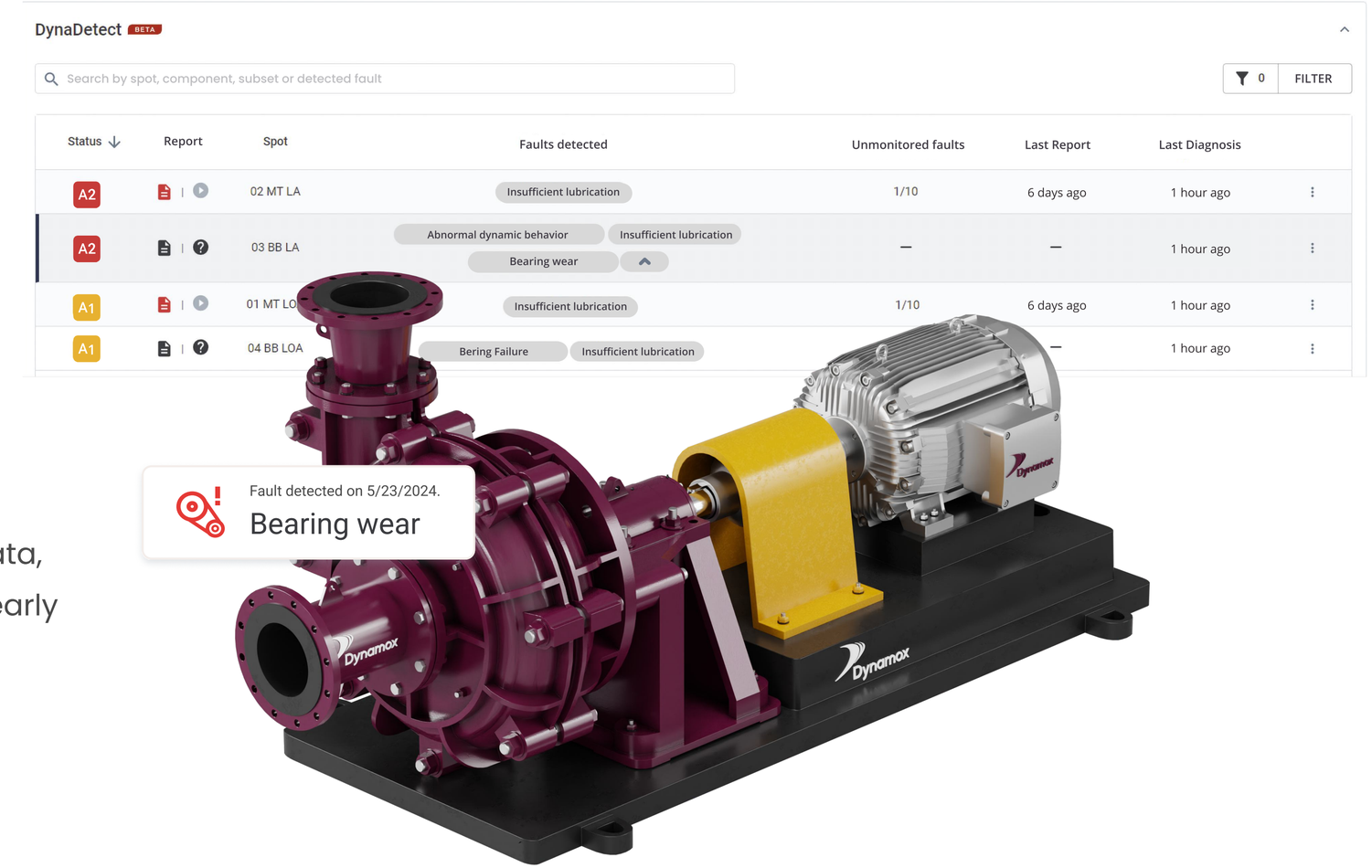
		Vibration and temperature	Sensitive inspection
Bearings (cylinder)	Bearing fault (Wear/Cracks)	✓	✓[1]
	Inadequate lubrication	✓	✓
	Looseness in adjustments of housings, bushings, and shafts	✓	⊗
	Misalignment	✓	⊗
	Mechanical looseness	✓	⊗
	Mechanical stress	✓	✓
Rotor (Impeller) /Housing	Wear and tear	✓	✓
	Loosening	✓	✓
	Friction (coating)	✓[1]	✓
	Leaks in general	✓[1]	✓
	Cavitation	✓	✓
	Foreign body	✓[1]	✓[1]

[1] Partial coverage

[2] Enging Solution | Predictive maintenance and fault detection for electrical assets. Learn more at www.enging.pt

Automated Detection

DynaDetect is an AI-supported tool designed to automatically analyze vibration and temperature data, providing quick diagnostics for potential failures at early stages.



Identifying faults

In addition to **pumps**, the Solution also applies to **motors,** offering assertive and detailed diagnosis for both.

Dynamox's detection tool identifies the following faults:

Mechanical faults

- Insufficient lubrication
- Lack of rigidity
- Bearing wear
- Abnormal dynamic behavior
- Cavitation
- Hydrodynamic failure
- Imbalance
- Structural imbalance

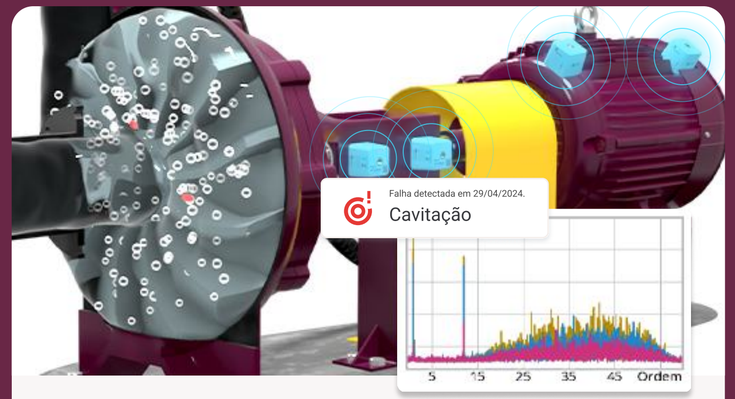
Electrical faults

- Stator fault
- Faulty rotor bar
- Electrical fault

DynaDetect: a predictive analysis tool

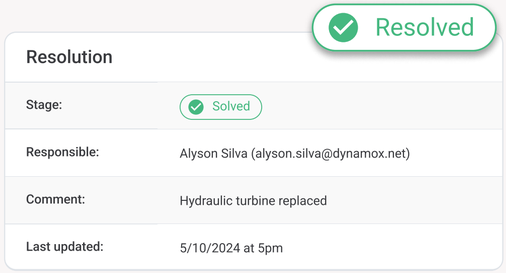
1. Data collection

Vibration and temperature data are collected continuously during the asset's operation.



2. AI analysis and detection

The artificial intelligence model specializing in pumps analyzes the data and draws up the diagnosis.

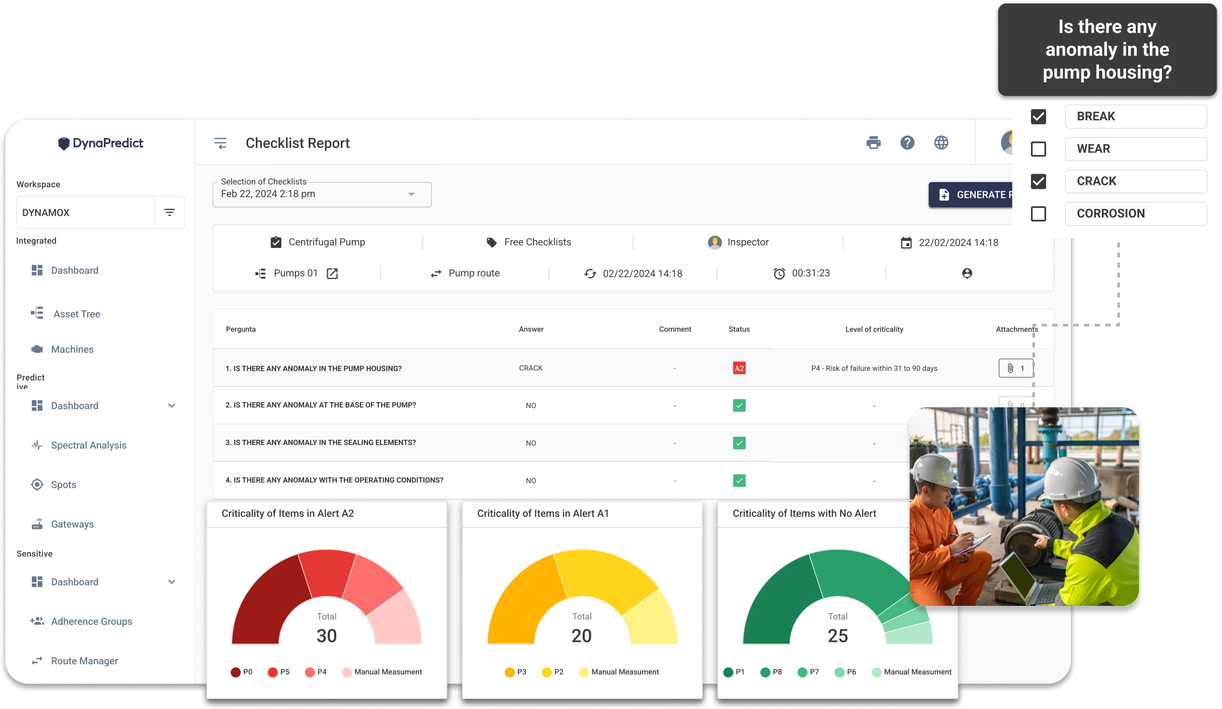


3. Report automation

DynaDetect helps in the preparation of reports, optimizing time and increasing the team's assertiveness.

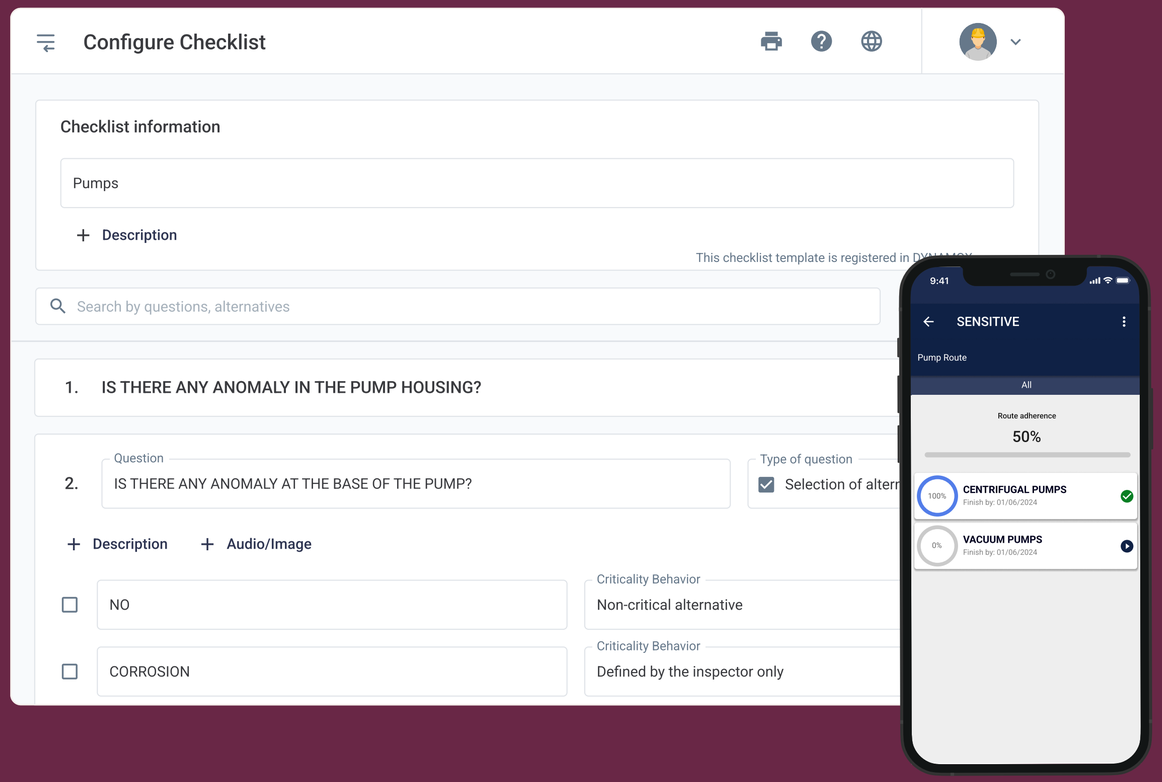
Sensitive inspection

Combined with monitoring via wireless sensors, DynaSens is a tool for keeping reliable and traceable records of inspection routines. With it, you can turn the data collected in the field into a valuable source of information on which to base assertive maintenance decisions.



Integrations

Creation of work orders integrated with ERP software



Checklists

Create or use standard checklist templates for the screen, incorporating them into the inspection routes.

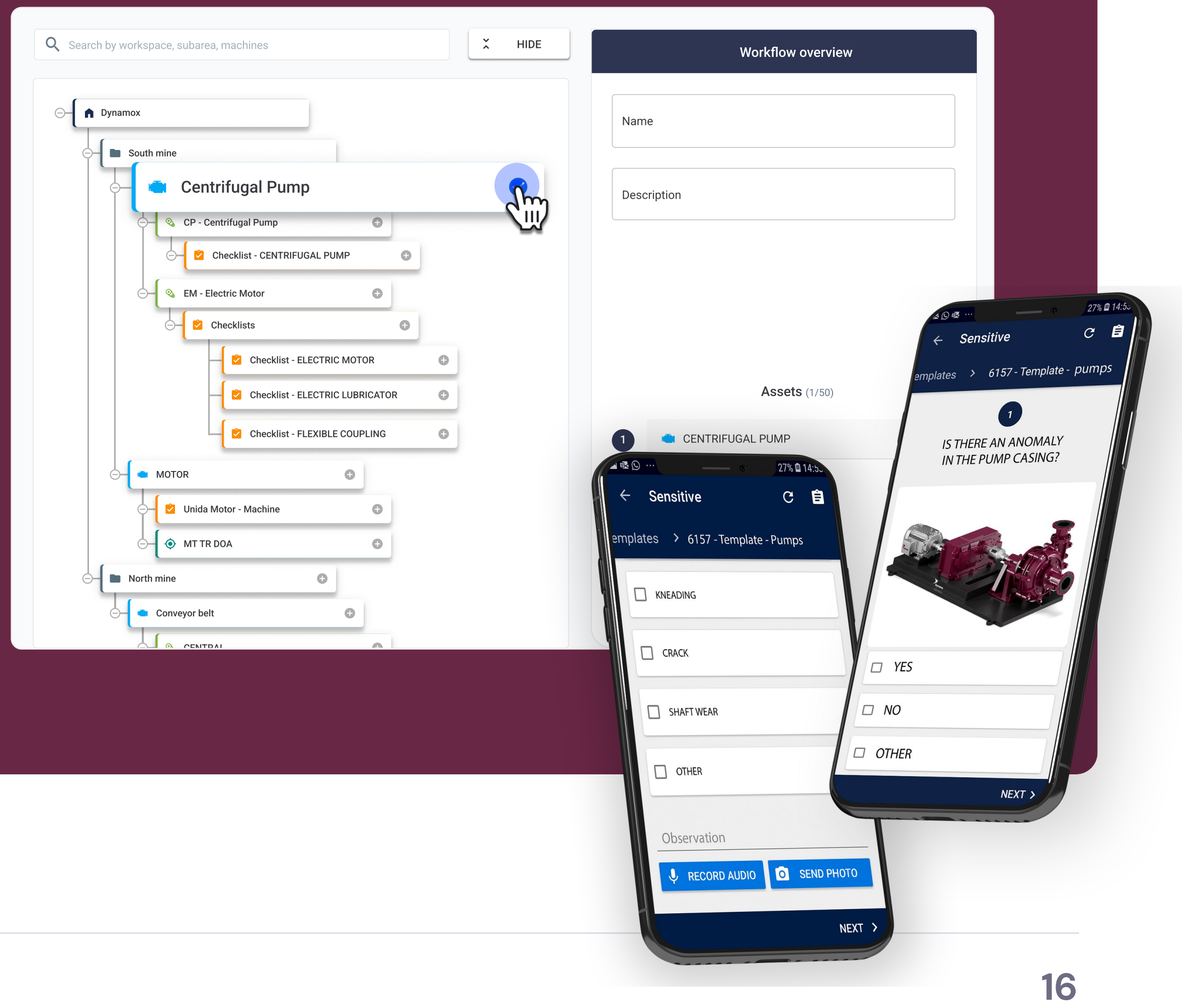
Routes

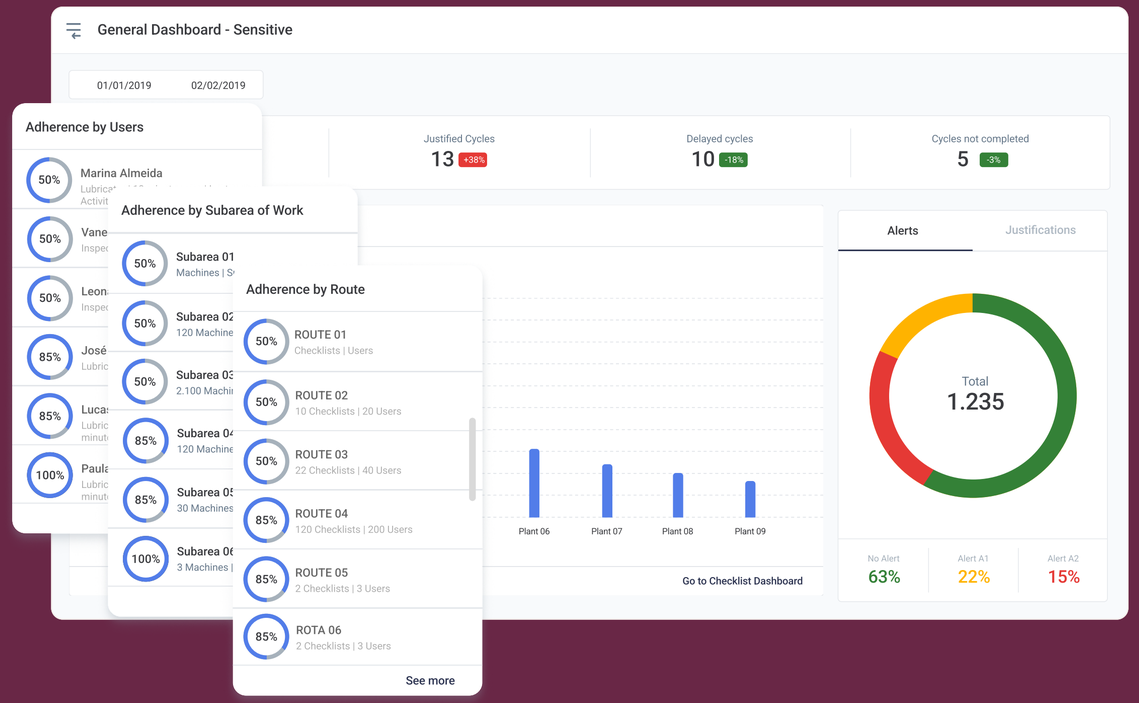
Create routes for inspectors, with customizable cycles, execution tolerances and configurations.

When running routes via the app, the checklist is displayed according to the template created on the platform with the questions, descriptions and alternatives registered.

Execution via App

- Offline execution
- Geolocation registration
- Photo and audio recording





Analysis

Analyze the reports generated in the field using dashboards. They provide an overview of the plant's health, organized by location, occurrence and alerts triggered.

Monitor inspector adherence, considering the areas covered by the inspection, the percentage of routes completed, justified or not carried out.

Use case

Here's a use case for the checklist functionality for pumps:

Checklist:	CHECKLIST PUMPS
Type:	Free Checklist
User:	inspector01@dynamox.net
Location in the Asset Tree:	Pump sets
Route:	WEEKLY MECHANICAL INSPECTION ROUTE
Date of answer:	12/05/2023 13:23
Sync:	12/05/2023 14:04
Aprox. Time Used:	00:06:04
Geolocation:	-20.1915 -43.4897

Question 1:	IS THERE ANY ANOMALY IN THE FIXING OF THE PUMP?
Answer:	MATERIAL BUILD-UP
Notes:	-
Criticality Level:	P0 - Risk Of Failure Less Than 15 Days
Attachments	Image on 12-05-2023 11:29.jpg

Question 2:	IS THERE ANY ANOMALY IN THE PUMP'S OPERATING CONDITIONS?
Answer:	ANORMAL NOISE
Notes:	-
Criticality Level:	P0 - Risk Of Failure Less Than 15 Days
Attachments:	Image on 12-05-2023 11:29.jpg Audio on 12-05-2023 11:29.jpg

Question 3:	IS THERE ANY ANOMALY IN THE PUMP LUBRICATION?
Answer:	LOW OIL LEVEL
Notes:	-
Criticality Level:	P4 - Risk of failure within 91 to 120 days
Attachments:	

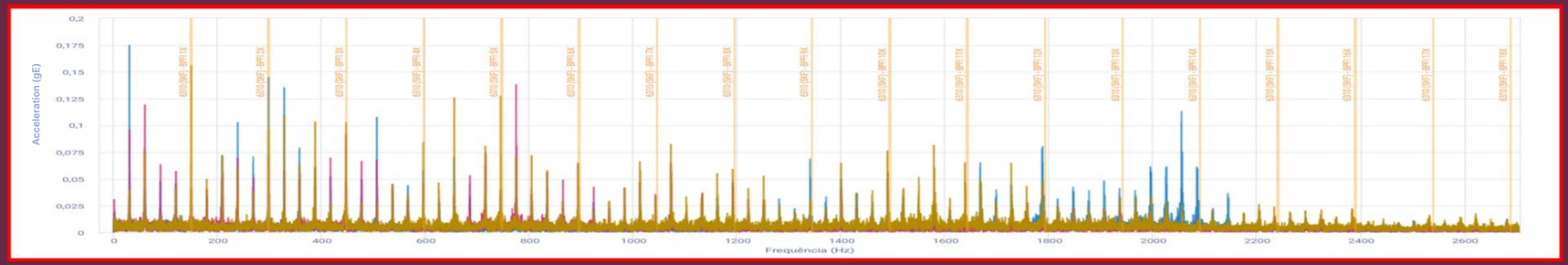
Question 4:	IS THERE ANY ANOMALY IN THE SEALING ELEMENTS?
Answer:	IRREGULAR SEALING
Notes:	-
Criticality Level:	P4 - Risk Of Failure Less Than 31 to 91 Days
Attachments:	Image on 12-05-2023 11:29.jpg

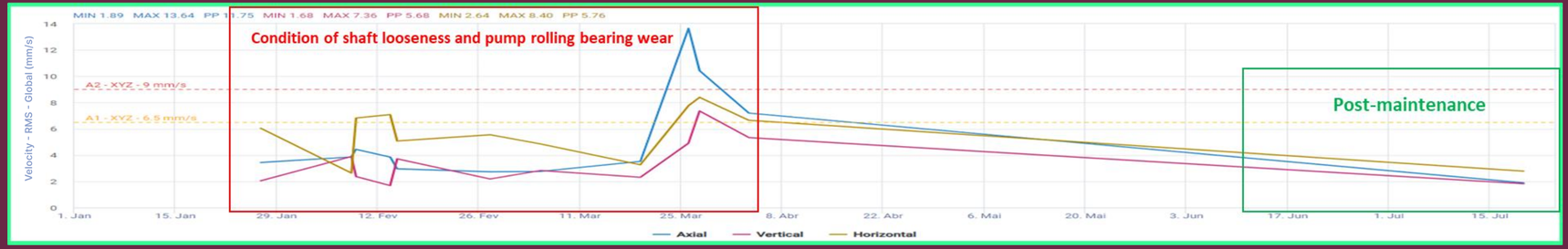
Use case:

COOLING TOWER PUMP

Through route monitoring conducted by inspectors in the area, looseness and failure of the inner race (BPFI) of the NDE bearing of the pump were diagnosed.

Technical report: Due to the frequency of the pump blades passing, it was recommended to replace the bearings, check shaft play, and inspect the impeller. In the field, the bearings were found to be defective, and the shaft tip and rotor key were broken.

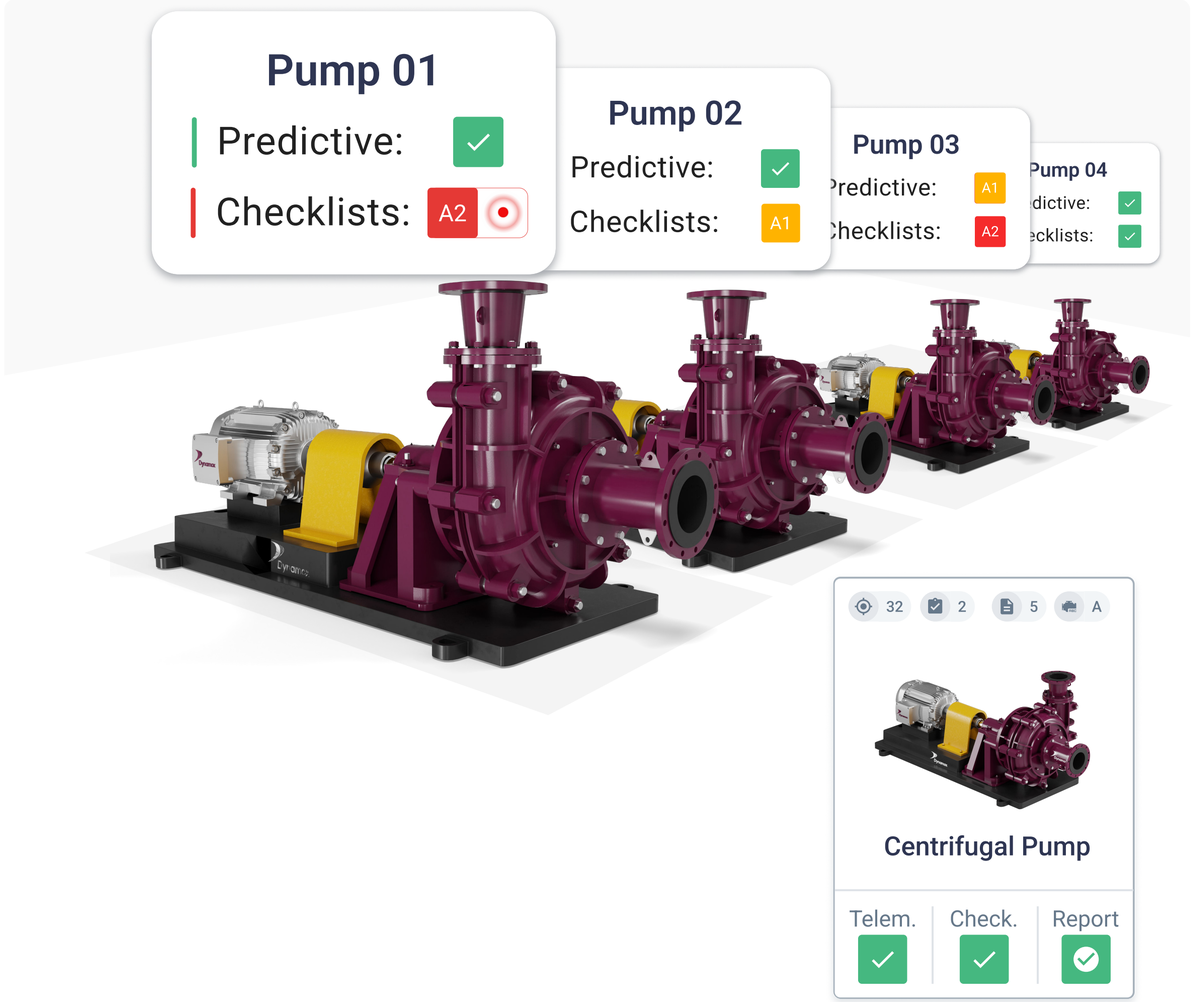




Visual Asset Management

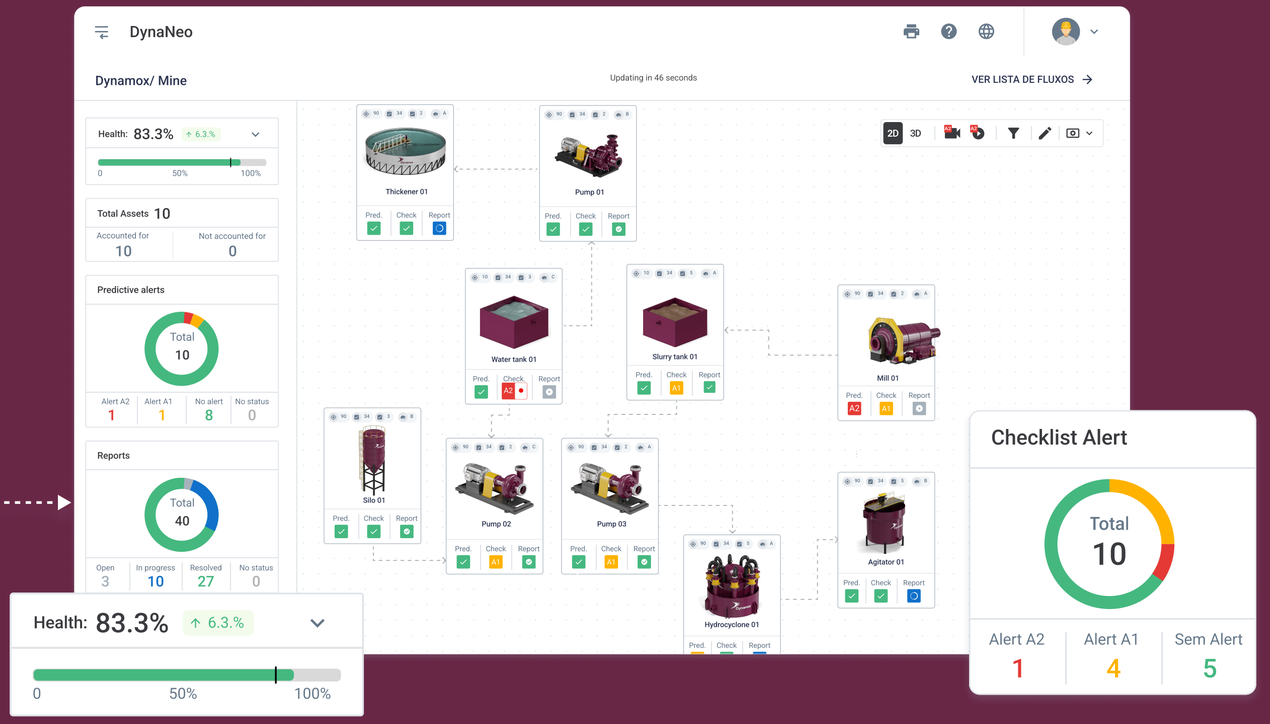
DynaNeo offers the centralization and visualization of management data such as critical temperature and vibration alerts, sensitive inspection checklists, and issued reports.

With this information easily visible, the task of establishing and directing maintenance priorities becomes more effective.



Workflow

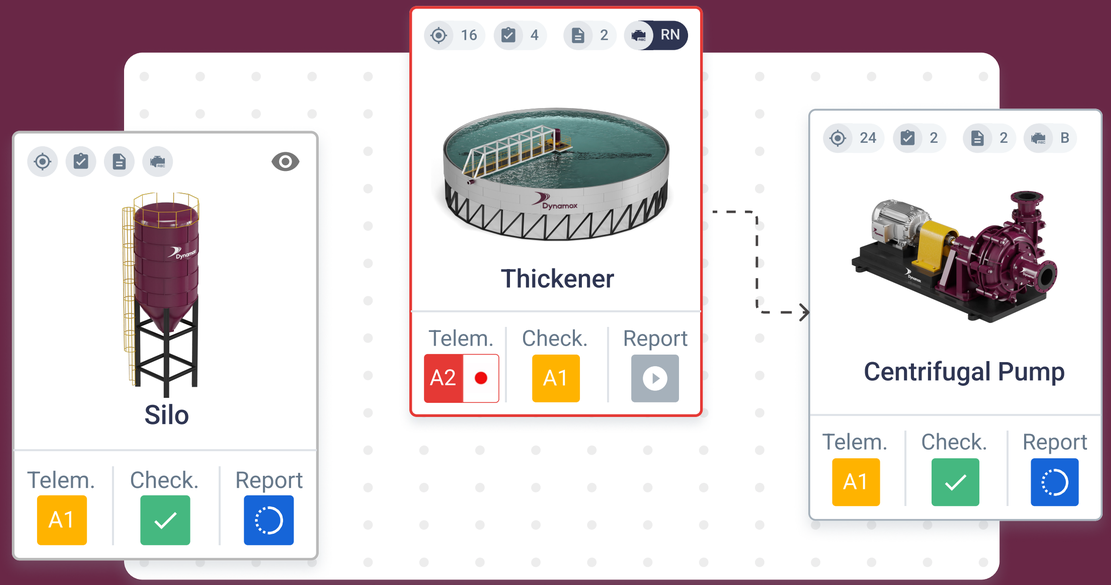
Choose the assets and indicators that are relevant to your production process and set up your workflow as you wish.



Process

Set up your process using drag and drop to easily connect the assets on the board to create the workflow.

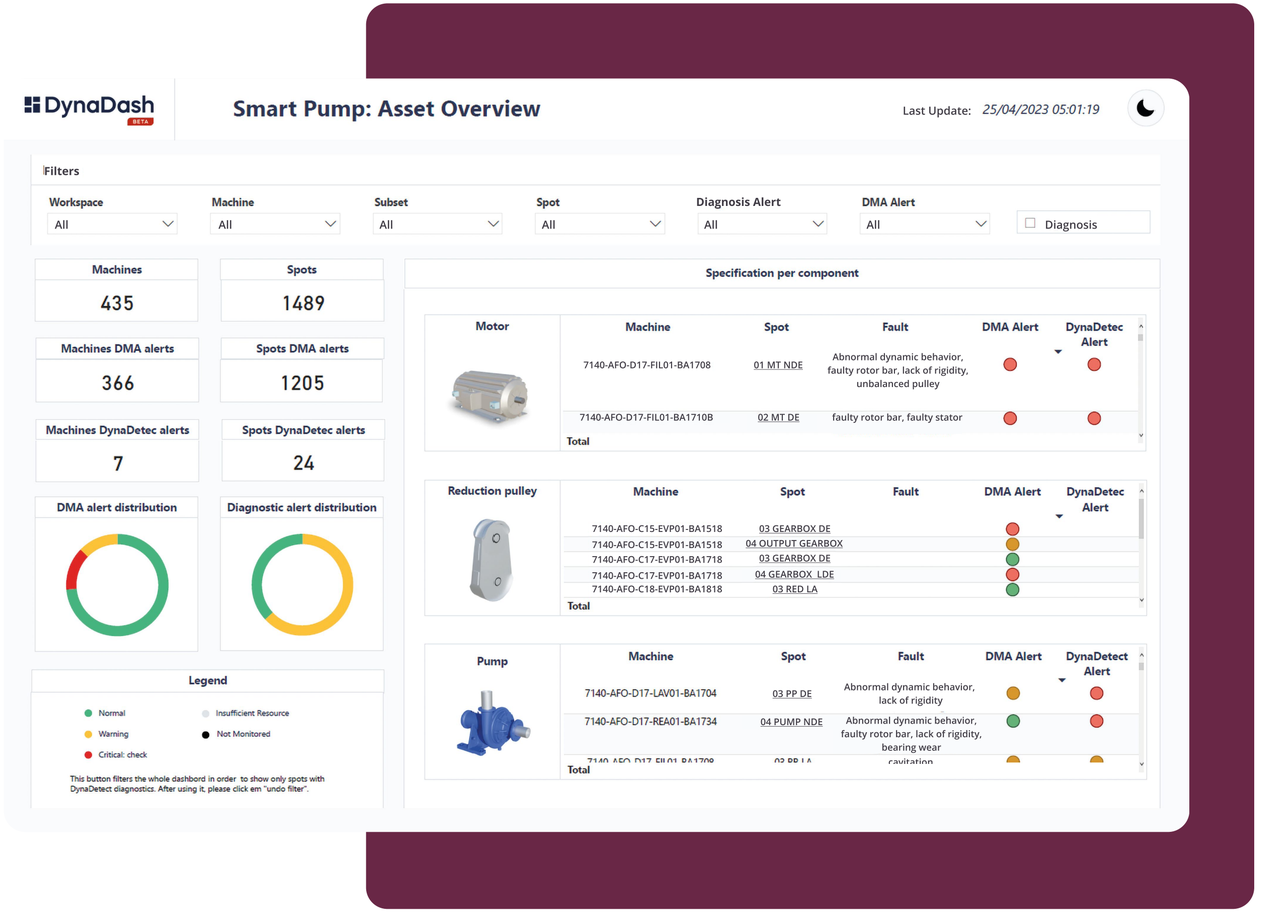
Visualize the consequences of a breakdown or maintenance in the process and quickly find the alarmed assets.



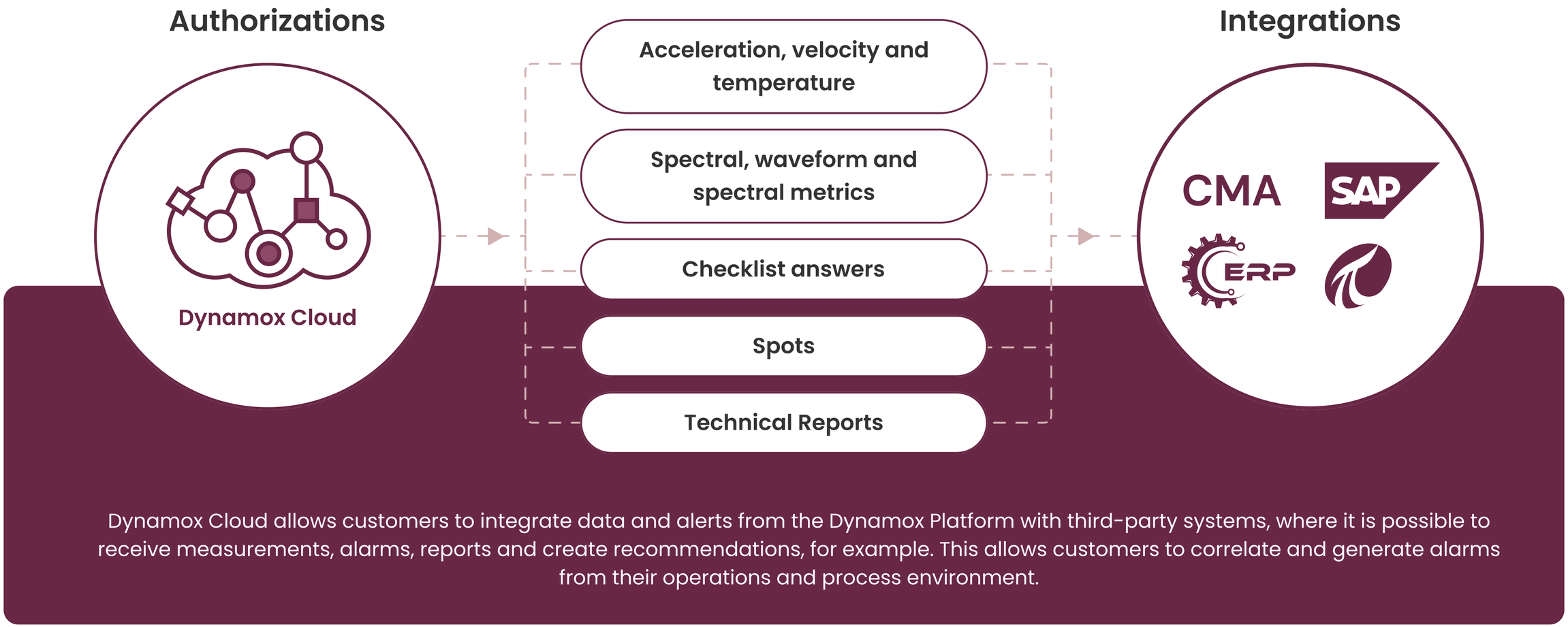
Specialist Dashbord

DynaDash is a feature that combines a comprehensive and organized view of various information.

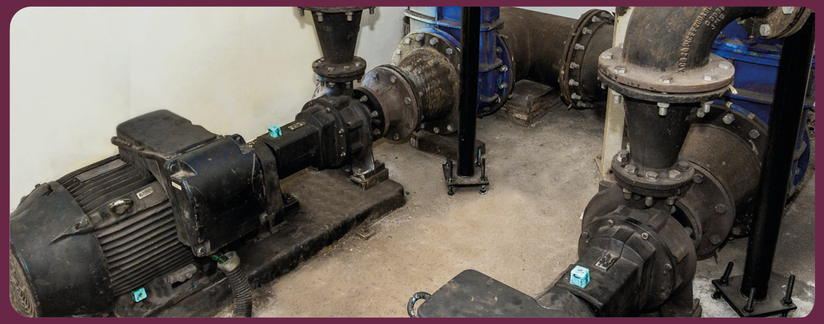
The feature allows you to visualize reports, condition indicators, automated detection diagnostics, and specific metrics, making it a powerful ally for efficient asset management.

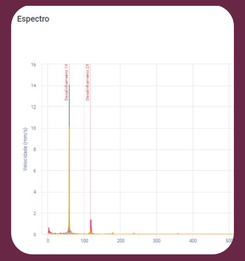


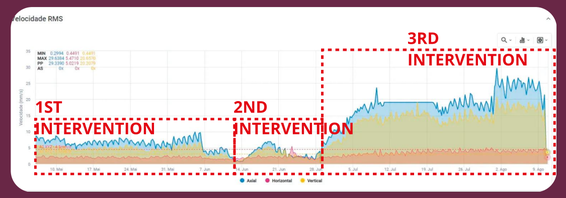
Integrations

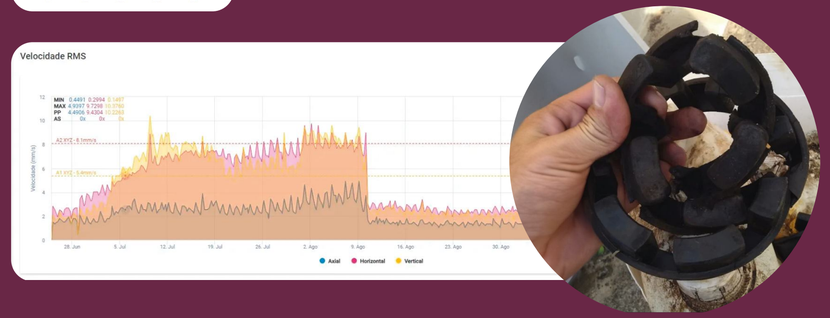


Dynamox Cloud allows customers to integrate data and alerts from the Dynamox Platform with third-party systems, where it is possible to receive measurements, alarms, reports and create recommendations, for example. This allows customers to correlate and generate alarms from their operations and process environment.









Success stories:
Misalignment

Two sets of motor and pump were monitored at the water treatment plant located in Florianópolis. With online monitoring, it was possible to track the historical evolution of vibration and temperature levels of the set.

Notice in the graph the significant increase in the vibration levels of the drive motor, indicating the presence of a developing anomaly.

In an initial diagnostic stage, it was possible to visualize two harmonic frequencies (1xRPM and 2xRPM) in the spectrum graph, indicating that the set might be misaligned.

In conclusion, following the technical report's findings, a typical misalignment behavior of the complementary pipeline lines was evidenced, and a future action plan was created by the company.

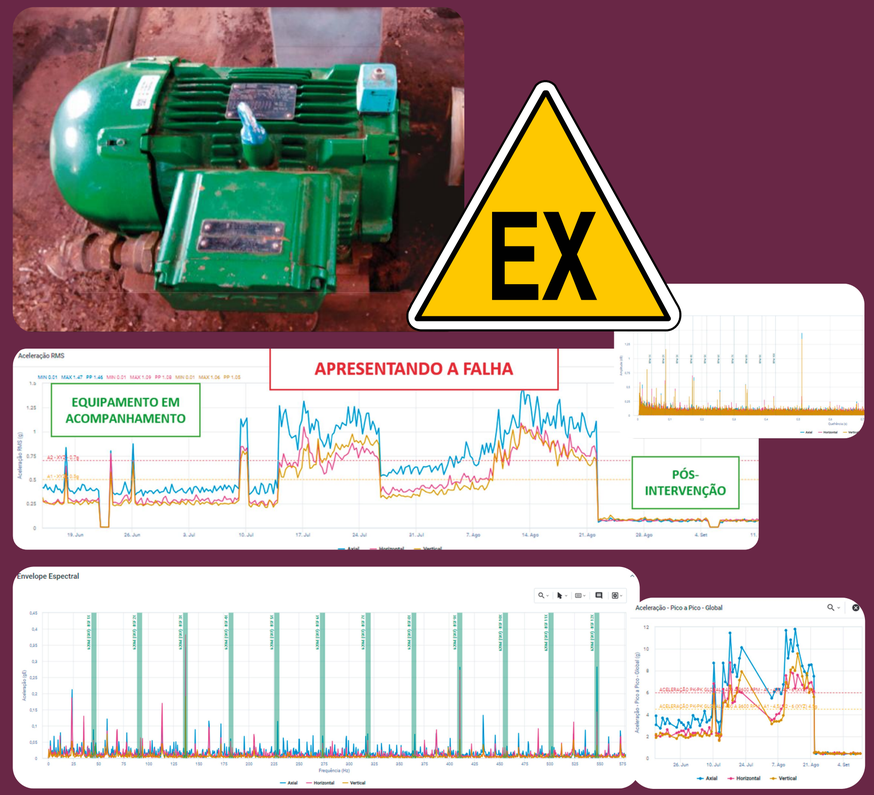
Success stories:

Bearing wear

Areas classified as Ex are those where there are risks of explosion formation. Dust, vapors, and gases are some of the elements present that classify the environment as Ex. In this case, the drive motor of a pump showed an increase in vibration level, which was verified both in telemetry and in the calculation in Envelope 2 kHz to 6.4 kHz Peak to Peak and Global Acceleration Peak to Peak.

When analyzing the vibration spectrum, peaks of 1x rotation and BSF with harmonics were identified. In the images below, it is possible to observe the vibration spectrum in envelope and cepstrum, where the fault and its severity can be seen in both.

After detecting the wear failure in the bearing, it was possible to schedule the maintenance of the asset for replacement. Finally, the monitoring continued, and a decrease in vibration levels was observed, which proves the effectiveness of the platform and the action at the right time.



Benefits

Plant Manager

With management tools, it is possible to obtain plant or production process health information quickly and in a centralized way, generating reports and ensuring predictability.

- **Get your KPIs in an automated way**
- **Increase plant reliability and availability**
- **Avoid corrective maintenance costs**

Vibration Analyst

With vibration analysis and AI-assisted fault detection tools, the analyst can identify and prioritize maintenance actions for faults at different stages.

- **Increase asset efficiency and productivity**
- **View assertive and complete diagnoses**
- **Monitor the plant minute by minute remotely**

Maintenance Technician

With the data obtained by Dynamox Solution, the maintenance technician's work becomes more agile and efficient, ensuring coverage of all the plant's assets.

- **Take targeted and assertive maintenance actions based on diagnoses and reports**
- **Increase asset productivity and efficiency**

Dynamox

Dynamox_s.a | Dynamox | Dynamox.net

All information in this brochure is the property of Dynamox and may not be used
or reproduced without authorization