



**AVEVAWORLD**  
PARIS



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# INTRODUCTION TO ROBIN – THE AVEVA PI SYSTEM FOR ASSET MONITORING

WITH A USE CASE ON VIBRATION

# Agenda

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- 01** **ENGIE Presentation**
- 02** **Our operational data infrastructure**
- 03** **Use cases**
- 04** **Latest and greatest : Vibration monitoring**



# ENGIE IS A WORLD LEADER IN ENERGY TRANSITION

## OUR PURPOSE

### To accelerate the transition to a carbon-neutral economy

Enshrined in the Group's bylaws, "the purpose ("Raison d'être") of ENGIE is to act to accelerate the transition to a carbon-neutral economy, through low-energy solutions that are more respectful of the environment. This purpose brings together the company, its employees, customers and shareholders, and reconciles economic performance and positive impact on people and the planet. ENGIE's action is assessed in its entirety and over time."

## ENGIE IN FIGURES <sup>(1)</sup>

**97,300**

employees

**302,774 km**

of gas and electricity transmission  
and distribution networks

**4.3 GW**

of nuclear electricity  
production installed capacity

**41.4 GW**

of total installed capacity  
in Renewables  
(+3.9 GW in 2023)

**58.5 GW**

of thermal electricity  
production installed  
capacity

**1.3 GW**

of battery storage  
in operation

**190,000**

B2B customers

**25.3 GW**

of decentralized energy production  
installed capacity (heating, cooling,  
electricity, etc.) <sup>(2)</sup>

**22.5 M**

B2C energy supply  
and service contracts

**€20.9bn**

green bonds issued  
since 2014



# ENGIE is building the low-carbon energy system of tomorrow

By focusing on 4 core activities

4 Global Business Units

## Renewables

Generating clean power

## Energy Solutions

Developing low carbon distributed energy infrastructure

## Networks

Delivering affordable energy for customers

## Flexible Generation & Retail

Providing balanced and flexible power generation, hydrogen and green solutions to B2C customers

## FLEX GEN & RETAIL GBU

The GBU contributes to ENGIE's Net Zero Carbon goal by 2045 by providing **flexible, reliable and affordable low-carbon energies** to the energy systems and **solutions to decarbonize** ENGIE's clients.



*Thermal generation from efficient gas assets*



*Power storage from batteries*



*Power storage from pumped hydro*



*Desalination from reverse osmosis*



*Hydrogen production to decarbonize gas assets & industrial clients*



*Energy sales & services to retail customers*

# Flexible Generation business challenges

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**BESS & H2**

New businesses



**FLEXIBILITY**

Complement to renewables



**GRID  
CAPACITY**

TSO support



**PREDICTIVE  
ANALYSIS**

Availability



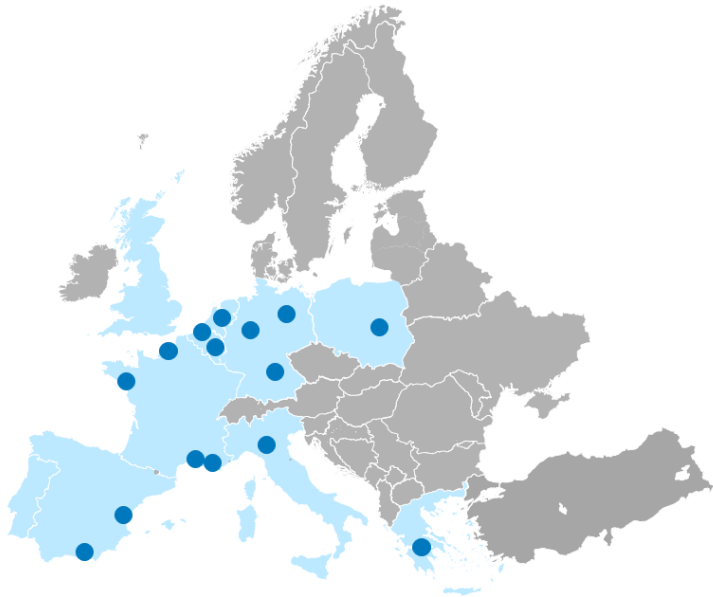
**CAPTURE  
VALUE with AI**

Efficiency

# Evolution of our PI System landscape



2015



Regional or asset-based

2017



Centralized system for  
Thermal assets in Europe

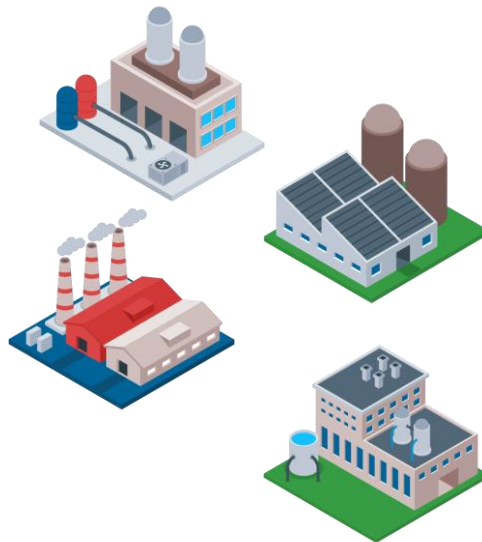
2019



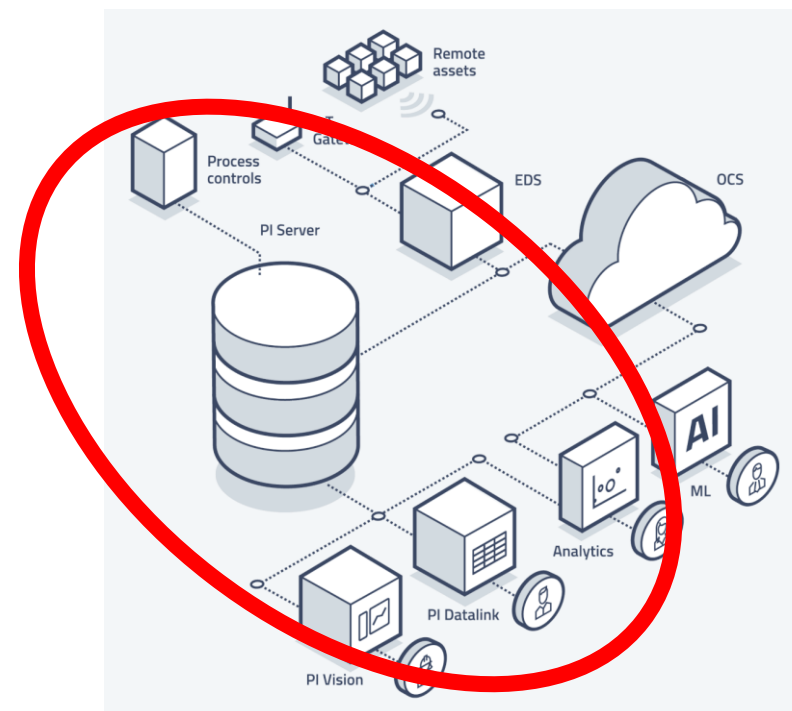
Centralized system for  
all businesses worldwide

# PI Robin

AVEVA

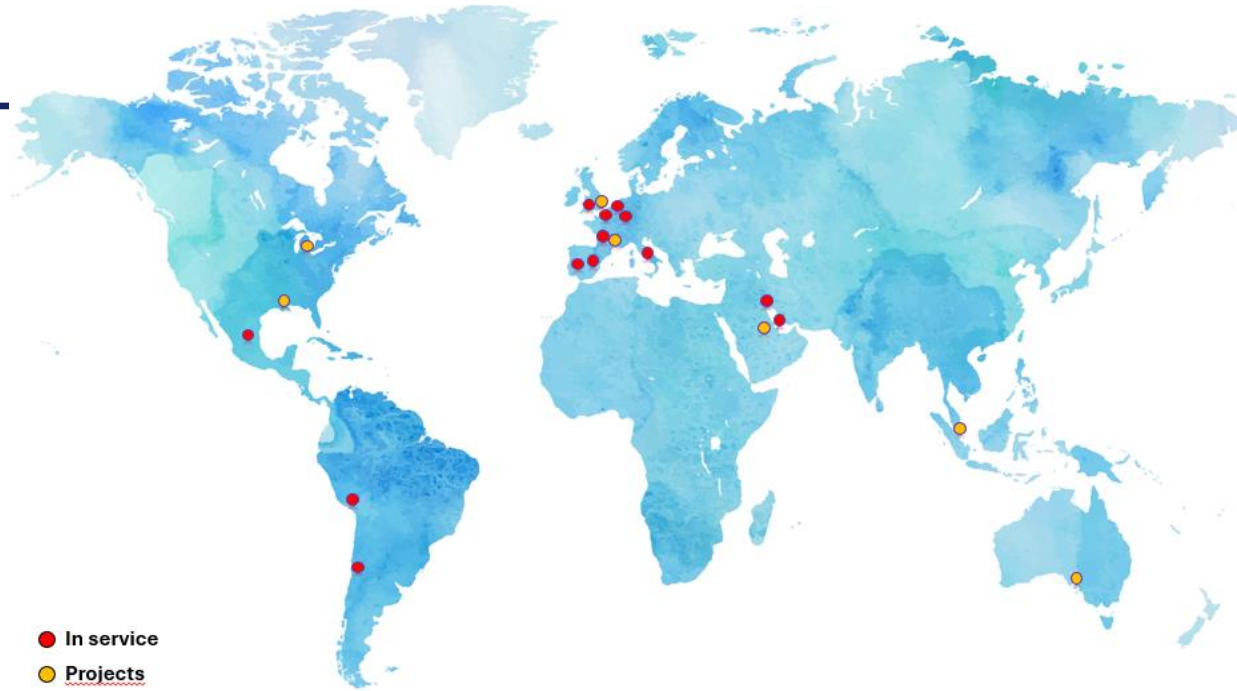


ROBIN is based on the AVEVA PI System technology. It is software used to capture, process, analyze, and store any form of **real-time** data.





# Robin today



3.355 users

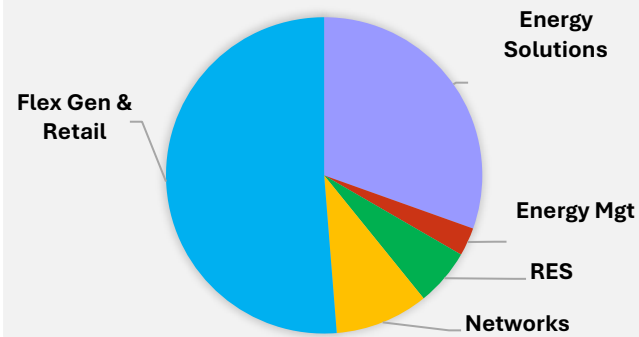
65.000  
analysis

403 interfaces  
Power plants,  
networks, LNG  
terminals, gas storage  
sites, ...

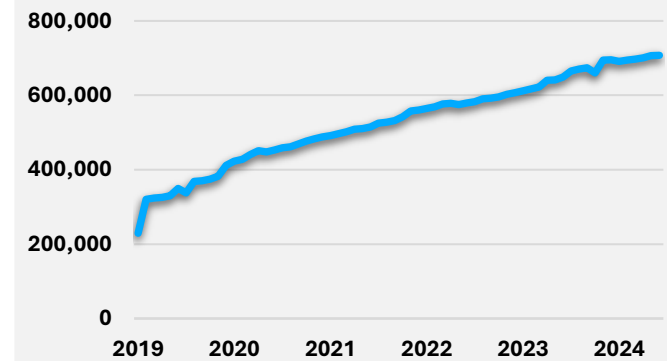
10.000  
displays

25+ years of  
data online

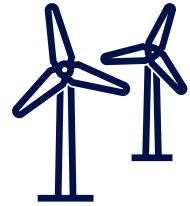
### Robin usage by GBU



### Tags evolution

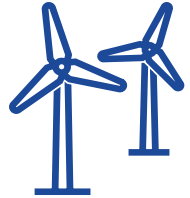


# The concept



# Collect & Store

- Collect real-time data from our assets
- Detect significant changes and forward them to the Robin historian
- Store the data and offer it for various purposes such as analysis, visualization, etc..
- API connection to external data providers



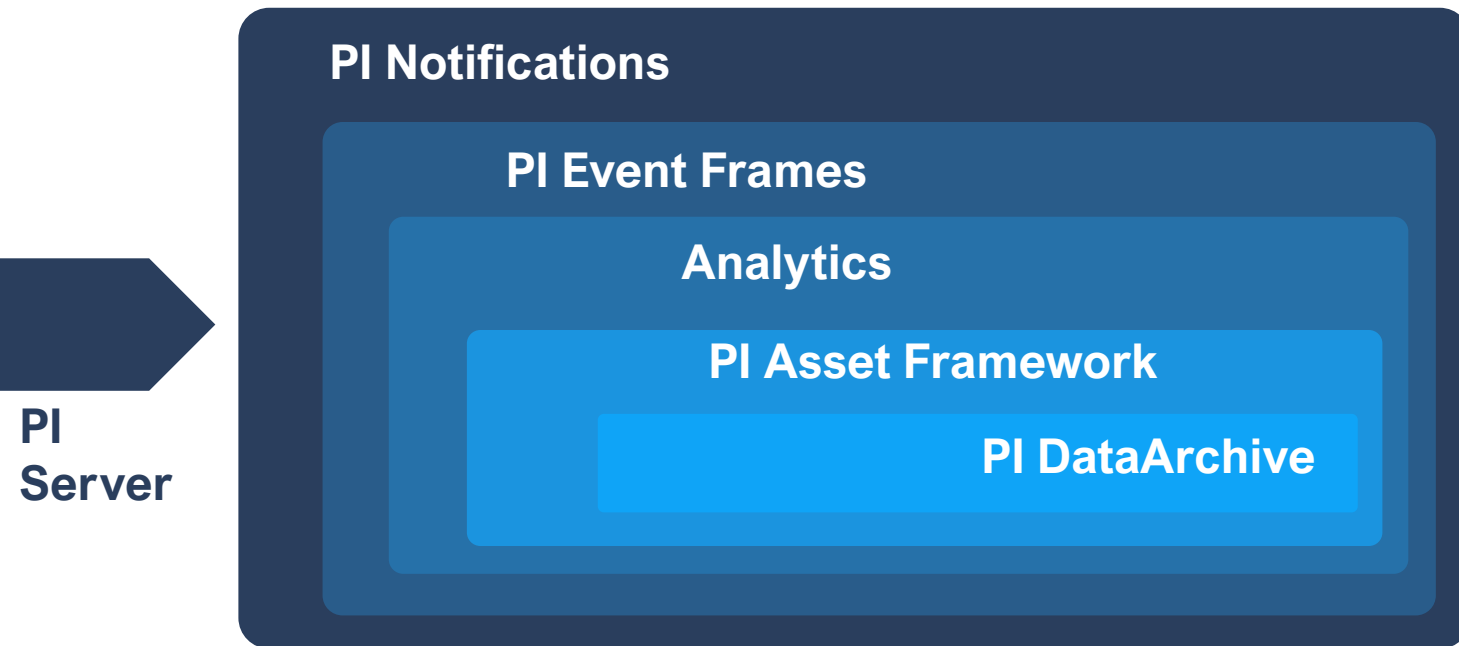
PI Interfaces & PI  
Connectors



PI  
Server

# Analyze

- Analysis of important events
- Generate business KPI's from process data
- Templates for wide range of components (pumps, fans, turbines, etc...)
- Additional tools for advanced analytics
- Assistance from business experts



# Extract

- Additional tools for visualization & reporting
- Interfaces with ENGIE's data lakes
- Predictive maintenance systems
- WebAPI for internal and external consumers



Python library



Power BI



PI Visualization Suite

# What do we do with all this data?

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**01**

## **Improve our performance**

Calculate efficiencies and performance parameters

**02**

## **Increase our availability**

Condition monitoring and predictive analysis

**03**

## **Get more value form the output**

Reduction of imbalance and improve capacity forecasts

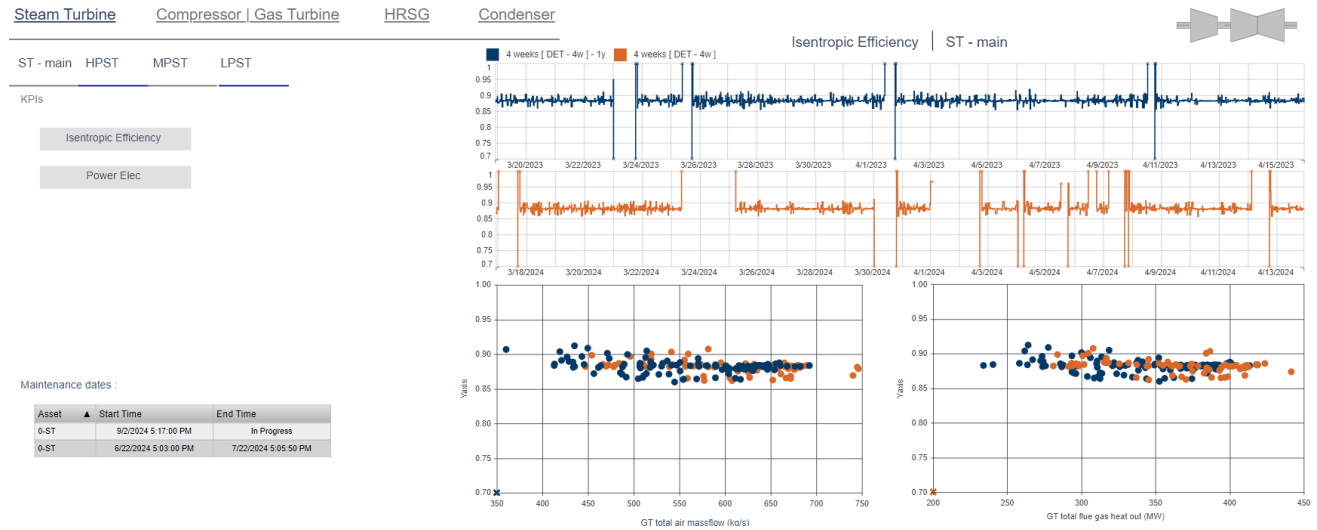
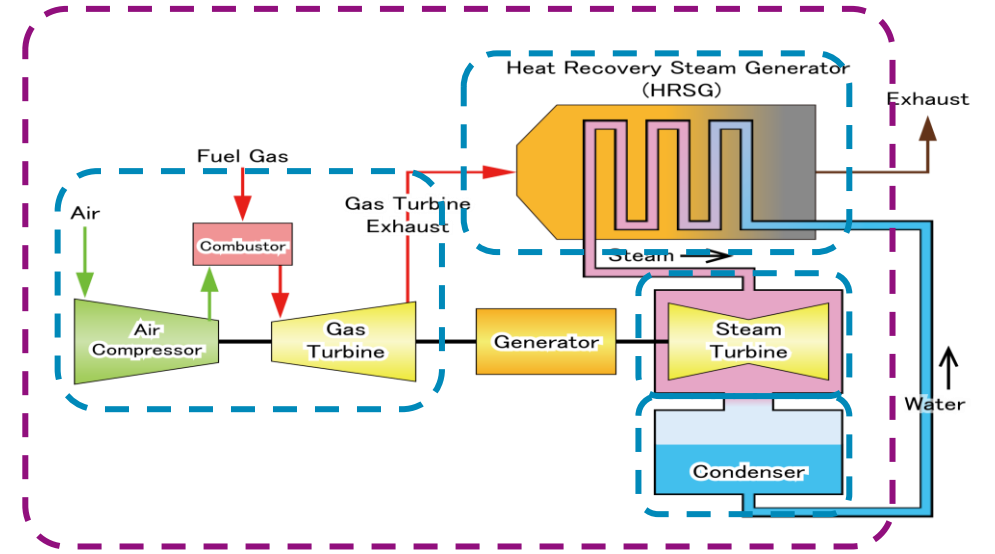
**04**

## **Limit our impact on the environment**

Emission monitoring

# Use cases : Performance monitoring

- Performance indicators for CCGT's
  - Complete cycle
  - Steam turbines
  - Gas turbines
  - Condensers
  - Pumps
  - Compressors
  - Steam generators
- Start performance
- Performance test



# Use cases : Condition monitoring

- Pumps
- Valves
- Filters
- Transfo's

Status **Active**

Hman  Cavitation  Efficiency

Configuration

LP drum 0.24574 barg

IP system 0.15625 barg 0 lh

HP system 0 barg 0 lh

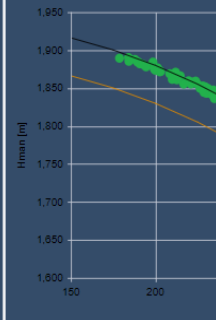
Pump LAB11

14.063 °C 3.0577 barg

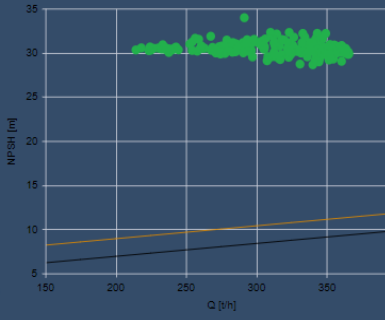
0 A

## Performance

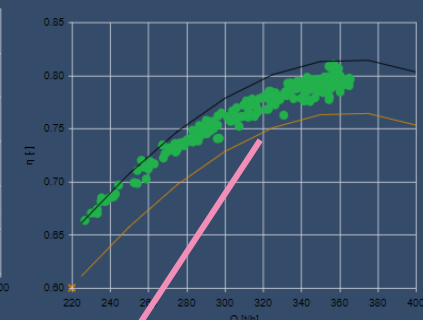
### Key Performance Indicators



## Cavitation



## Efficiency



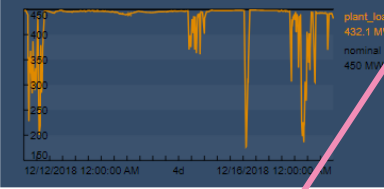
### Key Usage Indicators

	Since 01-01-2010	In Timerange
Running hours	18,490 h	95.92 h
Startups	145 count	0 count

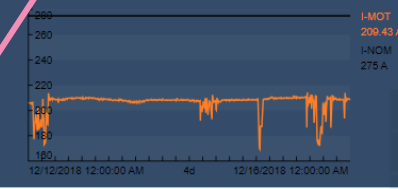
Starts 103.00 count

### Operational

#### Load



#### Current



### Event Frames

- EF mismatch Q steam meas & calculated 2018-11-30 10:55:00
- EF\_control\_valve\_curve 2018-12-10 13:45:00.000
- EF\_tightness\_of\_LCV 2018-12-11 09:25:00.000
- NPSH\_admissable 2018-12-21 15:50:00.000
- H\_man\_admissable 2018-12-21 15:50:00.000
- H\_man\_admissable 2018-12-21 16:25:00.000
- NPSH\_admissable 2018-12-21 16:25:00.000
- EF\_tightness\_of\_LCV 2018-12-24 12:04:32.513
- H\_man\_admissable 2018-12-24 13:30:00.000
- NPSH\_admissable 2018-12-24 13:30:00.000
- H\_man\_admissable 2018-12-24 13:30:00.000
- NPSH\_admissable 2018-12-24 13:30:00.000



# Use Case – Vibration Monitoring



RESTRICTED



INTERNAL



SECRET



# A journey through 40 years of vibration monitoring system @ Engie

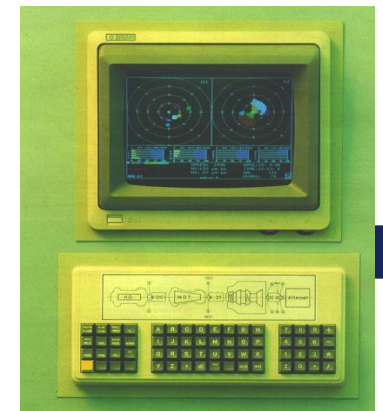
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# A journey through 40 years of vibration monitoring system @ Engie

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1985

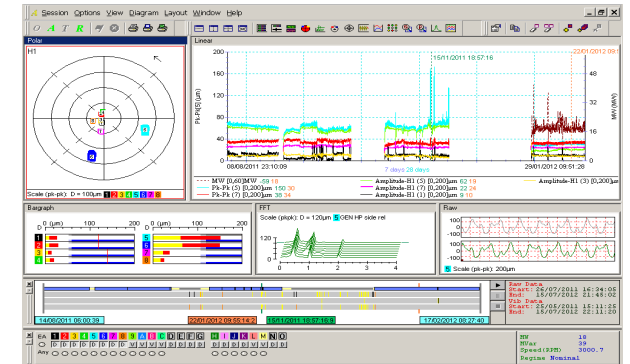
First monitoring System  
Installed in all Electrabel plants (Belgium)  
Local Storage and visualisation



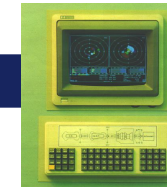
# A journey through 40 years of vibration monitoring system @ Engie

Introduction of first Laborelec Vibration Monitoring System  
Windows NT based  
Remote visualisation capabilities

## 2000



## 1985



Laborelec Vibration Monitoring System



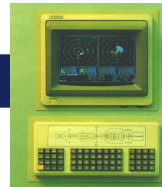
# A journey through 40 years of vibration monitoring system @ Engie

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# 2014

Mobile system for temporary missions  
Meanwhile the LVMS continuously  
monitors 80 shaft lines of ENGIE and thirds  
all around the world

1985



2000



# A journey through 40 years of vibration monitoring system @ Engie

2020

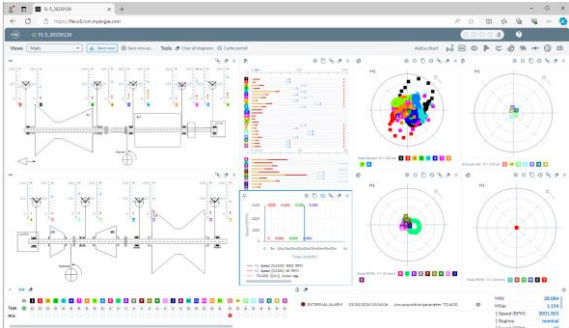
Renewal of hardware  
Software slowly becoming obsolete



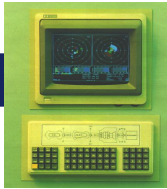
# A journey through 40 years of vibration monitoring system @ Engie

2024

Renewal of software  
Web based for live visualisation  
PI based for storage and analysis



1985



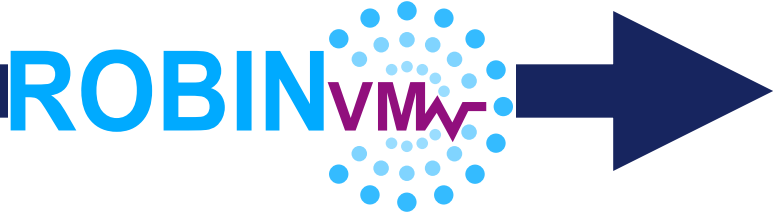
2000



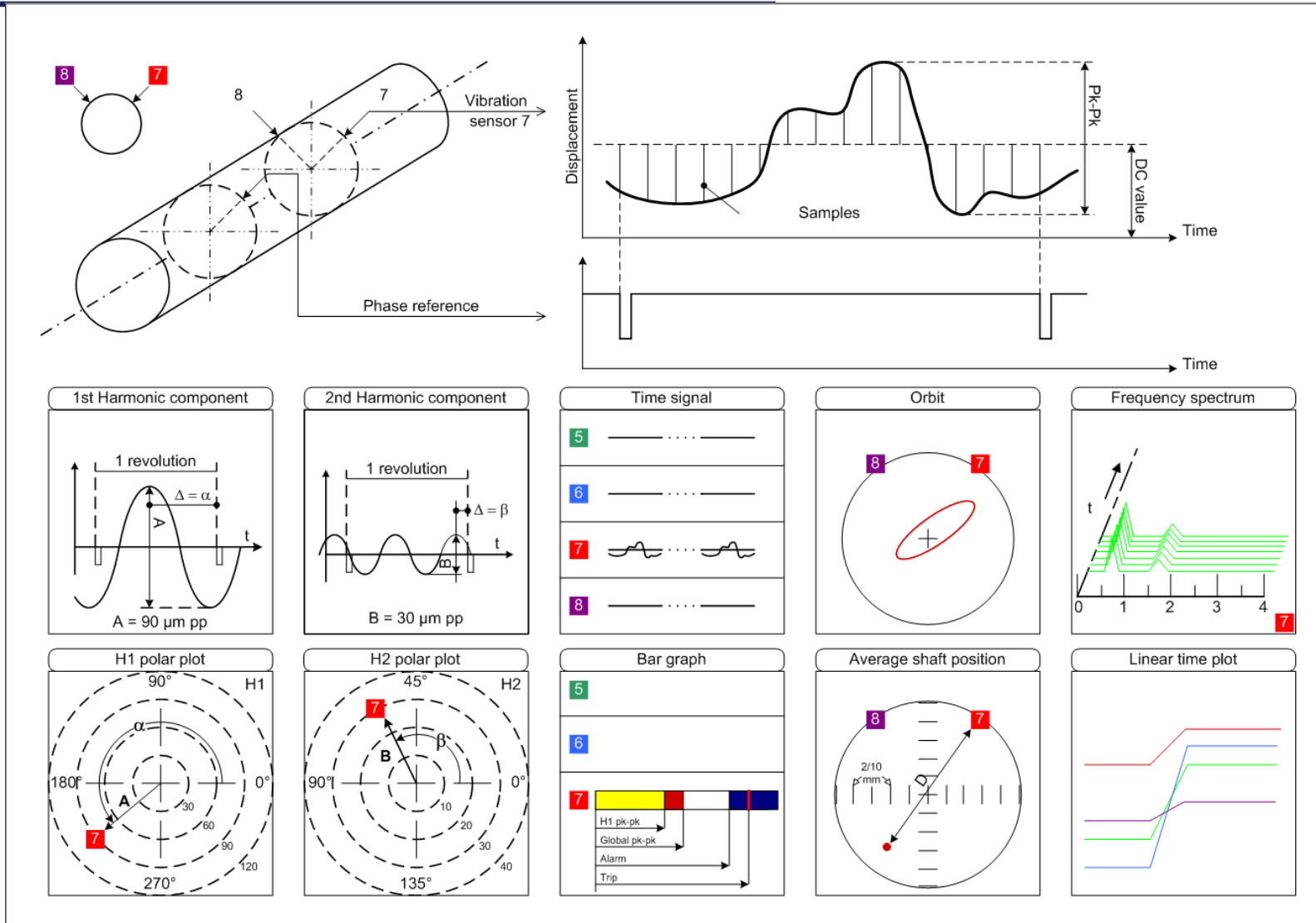
2014



2020



# What is needed for vibration monitoring for fluid film bearing



- Processed data:
  - Amplitude 1X and 2X
  - Phase 1X and 2X
  - Global value
  - DC value

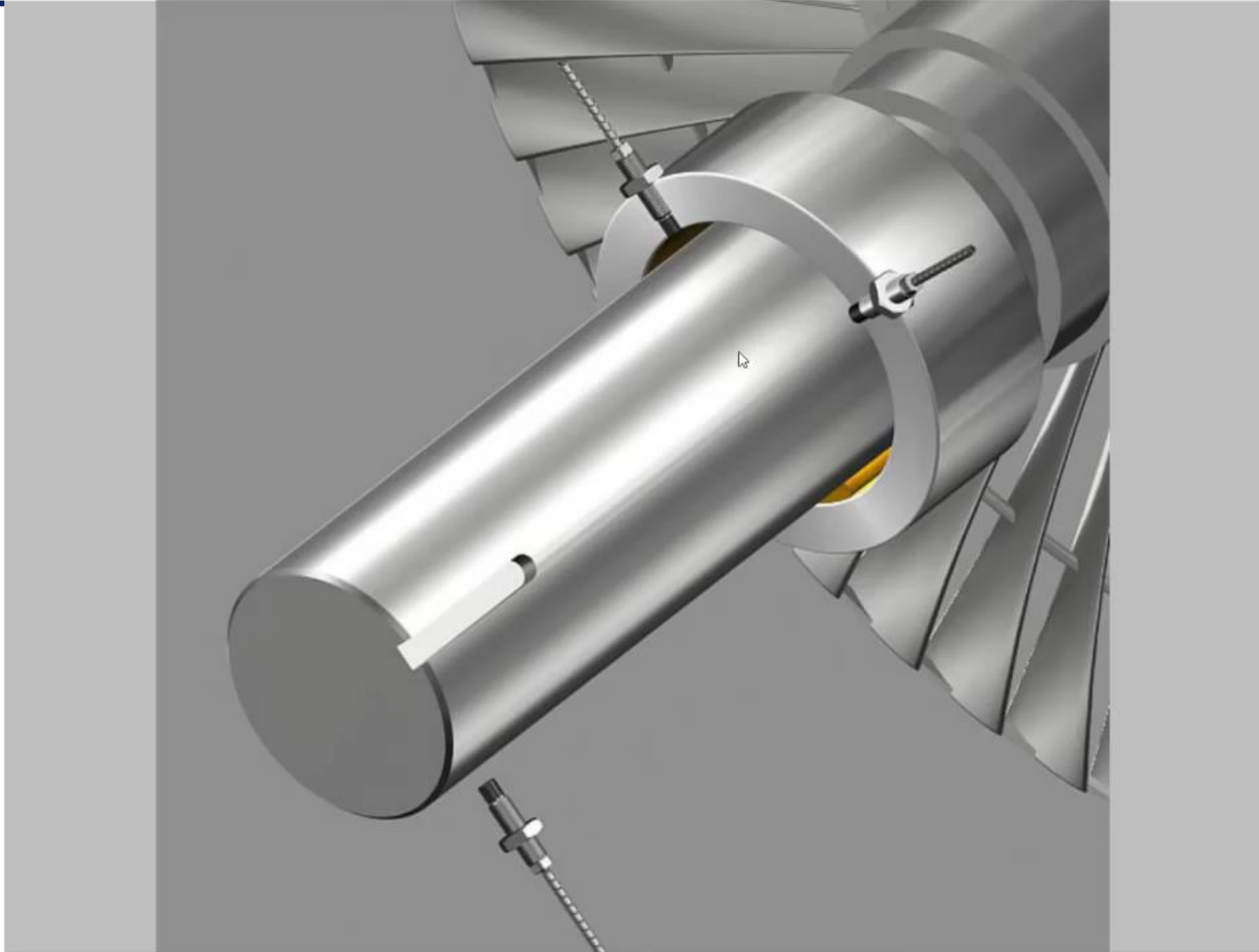
With those values, 90% of the vibration analysis is covered

Time signal needed for FFT and orbit, covering the last 10%

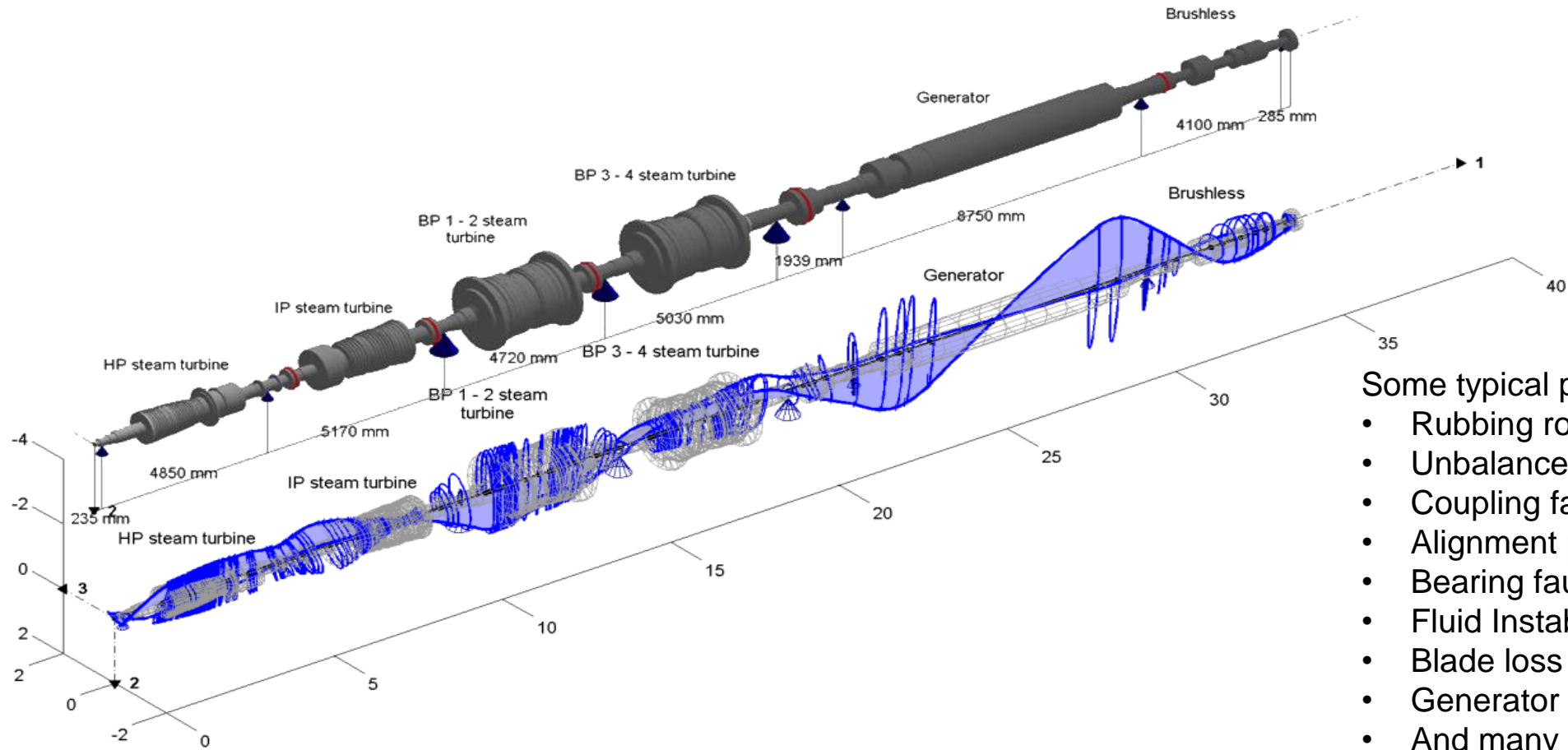


# Vibration monitoring

## How does that work?



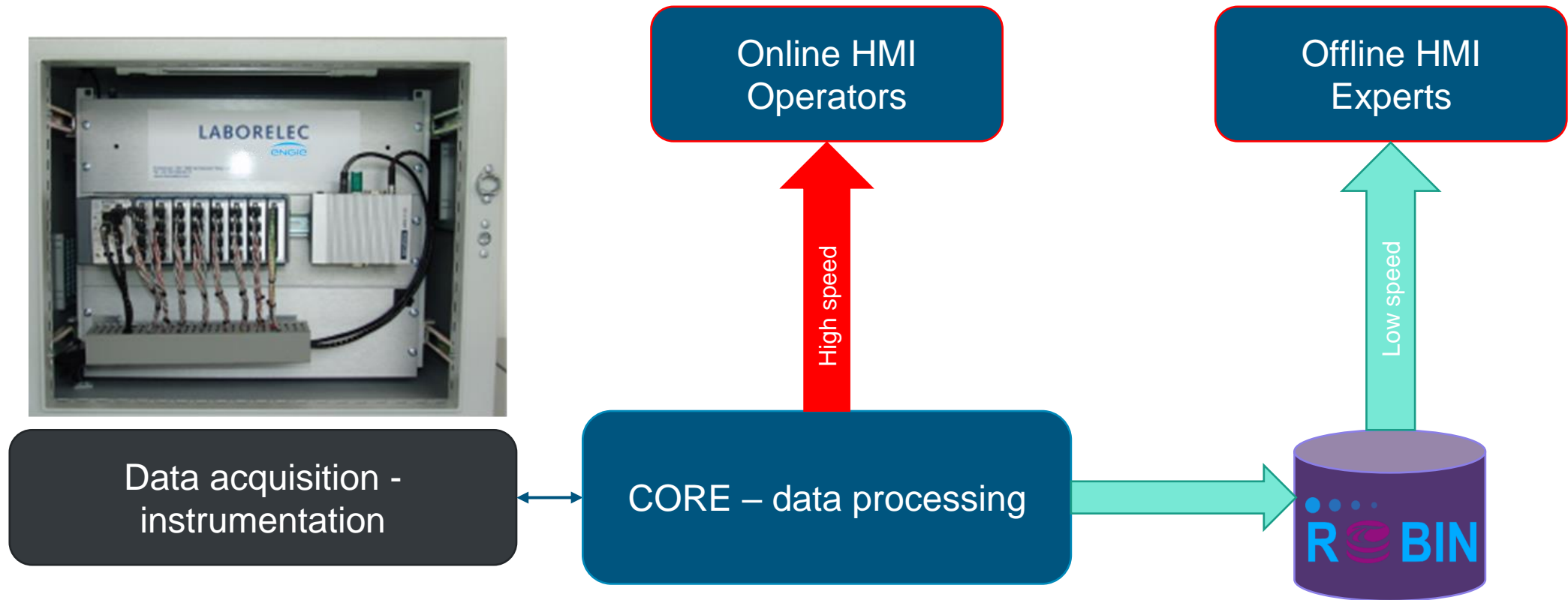
# Why a vibration monitoring system?



Some typical problems detected:

- Rubbing rotor-stator
- Unbalance
- Coupling faults
- Alignment problems
- Bearing faults
- Fluid Instabilities
- Blade loss
- Generator short circuits
- And many more...

# Special use case of PI/Robin: Vibration Monitoring







Timeline view showing a sequence of markers labeled 1 through P1. Below the markers, a detailed view of Regime AX1 is shown, along with AX2 and Relays. The Regime AX1 view includes a zoomed time range from 24/11/2019 08:51:53 to 24/11/2020 08:51:53. Markers are color-coded: Orange (24/11/2020 08:51:53) and Green (24/11/2019 08:51:53). A 'Regimes' filter is active. Search and zoom icons are present on the right side.

# Building use case on company wide data infrastructures

## Challenge

- Increase availability and performance of the assets
- Limit environmental impact of our activities
- Valorize output streams

## Solution

- Implement a company wide AVEVA™ PI System™ as a Software As a Service for Engie entities

## Results

- **Deployed AVEVA™ PI System™ for > 200 assets and 720 000 tags**
- **Implemented company wide use cases**
- **Developed new vibration monitoring system**





[engie.com](http://engie.com)

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