FLUKE
Reliability

Predictive Maintenance

THE BABY STEPS TO BIG RESULTS

Best Practices Webinar Series

C&W SERVICES

Predictive Maintenance

THE BABY STEPS TO BIG RESULTS

RESULTS

Contents

- SAFETY MOMENT
- MAINTENANCE STRATEGIES
- SENSORS
- IOT GATEWAYS
- MONITORING OPTIONS
- BABY STEPS
- THE WHY

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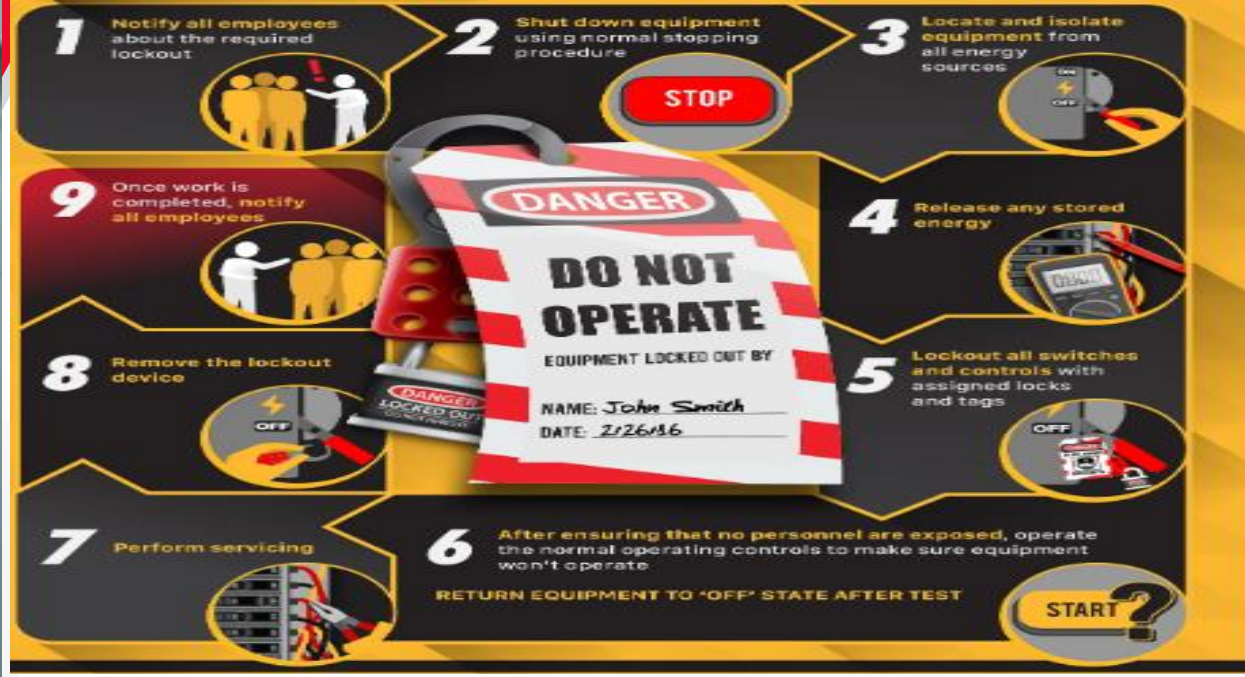
WE MAKE A DIFFERENCE


IMPACT
01
Safety Moment



LOCKOUT/TAGOUT PROCEDURE

1. Preparation understand hazards notify affected personnel
2. Machine or equipment shutdown
3. Isolate the machine from the energy source(s)
4. Apply lock/tag to energy isolating device(s)
5. Release or control stored energy
6. Verify zero energy state attempt start-up test equipment visually inspect
7. Place “out of service” tag at operator location.

RESULTS

02

Maintenance Strategies

COMMON MAINTENANCE STRATEGIES

Reactive Maintenance (RM)

Also known as **run-to-failure**, is a maintenance strategy that involves repairing or replacing equipment after it has failed. This approach can be cost-effective for non-critical systems where downtime doesn't significantly impact operations or productivity. However, it's important to note that while this strategy may seem less expensive in the short term, the cost of unexpected equipment failure can often be much higher than regular preventive maintenance. This could include the cost of rush orders for parts, overtime labor, and lost productivity during downtime. Therefore, it's crucial to consider these factors when deciding on a maintenance strategy.

Corrective Maintenance

This reactive approach that focuses on repairing or replacing equipment after a failure or malfunction has occurred. This strategy is crucial when preventive measures are not successful or when equipment failure is inevitable. The primary goal is to minimize downtime by quickly identifying and resolving the issue.

Corrective maintenance requires a team that is well-prepared and equipped with the necessary skills and resources to efficiently handle emergencies. However, it's worth noting that while this approach can be effective in certain situations, it may lead to higher costs in the long run due to unexpected breakdowns.

Preventive Maintenance (PM)

a cost-efficient strategy designed to reduce downtime and prolong the lifespan of machinery. This approach is similar to the regular service that consumer vehicles undergo, which is often based on time or usage.

Preventive maintenance follows the equipment manufacturer's recommended schedule and services machines during planned maintenance visits. The goal is to catch and address potential issues before they lead to significant problems or failures. This proactive approach can lead to improved equipment reliability, decreased production downtime, and cost savings over time.

However, it's important to note that while preventive maintenance can be highly effective, it requires careful planning and scheduling, and may involve upfront costs for regular inspections and part replacements. Therefore, it's often used in combination with other maintenance strategies to achieve the best results.

LESS COMMON MAINTENANCE STRATEGIES

Condition-Based Maintenance

This strategy indeed focuses on monitoring the real-time condition of equipment using various sensors, data analysis tools, and predictive maintenance software.

The key aspect of condition-based maintenance is that it relies on data to determine when maintenance is necessary. This approach optimizes resources and reduces unnecessary downtime by performing maintenance tasks only when they are needed, based on the actual condition of the equipment.

Condition-based maintenance can detect early signs of wear and tear, allowing for timely interventions that can prevent more significant issues and result in cost savings. Examples of this strategy in action include using vibration analysis to detect imbalances in rotating machinery or temperature sensors to monitor the condition of electrical equipment.

However, it's important to note that while condition-based maintenance can be highly effective, it requires the right tools and expertise to interpret the data correctly and make informed decisions. Therefore, it's often used in combination with other maintenance strategies to achieve the best results.

Predictive Maintenance

This strategy indeed takes condition-based maintenance a step further by using advanced analytics and machine learning algorithms.

Predictive maintenance not only monitors the conditions of equipment but also predicts when a component is likely to fail. This allows maintenance teams to perform targeted repairs or replacements just in time, which maximizes asset utilization, minimizes downtime, and reduces costs.

By leveraging historical data, sensor data, and predictive models, predictive maintenance enables maintenance teams to make informed decisions about when and how to maintain their equipment. This proactive approach can lead to significant cost savings and improved operational efficiency.

However, it's important to note that implementing a predictive maintenance strategy requires a significant investment in data collection and analysis tools, as well as the expertise to interpret the results and make informed decisions. Therefore, it's often used in combination with other maintenance strategies to achieve the best results.

CONDITION BASED MONITORING HISTORY -1850'S

Why has it taken so long to implement?

The history of condition monitoring can be traced to the 1850s, when railway maintenance engineers relied on small hammers to inspect and monitor the conditions of locomotive wheels. By tapping the wheels with the hammer and analyzing the sounds, engineers were able to assess the state of each individual wheel. A wheel in good condition would emit a high-pitched ring, while compromised wheels with cracks sounded dull and flat.

Today, the same concept has evolved into one of the most valuable tools used by mechanical operators. Advances in electronic sensors and software have reimagined the limits of condition monitoring and made it an instrumental tool used across a wide range of industries.

https://www.petro-online.com/news/analytical-instrumentation/11/breaking-news/condition-monitoring-everything-you-need-to-know/56822#:~:text=The%20history%20of%20condition%20monitoring%20can%20be%20traced%20to%20the,the%20conditions%20of%20locomotive%20wheels.

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03

Sensors

IMPACT

Low cost and a can be purchased form many different companies

IOT SENSORS

Sensors play a crucial role in various industries and applications. They can measure a wide range of characteristics such as **acceleration**, **motion**, **proximity**, **light**, **orientation**, **force**, **angular velocity**, **magnetic field**, **pressure**, **altitude**, **humidity**, and **temperature**.

In critical applications like **cold chain logistics** and **temperature & humidity-controlled rooms**, sensors are indispensable. They ensure that conditions remain within the required parameters, thereby preserving the quality and safety of the products.

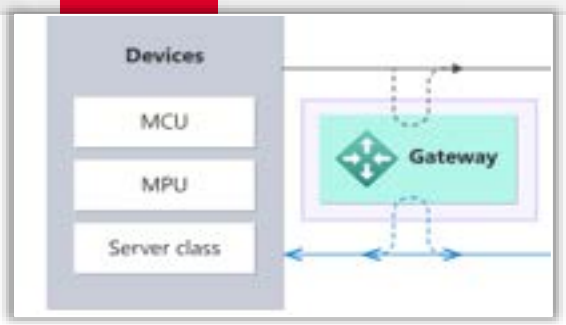
In **industrial plants**, sensors enable efficient asset tracking and collection of sensitive information on machinery. This includes data on **vibration**, **pressure**, **magnetic field**, and **water presence**. Such information is vital for predictive and condition-based maintenance strategies, as it allows for timely interventions, minimizing downtime and reducing costs.

04

IOT Gateways

IMPACT

CONNECTIVITY PROCESS MAP



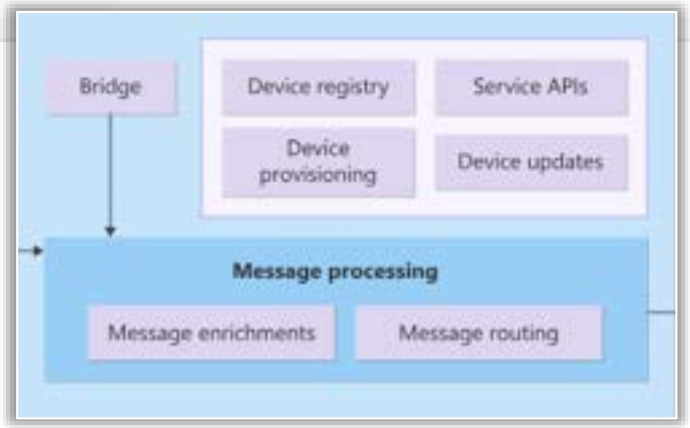
IoT devices are composed of circuit boards with various sensors that connect to the internet, typically via WiFi. These sensors enable the devices to monitor and respond to environmental changes, making them ideal for a wide range of applications:

•**Pressure Sensor**: Used in remote oil pumps to monitor pressure levels.

•**Temperature and Humidity Sensors**: Found in air-conditioning units to regulate the environment.

•**Accelerometer**: Utilized in elevators to detect motion and ensure safety.

•**Presence Sensors**: Installed in rooms to detect occupancy for security or energy-saving purposes.

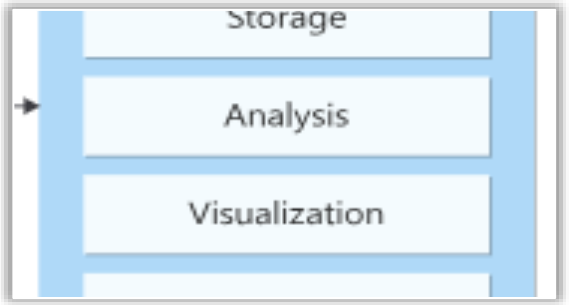


Communication between IoT devices and cloud services, highlighting both device-to-cloud (D2C) and cloud-to-device (C2D) interactions. Here's a brief overview:

•**Device-to-Cloud (D2C)**: IoT devices send telemetry data from their sensors to cloud services. This data can include various measurements like temperature, pressure, or motion.

•**Cloud-to-Device (C2D)**: Cloud services can send commands or updates back to the IoT devices, allowing for remote control, configuration, or software updates.

This two-way communication enables a robust IoT ecosystem where real-time data can be used for analytics, and devices can be managed and updated remotely.



In an IoT solution, cloud services play a pivotal role in managing and interacting with devices. Here's a concise overview of their typical functions:

•**Telemetry Processing**: They receive large volumes of data from devices and decide how to process and store it.

•**Data Analysis**: They analyze telemetry to offer insights, either in real-time or later.

•**Device Commands**: They send instructions from the cloud to specific devices.

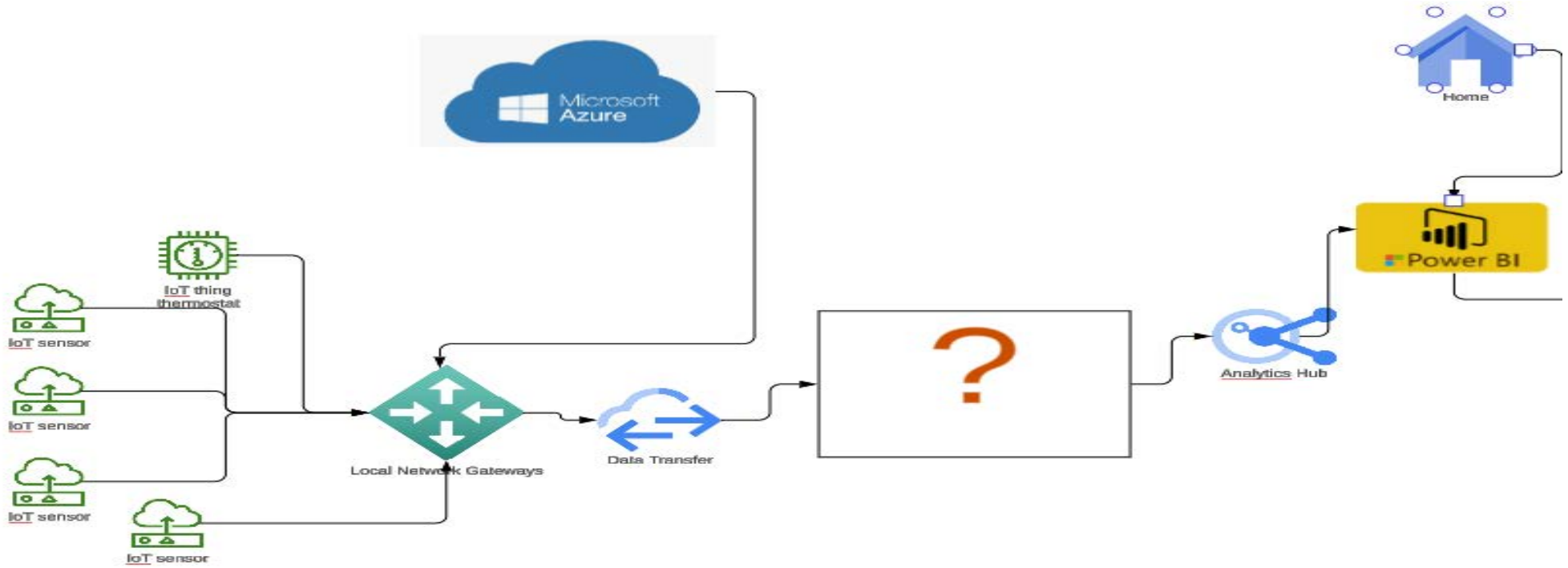
•**Device Provisioning**: They provision devices and manage their connectivity to the infrastructure.

•**State Management**: They control and monitor the state and activities of devices.

•**Firmware Management**: They handle the firmware updates on devices.

These functions ensure efficient operation, maintenance, and management of IoT devices within a network.

PROCESS FLOW



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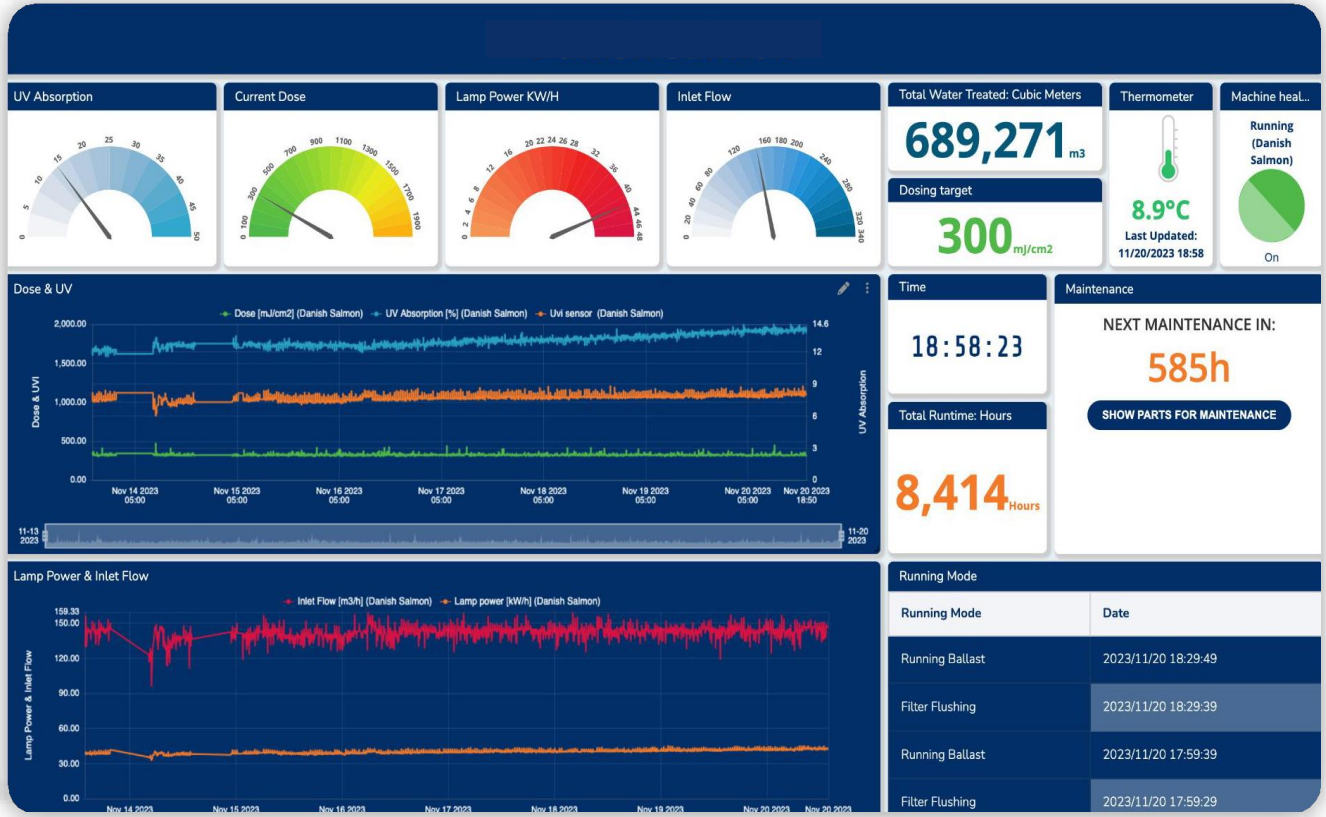
05

Monitoring Options

DASHBOARDS

Desktop dashboard

Utilities dashboard



PUMP DASHBOARD

RESULTS

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Baby steps

WE MAKE A DIFFERENCE

THREE STEPS

Identify critical equipment

Is your equipment properly identified based on site criticality?

Pick 1-3 pieces to install sensors on

- Wireless Temperature Sensors
- Humidity Sensors
- Wireless Open-Closed Sensors
- Motion and Occupancy Sensors
- Wireless AC Current Meters
- Wireless Light Meters
- Wireless Three-Phase Current Meters

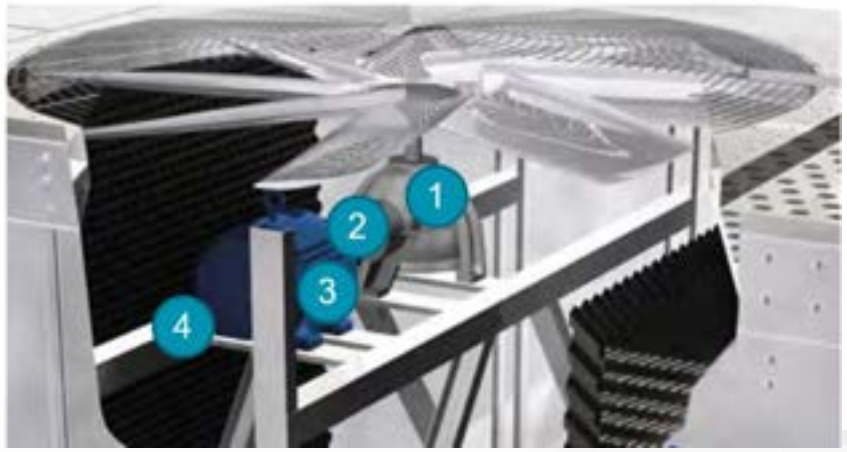
Staff

I identify your tech that will own the program and get vibration training.

- The most critical step!

LOW HANGING FRUIT

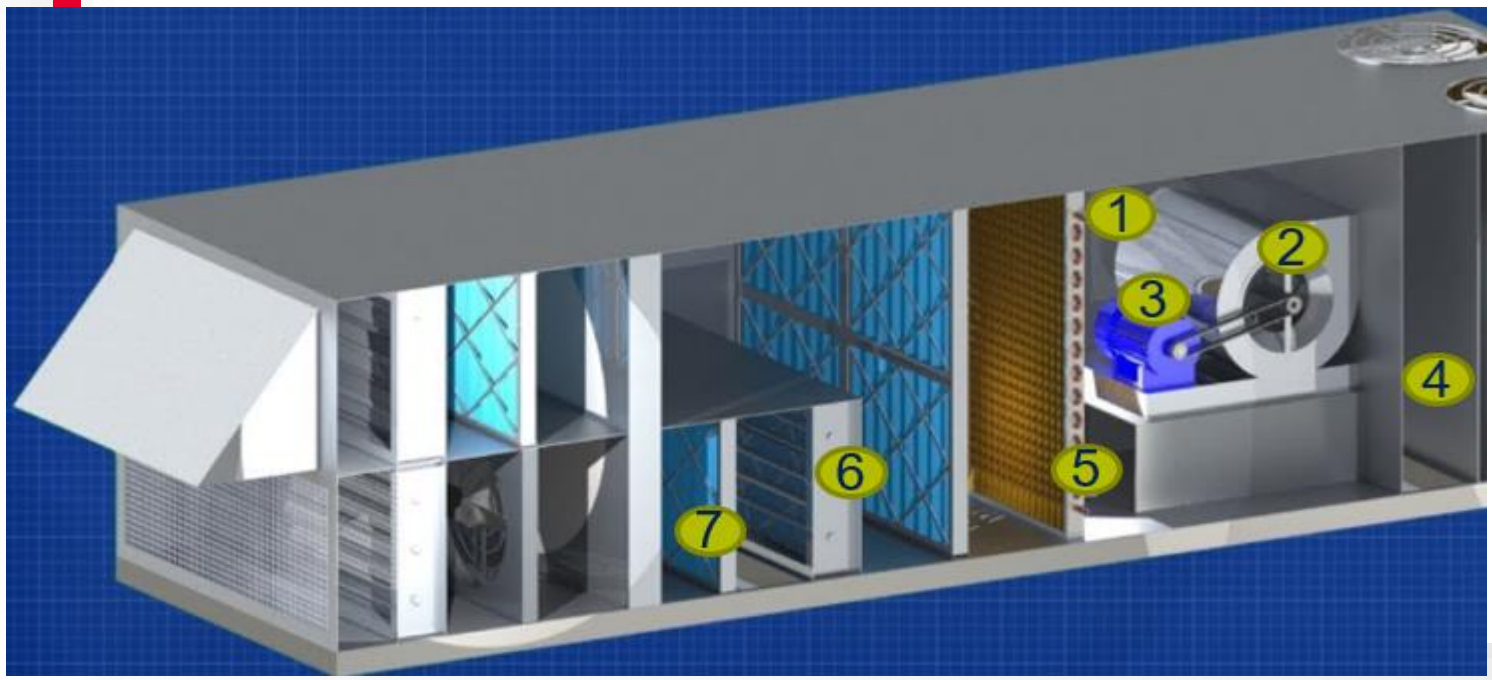
Pick out that nagging pump and place the sensors in the three locations identified.

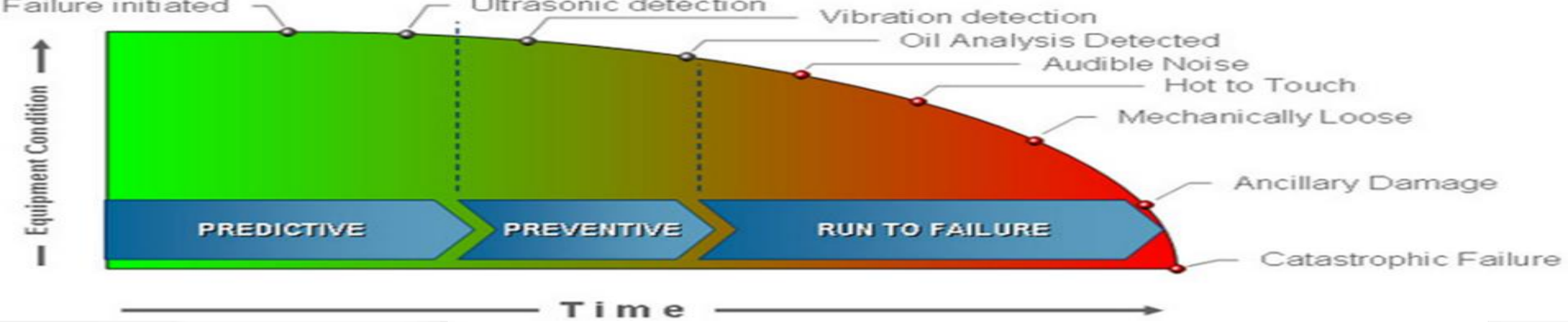


Or that state of the art cooling tower and place the sensors in the three locations identified.

LOW HANGING FRUIT

Many different options on an air handler to place the sensors.





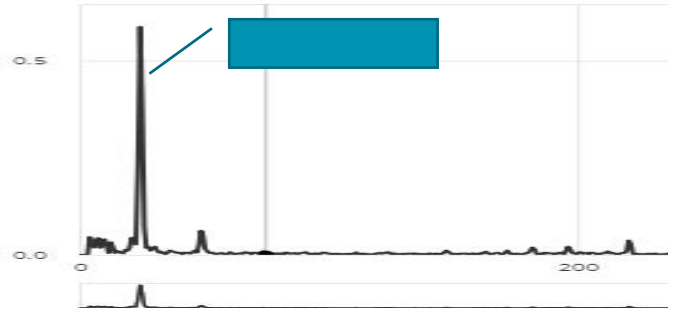
OVERVIEW OF HOW AND WHY

A 70% probability of missing!

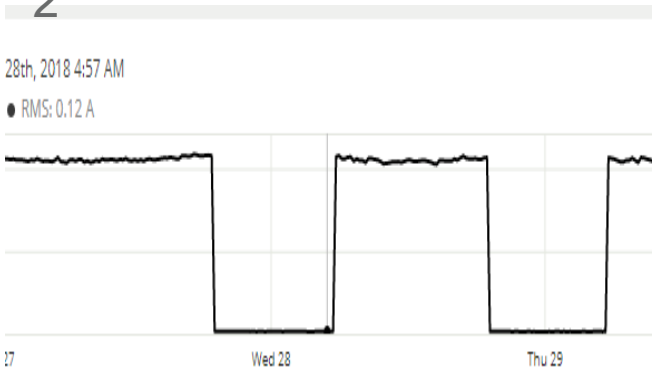
WIRELESS VIBRATION PROGRAM

Overview of issues week 1 of PDM

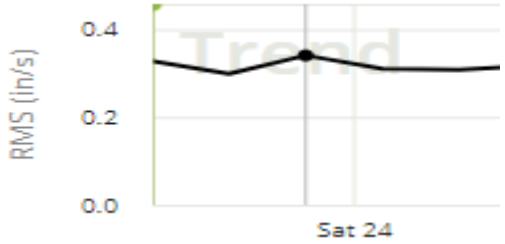
- ❑ Bearing needing grease AC6-1



- ❑ HVAC unit shutting down Ac6-2



- ❑ Belt out of alignment AC2-19



THE WHY

- ❑ Comprehensive Equipment Monitoring
- ❑ Effective Cost Realization
- ❑ Substantial Maintenance Benefits
- ❑ Improved employee utilization
- ❑ Potential failure detected before failure
- ❑ 70-80% of failure is caused by us

Thank You!

Q&A

To learn more about Fluke Reliability and our Webinar Series

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