



# Bently Nevada Online Varlık İzleme Çözümleri ve Endüstride Dijitalleşme





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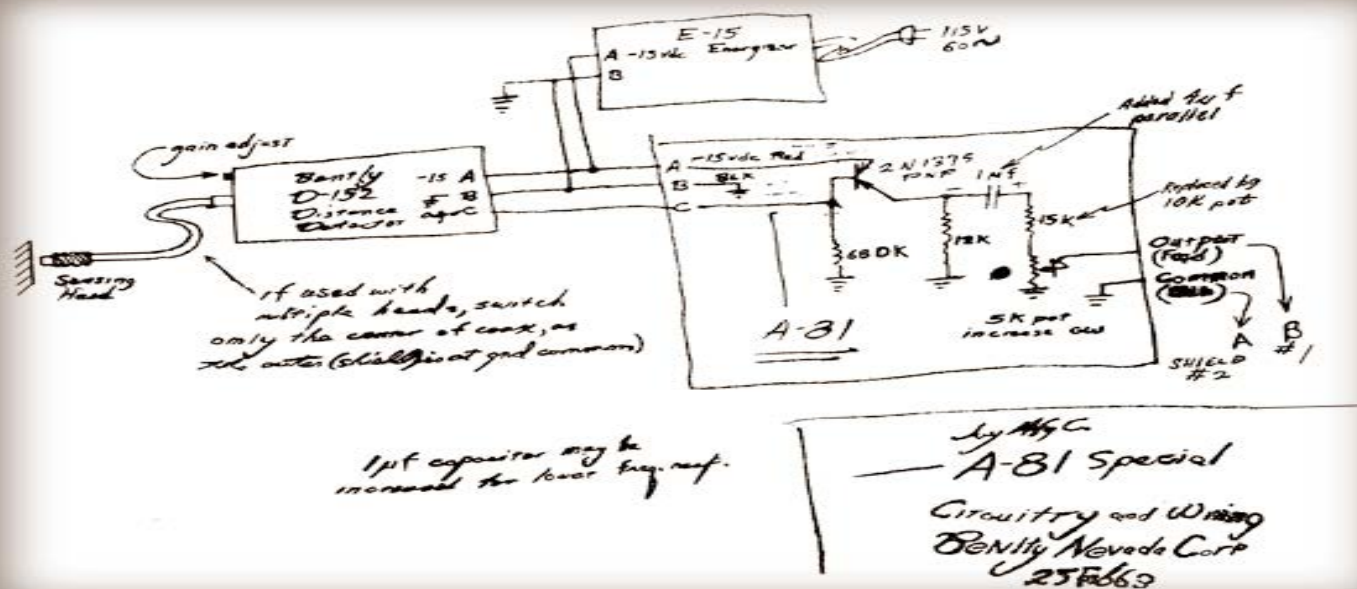
03.05.2024

# Baker Hughes

## Baker Hughes Partnerships

-  Panametrics since 2008
-  Bently Nevada since 2016
-  Druck since end of 2017
-  Reuter Stokes since end of 2021

# 1955 Where it all began...



# Bently Nevada Monitoring Systems – Historical Perspective

S1

**BN Pioneered**

**1700 Series**

**7200 Series**

**3500 Series**

**Orbit 60 Series**

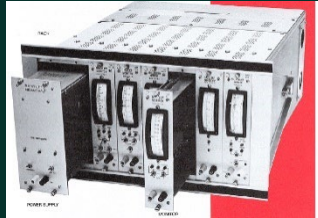
**Proximity Probes**

1973-1998

1975-2003

1995/2000-Future

2020 – Future



★ 85,000 Racks Installed Globally



1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2017 | 2020 | 2025 | 2030+

**5000 Series**

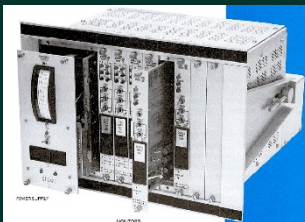
**9000 Series**

**3300 Series**

1966-1996

1974-2001

1988-2014



- Int. barriers, new P/S
- /93 Display, +position
- M Series Monitors
- New TDI +recip.
- Haz. Gas, Multi -mode
- 3500/50 improvements
- /50M +16 chan. temp
- 3500 SIL Improvements
- Motor Monitoring
- New Dynamic Pressure
- RoHS Refresh, + Profinet
- New 3500/94M Display
- TDI Refresh

3500 Updates



# Bently Nevada

## We are asset protection and condition monitoring

### A Horizontal solution provider for:

- ✓ Condition monitoring and protection devices
- ✓ Advanced analytics and software solutions
- ✓ Industry leading services, machinery diagnostics, and technical support

### Quick facts

- 9 facilities in nine countries
- 53 technical training centers worldwide
- 60 over 60 years of innovation
- 600+ patents
- 1,200+ System 1 customers worldwide
- 10,000 overspeed detection systems sold since 1994
- 32,000+ protecting over 32,000 wind turbines globally
- 100,000+ rack monitoring systems installed globally
- 6,000,000+ installed sensor monitoring points



# MDS Team Delivering Continuous Operational Excellence

**18000**  
Successful  
MDS  
PROJECTS

**5000**  
REACTIVE  
JOBS  
since 1993

**1250** years  
Cumulated with MDS  
9 years in average

**320**  
Supporting  
Services  
AGREEMENTS

**140**  
Machinery  
DIAGNOSTIC  
ENGINEERS

**10**  
Services  
REGIONS

**53**  
Technical  
TRAINING  
Centers

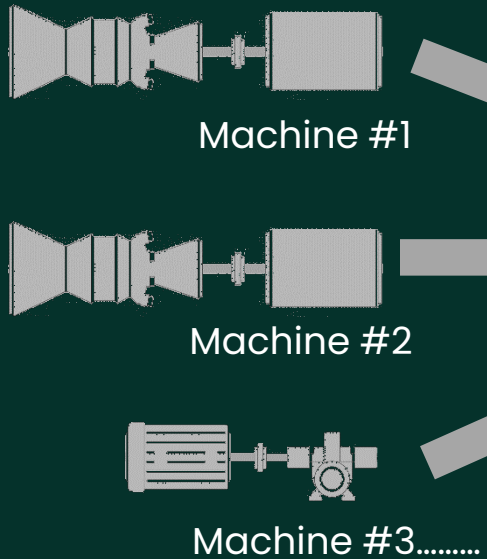




# Orbit 60

Control System / DCS

High channel density, connect multiple machines



Bi-direction control system communication, capturing High Speed Process Data

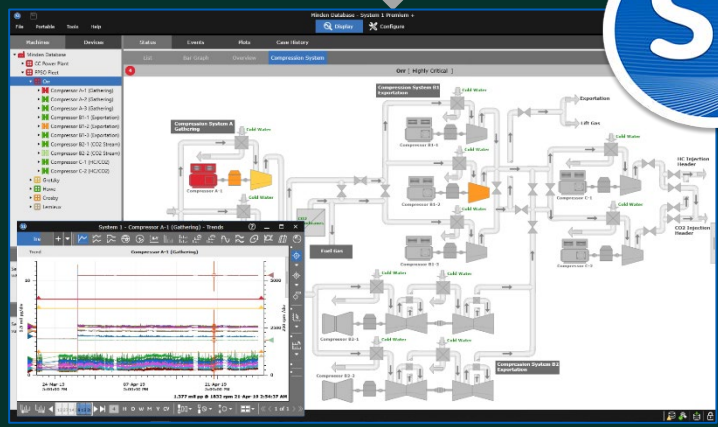


Direct connection to business network

Built-In Cyber Security- Isolation between Condition Monitoring & Protection



No Keyphasor Limitations, Connect Multiple Existing Racks into a Single Architecture



Flexible Deployments



Extend the Digital Backplane through Bridge Modules



Expand to Remote I/O, Reduce Field Wiring Lengths

Note: Dedicated Bridge Module required for each base connection



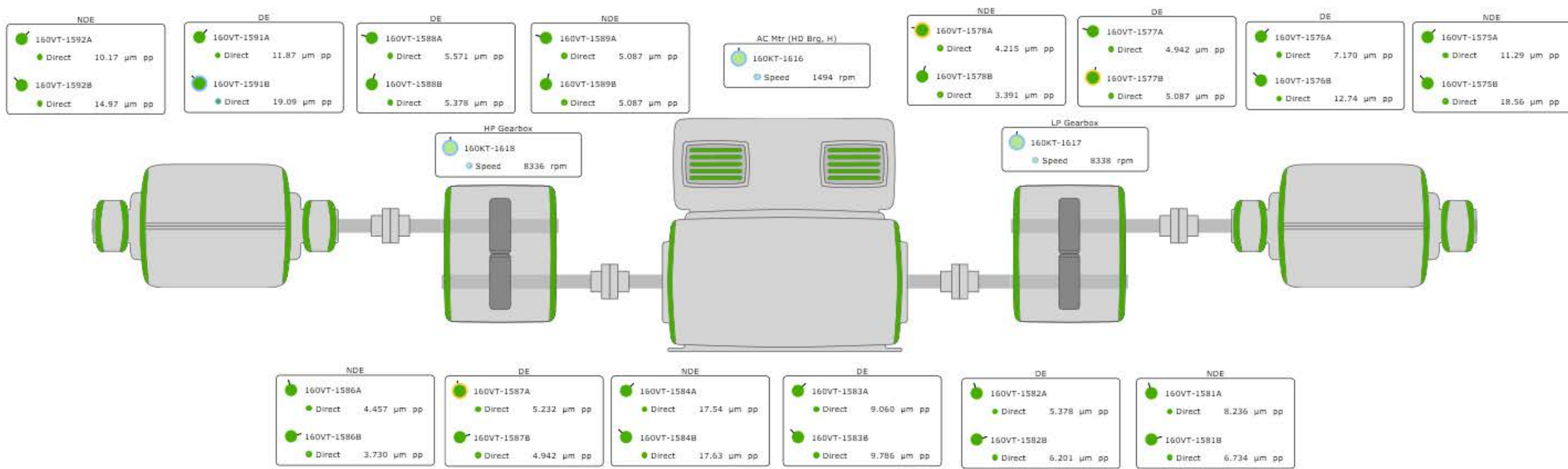




# Cordant™ Asset Health

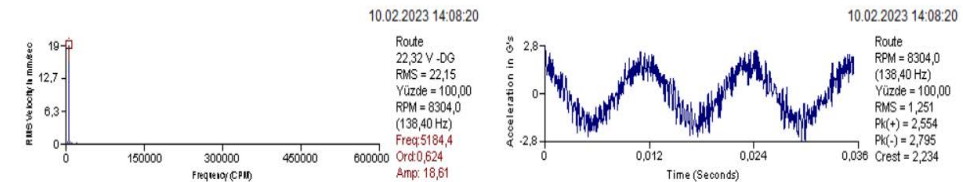
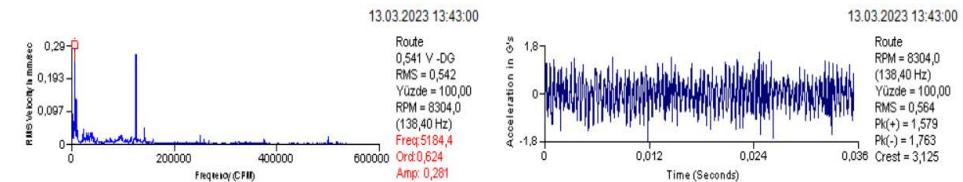
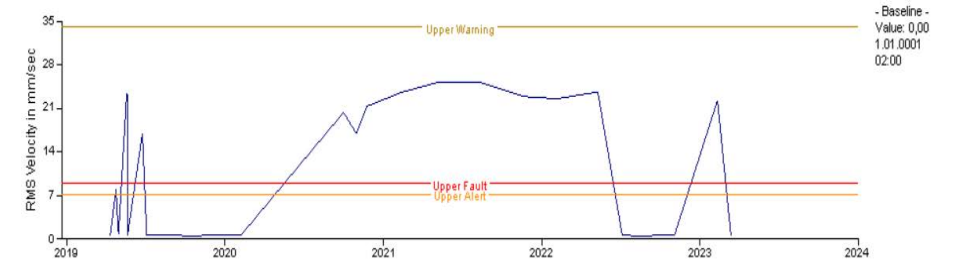
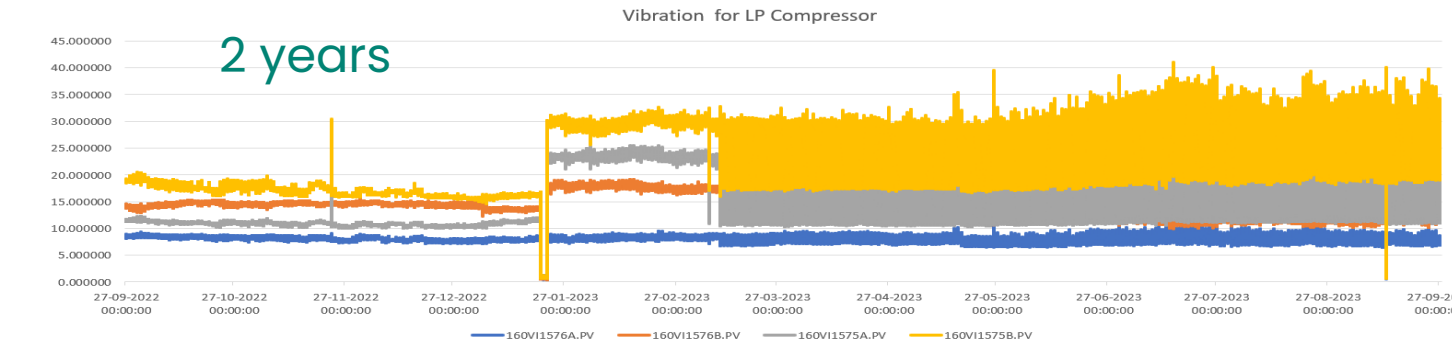
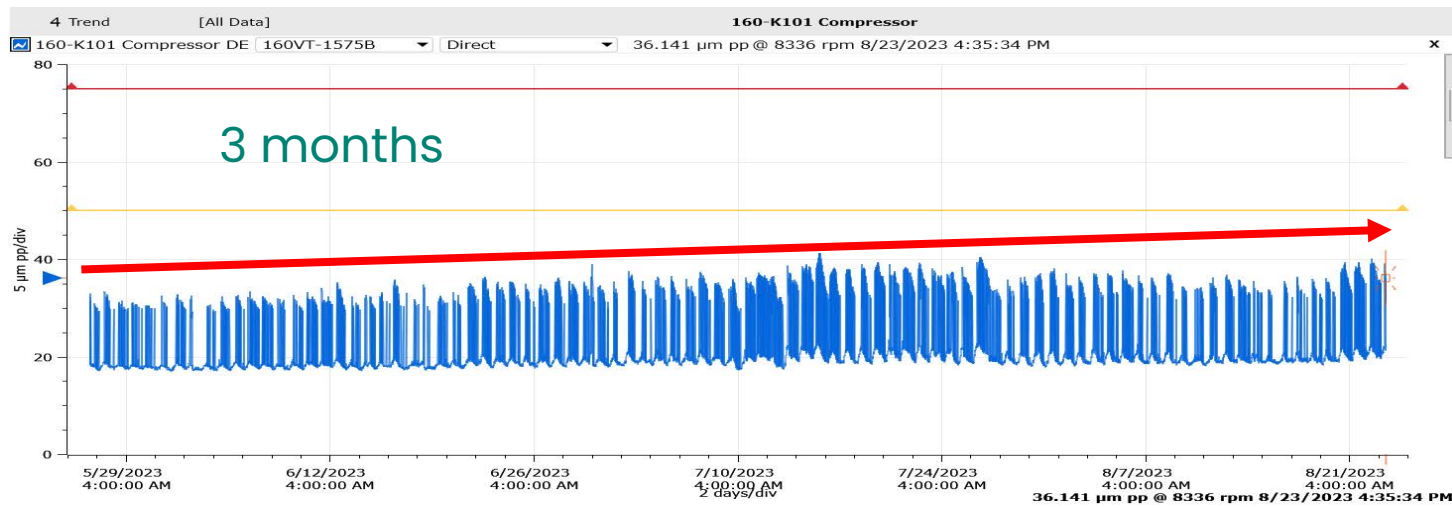
# Introduction of System 1 capabilities

Unit consist from main Electric Motor, two gearbox and two compressors of High and Low Pressure (From left to right). Low speed shaft – 1500 RPM, high speed shaft – 8340 RPM. Bearing clearance at compressor – around 150  $\mu\text{m}$ .

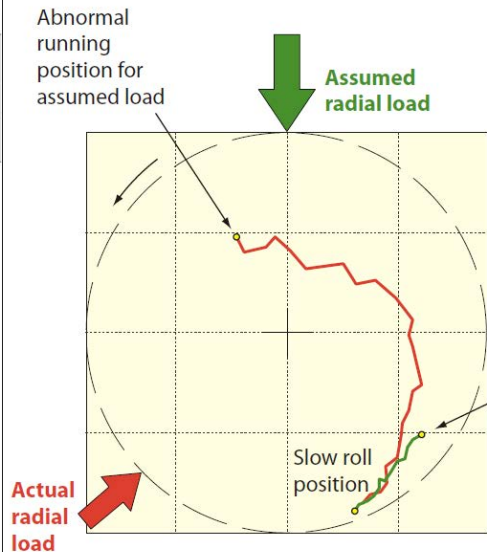
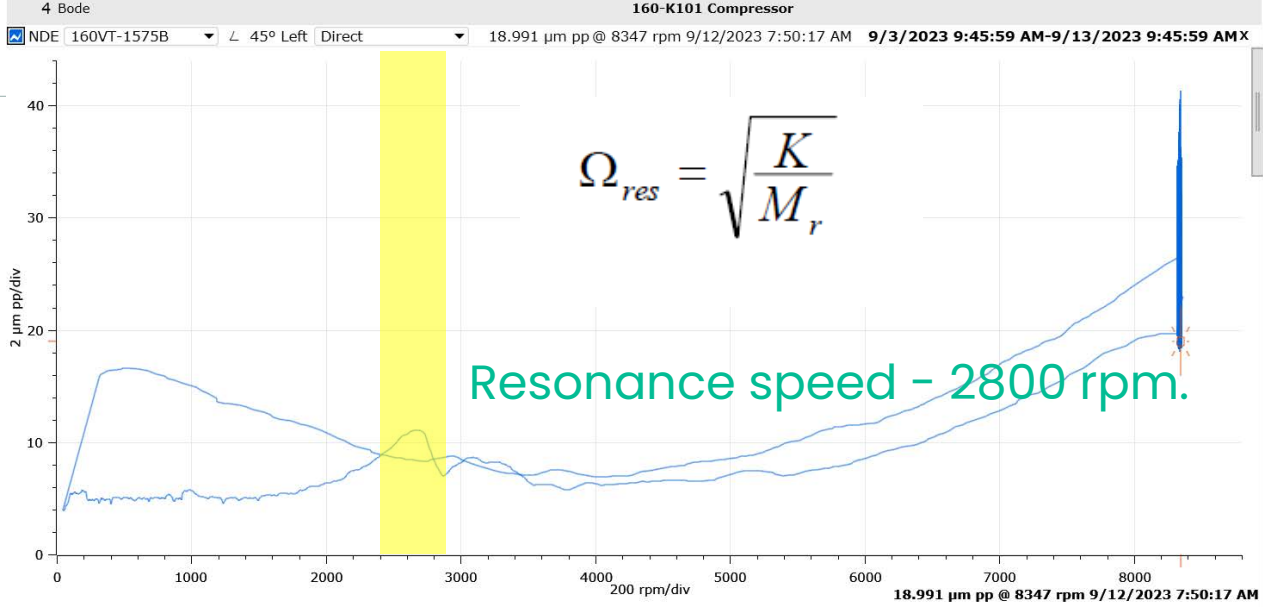


# Findings – LP Comp NDE. Overall vibration jumping

Jumping radial vibration on NDE LP compressor bearing and slowly trend of vibration rising up. At the same time we see high case vibration – 22 mm/s

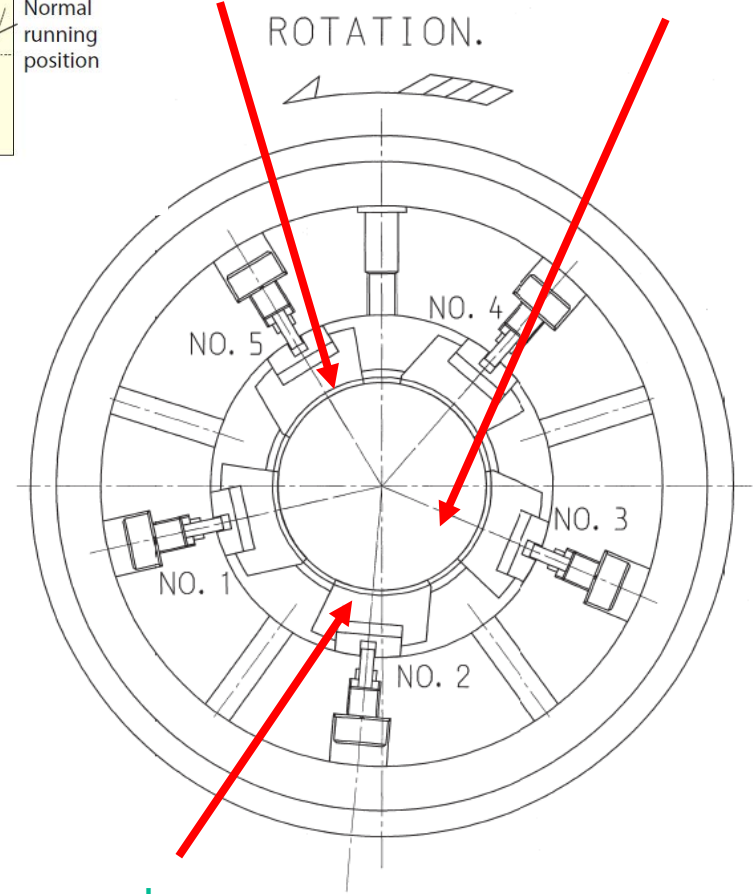




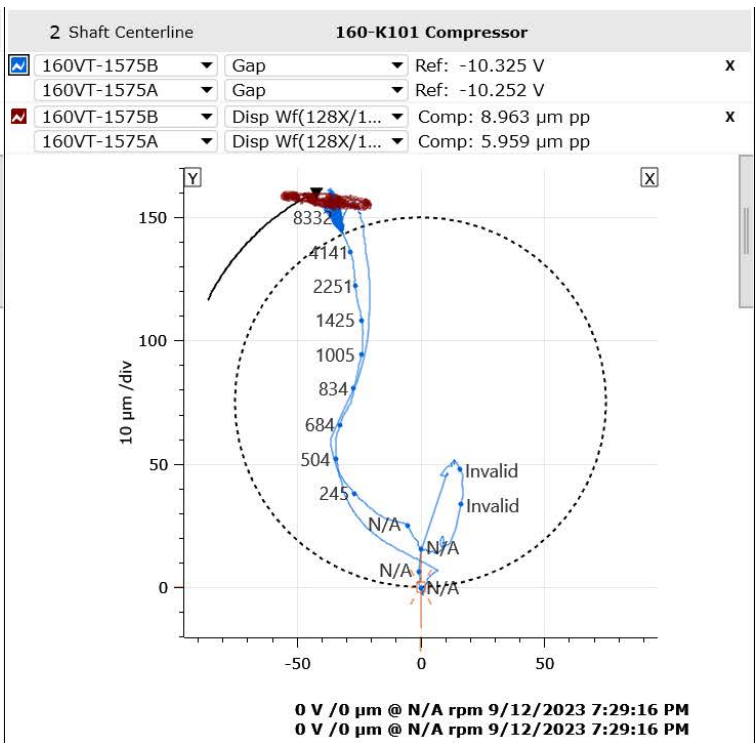
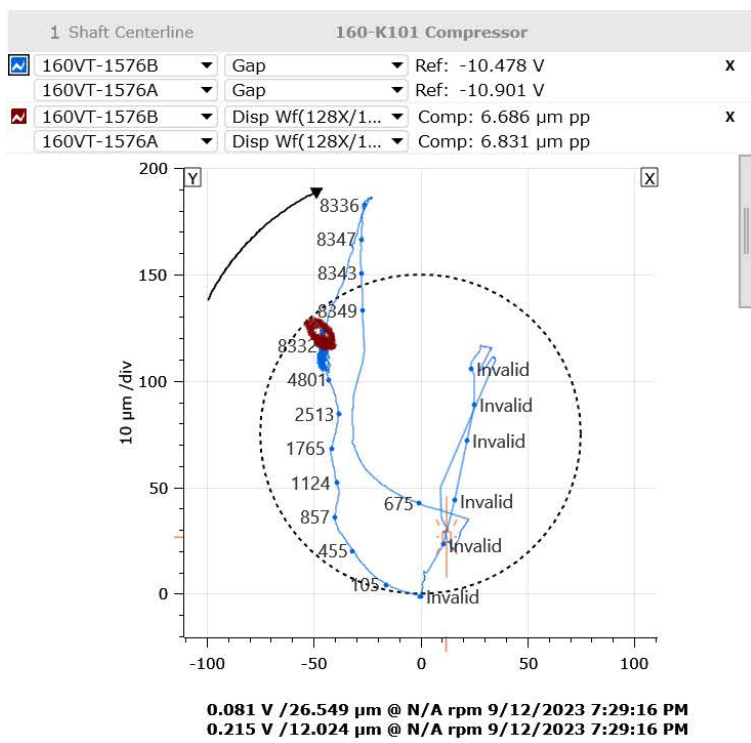


Where shaft really work

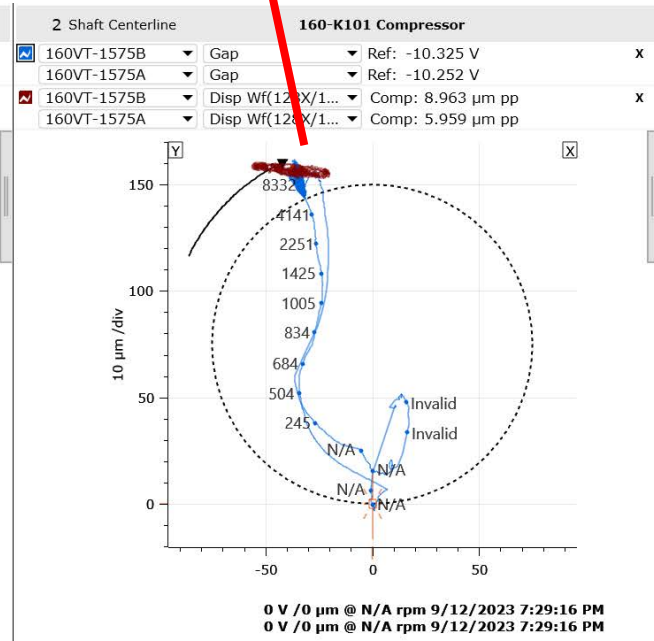
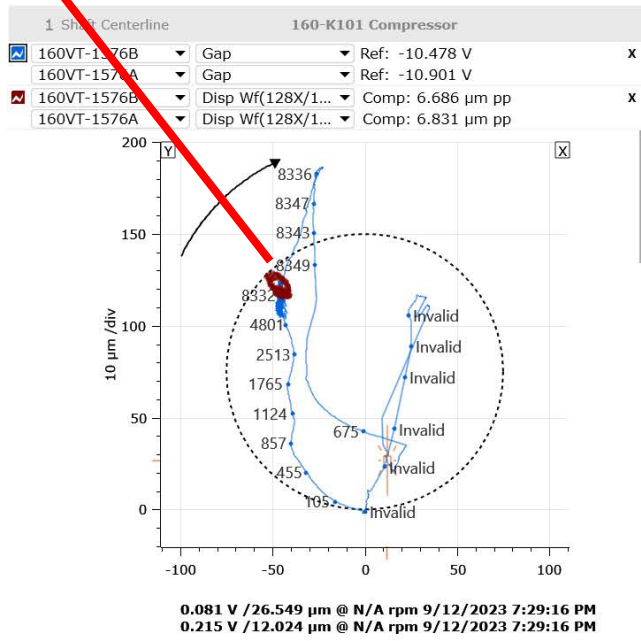
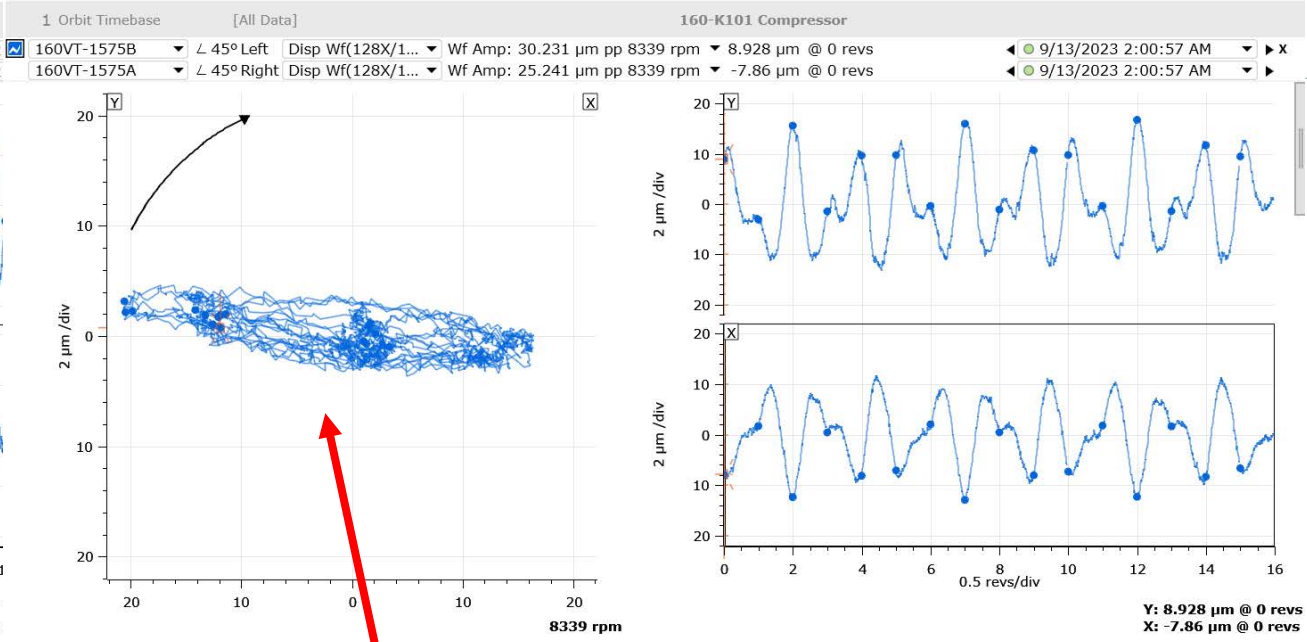
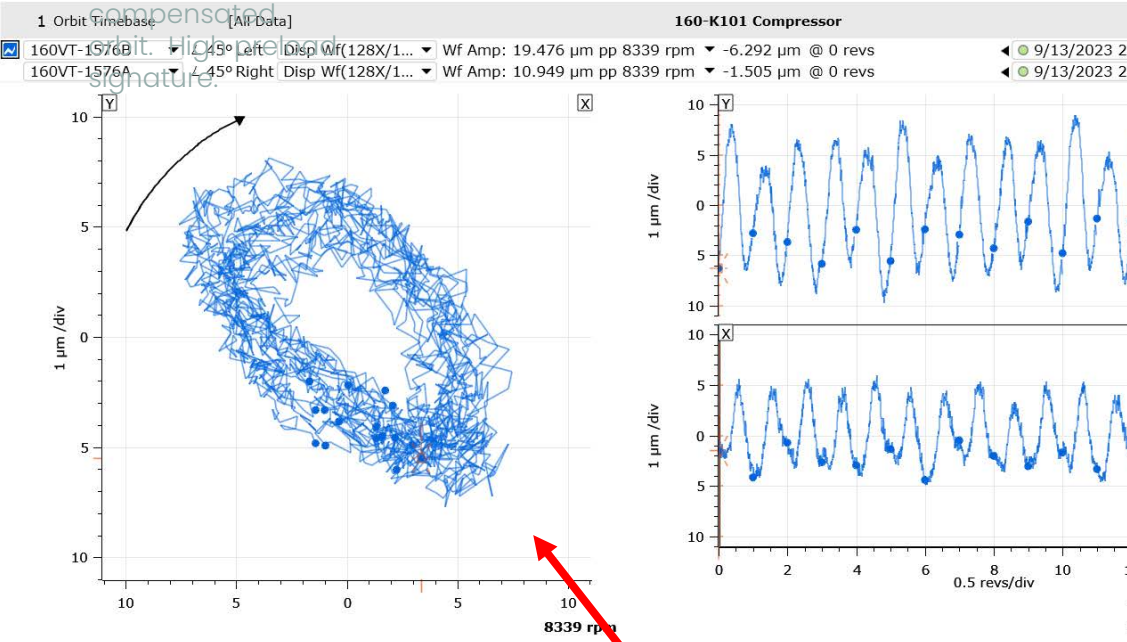
Where shaft must work



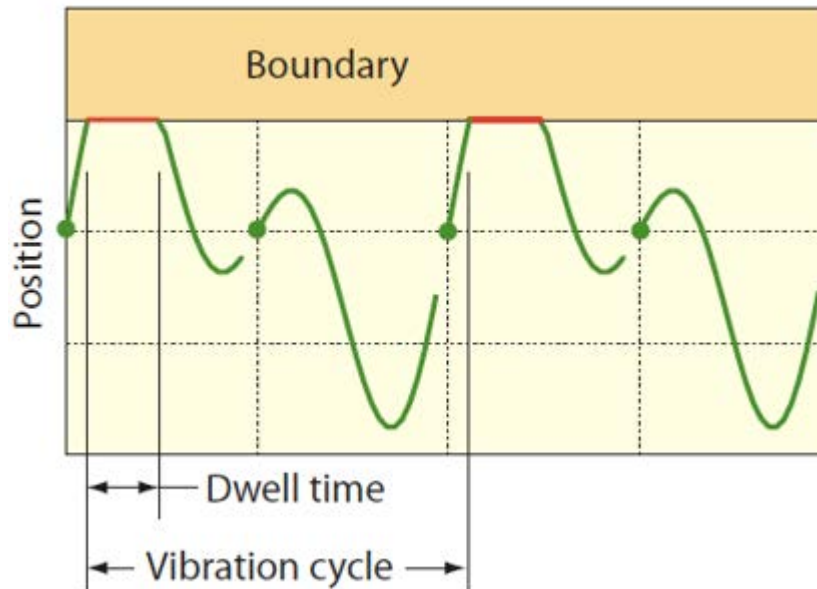
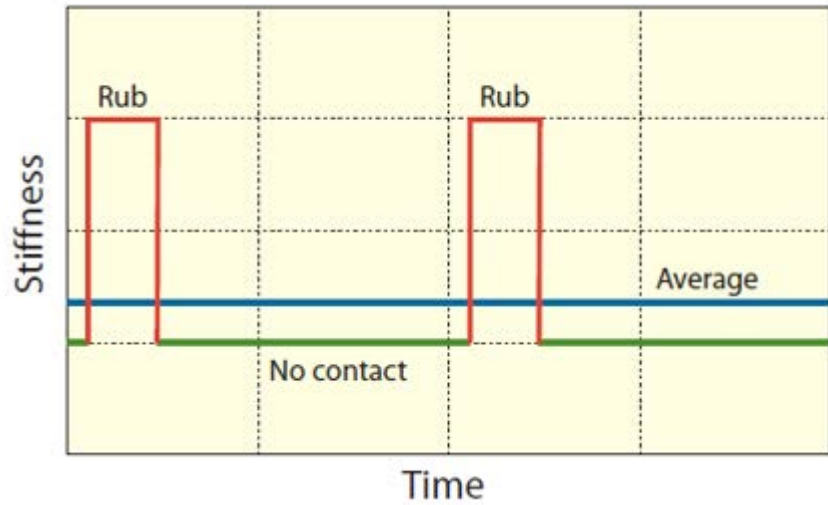
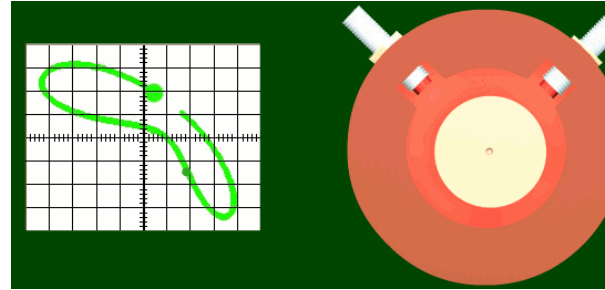
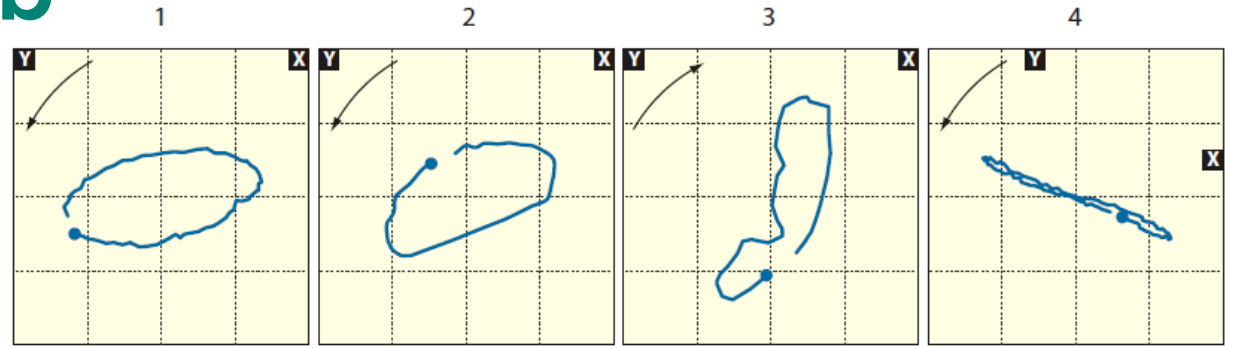
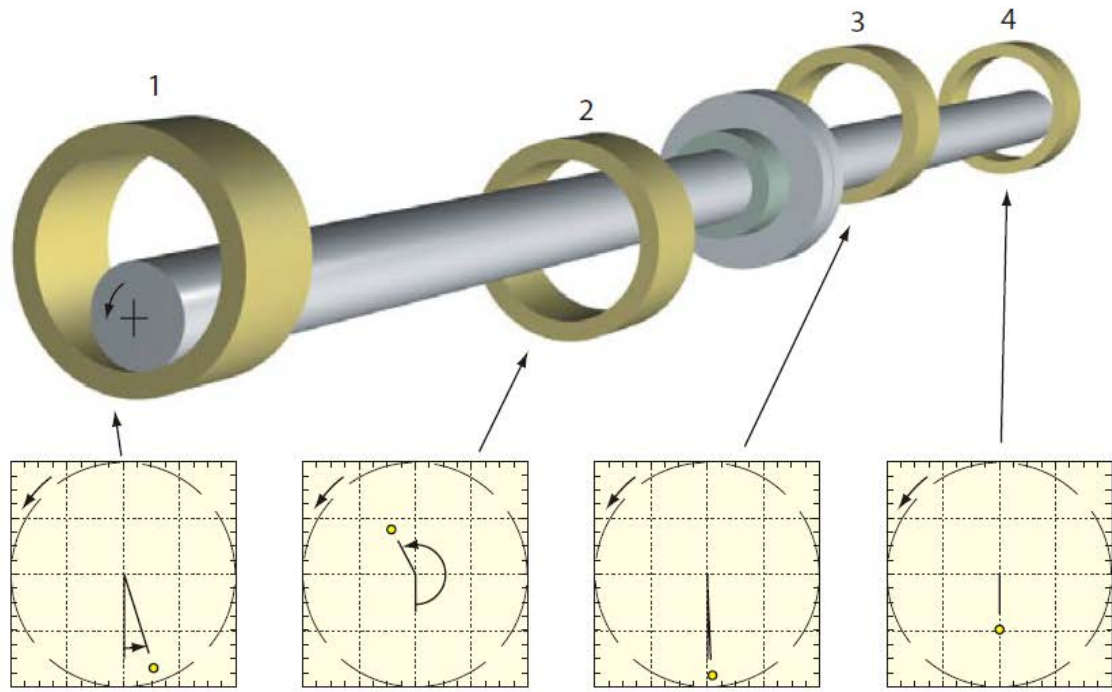
Temperature transducers



High - elliptical orbit. High preload signature.



# Description of preload and rub





## CHALLENGES

Making timely and accurate maintenance and operational decisions

across a fleet of equipment and machinery

Delivering measurable asset health management outcomes

across install-base of existing monitoring technology

Quantifying return on investment

with a shifting model from CapEx to OpEx and aaS

## CAUSES

Fragmentation

High volume of disparate datasets from hundreds to thousands of geographically distributed assets

Alarm fatigue

Too many alarms, too few resources, resulting in noise and fallback to reactive firefighting

Stakeholder and toolset silos

No single source of truth, driving inefficiencies in priority assessment, collaborative action management, and business impact evaluation

Diminishing experienced workforce

Knowhow exit and resource constraints, leading to a loss of asset knowledge that was never digitally captured or transferred

## IMPACT

Monitoring to failure

Due to too many alarms and a lack of enabled resources

Inability to prioritize mitigation

Due to lack of visibility on comparative operational and business impact

Unexecuted maintenance or repair

Due to lack of connection between asset health monitoring and work execution processes



Health & safety



Cost of asset care



Availability & Uptime




👤 EnerTech

 **EnerTech**

|              |     |
|--------------|-----|
| Total Sites  | 15  |
| Total Assets | 686 |

Aug 3, 2023  
🕒 1 minute ago ...

Asset Health

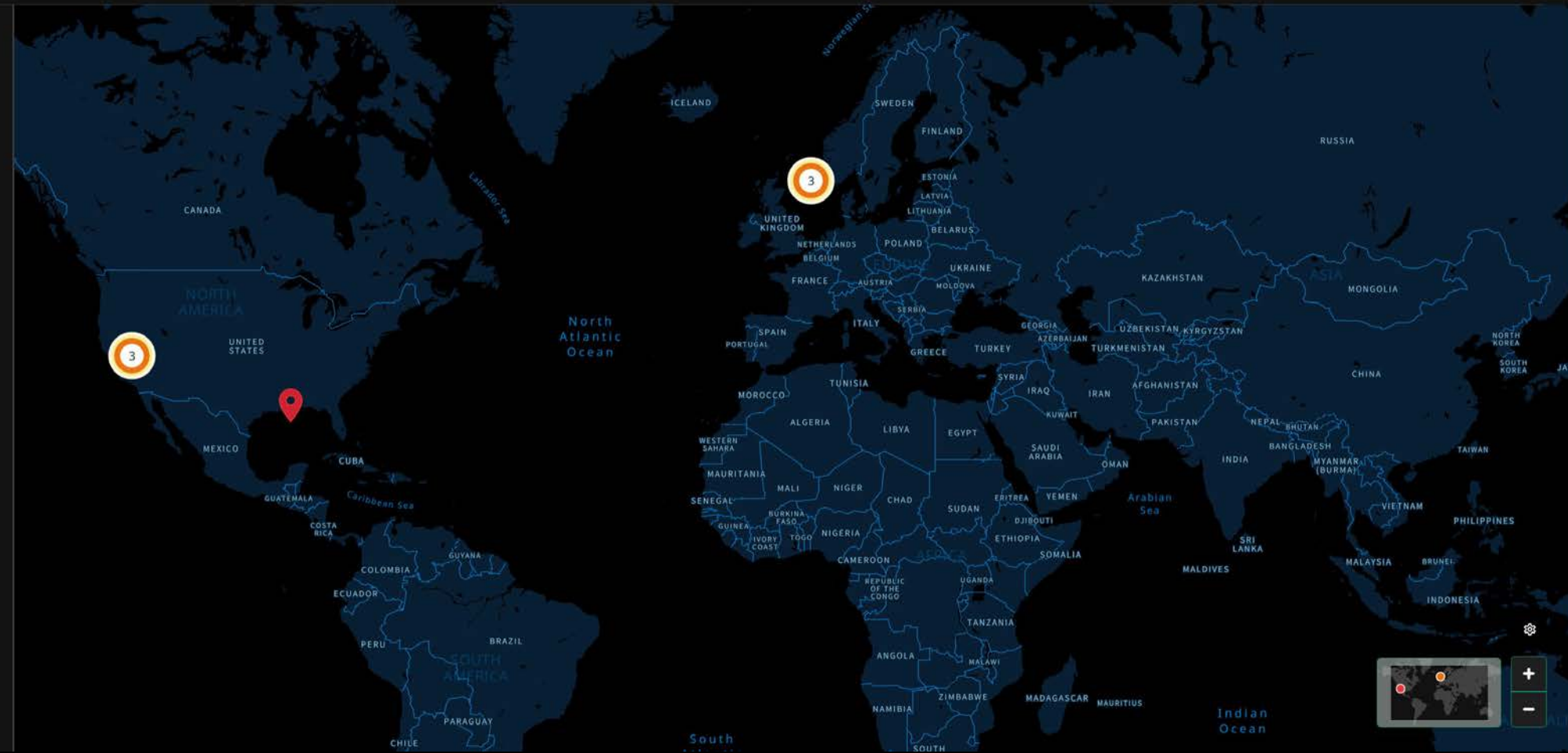
-  Intervene > **1**
-  Schedule > **11**
-  Monitor > **92**
- History ▾

Work Management

**50 (58)**  
Cases

**\$ 112K**  
Cost Avoidance

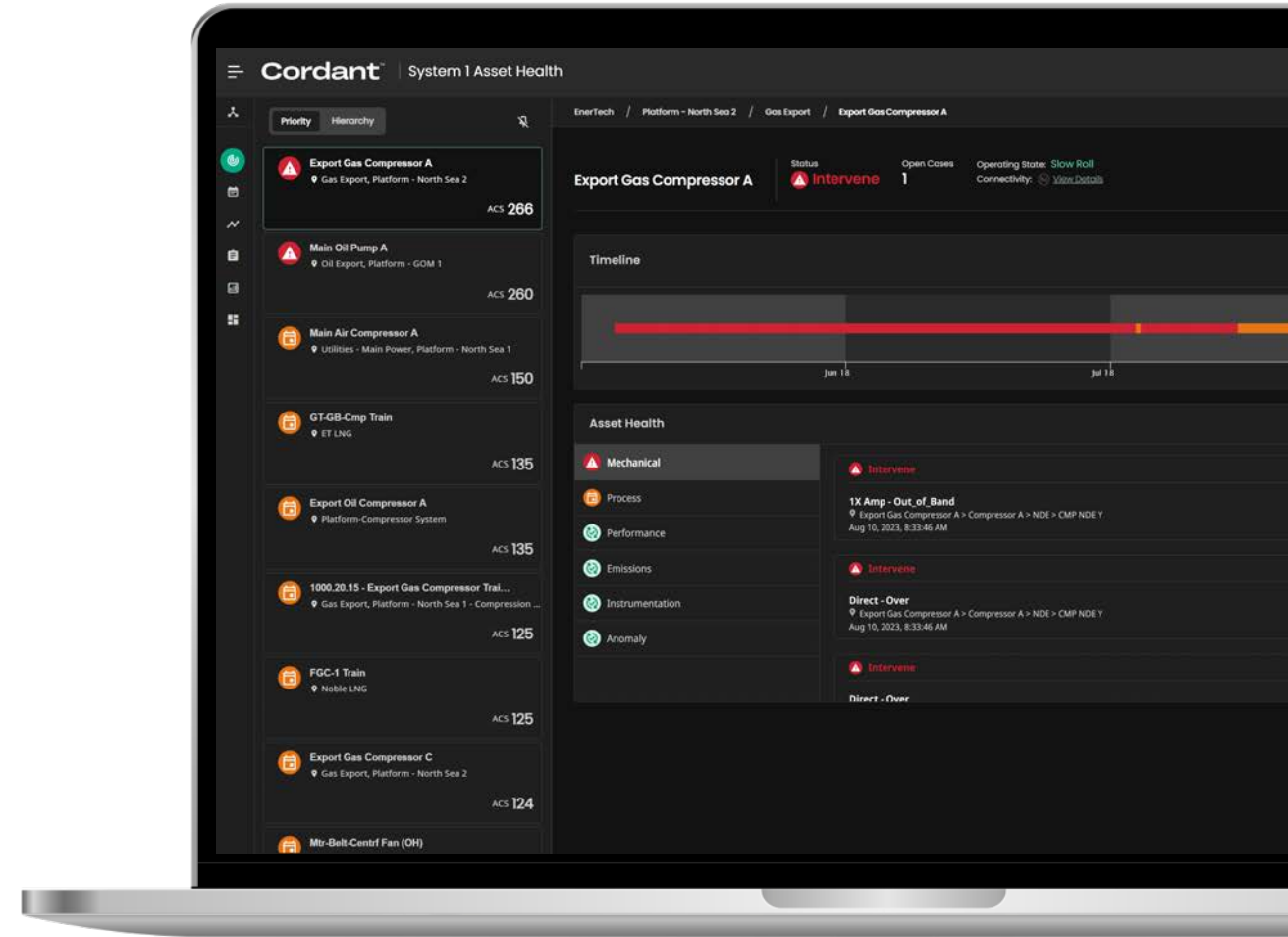
**2Days**  
Time to Action



# Cordant Asset Health built on System 1 Include physics rules and anomaly detection

Connects vast quantities of disparate asset health data from individual machines and equipment, sites, and systems into a streamlined action-oriented workflow to:

- Mitigate failure and unplanned downtime
- Optimize the cost of asset care
- Quantify return on investment



We've got you covered.



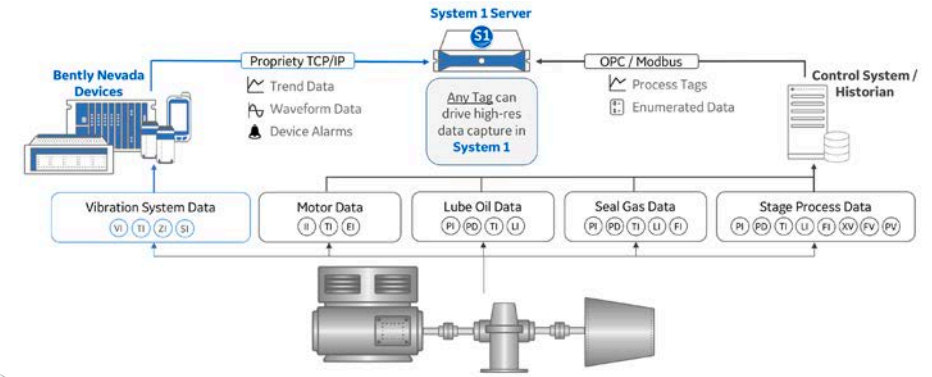
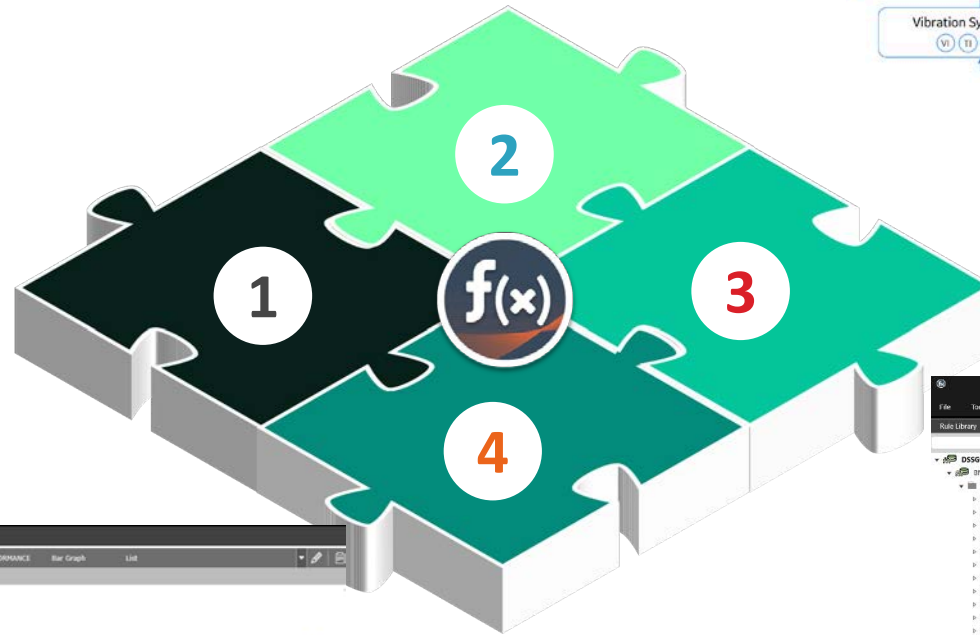
# Expert Rule Based Analytics

## 1 Configured Properties

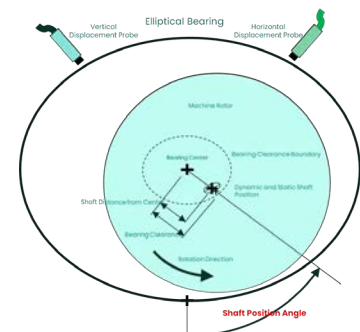
- Bearing Clearance.
- Probe location.
- Design Speed.
- Critical speed.
- Max Exhaust temperature.
- Max allowable pressure drop.
- .....

## 4 InsightPak

## 2 Measurements



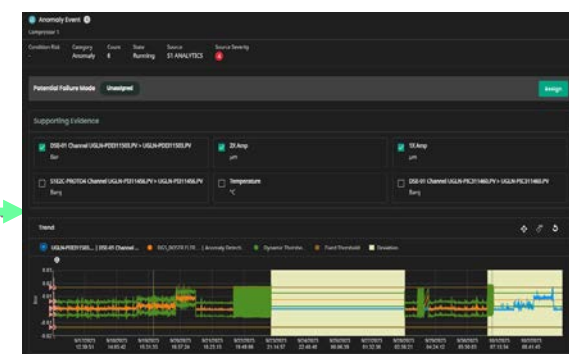
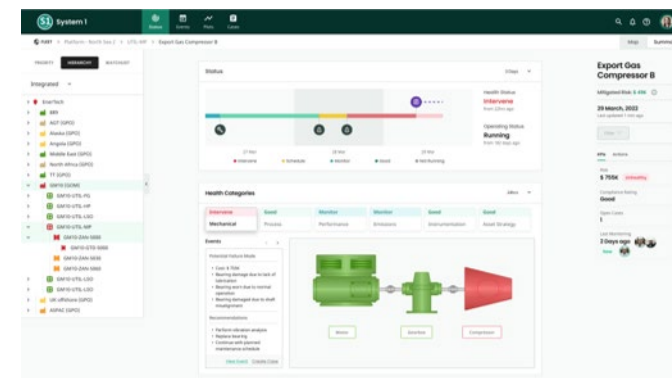
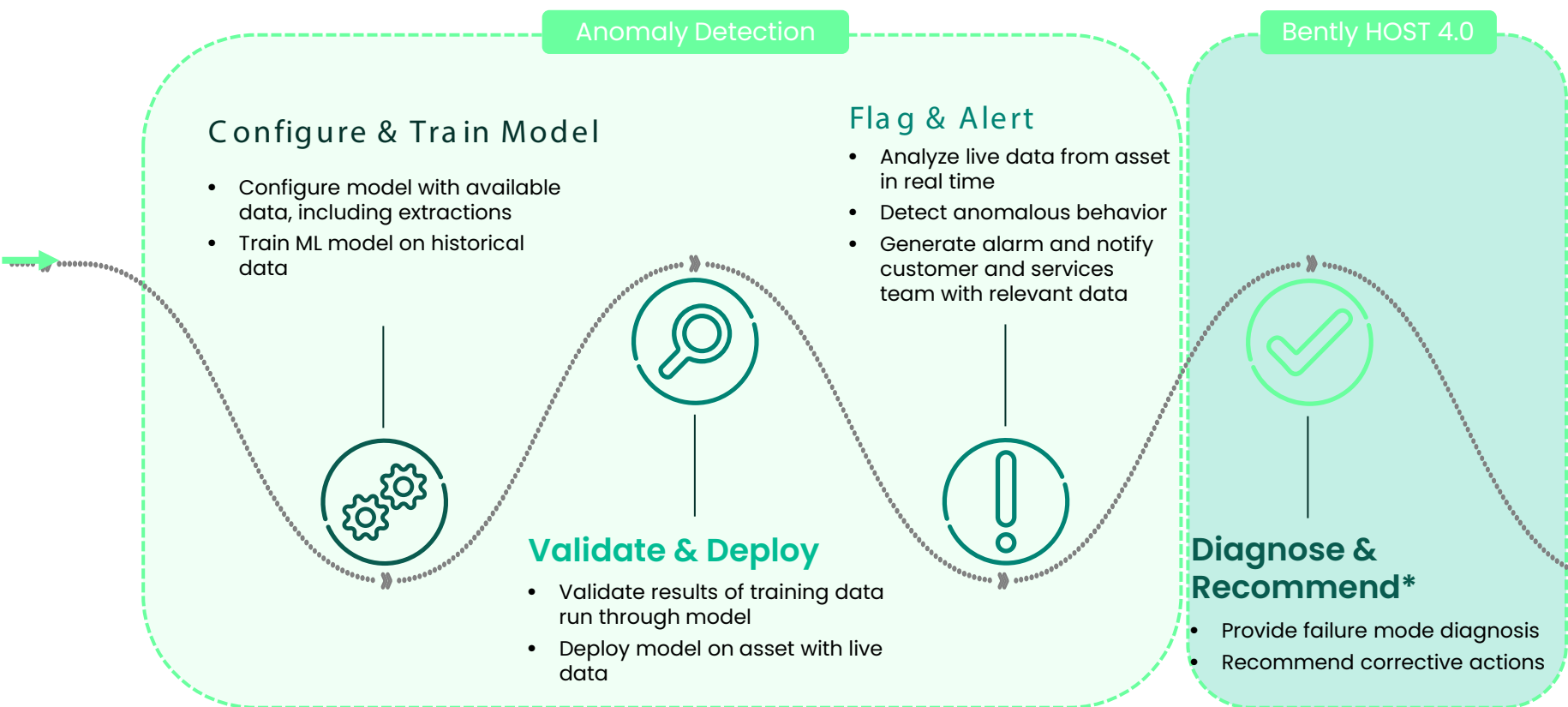
## 3 Extractions



# AI/ML Based Anomaly Detection Analytics

Bently Nevada’s organic anomaly detection solution detects significant changes in an assets’ operating condition which could lead to potential failures. The advanced technique uses multi-variate modeling to identify anomalies against the normal and expected behavior of machines.

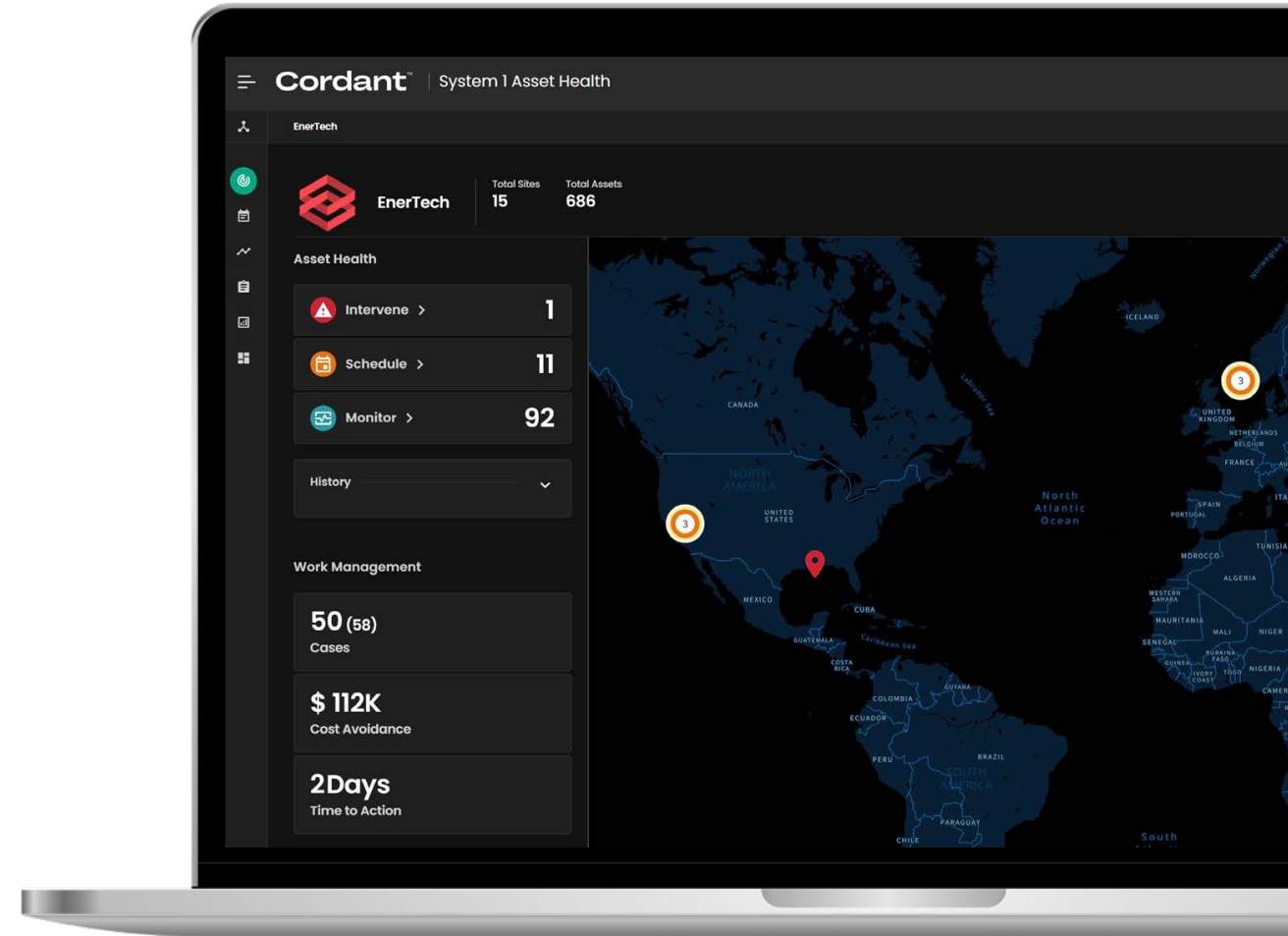
The solution is coupled with Bently Nevada’s experienced RM&D services to provide a full-scale solution for detecting anomalous behaviors and diagnosing failure modes.



# Manage via action workflow

Leverage co-pilot insights approach for action-oriented focus area advisories

- Engage based on intelligent rationalization: intervene, schedule, or monitor
- Utilize profiling to allocate areas of responsibility across a global team
- Leverage notification plans to drive by-exception asset management

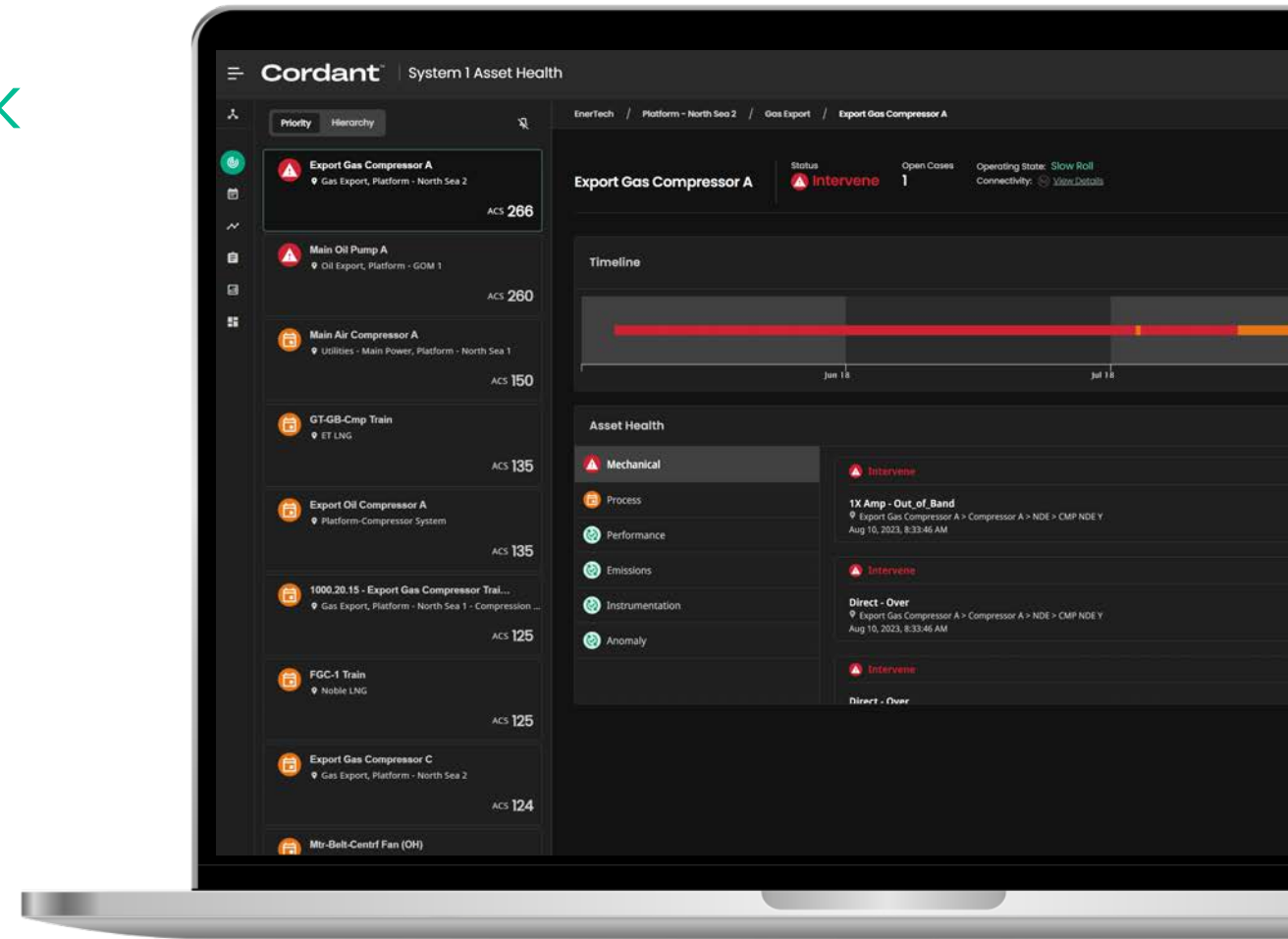




# Prioritize by condition score/risk

Leverage autonomous real-time ranking of assets by health KPI(s)

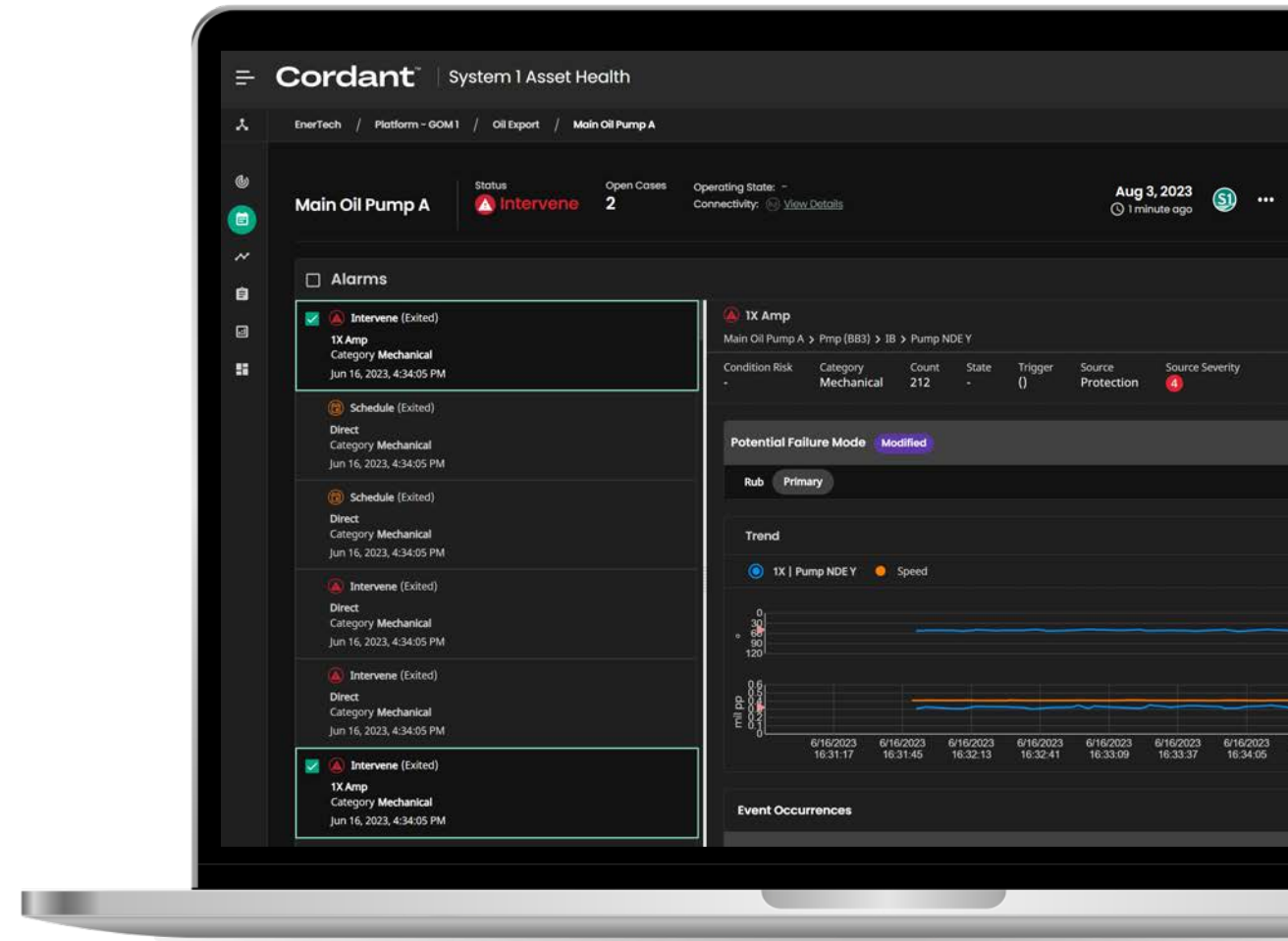
- Prioritize assets across the fleet via pre-defined KPIs
- Create your own Analytics/KPIs for customized asset prioritization
- Quickly navigate to high priority assets to verify insights through first line analysis



# Analyze and collaborate

Utilize first line analysis tools, failure mode advisories and leverage expertise across teams

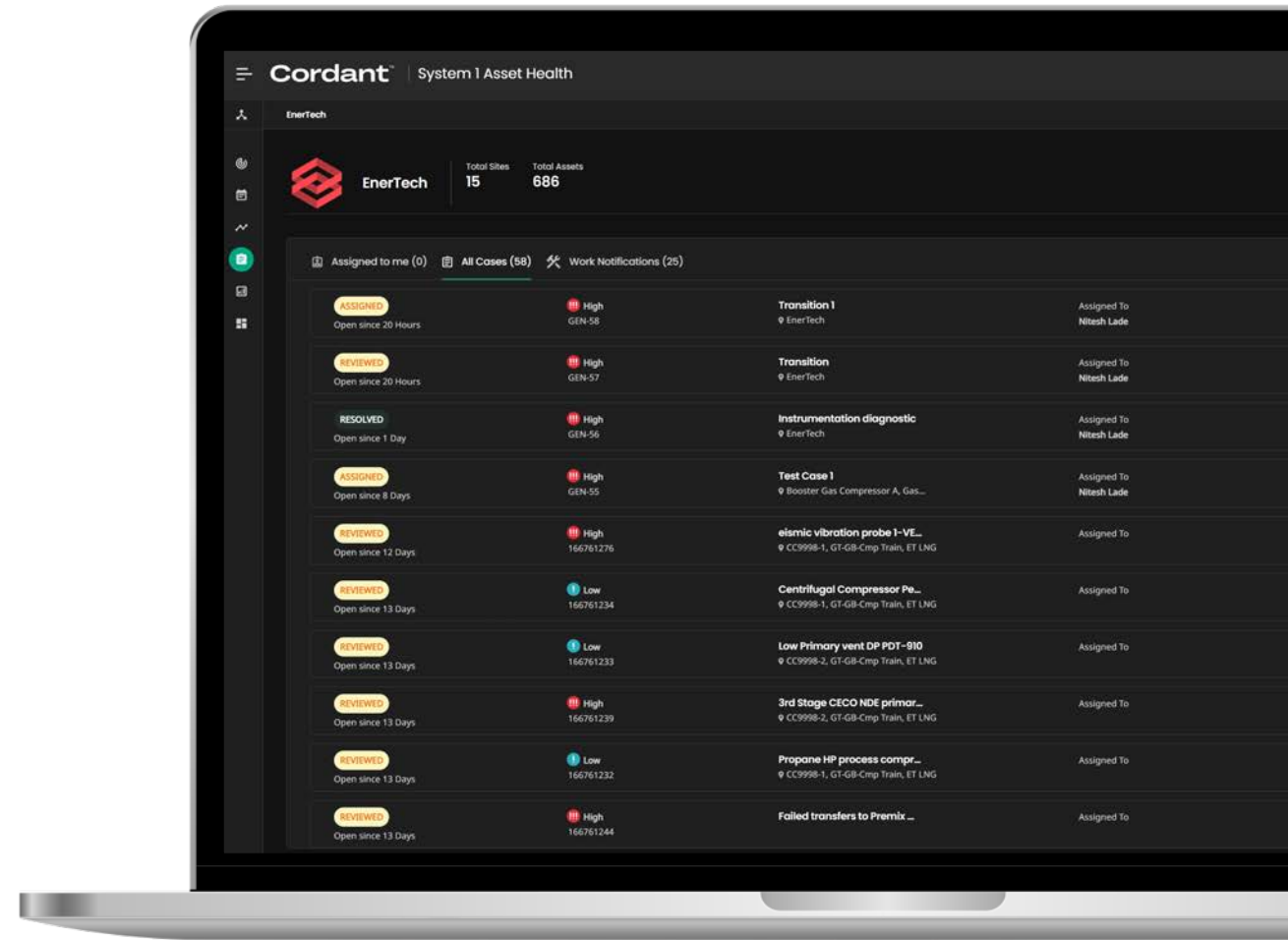
- Extract and analyze supporting health dataset
- Jump-off with context to desktop condition monitoring system for in-depth analysis
- Collaborate with subject matter experts through integrated case management toolset



## Drive corrective action

Evergreen bidirectional CMMS integration to connect health actions to work execution

- Seamlessly integrate with CMMS (SAP/Maximo) for traceability of work process
- Populate cases with work order and cost data for automated cost avoidance valuation
- View integrated work history timeline for sequence of events analysis and context





## Evaluate and report

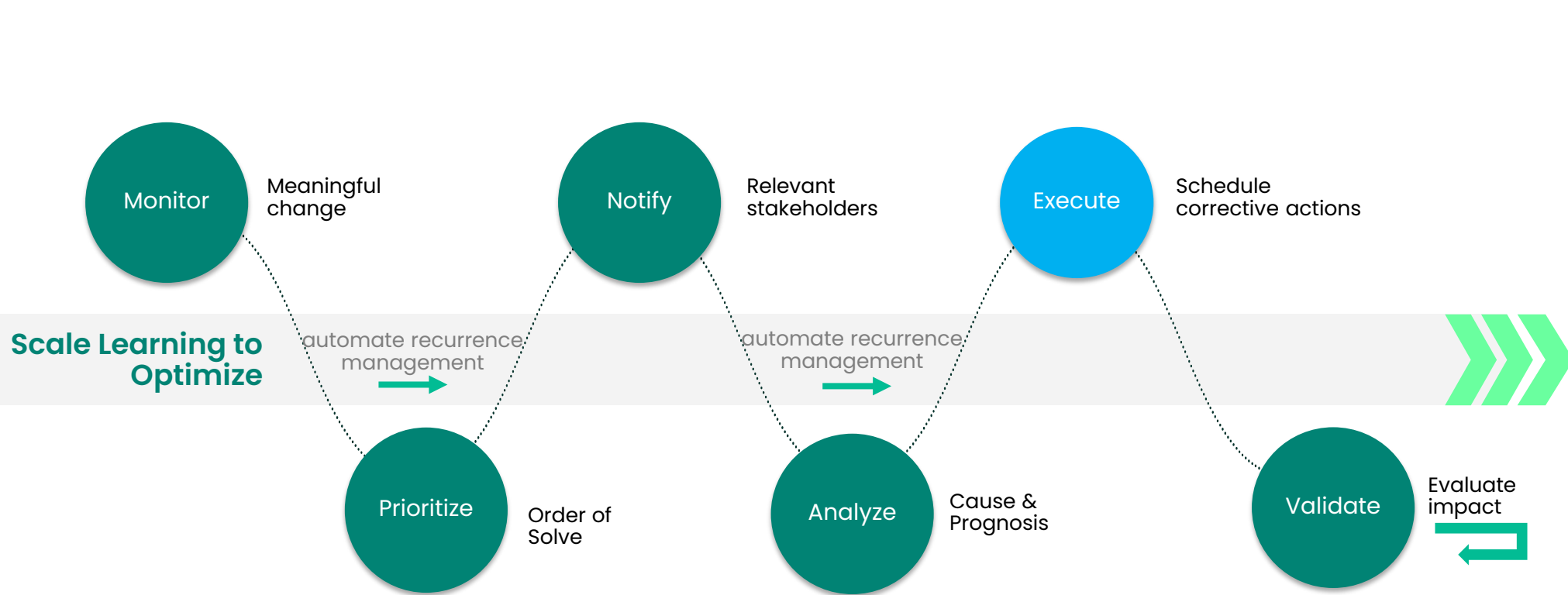
Leverage KPI dashboarding and reporting to analyze health program performance

- Review pre-defined KPIs for health and work management to track progress
- Create custom analytics/KPIs to assess company-specific performance metrics
- Produce automated reports for periodic meetings and reviews



# Holistic asset health management

System-driven consistent and collaborative work practice with analytic supported continuous improvement workflow



55%

reduction in machine failures

30%

improvement in machinery availability & life

40%

reduction in unplanned downtime



**Bentley Nevada**

a Baker Hughes business