Levine Lectronics & Lectric, Inc.

DYNAPAR

Remote Cloud Monitoring of Motor Health by Mark Langille and Derek Lammel of Dynapar (1 hour)

Today's Topics

- How remote monitoring integrates with route-based vibration monitoring
- How field service vibration technicians helped a major food producer prevent downtime
- How a packaging material manufacturer prevented bearing failure
- How to prioritize and identify assets for remote monitoring
- Where to start with a pilot project

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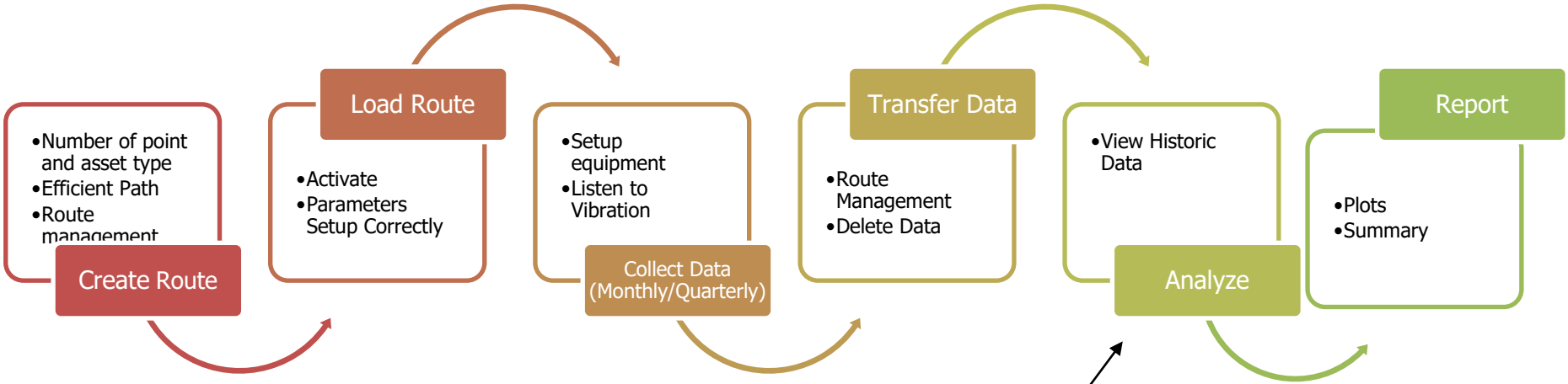
Manager, Condition Monitoring Systems

Derek Lammel
Reliability Engineer
Cat III Vibration Analyst

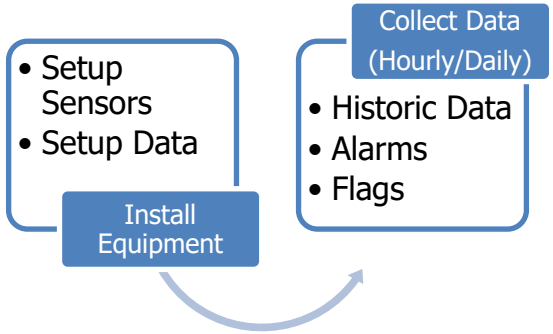
Route vs Remote Vibration Monitoring

- Route-based vibration monitoring can catch problems early
- Misalignment, Looseness, Unbalance, Bearing Faults, Electric Faults
- But with fast changing conditions, route can't continually monitor the problem

Route



Remote Monitoring



Route vs Remote Vibration Monitoring

- Pros and Cons of Route vs IoT systems

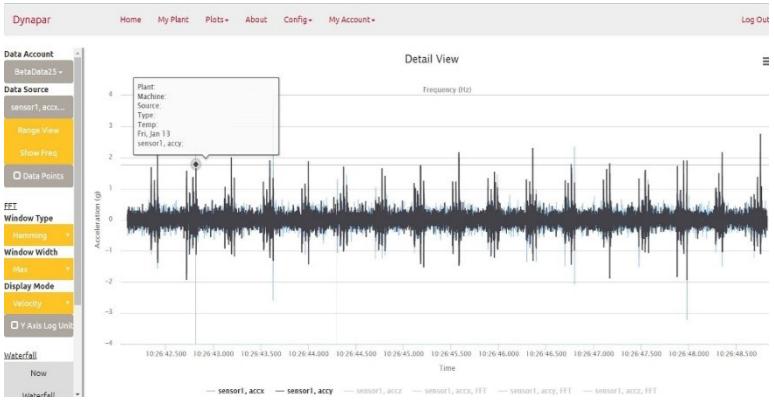
	Route	IoT
Monitor Large Number of Assets	✓	✗
Early Detection	✓	✓
Continuous Monitoring	✗	✓
Quick Deployment	✓	✓
Labor Intensity	✗	✓
Cost	✓	✗

What is The Dynapar Onsite™ System

More than just an alarm, the Dynapar OnSite™ system provides high quality data with expert level tools that allow you to detect problems and diagnose them remotely.

Dynapar OnSite™ System

- Affordable, 24/7 condition monitoring
- Integrated triaxial vibration and temperature sensors
- Easy to deploy and easy to use by anyone
- No custom gateway or large upfront investment required
- Easy to expand, scale and redeploy to other assets
- Tough enough to survive the harshest conditions
- Setup in minutes, no need interfere with control architecture

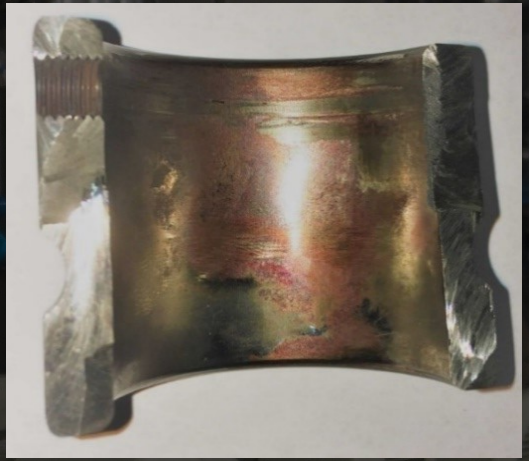


Dynapar OnSite™ Analytics

- Pre-programmed with configurable dashboards
- Easy to use alarms send alerts via text or email
- Cloud-based, access from any device
- Intuitive interface similar to your handheld tools
- Built-in tools including FFT, waterfall plots, RMS trend and more
- Designed for multi-stakeholder access
- Supports vibration analysis for both experts and non-experts

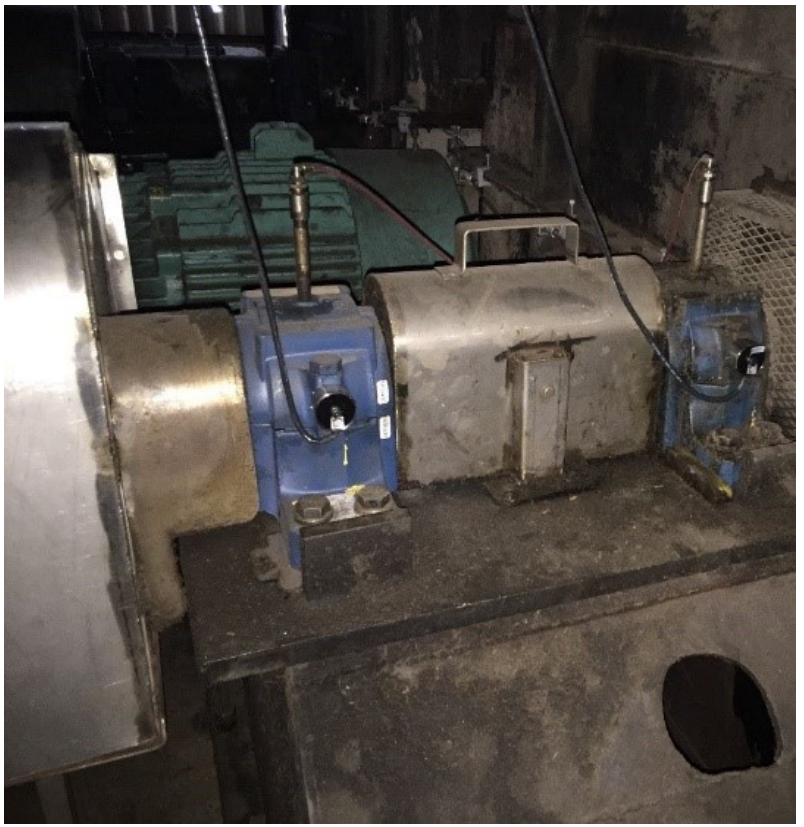
Benefits of a Hybrid Approach:

Successful Case Studies



Case Study – Troubled Asset

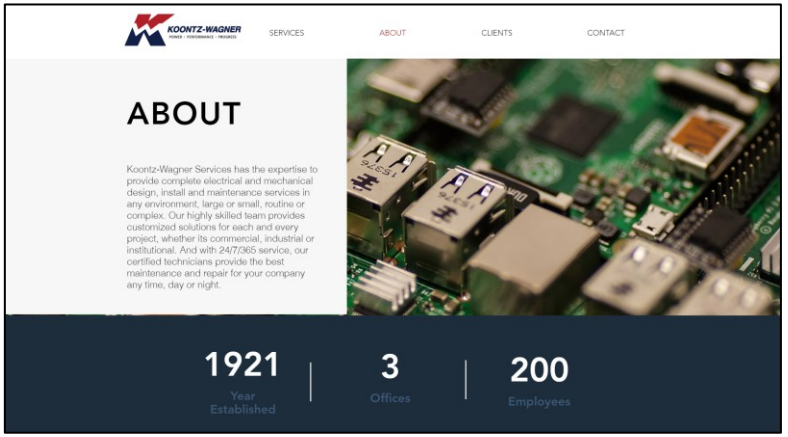
- Rooftop blower routinely failed, difficult to monitor via route-based vibration analysis.
- System could fail quickly, between regular route.
- Tight production schedules did not allow for downtime.
- A catastrophic blower failure would result in more downtime than needed for maintenance.



Does this sound familiar?

Case Study – Troubled Asset

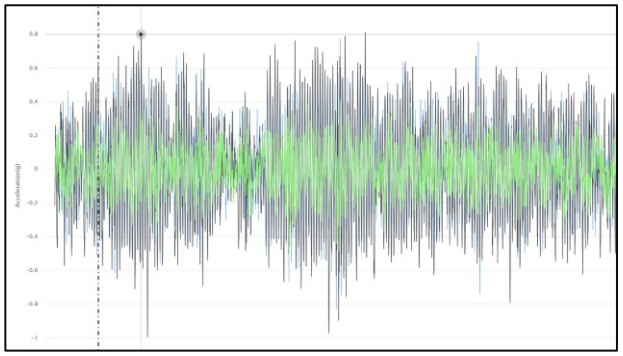
- When a bearing problem was detected, operations wanted to continue production until the bearing was just about to fail.
- Field service tech had to answer:
  - How bad is the bearing?
  - How long do I have?
- Solution: tech turned to Dynapar's remote condition monitoring



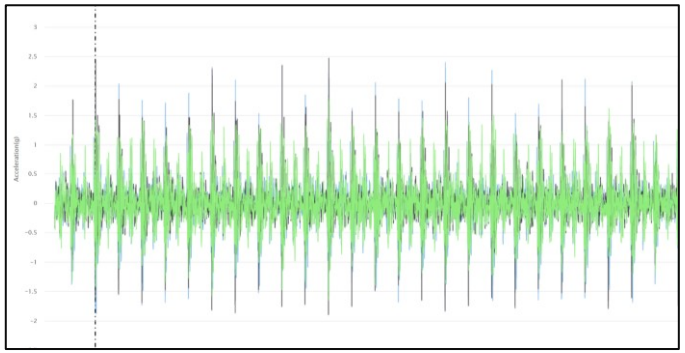
Case Study – Troubled Asset

TWF

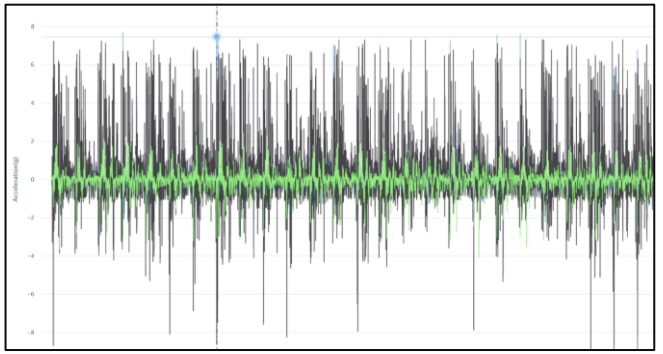
Day 10



Day 26



Day 44



FFT

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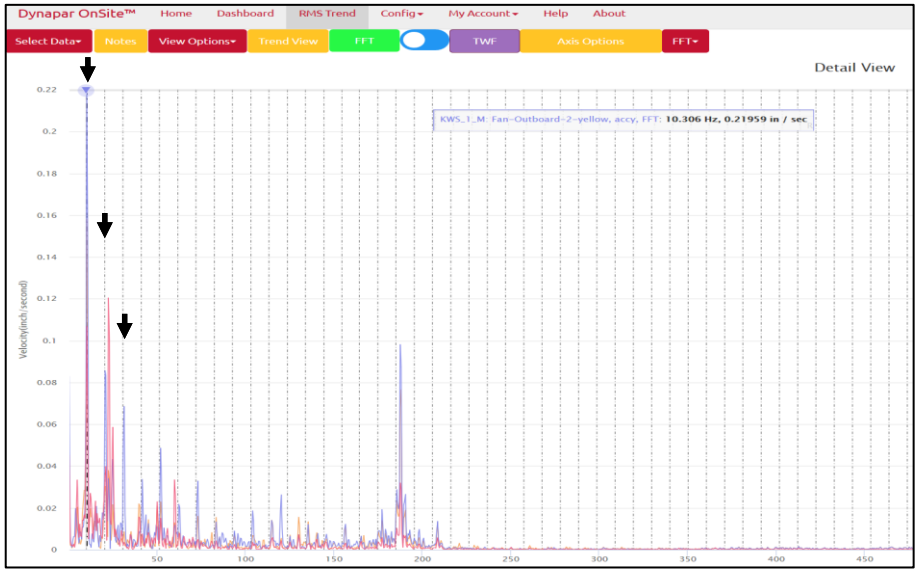

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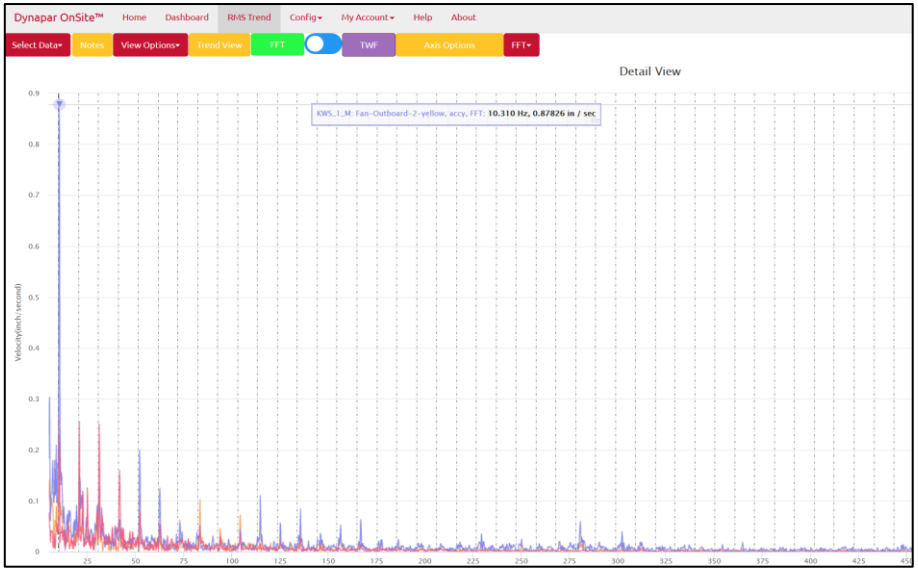
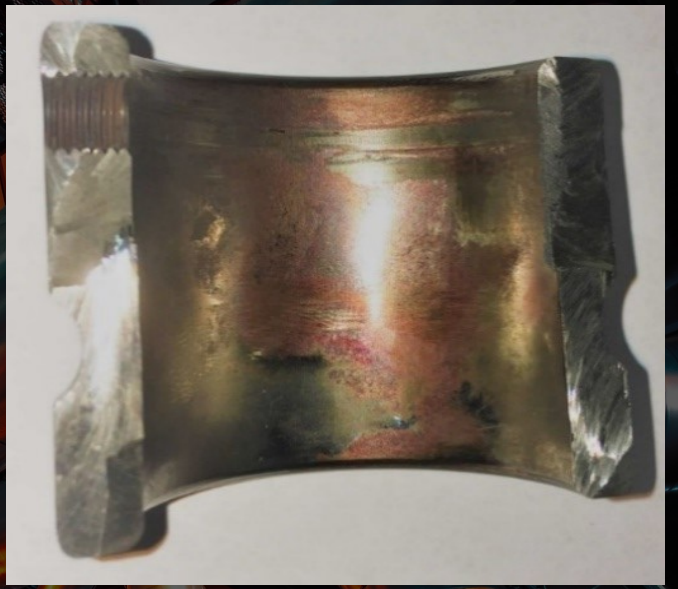


Troubled Asset Timeline

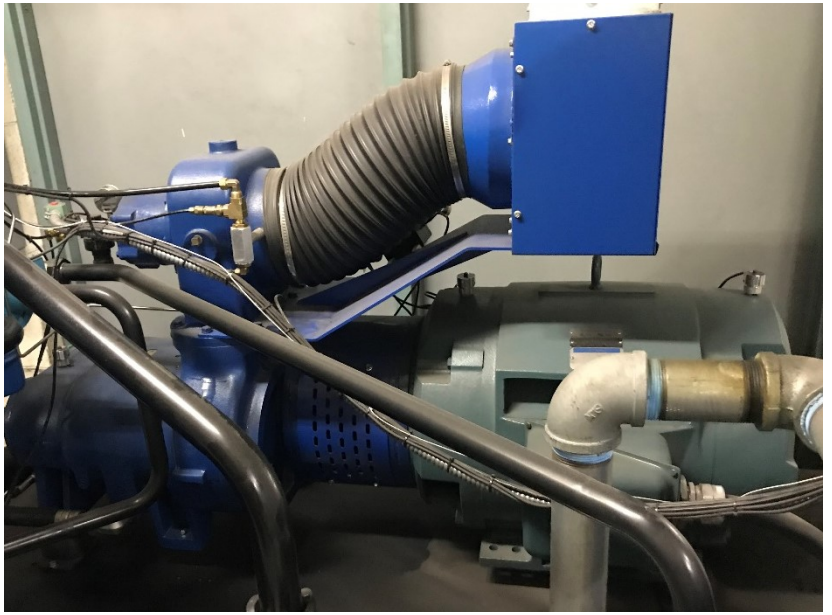
- October 7th : Problem detected with Route
- October 17th : OnSite Installed
- November 3rd : Problem worsens, replacement is scheduled
- November 28th : Bearing replaced during scheduled downtime
- 53 days of additional uptime



POLL

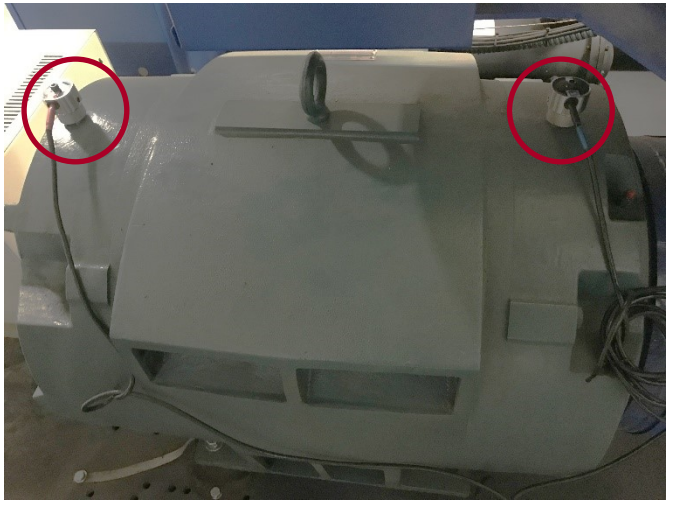
Case Study – Bad Actor

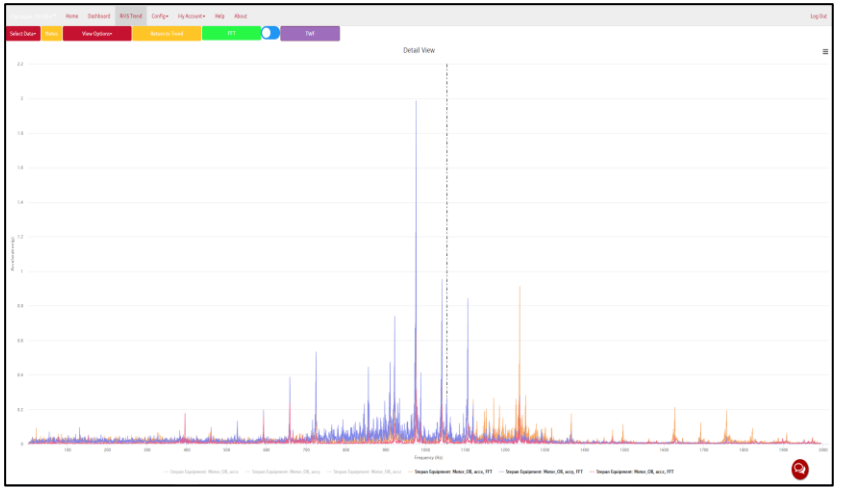
- Compressor motor, critical to production had a history of failure
- Previous event was catastrophic and caused major outage when compressor went down, required rental compressor while replacement parts were ordered
- Total cost of downtime:
  - $20,000/week for rental compressor
  - Cost of lost production of 2 days $40,000
  - Replacement part/labor cost of ~$5,000
- Total cost of downtime $45,000
- Remote vibration monitoring was added when asset was replaced



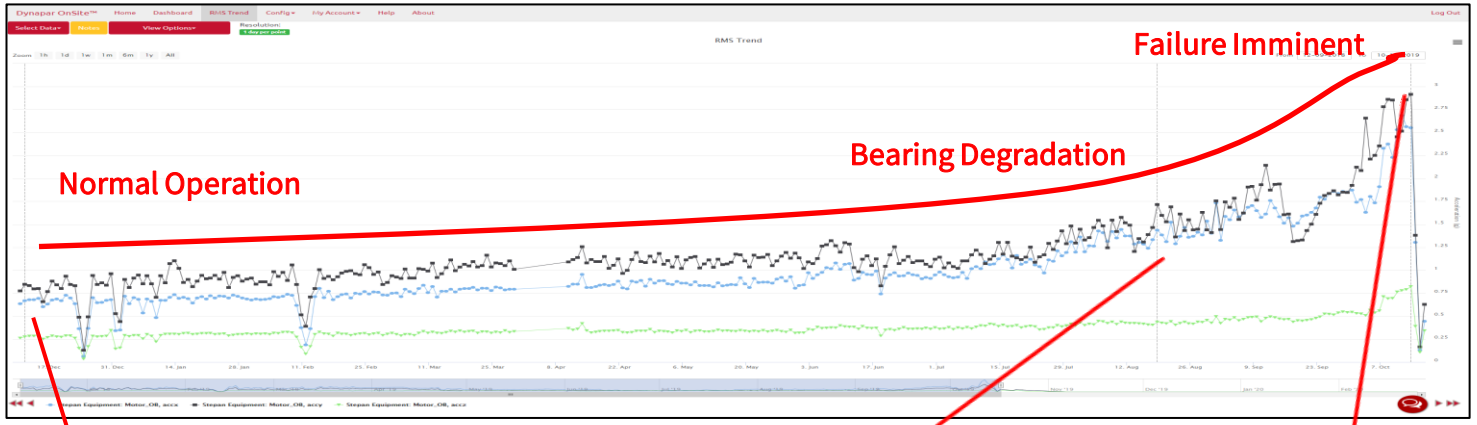
Case Study – Bad Actor

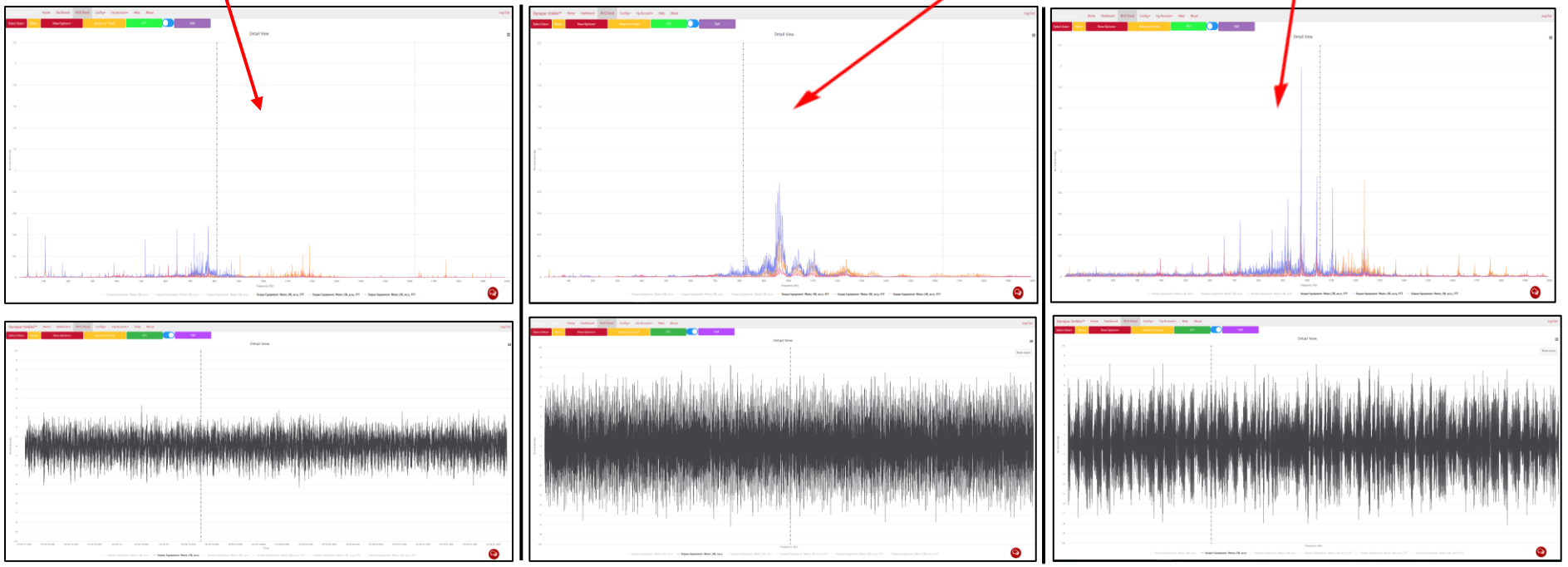
- On August 15, 2019, an issue was detected via remote monitoring
- Dynapar OnSite condition monitoring system detected an outer-race defect on the drive end bearing
- The team was able to secure a replacement and schedule a bearing replacement while continuously monitoring the motor's condition
- Bearing arrived and a change out was conducted
- Cost of repair was much lower than changing the whole motor due to a rotor strike and much lower than the previous catastrophic failure





Case Study – Bad Actor





› How can you maintain production while monitoring troubled assets in your facility?

How to Get Started Quickly in Your Facility

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- How can you maintain production while monitoring troubled assets in your facility?
  - Regular route-based vibration monitoring
  - When an issue is detected, apply remote monitoring
  - But traditional systems are complicated to install & expensive
  - Need a system that can be quickly deployed and re-deployed

- **Where to deploy in your facility?**

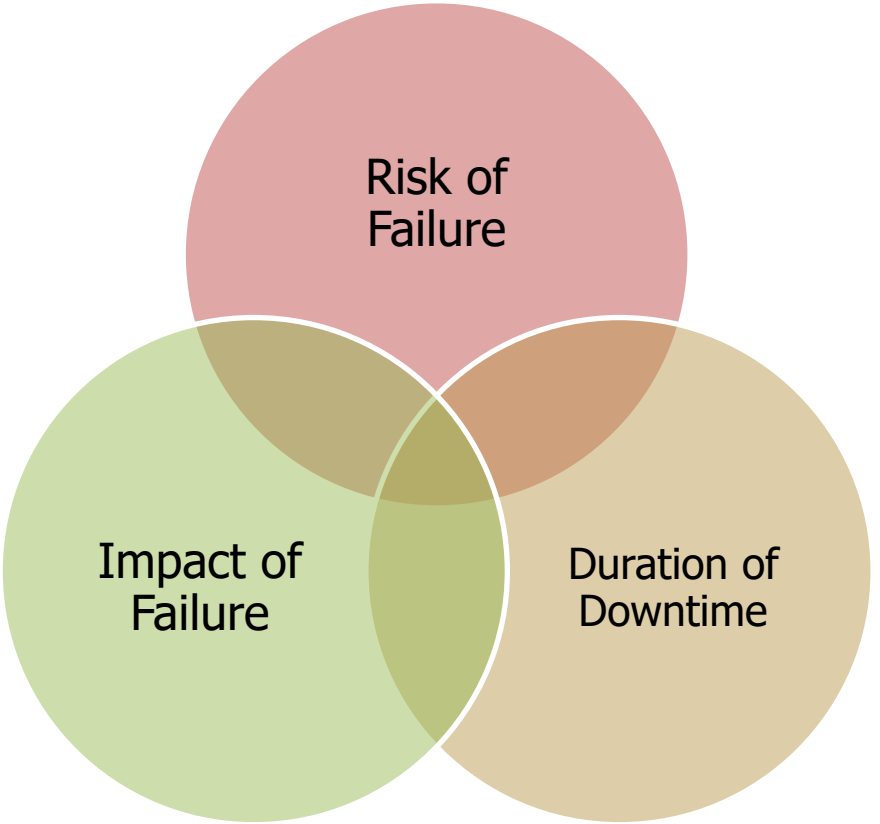
Where to deploy in your facility?

- Build a pilot program starting with a group or class of assets
- Audit facility to identify assets ideal for remote condition monitoring
- Calculate the total value of downtime avoided due to the pilot program and use this to sell predictive maintenance within your organization

- **How to choose the right asset for remote monitoring?**

How to Choose Assets for Remote Monitoring?

- Identifying a pilot project starts with auditing asset classes:
- Risk of Failure
  - Consider environment, regularity of maintenance and history of failure
- Impact of Failure
  - Consider how many cells/lines will be impacted
- Duration of Downtime
  - Replacements available, lead time of parts and equipment needed to repair asset



How to Prioritize Assets for Remote Monitoring

Asset Class	Risk of Failure	Impact of Failure	Duration of Downtime	Priority
Conveyor Motors	Medium – routinely lubricated but dirty environment	High	Low – easily replaced, spare motors on site	Medium
Boiler Feed Pumps	Low – routinely lubricated, well maintained	High	Low – backup system available	Low
Blower Motors	High – located on roof, exposed to environment	High	High – no backup available	High

Ideal to get started

› Group assets into classes and conduct a similar analysis in your facility

Poll

Common Examples of High Priority Assets

Crane Motors

Compressors

Air Handlers

Conveyor Motors

Fans/Blowers

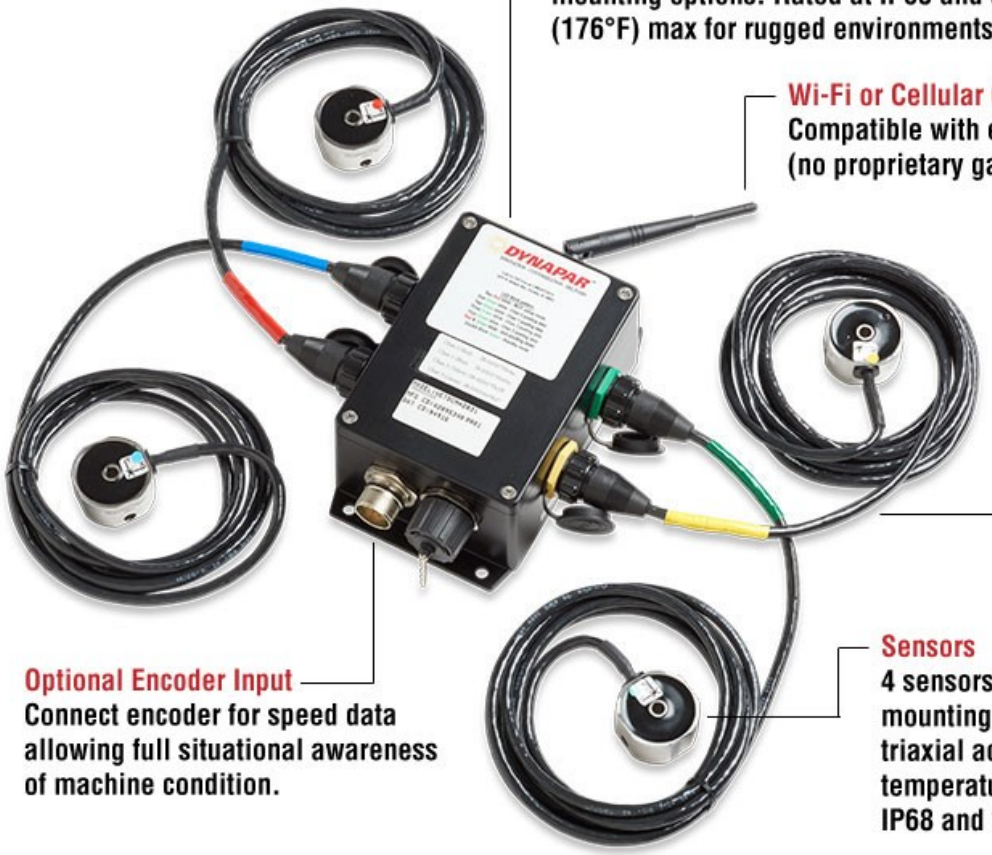
Pumps

What you should look for in a remote monitoring system

What you should look for in a remote monitoring system

- Easy and fast to installation
- Rich data and tools to analyze how bad the problem is
- Data accuracy: +/- 1 Hz can make a difference when analyzing frequency spectrum
- Cost justification: affordable for one asset / no infrastructure needed
- Re-deployable to other assets
- Integration of other sensor data for correlation (real-time speed, temperature, etc.)

Hardware Overview



Sensor Hub
Easily installs in minutes wit multiple mounting options. Rated at IP65 and 80°C (176°F) max for rugged environments.

Wi-Fi or Cellular Communication
Compatible with existing infrastructure (no proprietary gateway needed).

Cables
Up to 30ft (9.1m) sensor cables for hard to reach locations.

Optional Encoder Input
Connect encoder for speed data allowing full situational awareness of machine condition.

Sensors
4 sensors per node with multiple mounting options. Each contain triaxial accelerometers and temperature sensors. Rated at IP68 and 105°C (221°F) max.

Edge Trigger Data Collector
Push button for off schedule data capture.

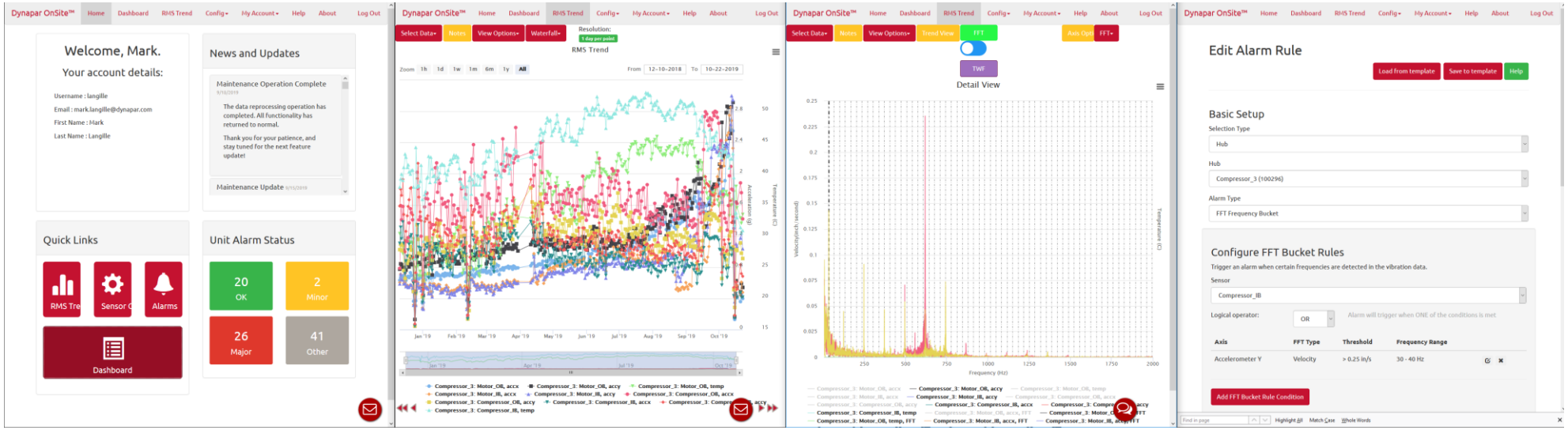
Asset Status Indicator
Multifunction LED to visually confirm device status

Web Application Overview

The OnSite™ system is a hardware and software solution that combines flexibility with fast results. The hardware hub collects vibration, temperature and speed (with an encoder present) and transmits it via a Wi-Fi or Cellular network. There is no need to download software - the application resides in the cloud. Setup in minutes by attaching the sensors, turn on the power and the OnSite™ System does the rest. Built in software tools allow alarms to be set and real time data to be analyzed.

Easy Access Dashboards

Drill down and diagnose
With expert tools (FFT,TWF,
Waterfall)



Quickly trend data in RT

Create rules and alarms to automatically check status

Reduce downtime and increase productivity by changing how you work

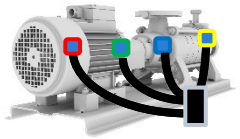
DYNAPAR™

Store Data & Access Anywhere

- Cloud based, not wired into control architecture/software
- Send automated alarms on predefined limits
- Access from any device
- Automatically timestamp and run calculations/analytics

Collect Real Time Data

Secure WiFi or Cellular Network



Deploy in minutes
Collect data on:
- Vibration
- Temperature
- Speed (with encoder option)

Analyze & Trend Data

Analyze with built in tools:
- Overall Trend Plot
- Full Waveform Plot
- FFT Plot
- Waterfall Plots
- Asset Dashboard
- Harmonic Cursors
- Sideband Cursors
- Export Data Function

Share, Collaborate & Act on Data

Reliability

Vibe Technician

Operations

Maintenance

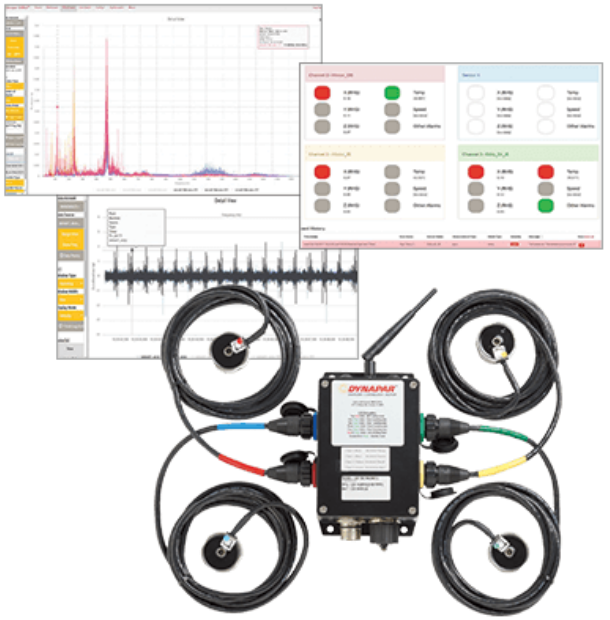
Plant Manager

Poll

Conclusion

- Use regular route to monitor all assets
- When an issue is detected, quickly apply IoT remote monitoring systems
- Build a pilot program starting with a group or class of assets
- Audit facility to identify assets ideal for remote monitoring
- Long term, implement a hybrid approach that incorporates continuous monitoring for critical assets
- Expand until all assets are monitored in the whole facility

Balancing IoT with Predictive Maintenance Programs



Questions?

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