

The background of the advertisement is a collage of industrial scenes. In the top left, there are blue industrial motors. In the top right, a large metal gear is being processed on a lathe. In the bottom left, a worker in a blue hard hat and safety vest is visible in a factory setting. In the center, a worker in a red safety jacket and blue hard hat is looking at a laptop. The entire image is overlaid with a white geometric grid pattern.

**FLUKE**<sup>®</sup>

Reliability

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**Connected  
Reliability  
-Automotive-**

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## Speaker Bio



### **Christian Silbernagel**

Global Strategic Enterprise Account Manager, FRS

- ✓ 10+ years in maintenance and reliability
- ✓ Online Condition Monitoring
- ✓ Outdoors, Camping, Hiking



### **Gavin Robinson**

Key Account Manager (Automotive), FRS

- ✓ 7+ years in maintenance and reliability
- ✓ Fluke's CMMS, eMaint
- ✓ Travelling, Sports

# Agenda

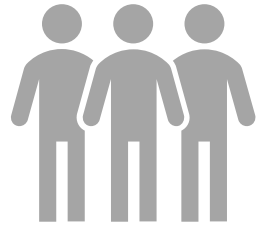
- ▶ **Introduction**
- ▶ **Connected Reliability in Automotive**
  - ▶ Obstacles
  - ▶ Creating Insights
  - ▶ Transforming findings into actions
  - ▶ Bridging the knowledge gap
- ▶ **Q&A**

# FLUKE RELIABILITY

## BY THE NUMBERS



**16,966**  
MAINTENANCE  
TEAMS



**700+**  
EMPLOYEES



**24**  
OFFICES

IN

**20**  
COUNTRIES  
AROUND  
THE WORLD



Serving maintenance &  
reliability leaders

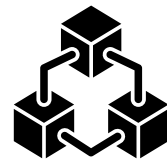
**70,000**  
CUSTOMERS



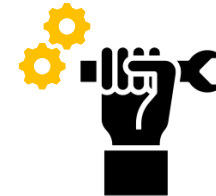
**116**  
COUNTRIES



**150,000**  
USERS



**10 MILLION**  
ASSETS MANAGED



**7,253**  
EXPERT SERVICES USED

**3,416,669+**  
MACHINES FIXED



**164,547,896**  
WORK ORDERS CREATED

# CHANGE IS CONSTANT



**Expertise/skills gap continues to grow**



**Resilience powered by Artificial Intelligence and IIoT**



**Automation & Digitization: Connection of Assets, Process and People**



**Reshoring**



**ESG**



**Manufacturers are investing **\$524 billion** annually in digital transformation initiatives**

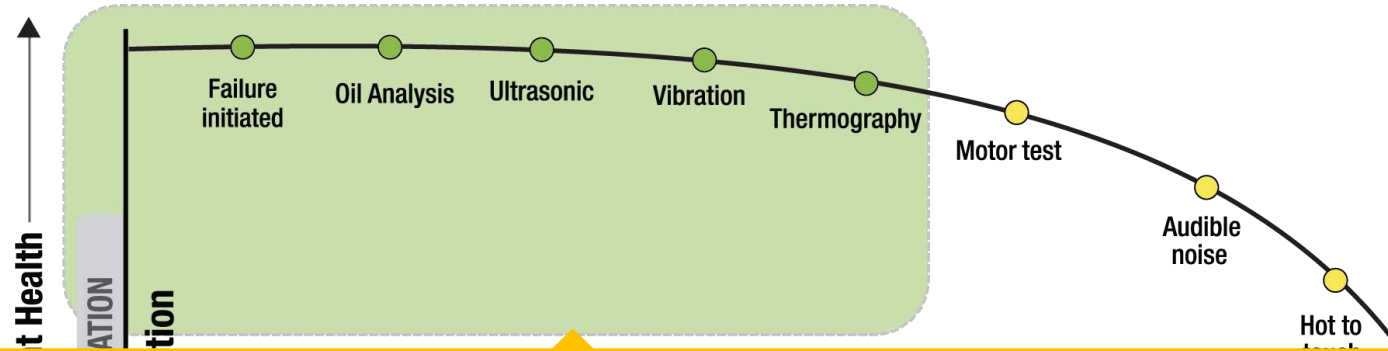
## A Connected Reliability ecosystem

Connected reliability is a framework that combines hardware and software systems from across the enterprise into one cloud-based maintenance ecosystem.

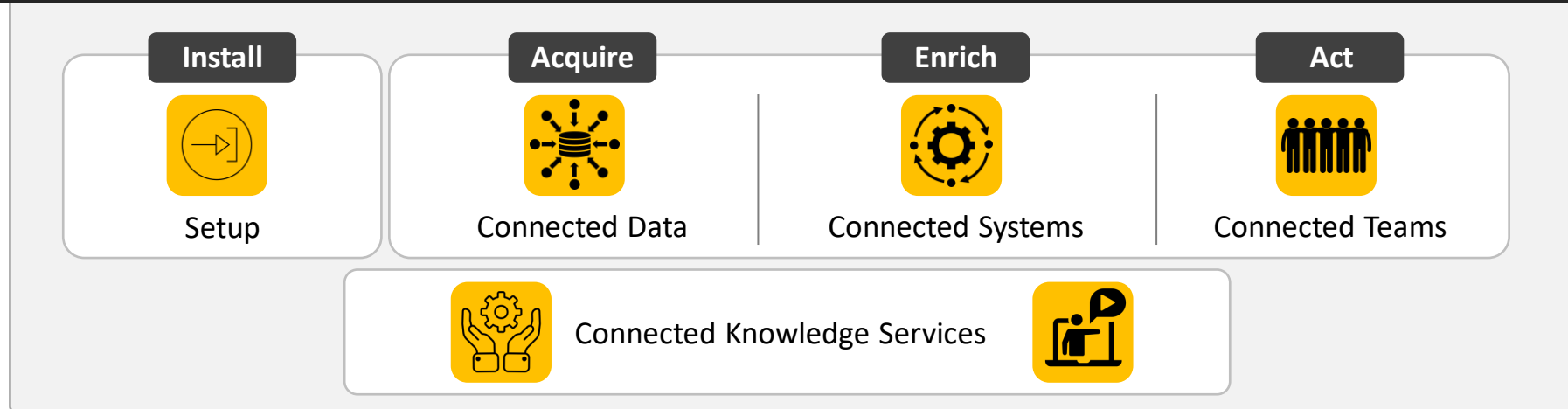
Maintenance management is automatically integrated with data acquisition and analysis, giving industrial leaders unprecedented real-time visibility and empowering maintenance managers to make data-driven decisions that avoid downtime.



# 5 Pillars Connected Reliability



**Install with precision** → **then operate at the top-left of the P-F Curve**



# Obstacles





## Industry Challenges

- Heavy Supply chain dependent
- Many Dynamic Applications
- Competitive Market (EV entering over the past years)
- High Energy Costs

# COMMON PITFALLS



**Siloed Implementation**



**Pilot Purgatory**



**One Size Fits All**



**Prioritizing Technology  
Over Value**

# Creating Insights

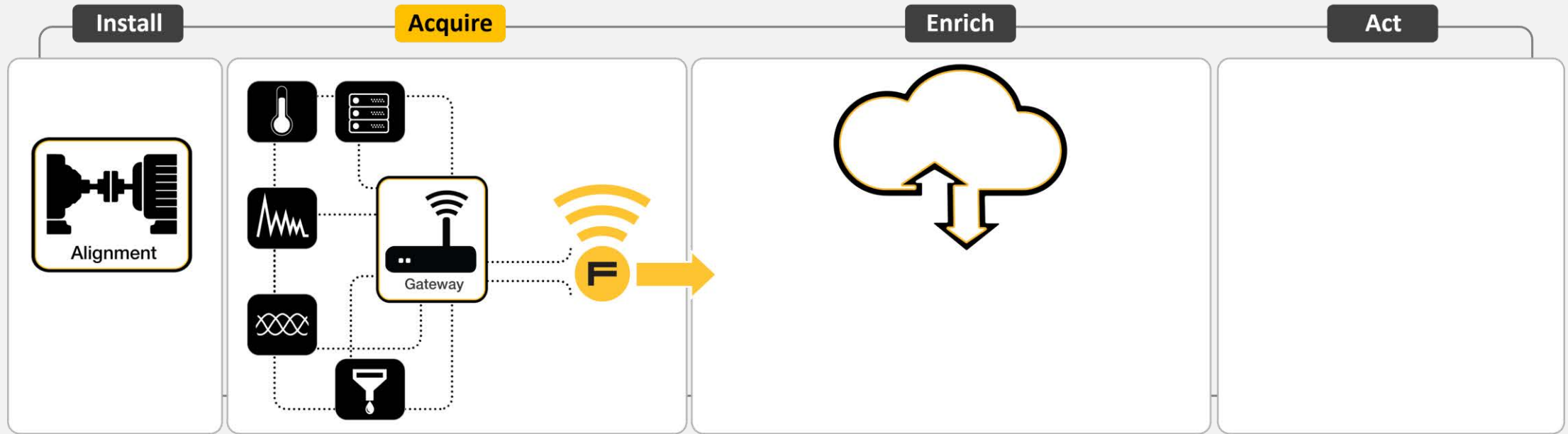


# Install: Peak Performance from Day 1



Laser Shaft Alignment	Intrinsically Safe	Active Situational Intelligence	Geometrical Alignment	Pulley Alignment
				

# Connected Data



Handheld Tools

Wired Sensors

Wireless Sensors

Automation & Controls



- Route- and sensor-based tools
- Simple to complex measurement
- Multiple P-F Curve modalities (vibration, ultrasound, oil analysis, etc.)

# Mix of Applications/Assets

## Press Shop Main machines

- Coil unwinder
- Scrap conveyors
- Hydraulic Pumps
- Press



## Power Train Main machines

- Conveyor belts
- Transportation systems
- Lifting systems



## Body Shop Main machines

- Robotic arms
- Elevator drives
- Transport systems



## Paint Shop Main machines

- Direct/belt coupled blowers
- Motor-pump aggregates
- Submerged pumps



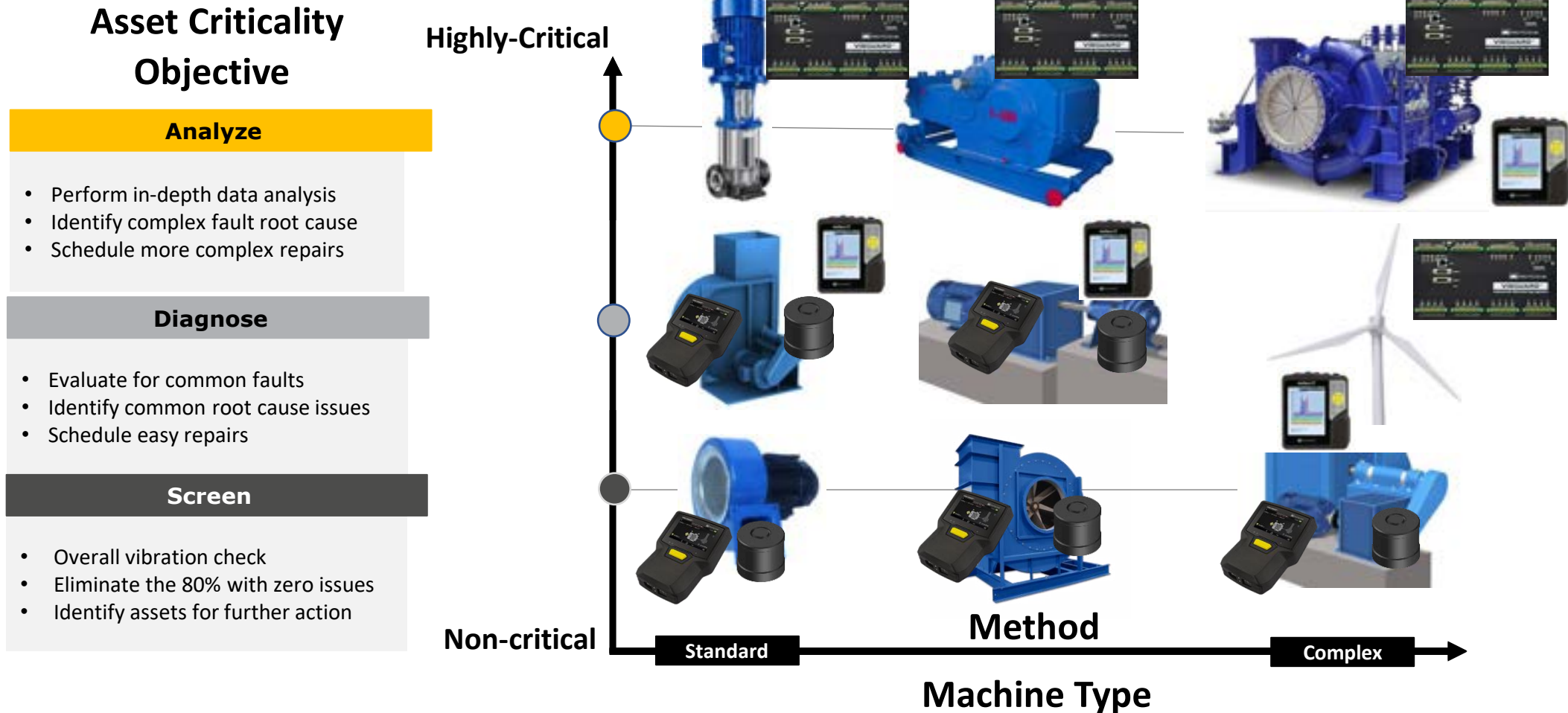
## Main machines in assembly

- Extraction blowers
- Elevators drives
- Rolls (Test stand)



# Asset coverage with the right solution (Verification)

*Peak performance addresses all assets, not just the critical few*



## Analyze

- Perform in-depth data analysis
- Identify complex fault root cause
- Schedule more complex repairs

## Diagnose

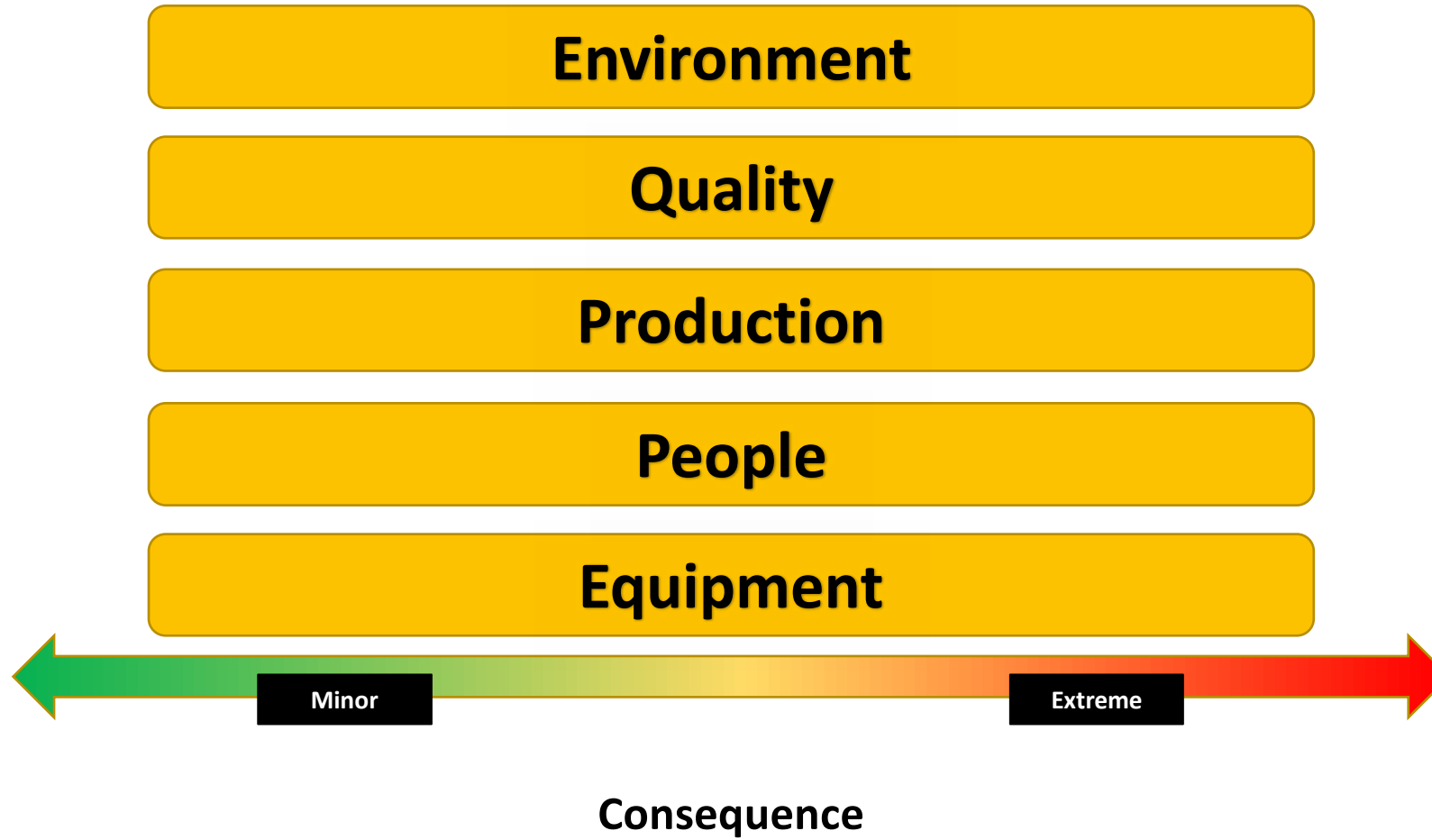
- Evaluate for common faults
- Identify common root cause issues
- Schedule easy repairs

## Screen

- Overall vibration check
- Eliminate the 80% with zero issues
- Identify assets for further action

Different products/solution for the different requirements

# The different Faces of Criticality (Verification)





# Example VIBRATION Tools



High End Vibration Analyzer



Easy-to-use vibration data collector



Analysis Vibration Sensor



Flexible architecture for a wide range of assets & applications

## HANDHELD Vibration Analyzers

### *Deep Vibration Diagnostics, or Fast Data Collection*

- Highly differentiated high-end tool
- Efficient, easy-to-use tool for non-experts to collect data quickly

#### Benefit

*Collect data on many assets, at a very economical price*

## WIRELESS Vibration Sensors

### *Conveniently commission and monitor tier 2 assets*

- Capture vibration data at higher frequencies, to detect issues earlier
- Simple “screening” indication of faults

#### Benefit

*Easy semi-continuous monitoring, at lower overall cost*

## ONLINE Vibration Monitoring

### *Continuous Monitoring of Critical Assets*

- Automatically collecting data many times per hour, for critical machines
- Highly configurable for complex assets

#### Benefit

*Collect continuous data, to get deep insights on critical machines*

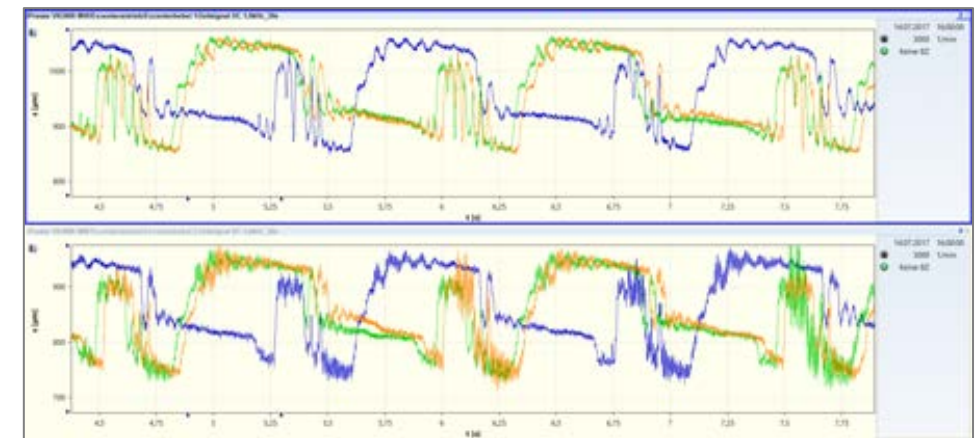
# Applications-Automotive Press

## Types of automotive presses

- Transfer presses with eccentric drive
- Hydraulic press lines
- Servo motor press lines

## Press lines for highly efficient forming processes and

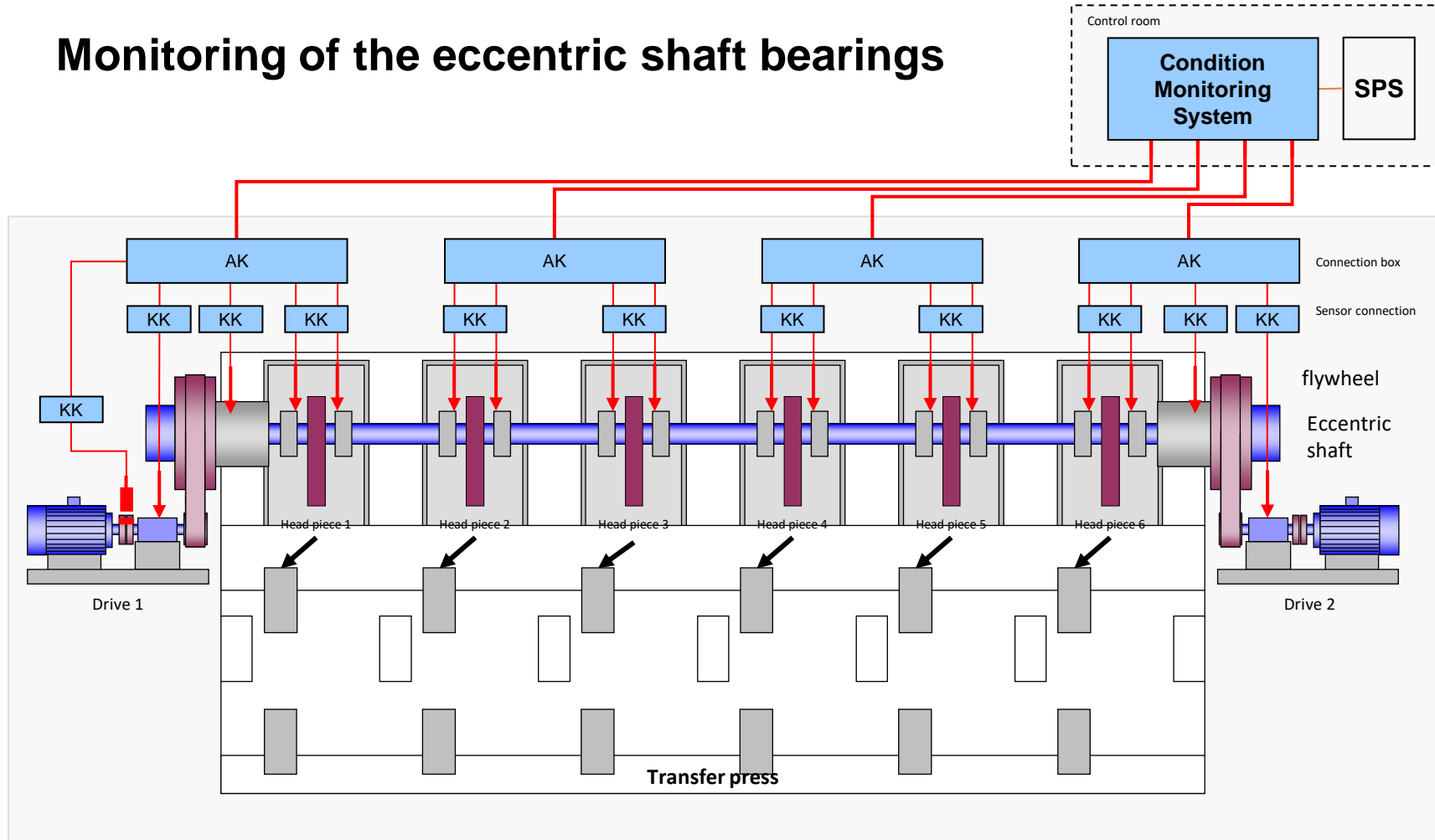
- State of the art transfer presses
- Designed for series production 24/7
- Highest requirements on machine availability and reliability



# Transfer presses with eccentric drive

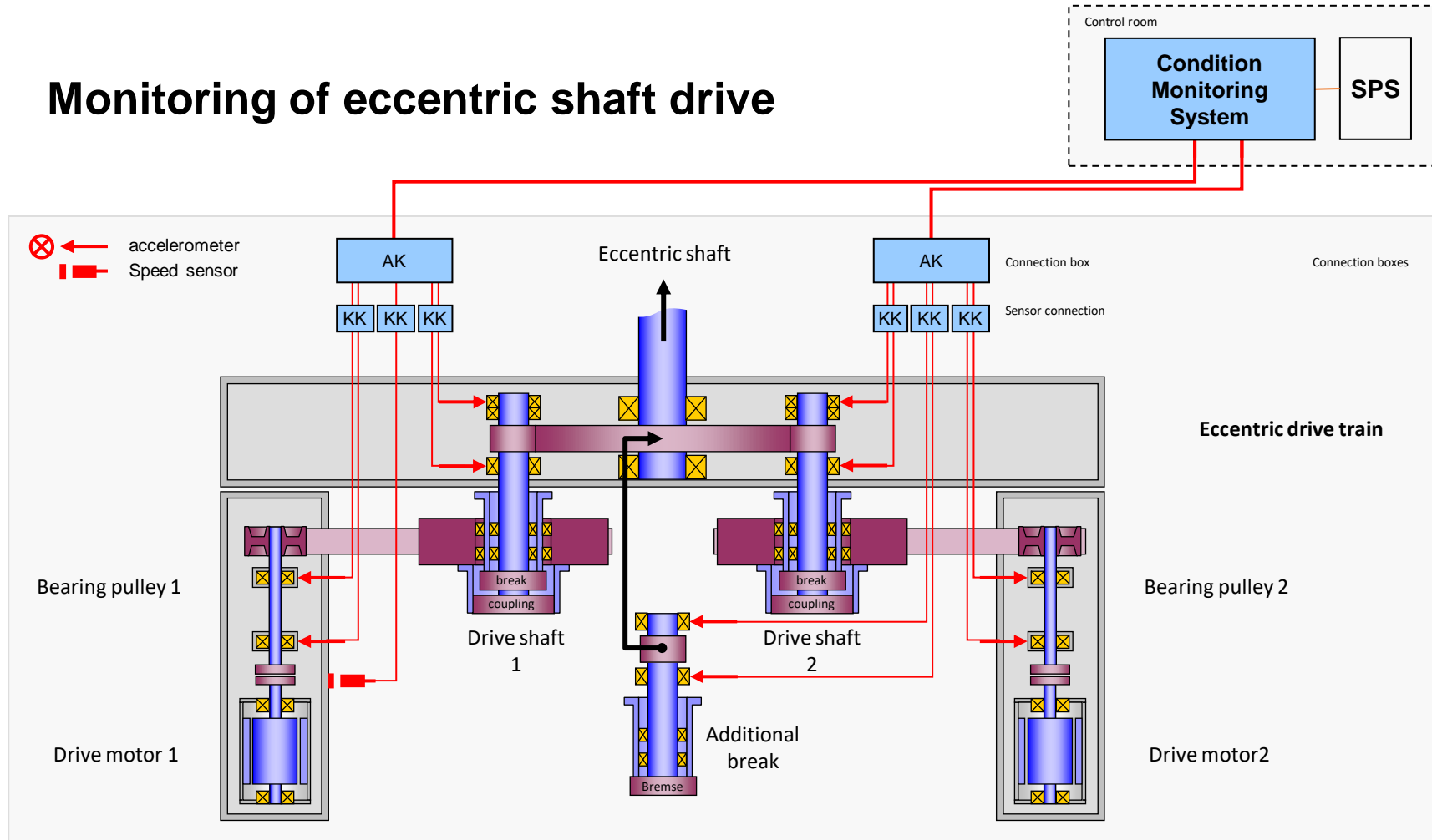
⊗ ← accelerometer  
▬ speed sensor/ Keyphaser

## Monitoring of the eccentric shaft bearings



# Transfer presses with eccentric drive

## Monitoring of eccentric shaft drive

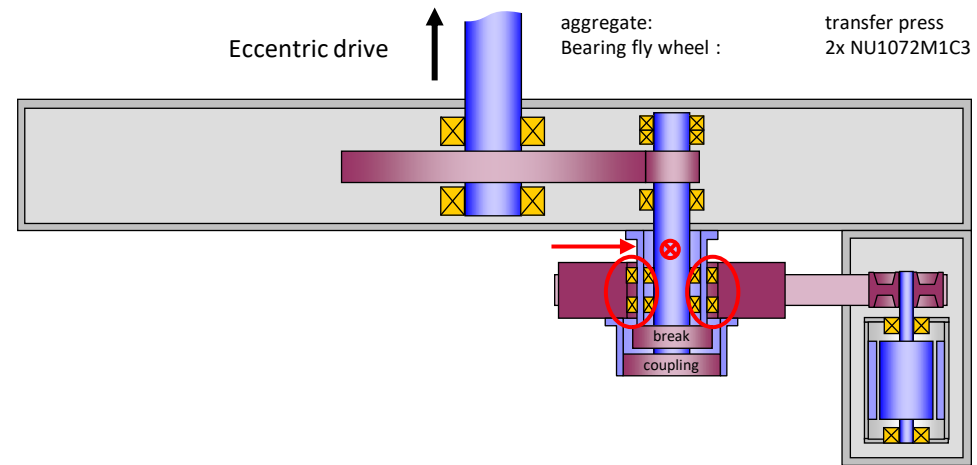


# Diagnosis example - drive train

## Bearing fault

### Bearing fault, flywheel bearing

- Failure mode: chip 35 x 25 mm
- Poor installation was probably the reason
- Surface damages on inner race due to peeling of the rolling elements during flywheel installation.

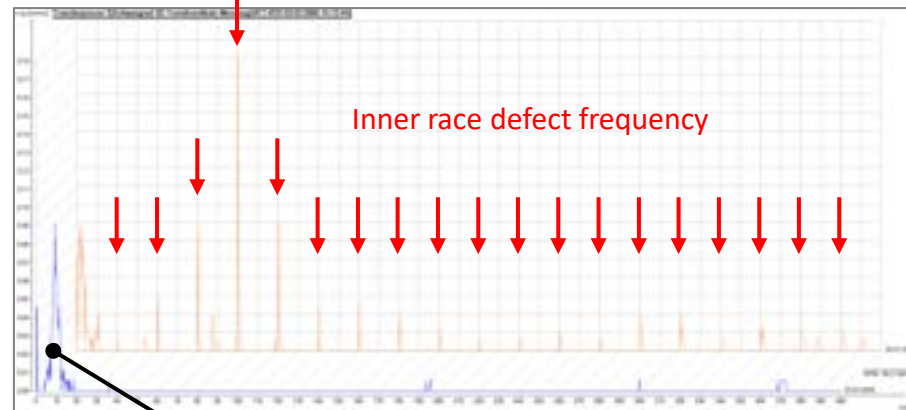


Inner race defect on the flywheel



Diagnostic pattern:

Inner race defect frequency with harmonics visible in envelop spectra.



Spectra after repair

# Applications-Servo Motor Press

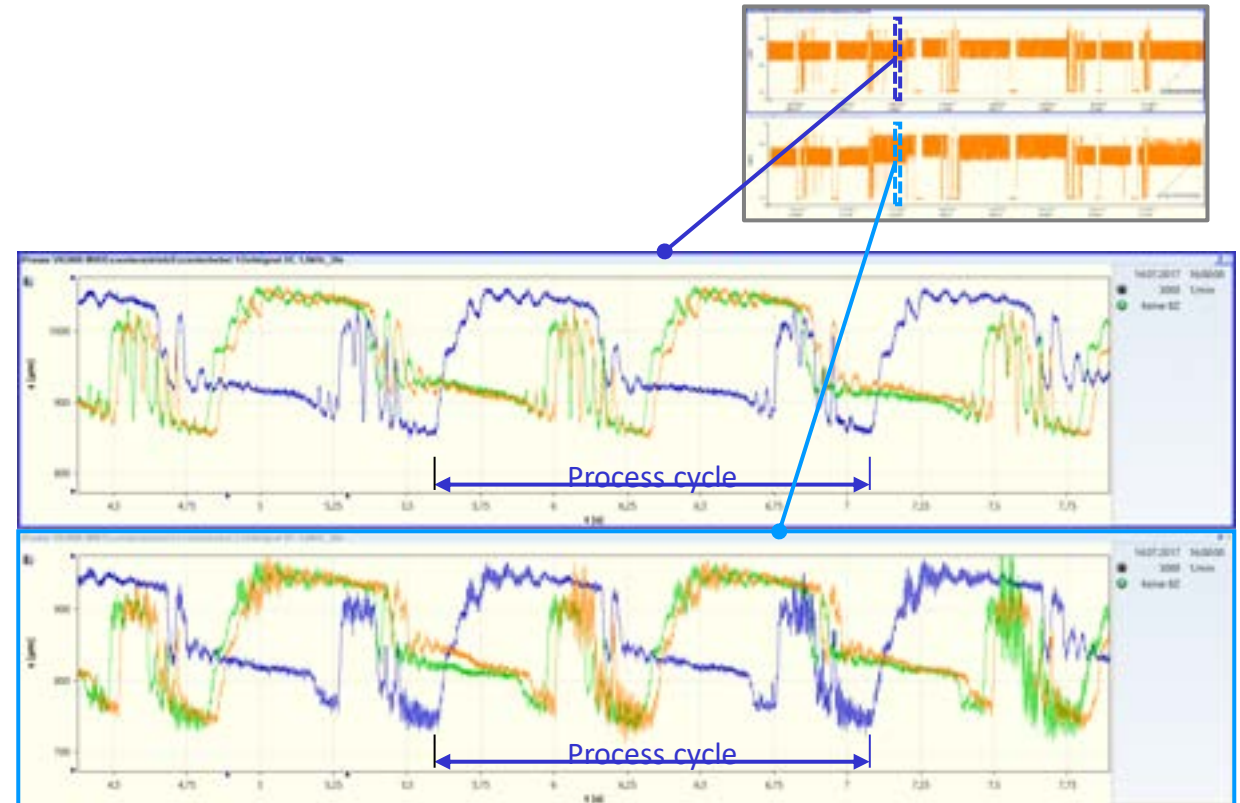
## Monitoring of high torque Servo motors + eccentric shaft drive

- Servo motors with extreme dynamic operational mode
- extreme short cycle-operating times between (appr. 4...6 sec)
- significant influences by shocks from the press technology

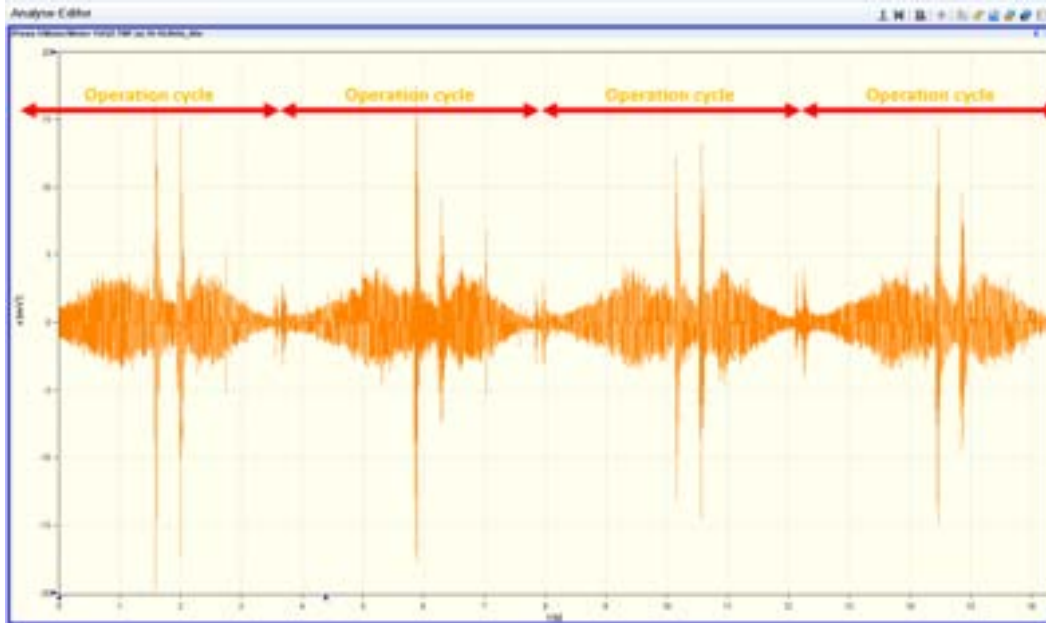
Servo motor



Eccentric shaft drive

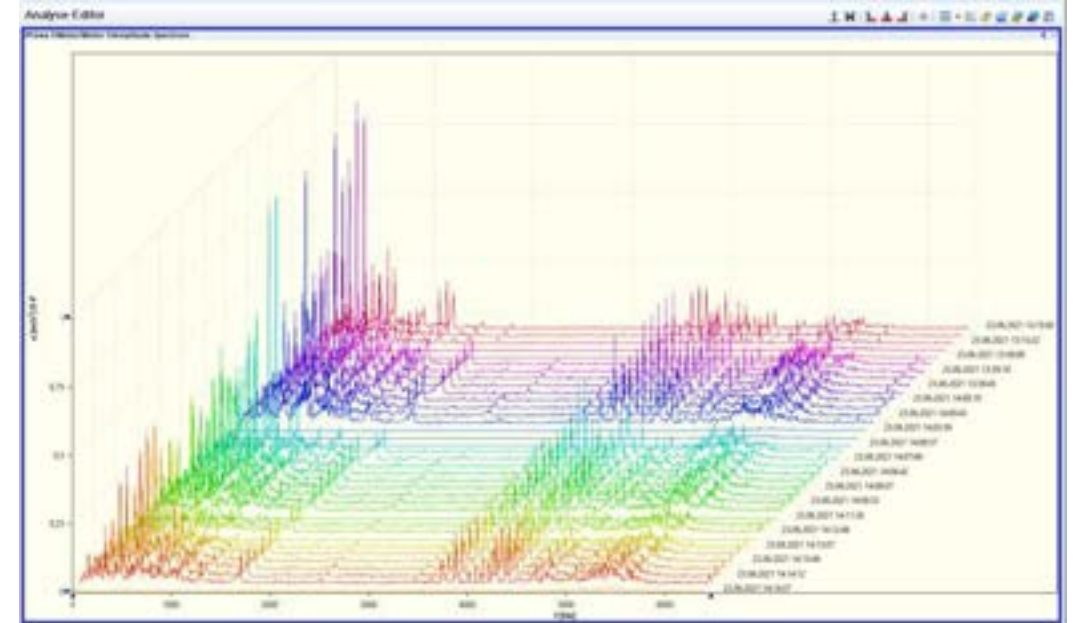


# Servo motor press line measurement



## Time domain signal acceleration:

- Zoom 4 operation cycles
- 2 significant shocks from press technology per operation cycle

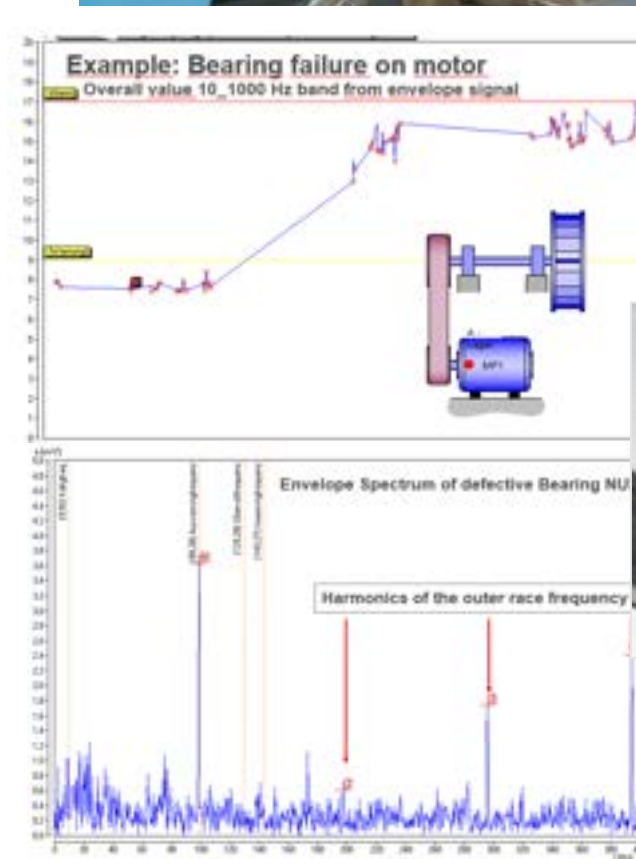
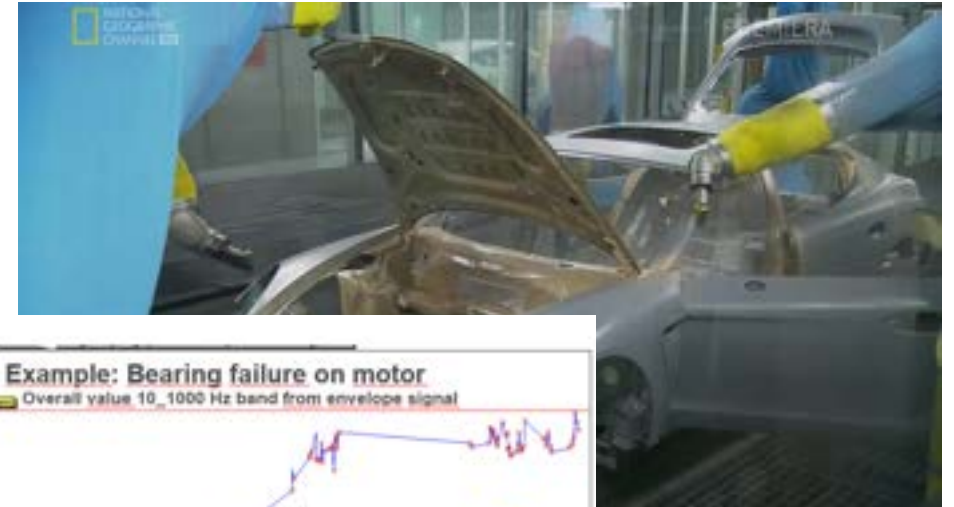


## Vibration diagnosis:

- Amplitude spectras acceleration - Waterfall diagram
- significant kinematic frequencies monitored

# Application-Paintshop

- **Application:**
  - Paint Shop
- **Assets:**
  - Vent Fans
- **Challenges:**
  - High Impact on Product Quality
- **Solution:**
  - Wireless / Online Condition Monitoring
  - Repeatable Measurements
  - Process Values: Temp, RPM





# Application-Testing

## ■ Application:

- Motor/Brake Testing

## ■ Assets:

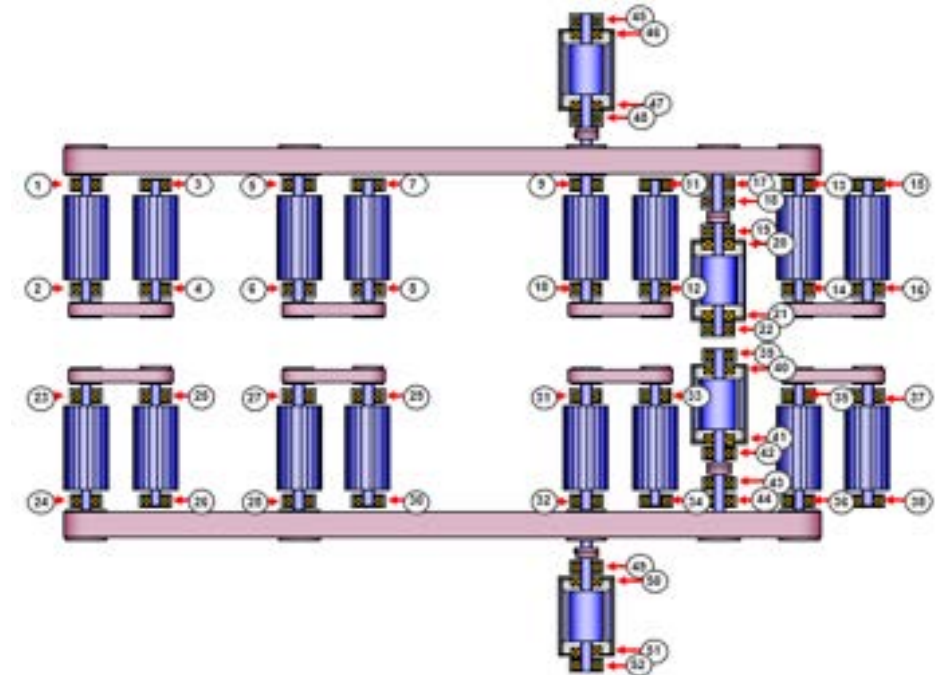
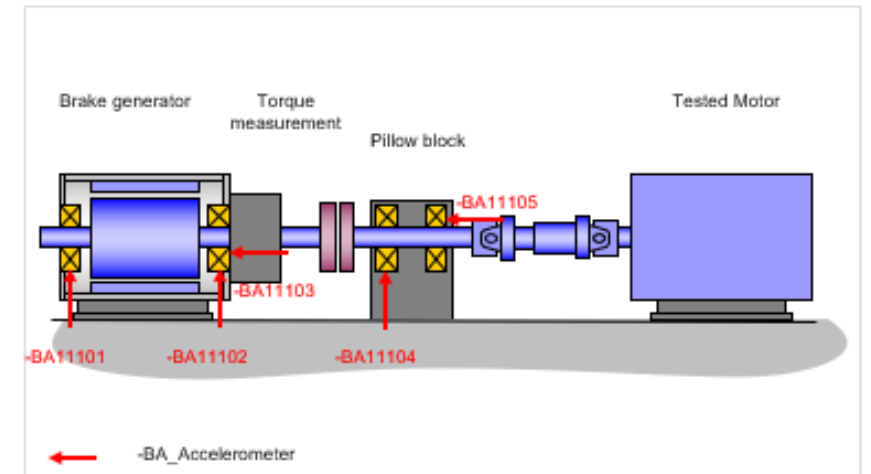
- Bearing, Motor

## ■ Challenges:

- High Dynamic Application
- High Variations in Vibration Readings
- Repeatability in Readings

## ■ Solution:

- Adaptable Online Condition Monitoring
- Operating States
- Process Values: Temp, RPM



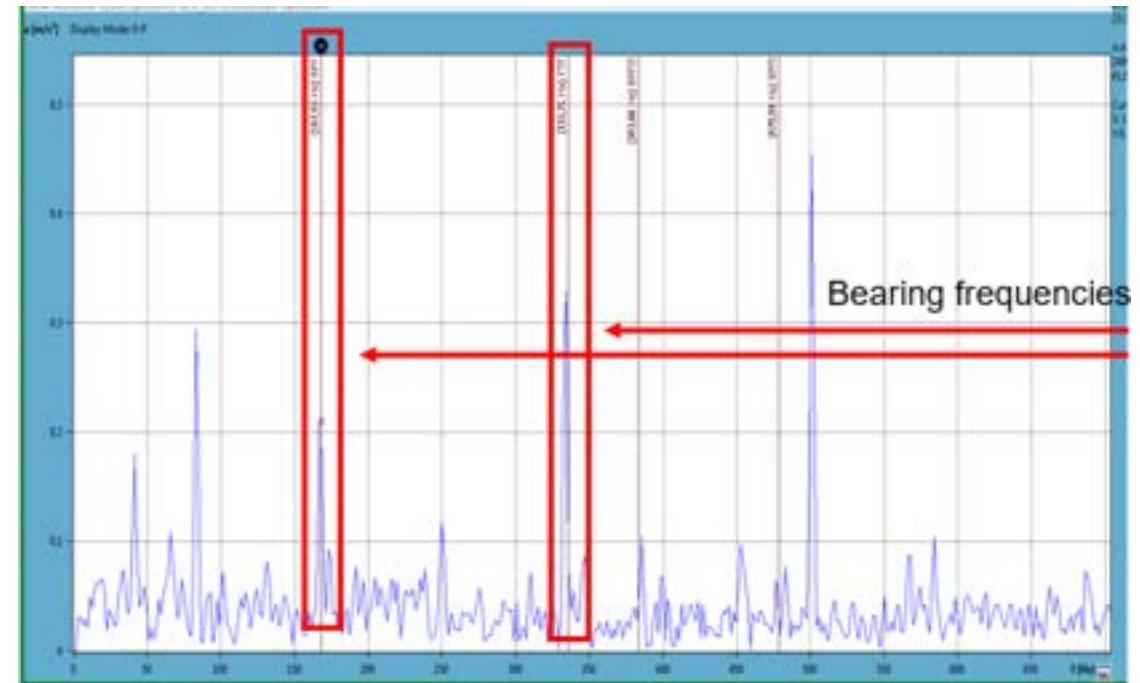
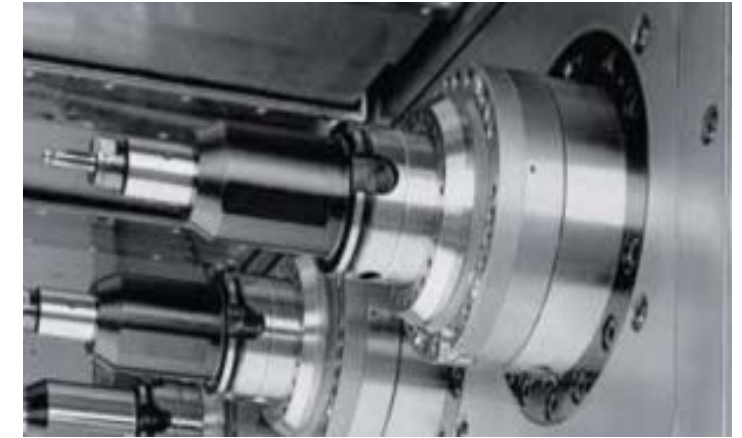
# Application-EV Battery Production

- **Application:**
  - Coating, Calendering
- **Assets:**
  - Rolls
- **Challenges:**
  - Small Asset Deterioration
  - > High Impact on Product Quality
- **Solution:**
  - High Precise Geometrical Alignment

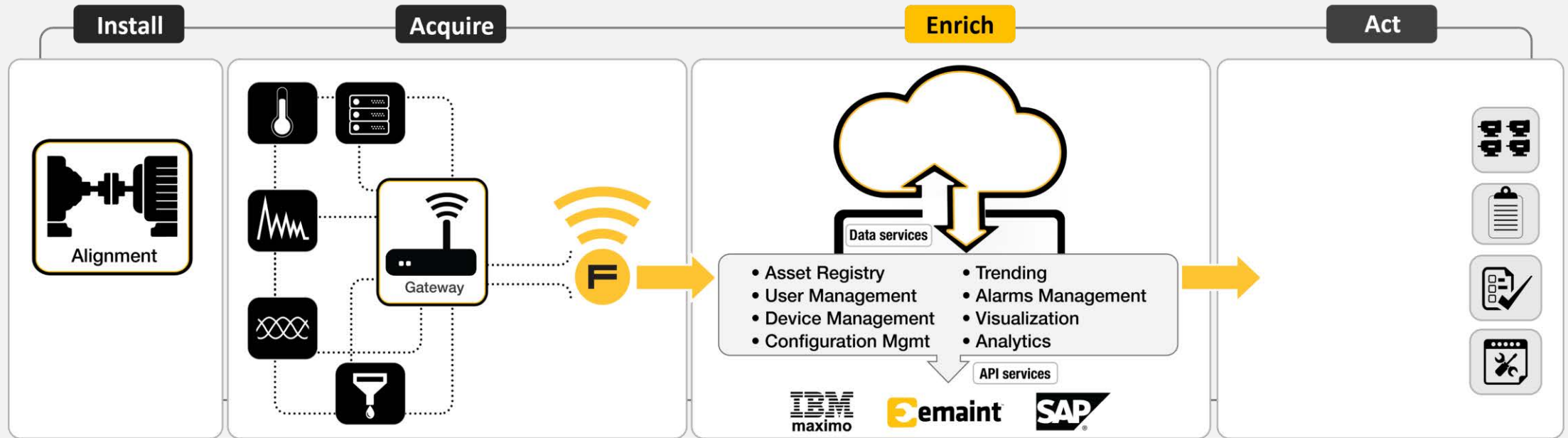


# Application-Spindles

- **Application:**
  - Spindle
- **Assets:**
  - Spindle (bearings/tool)
- **Challenges:**
  - High Dynamic Application
  - High Variations in Vibration Readings
- **Solution:**
  - Adaptable Online Condition Monitoring
  - Operating States
  - Process Values: Temp, RPM, Position



# Connected Systems



Data and API services provided by the Accelix Data Platform

Aggregated data supports long-term trend analysis and machine learning

Enriched condition data via integration with CMMS/EAM systems

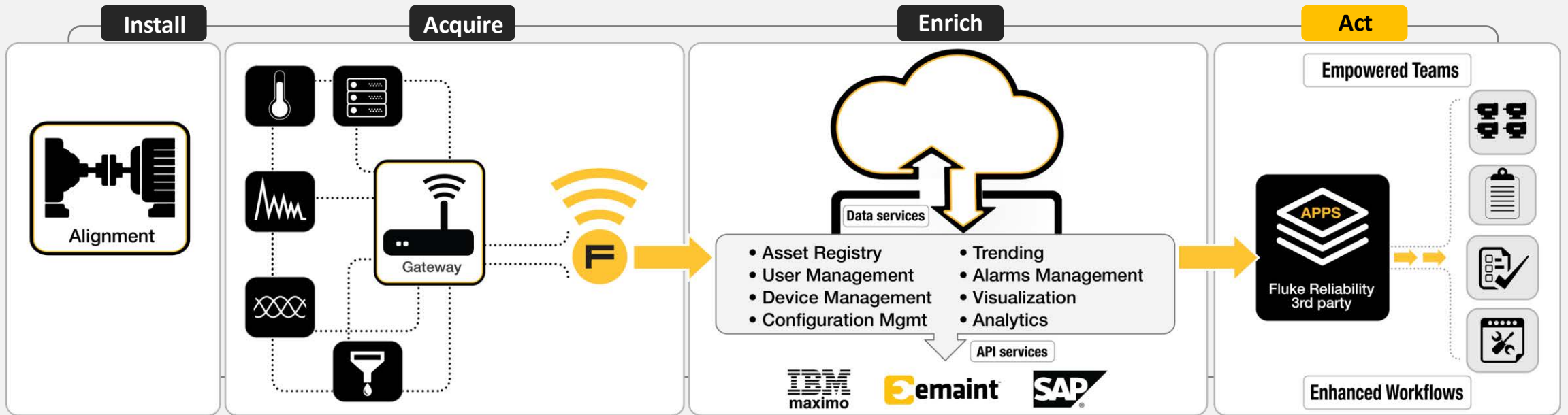
## Result:

- A more complete picture of asset history and current health
- A solid basis for decision support and maintenance actions

# Transforming findings into actions

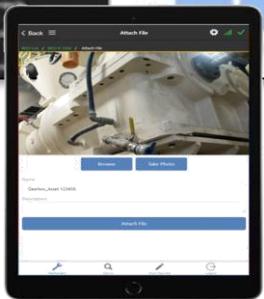


# Connected Teams

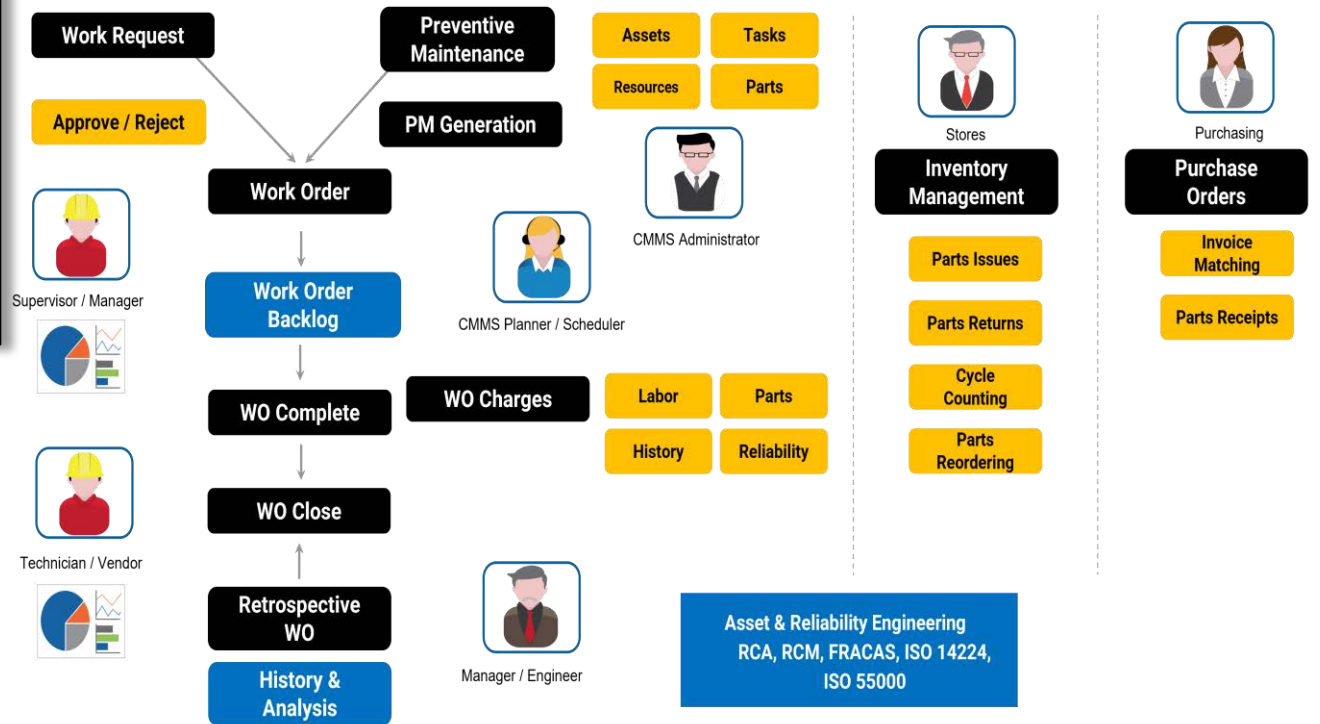


Reliability-centered maintenance actions | Mobile workforce enablement | Enhanced workflows

# Act on the Data



CMMS/EAM and Mobility



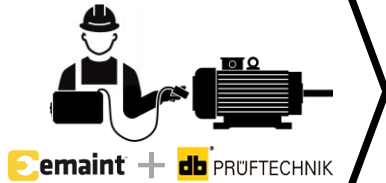
# Connected by Workflows



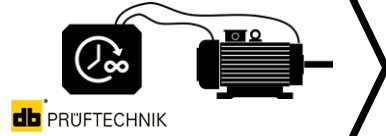
## 1) Monitor Vibrations on Running Machines

3 Different Ways:

**Workorders** for Walk-Around Data Collection Routes, Using **Handheld** Tools



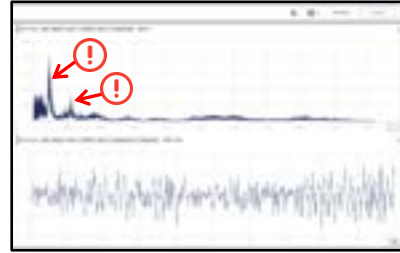
**Online** Continuous Monitoring



**Wireless** Periodic Monitoring



## 2) Analyze Data to Find Machine Problems

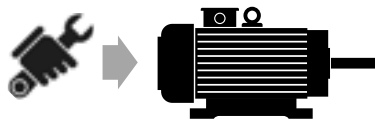


## 3) Assign a Workorder To Correct Problems



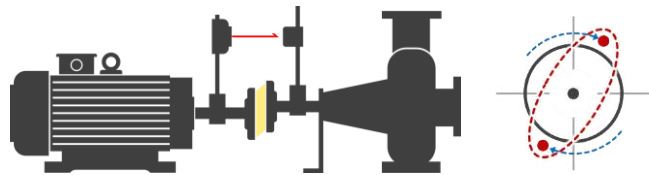
emaint

## 4) Perform Preventive Or Corrective Maintenance



- Replace Bearings
- Rebuild Seals
- Overhaul
- Rebalance
- Etc.

## 6) Re-Align and Re-Balance the Machine with Precision Devices



db PRUFTECHNIK

## 5) Attach Device Results to Close the Work Order

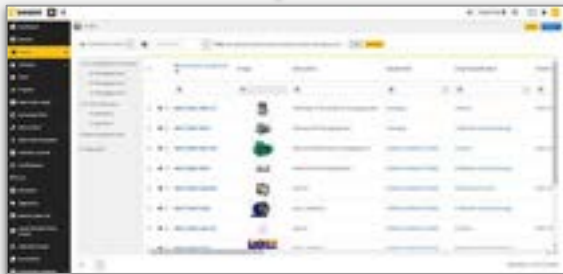


emaint + db PRUFTECHNIK



# Connect2Assets

## CMMS Platform



## Local Deployment

Data Connector  
Site Server



## Local Automation Systems

Site OPC  
PLCs

Building Automation  
Systems, SCADA,  
Building Management  
Systems



# eMaint in Action: Dana Corp.



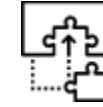
## OVERVIEW

Dana Corp. is a worldwide supplier of powertrain components. They are building the digital tool box for maintenance and reliability.



## CHALLENGES

- Minimize critical equipment downtime
- Demonstrate equipment improvements
- Expand reliability program with predictive maintenance



## RESULTS

- Implemented eMaint as their CMMS solution
- Stream asset data from Fluke 3540 FC, 3550 FC and 3530 FC sensors into eMaint
- Real-time access to data anytime, anywhere



I speak for my team when I say we are beyond excited about the possibilities eMaint brings.

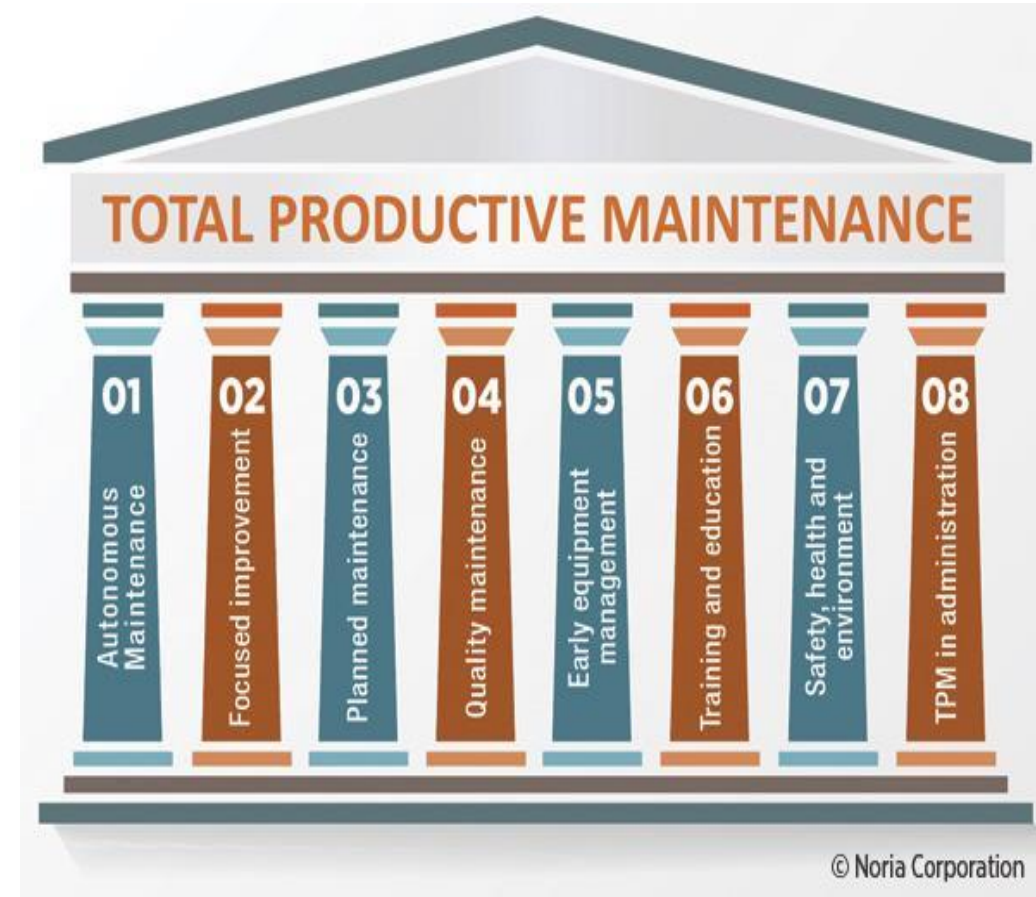
Sr. Maintenance Manager, Dana Corp.



# How a CMMS/EAM can enable a TPM Strategy

Total Productive Maintenance (TPM) is a holistic approach aimed at maximizing equipment effectiveness, preventing breakdowns, ensuring safe operations, and increasing productivity.

- Operator Inspections – Digital Checklists
- Centralized platform to manage equipment
- Emphasis on proactive, rather than reactive, maintenance
- OEE Monitoring

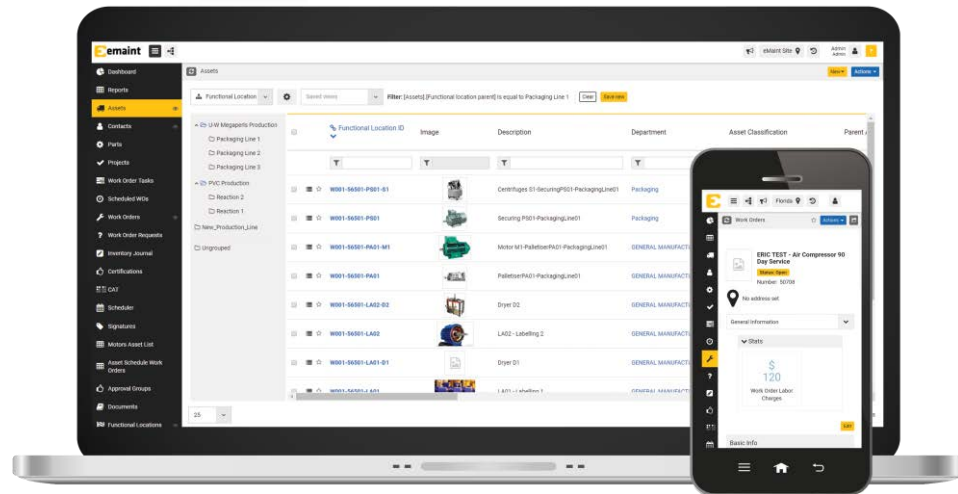


# Simplifying IATF Compliance with CMMS/EAM



Essential requirement for all automotive manufacturers and suppliers

- Preventive and Predictive Maintenance
- Risk Management
- Corrective and Preventive Actions
- Document Control and Record Keeping



## Benefits of a CMMS/EAM

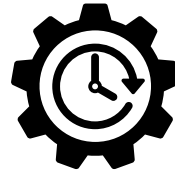


- ❑ Comply with Regulatory & Best Practices Standards:
- ❑ IATF, OSHA, ISO9001, Total Productive Maintenance (TPM)
- ❑ Increase productivity and reduce response time through Mobile Activities
- ❑ Average of 44 minutes/day saved

## Improve Compliance through CMMS



Comply with IATF, OSHA, ISO9001, and TPM Standards.



Reduce unplanned downtime.

Digitize: Mobile, preventative and predictive work orders, asset management, and scheduling.



Optimize & Save

User-friendly dashboards offer quick visibility for audits, PMs, parts, downtime trends & more.



Easy IATF, OSHA, Customer Audit Prep



Standardize Work Across Sites, Languages, and the Globe

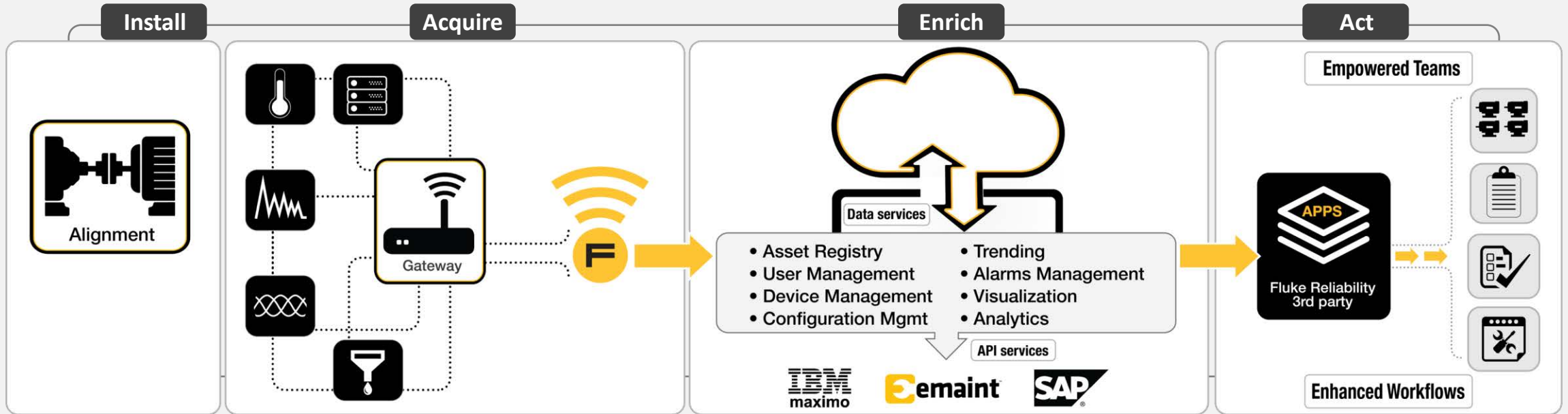


See machine failures in advance with condition monitoring and automated work orders based on triggers.

# Connected Knowledge



# Connected Knowledge



## Connected Knowledge Services



### Active Assistance

- Onsite Machinery Services
- PARALIGN
- TELEDIAGNOSIS
- Remote Condition Monitoring



### On-Demand Expertise

- ISO CAT Training
- Online & In-Person Courses
- Reliability Program Consulting
- Customer Success Team



# Shorten the time to value



## Consulting

- ❖ Asset Criticality Workshop
- ❖ Asset Criticality Assessment

*We help you ensure Reliability program success*



## Implementation

1. Project engineering
2. Installation
3. Configuration
4. Customer acceptance

*We ensure that you are set up for success from the get-go*



## Analysis & Reporting

- ❖ Status Reports, provided on periodic interval
- ❖ Event Reports, provided on event-driven basis

*We provide expert-level assessments*



## Data-Management

- ❖ Infrastructure Service
- ❖ Data access

*We can manage required IT infrastructure and software*



## Expert On-demand

- ❖ Remote Mentoring
- ❖ Training
- ❖ Corrective Field Services
- ❖ Repair & Calibration

*We provide a wide range of Services to solve specific issues*

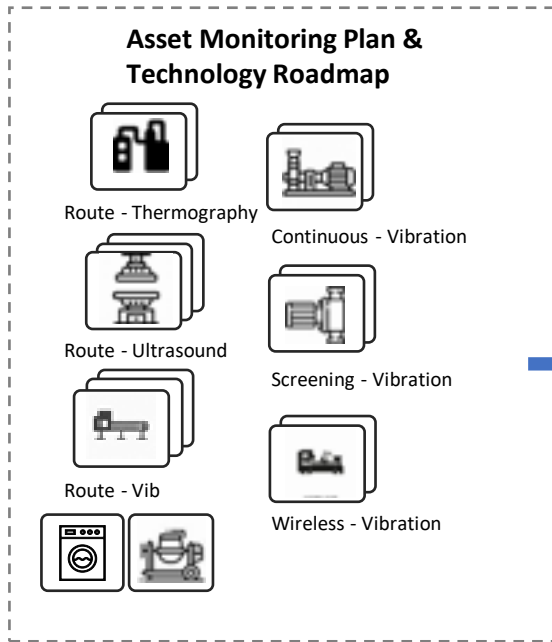
# Enrich



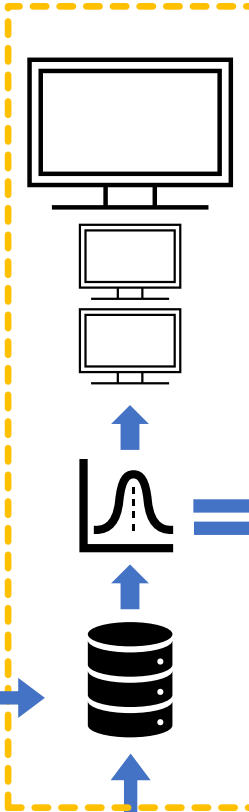
Where to start



Site Assessment  
& Solution  
Engineering



## Condition Monitoring Operations Center



Expert and  
Automated Analysis

## Remote Services



### Active Assistance

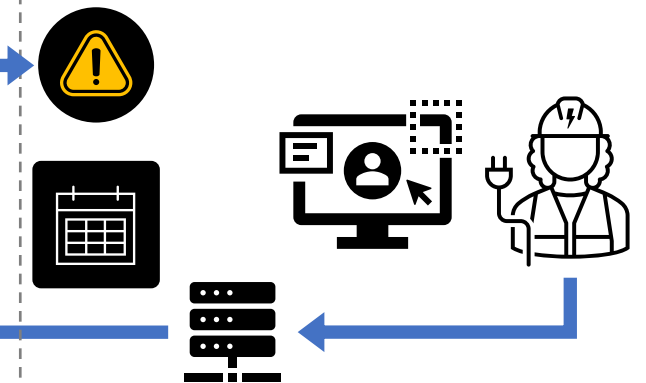
- Onsite Machinery Services
- TELEDIAGNOSIS
- Remote Condition Monitoring



### On-Demand Expertise

- ISO CAT Training
- Online & In-Person Courses
- Reliability Program Consulting
- Customer Success Team

### Manual Data Collection



# Thank you for your attention!

## Q&A

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