

The background of the slide is a collage of industrial images. In the center, a worker wearing a white hard hat, safety glasses, and an orange high-visibility jacket is looking at a laptop. Surrounding this central image are other industrial scenes: blue electric motors on the left, a large metal gear assembly on the top right, and a factory interior with blue machinery on the bottom left. A white geometric grid pattern is overlaid on the entire image.

FLUKE®

Reliability

5 Pillars of Connected Reliability

Speaker Bio



Christian Silbernagel

Global Strategic Enterprise Account Manager, FRS

- ✔ ISO CAT III certified Vibration Analyst
- ✔ Online Condition Monitoring
- ✔ Outdoors, Camping, Hiking

Agenda

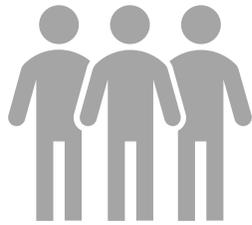
- ▶ **Introduction**
- ▶ **Five Pillars of Connected Reliability**
 - ▶ Install
 - ▶ Acquire
 - ▶ Enrich
 - ▶ Act
 - ▶ Connected Knowledge
- ▶ **Q&A**

FLUKE RELIABILITY

BY THE NUMBERS



16,966
MAINTENANCE
TEAMS



700+
EMPLOYEES



24
OFFICES

IN

20
COUNTRIES
AROUND
THE WORLD



Serving maintenance &
reliability leaders

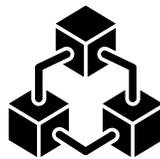
70,000
CUSTOMERS



116
COUNTRIES



108,334
USERS



10 MILLION
ASSETS MANAGED



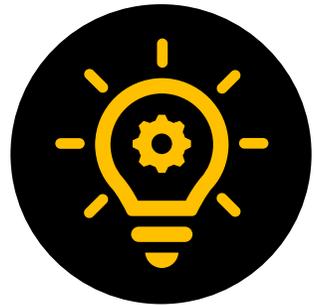
7,253
EXPERT SERVICES USED

3,416,669+
MACHINES FIXED



164,547,896
WORK ORDERS CREATED

CHANGE IS CONSTANT



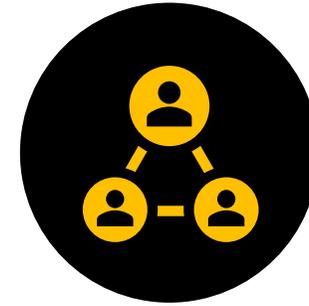
**Resilience
powered by
Artificial
Intelligence
and IIoT**



**Expertise/skills
gap continues to
grow**



Reshoring



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



ESG

COMMON PITFALLS



Siloed Implementation



Pilot Purgatory



One Size Fits All



**Letting 'Perfect' Get
In The Way Of Better**



**Prioritizing Technology
Over Value**



**Lack Of Alignment
On Goals**

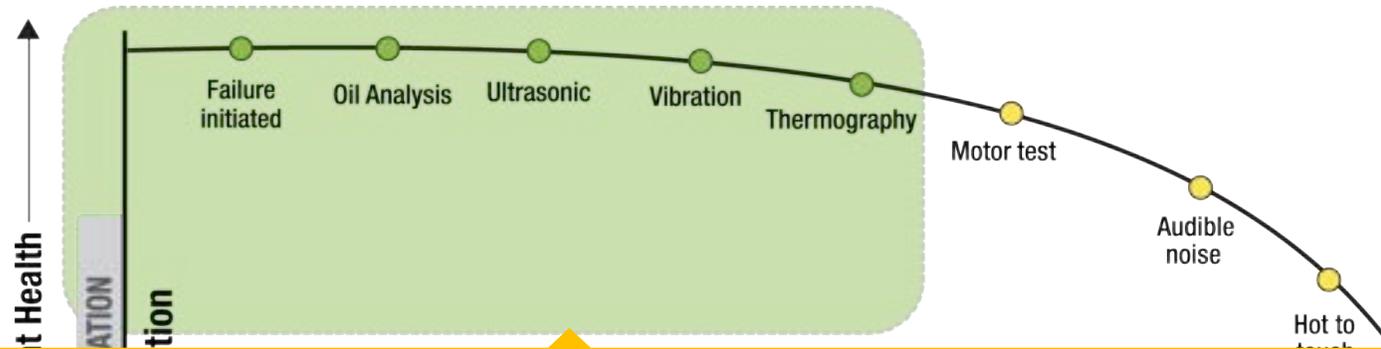
A Connected Reliability ecosystem

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

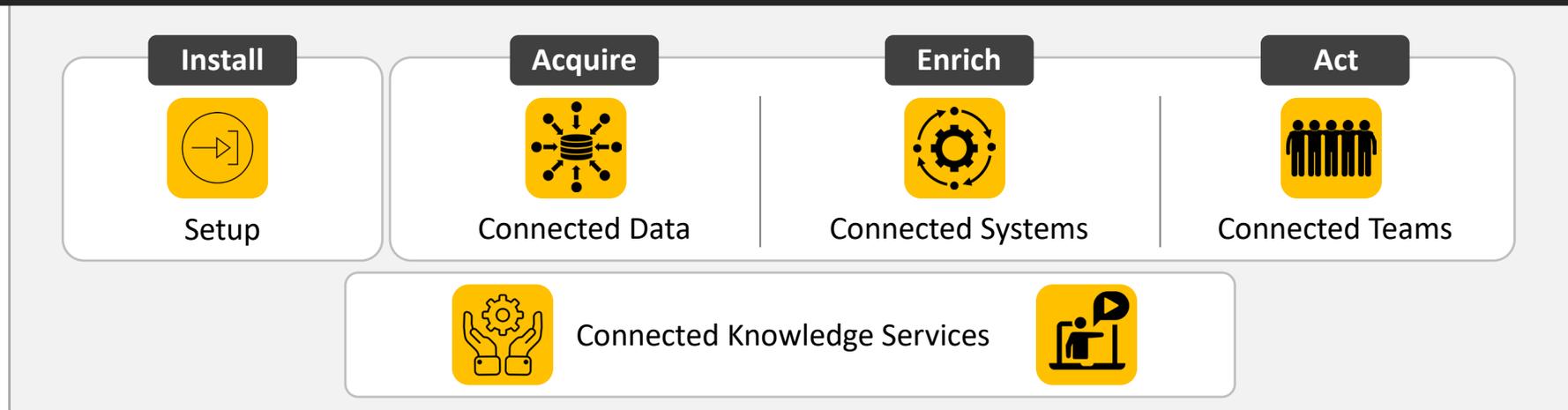
Maintenance management is automatically integrated with data acquisition and analysis, giving industrial leaders unprecedented real-time visibility and empowering maintenance managers to make data-driven decisions that avoid downtime.



5 Pillars Connected Reliability



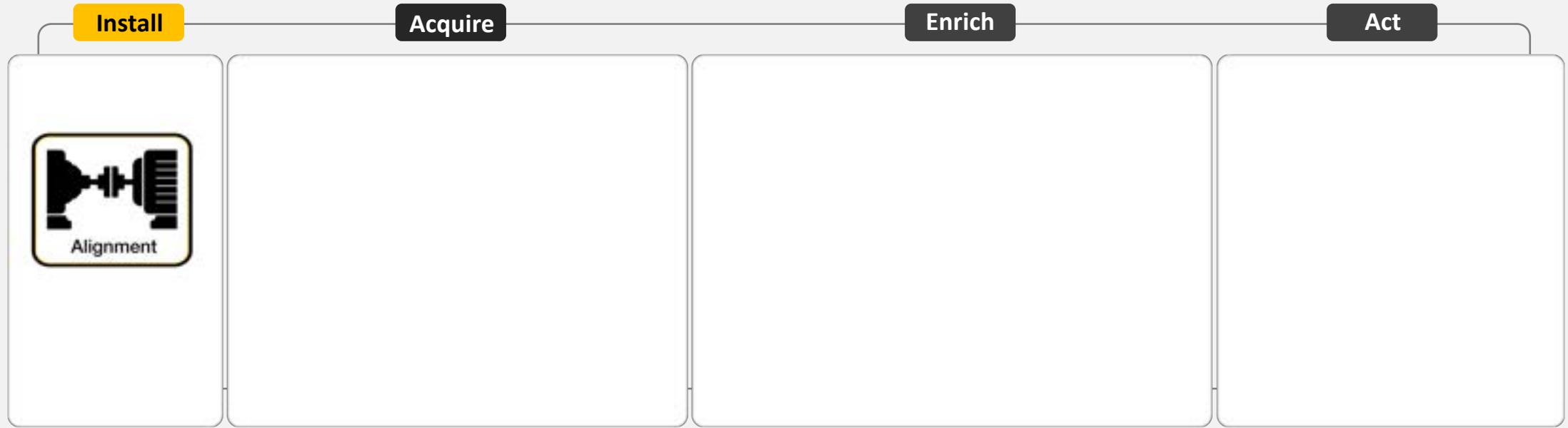
Install with precision → **then operate at the top-left of the P-F Curve**



Install

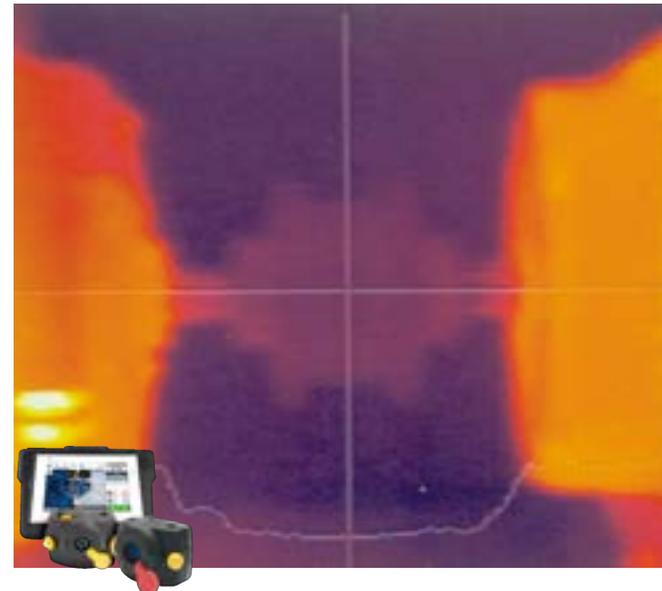
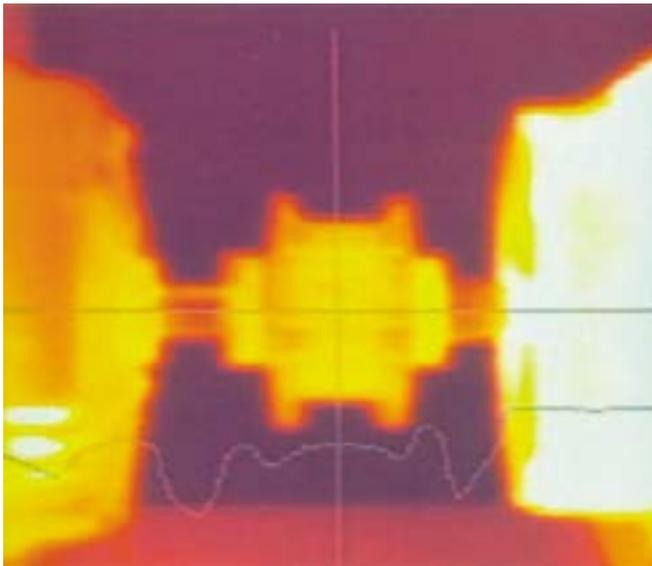


Install: Peak Performance from Day 1



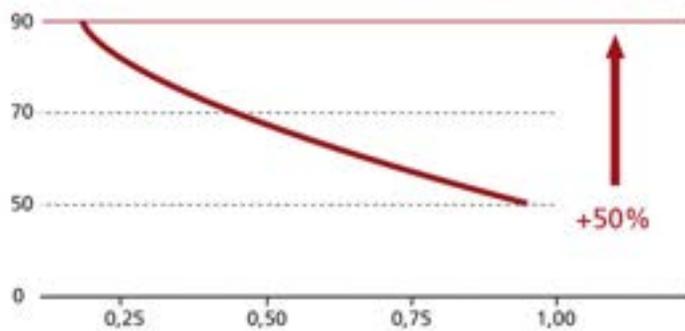
Laser Shaft Alignment	Intrinsically Safe	Active Situational Intelligence	Geometrical Alignment	Pulley Alignment

Installation with Precision to Save Cost



Bearing life cycle (%)

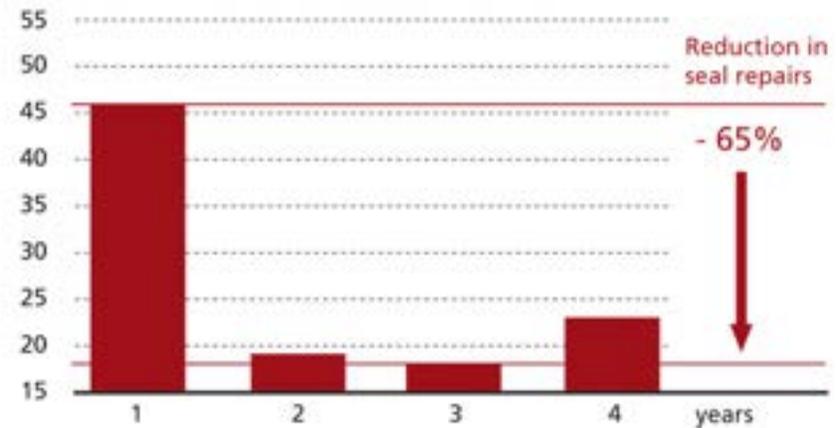
Increase in bearing life cycle



Offset (mm)



Number of mechanical seal repairs



Reduction in seal repairs

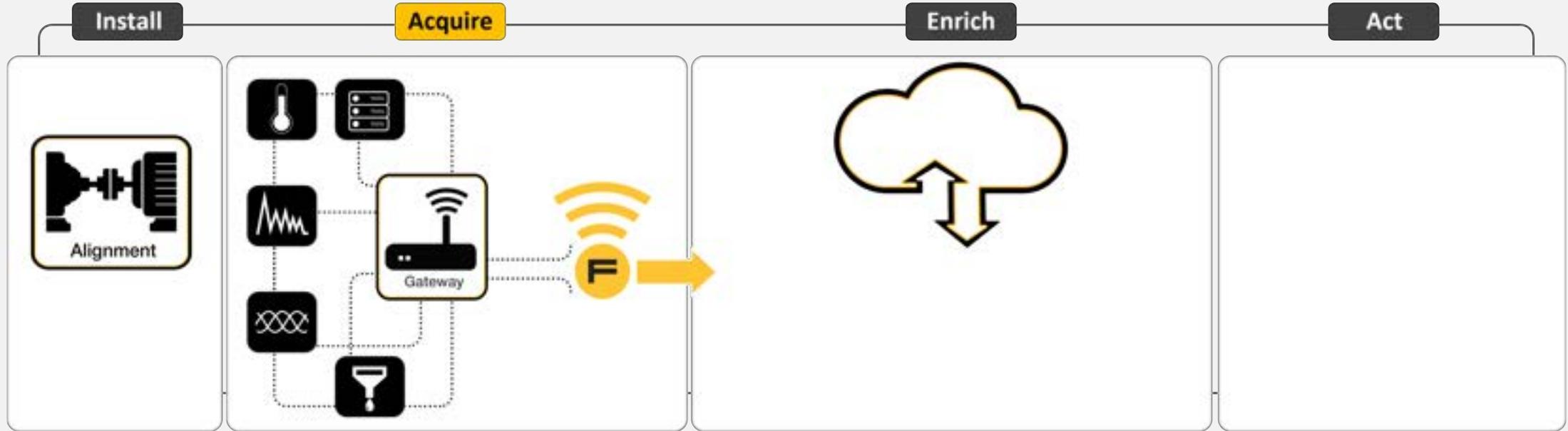
- 65%

years

Aquire



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.)

Industry Expertise

- Automotive
- Pulp&Paper
- Food & Bev
- Pharma



- PowerGen
- Wind
- Hydro
- Oil and Gas



- Chemicals
- Mining
- Cement
- Steel



Asset coverage with the right solution (Verification)

Peak performance addresses all assets, not just the critical few

Asset Criticality Objective

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

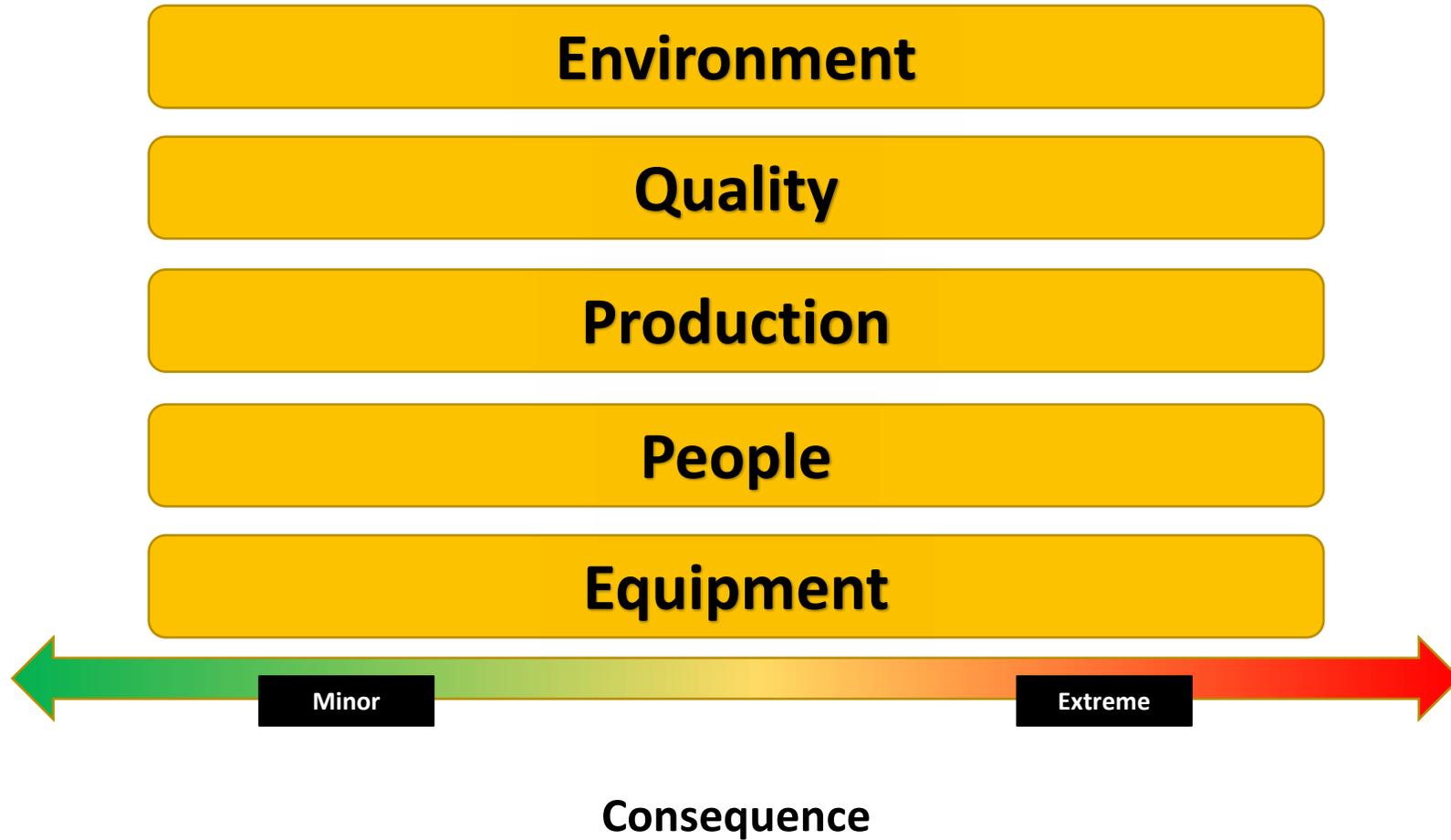
Screen

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

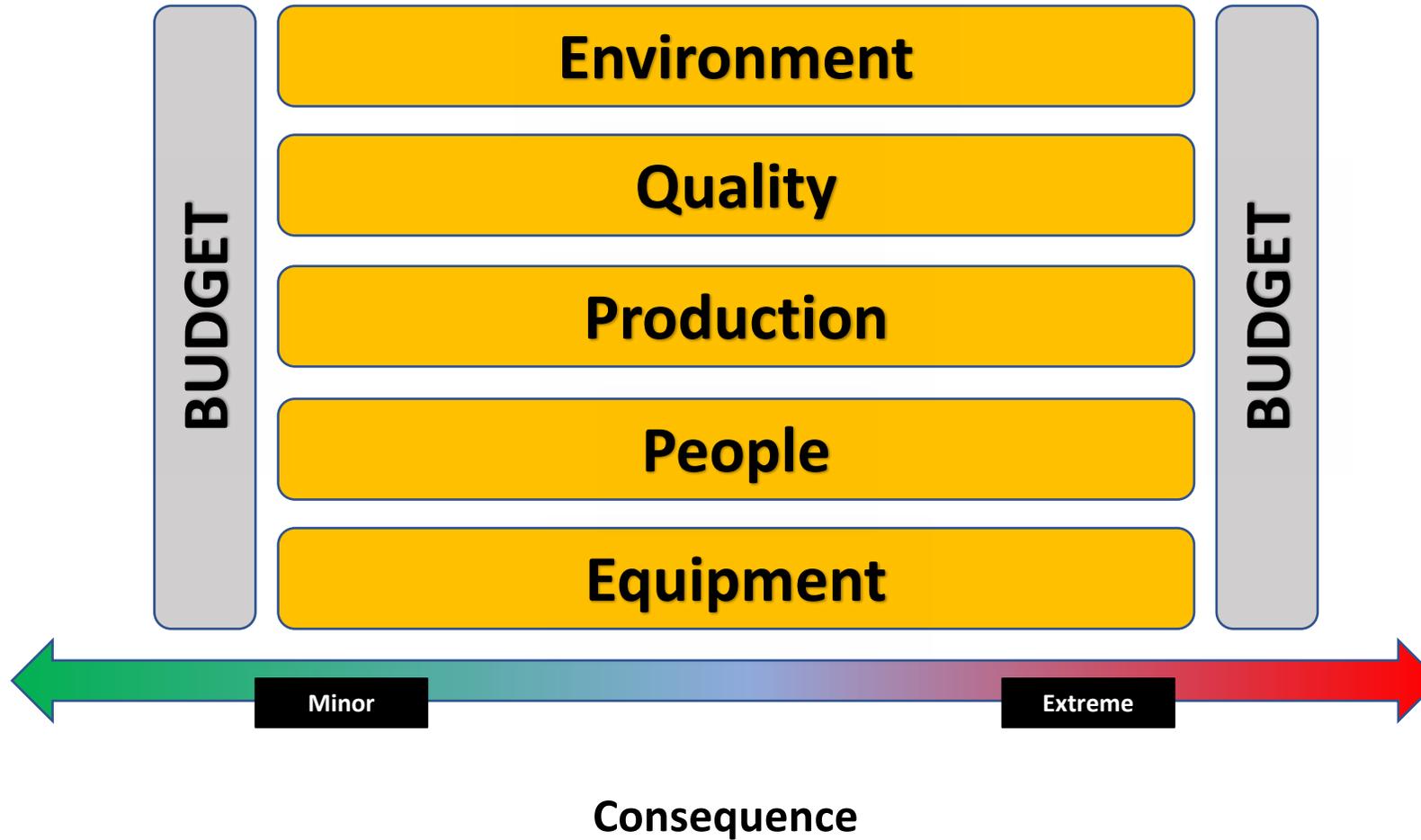


Different products/solution for the different requirements

The different Faces of Criticality (Verification)



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

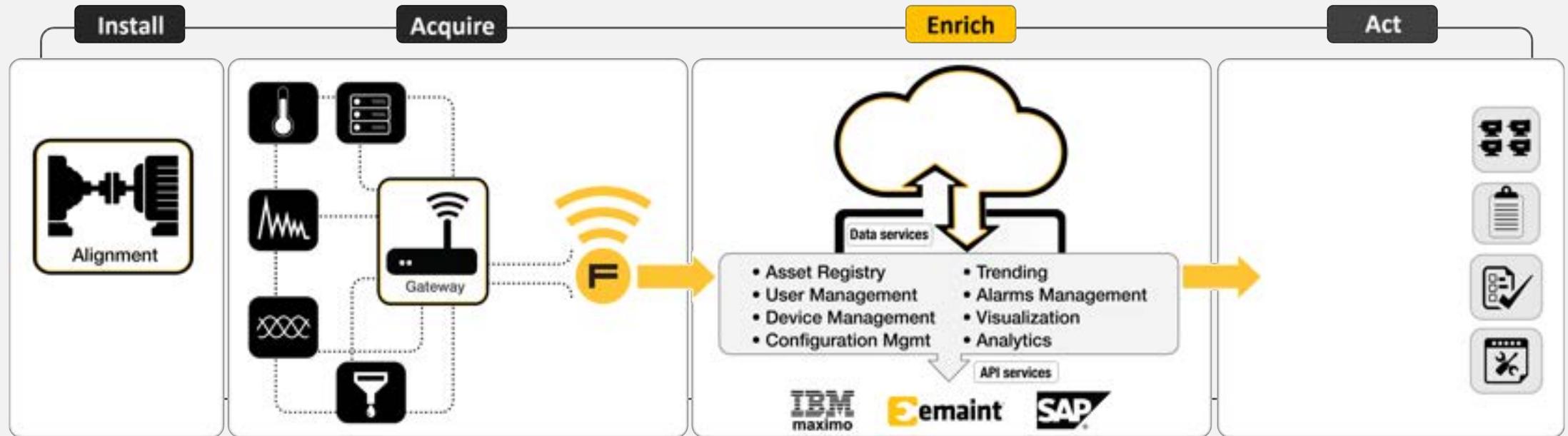
Benefit

Collect continuous data, to get deep insights on critical machines

Enrich



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:

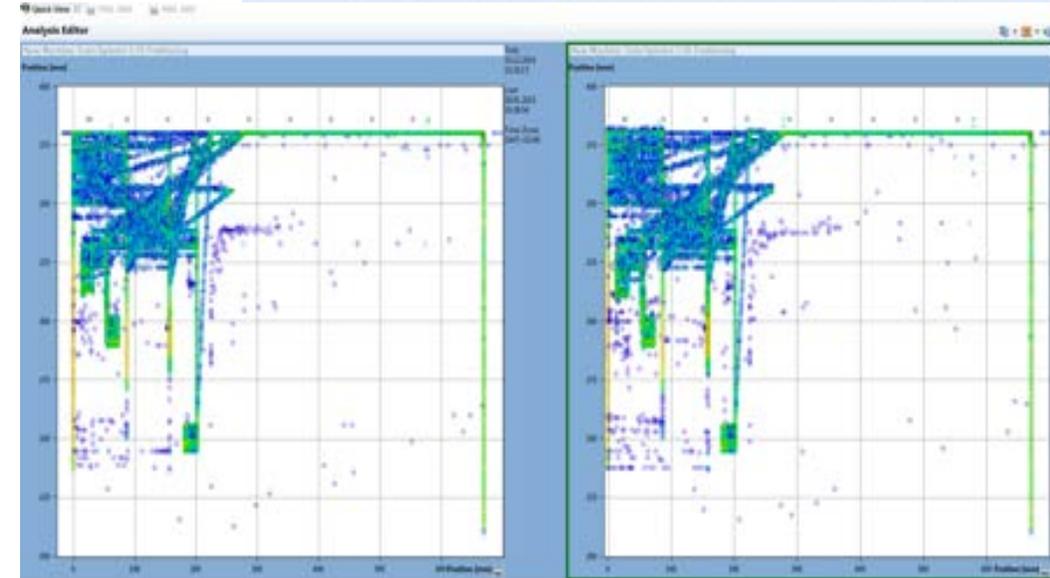
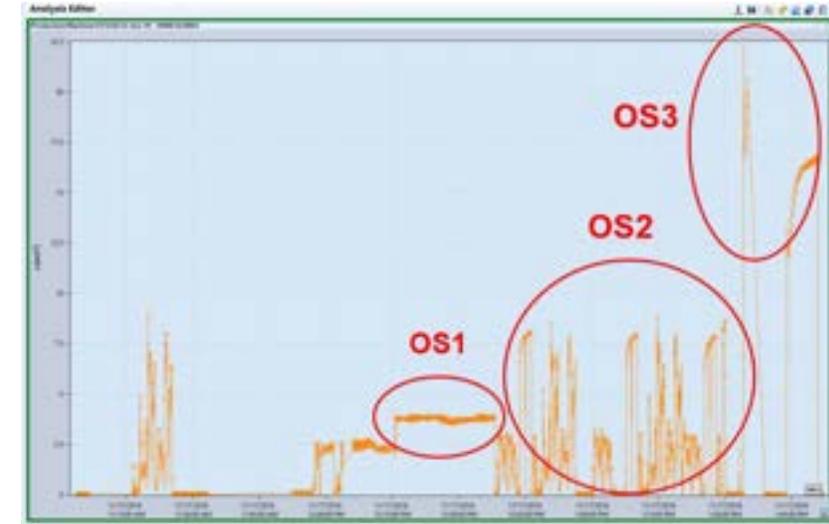
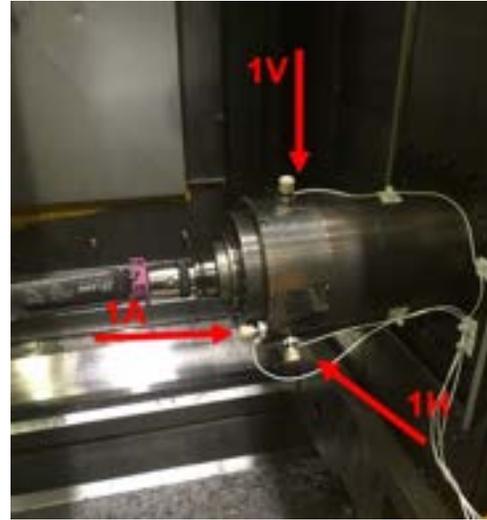
- A more complete picture of asset history and current health
- A solid basis for decision support and maintenance actions

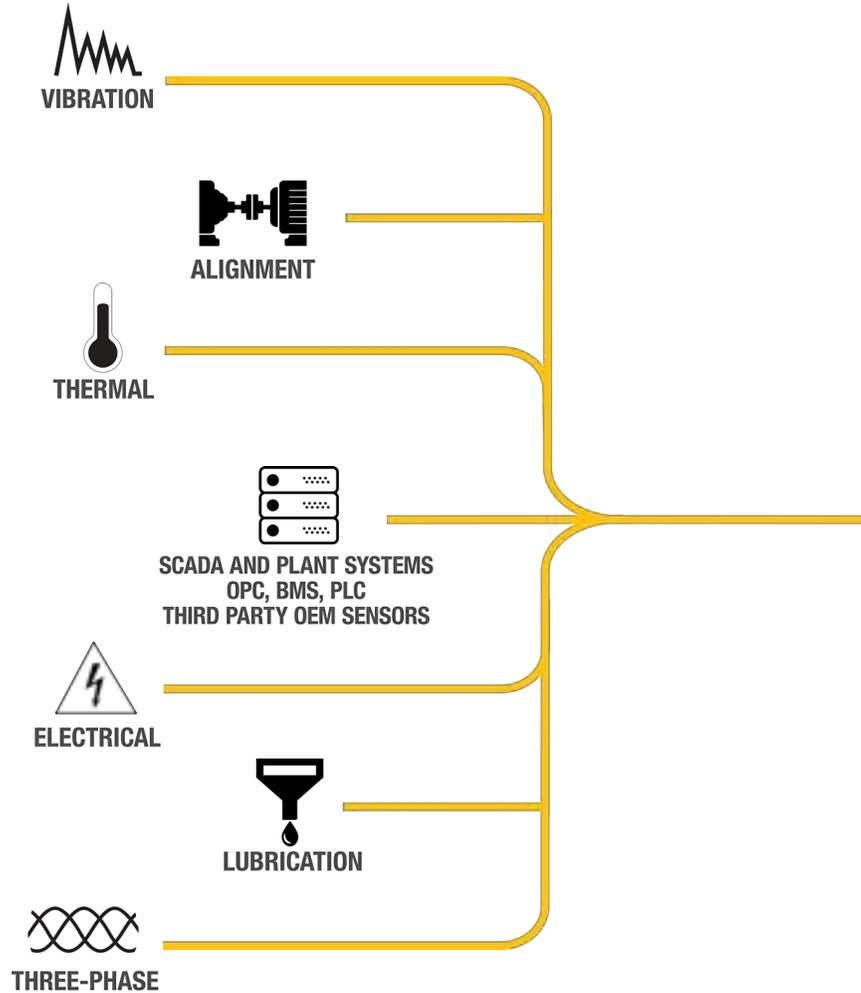
**“vibration data
seems to be very
challenging”**



Enrich

- **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 Data as Driver for more accurate Expert and Automated Analysis

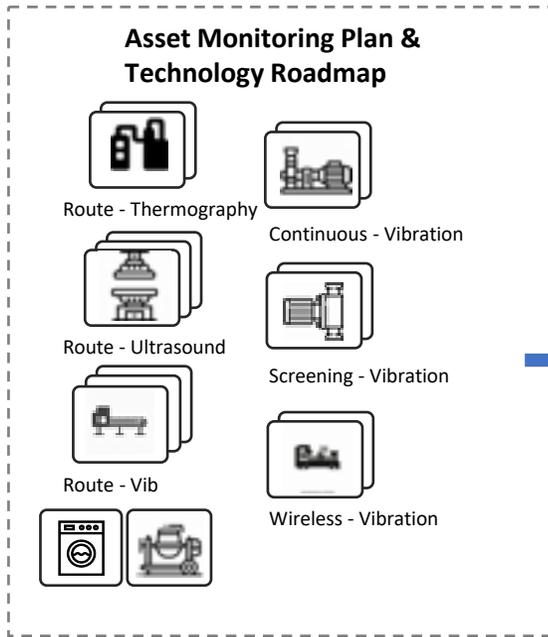
Enrich



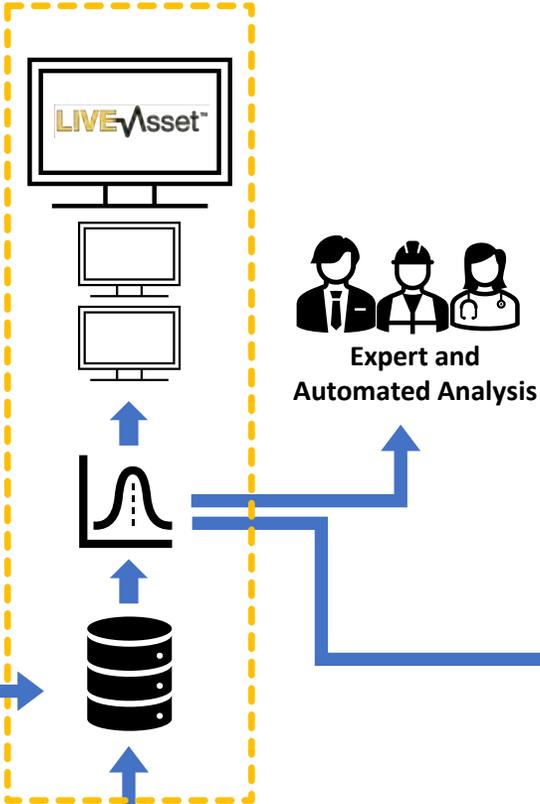
Where to start



Site Assessment & Solution Engineering



Condition Monitoring Operations Center



Remote Services



Active Assistance

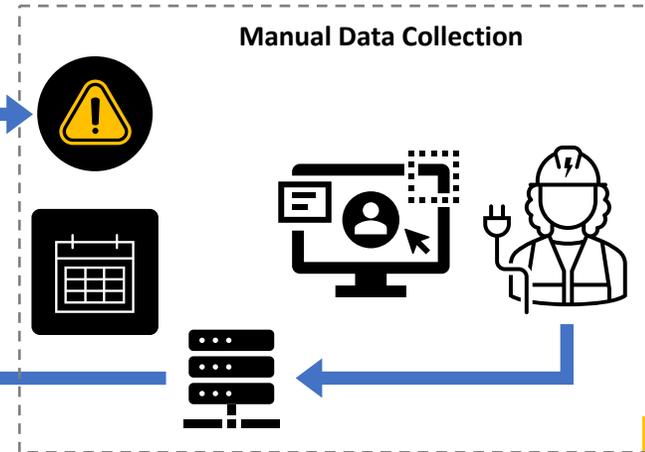
- Onsite Machinery Services
- TELEDIAGNOSIS
- Remote Condition Monitoring



On-Demand Expertise

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

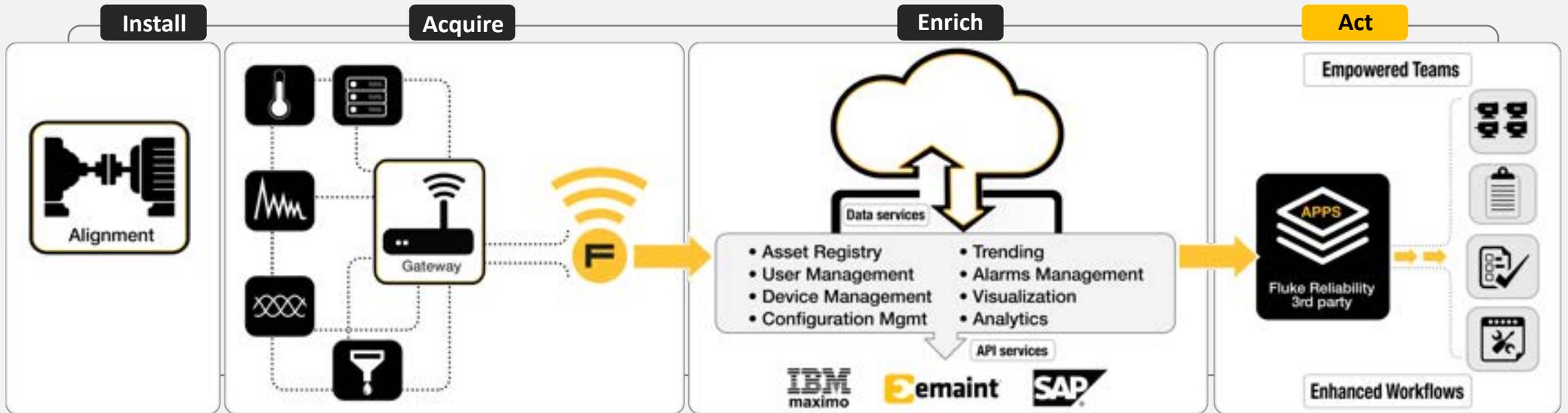
Manual Data Collection



Act

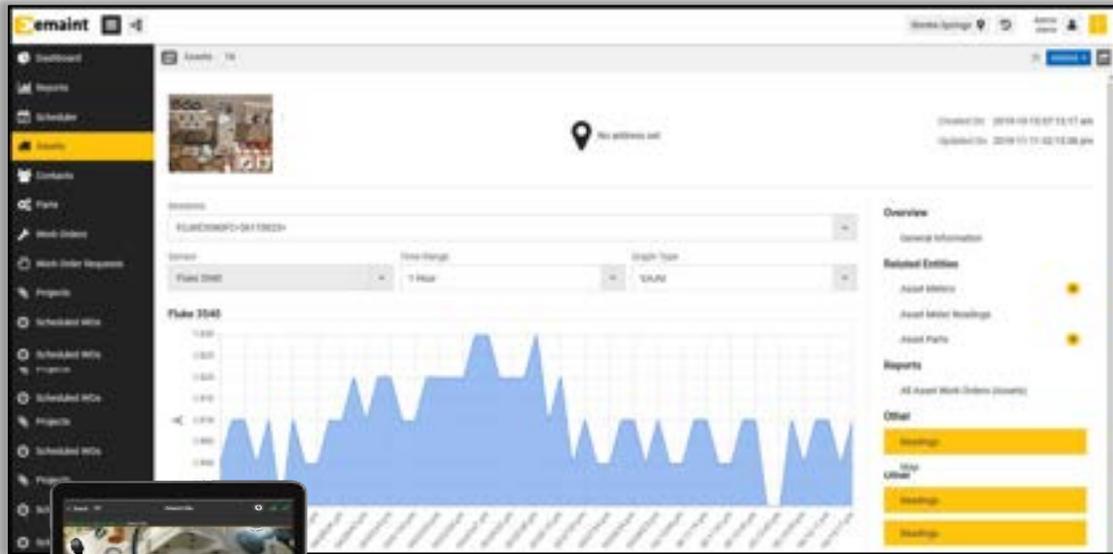


Connected Teams

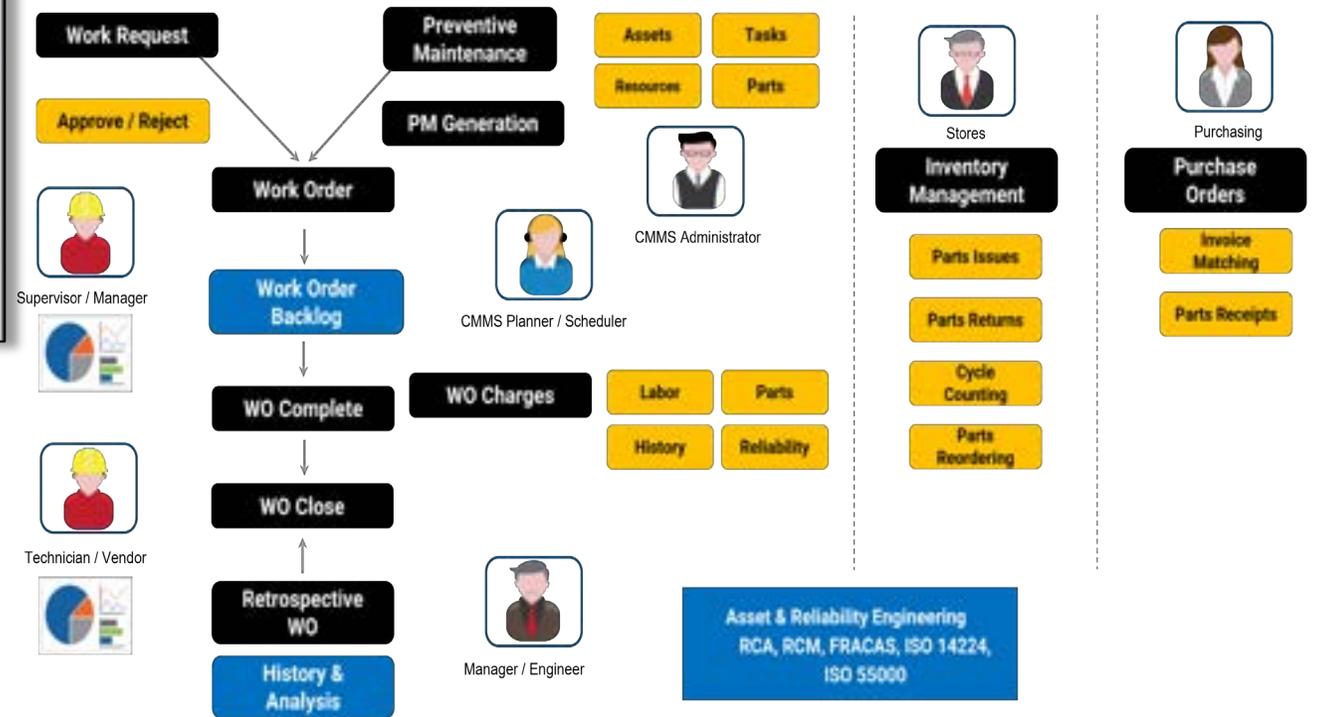


Reliability-centered maintenance actions | Mobile workforce enablement | Enhanced workflows

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

emaint + PRÜFTECHNIK

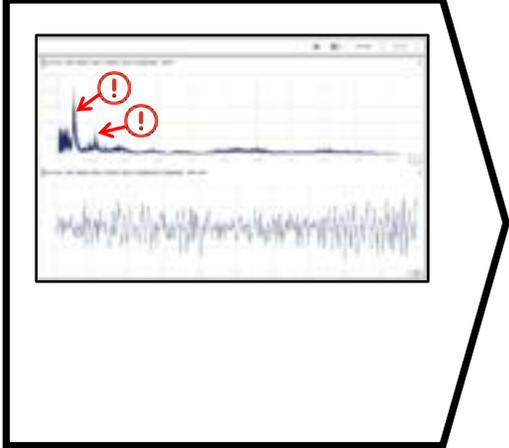
Online Continuous Monitoring

PRÜFTECHNIK

Wireless Periodic Monitoring

PRÜFTECHNIK

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

PRÜFTECHNIK

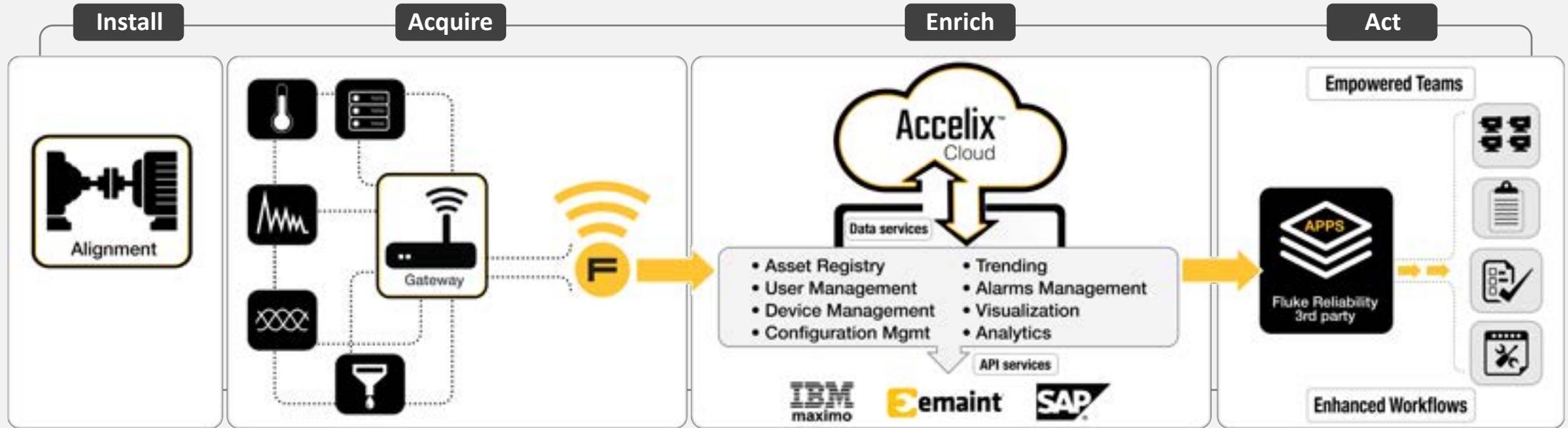
5) Attach Device Results to Close the Work Order

emaint + PRÜFTECHNIK

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

Case Study: Critical Equipment Monitoring

Ensuring uptime of critical equipment through connected reliability

CHALLENGE

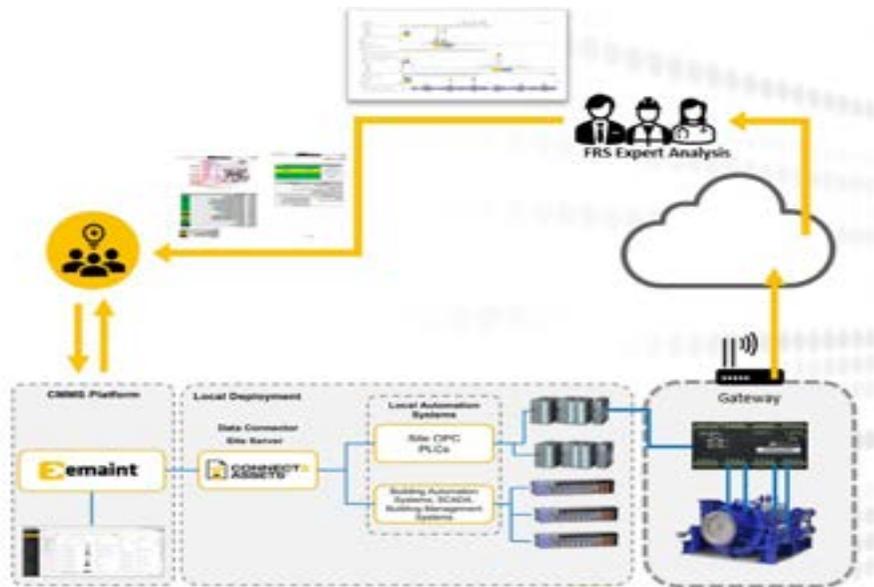
Customer Situation: A major global company in the agriscience sector stores and packages seeds. The product is harvested once a year and stored till packaging.

Customer Complication: product has to stay under constant conditions (temperature and moisture), dryer fans achieve this by ventilation. If asset fails, full production batch of 1 year is at risk.

SOLUTION: Connected reliability

By implementing online condition monitoring systems and CMMS software, paired with remote condition monitoring by experts, the user can now leverage connected reliability to receive recommendations and make repairs before their dryer fans fail.

Thanks to remote condition monitoring, plus work orders in the CMMS, the customer can turn machine health data into action, deploying technicians before disaster strikes in the future.



CUSTOMER OUTCOMES

- ✓ **24/7** machine condition monitoring versus planned maintenance
- ✓ Protection of equipment and product
- ✓ Implementing predictive maintenance, bridging the gap in expertise by partnering with Connected Reliability provider

Case Study: Critical Equipment Monitoring

Ensuring uptime of critical equipment through connected reliability

CHALLENGE

Customer Situation: A company in the F&B sector refrigerates with highly-efficient, and toxic, liquid ammonia during production.

Customer Complication: In 2022, thousands of pounds of anhydrous ammonia leaked, forcing evacuations and, ultimately, regulator fines.

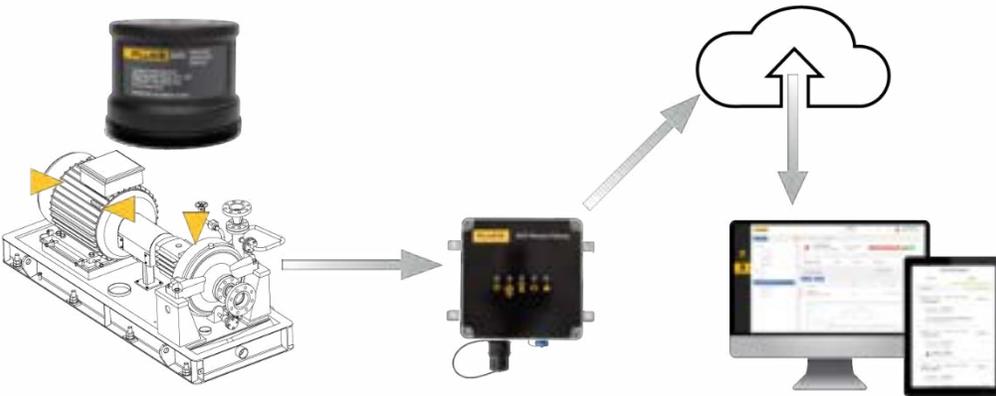
SOLUTION: Connected reliability

By implementing wireless vibration sensors and CMMS software, the company can now leverage connected reliability to receive alarms and make repairs before their ammonia equipment fails.

Thanks to vibration monitoring, plus work orders in CMMS, the company can turn machine health data into action, deploying technicians before disaster strikes in the future. This drives results that are both operationally-efficient, as well as environmentally-sound.

CUSTOMER OUTCOMES

- ✓ **24/7** machine condition monitoring versus every **6** months
- ✓ **8** ammonia compressors connected across **2** Midwest sites
- ✓ **4** most common faults can be caught with narrowband alarms



Thank you for your attention!

Q&A

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