Howden Uptime

A data driven solution tailored to your needs

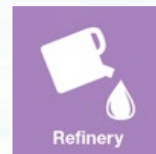Revolving Around You™

Contents

Revolving around you

Unmonitored
Unplanned-downtime
Critical-equipment
Condition-based
Countermeasures
Predictive-maintenance
Asset-efficiency
Safety Process-critical
Route-cause
Constrained-resources
Maintenance-intervals

Upstream

Midstream

Petrochemical

Refinery

Digital Twin

- **In-depth asset analytics**

- **Predictive analytics**

- **Data driven analytics**

- **Model driven analytics**

Digital Twin

- Core of the Uptime digital solution portfolio, driven by Howden's domain knowledge and built on world leading Industrial IoT solutions

- Dynamic link between real-time performance data and physics-based model

- The physics based model does not rely on the existence of historical data, nor is it conditioned by the data quality

Process data — **Time**

Design data

Operational data

Detecting rotating equipment failure before it occurs and identifying the root cause

Understanding the impact of change in operating conditions on the equipment and process performance

Moving critical equipment maintenance strategies from reactive to full predictive
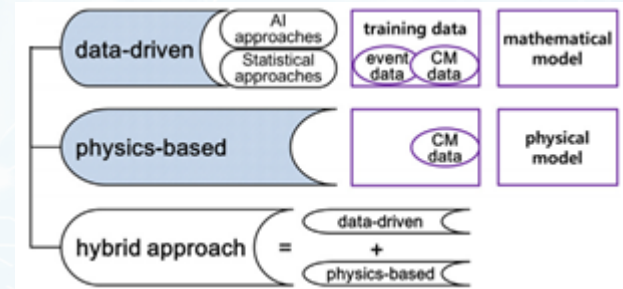
Digital Twin
Predictive analytics

Asset Types

- Homogeneous
  - Identical assets
  - Identical environment
- Heterogeneous
  - Similar but not identical assets
 - Varying environments

Digital Twin types

- Data-driven
 - Requires data
  - Less complex, limited applicability
- Model-driven
  - Requires domain knowledge
  - More complex, broader applicability

Physics-based Digital Twin

- Thermodynamics, equations of state

- Asset agnostic core, so applicable on both Howden and non-Howden assets

Self learning

- Real-time coupling to sensor data

- Continuously mirroring the virtual asset replication

Digital Twin

Model-driven analytics – domain knowledge

We know that side winds lead to performance reduction and increased dynamic loads / vibrations for ACC fans and have many years of experience analyzing these measurements.
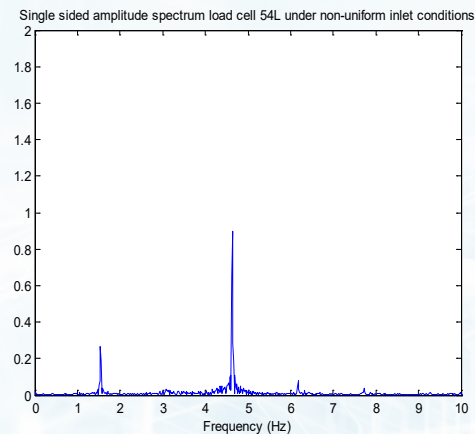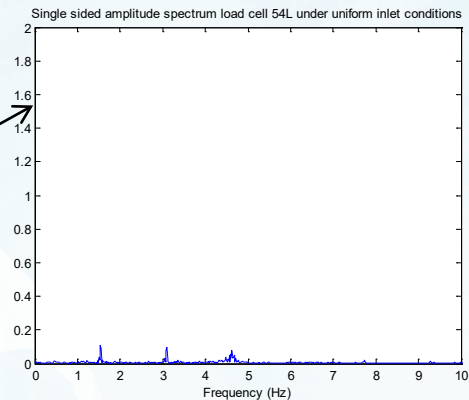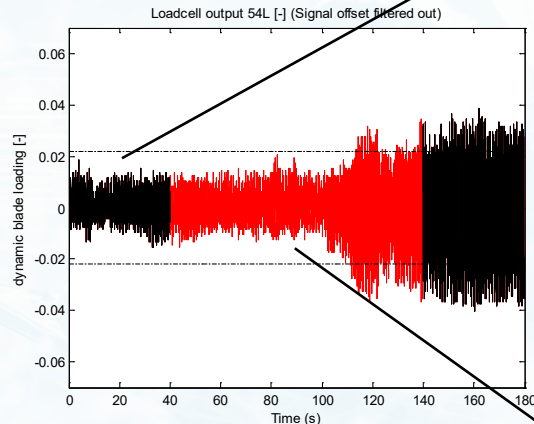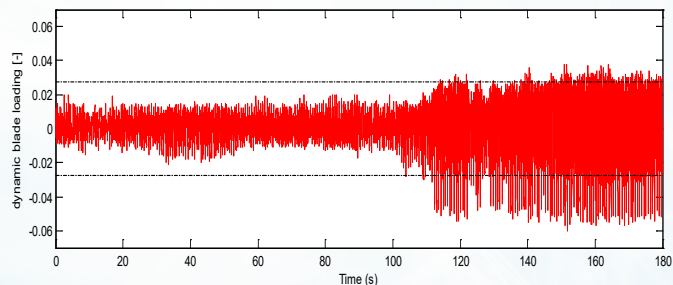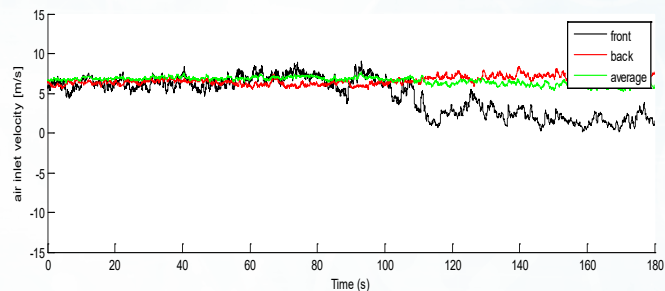
Data capturing & connectivity

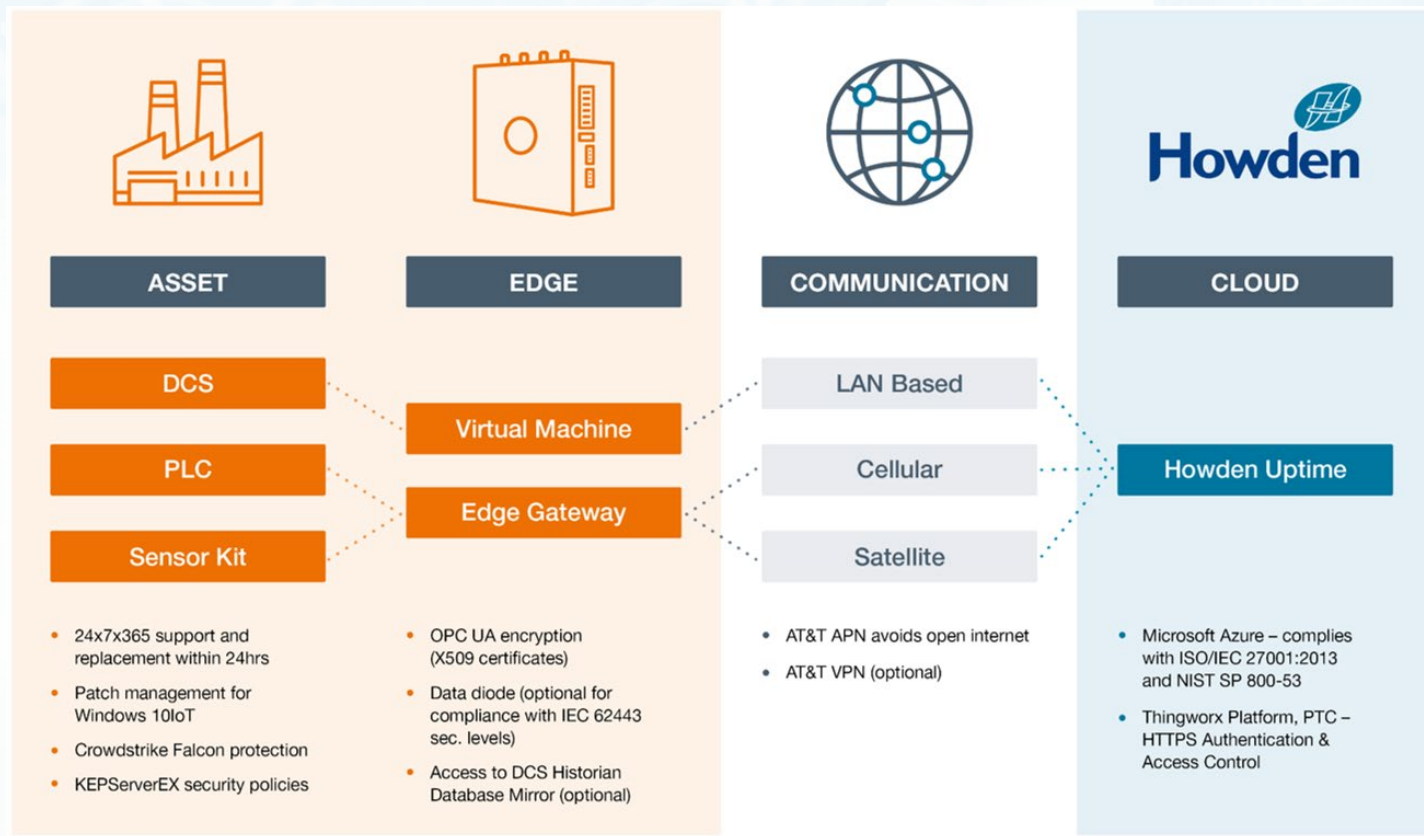- **A brief introduction of the data journey**
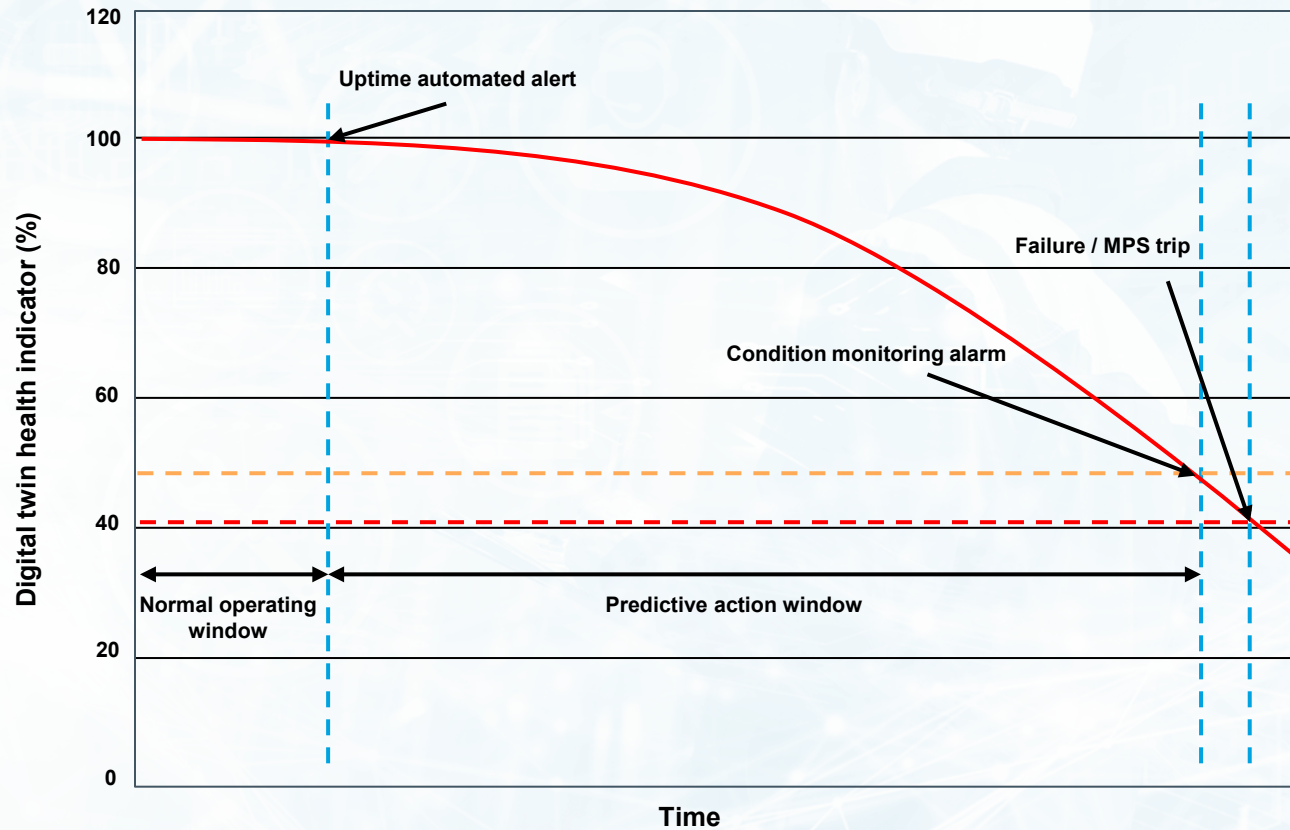
Data capturing & connectivity

The Data Journey

ASSET
- DCS
- PLC
- Sensor Kit

- 24x7x365 support and replacement within 24hrs
- Patch management for Windows 10IoT
- Crowdstrike Falcon protection
- KEPServerEX security policies

EDGE
- Virtual Machine
- Edge Gateway

- OPC UA encryption (X509 certificates)
- Data diode (optional for compliance with IEC 62443 sec. levels)
- Access to DCS Historian Database Mirror (optional)

COMMUNICATION
- LAN Based
- Cellular
- Satellite

- AT&T APN avoids open internet
- AT&T VPN (optional)

CLOUD

Howden

- Howden Uptime

- Microsoft Azure – complies with ISO/IEC 27001:2013 and NIST SP 800-53
- Thingworx Platform, PTC – HTTPS Authentication & Access Control

From data to added value

- **Goal**
- **Focus**
- **Uptime portal**

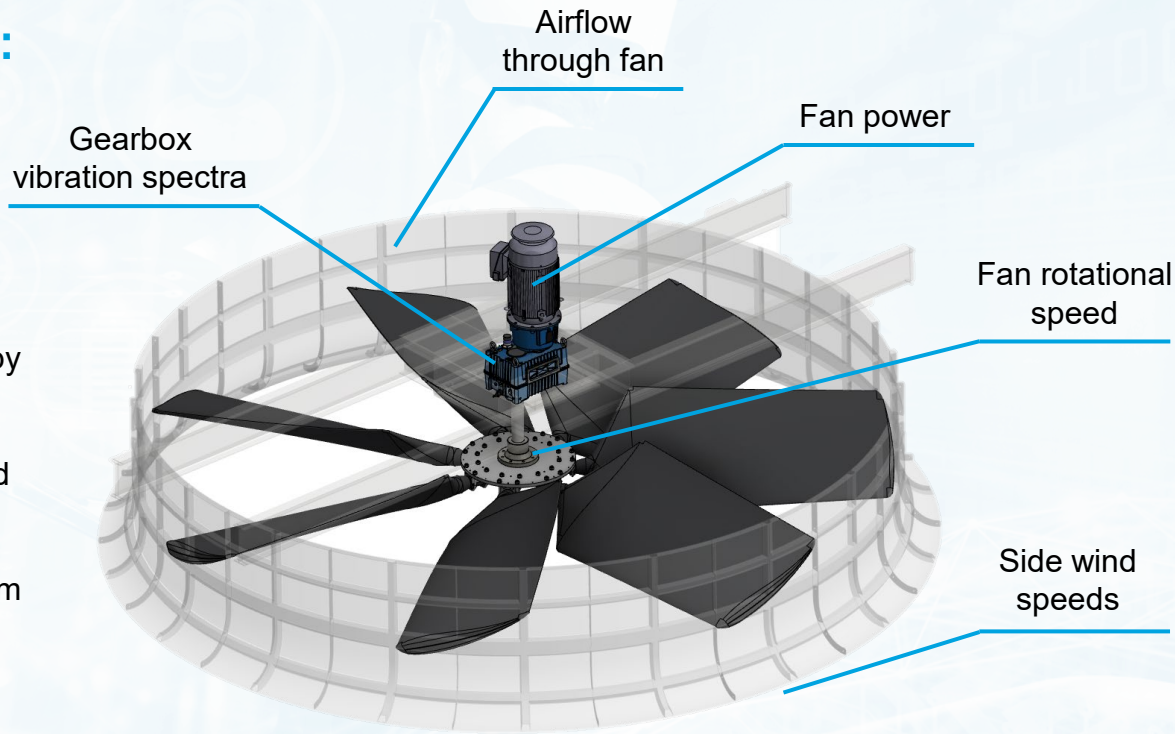# From data to added value

Goal

From data to added value

Commonly occurring issues:

- High vibrations
- Fan rotor failures
- Bearing failures
- Gear failures
- Reduced performance

From experience, many of these are caused by load variations due to increased side winds.

Simultaneously monitoring multiple assets and wind conditions in an ACC is an advantage.

Additionally, drive damage can be isolated from wind effects with vibration spectra.

Airflow through fan

Fan power

Gearbox vibration spectra

Fan rotational speed

Side wind speeds

From data to added value

Proposed Uptime portal for cooling fans (ACC with 3 fans)
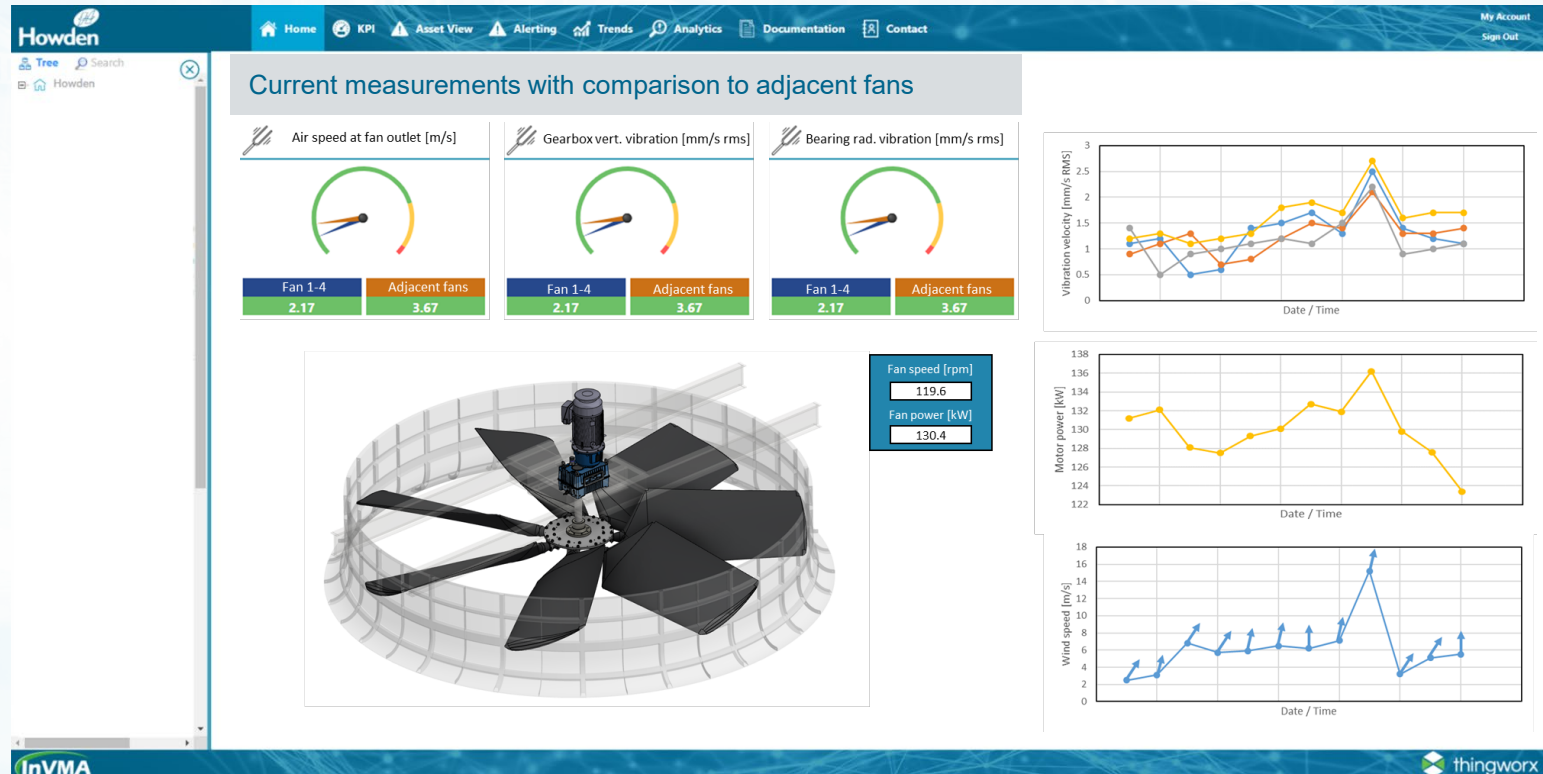
Site overview
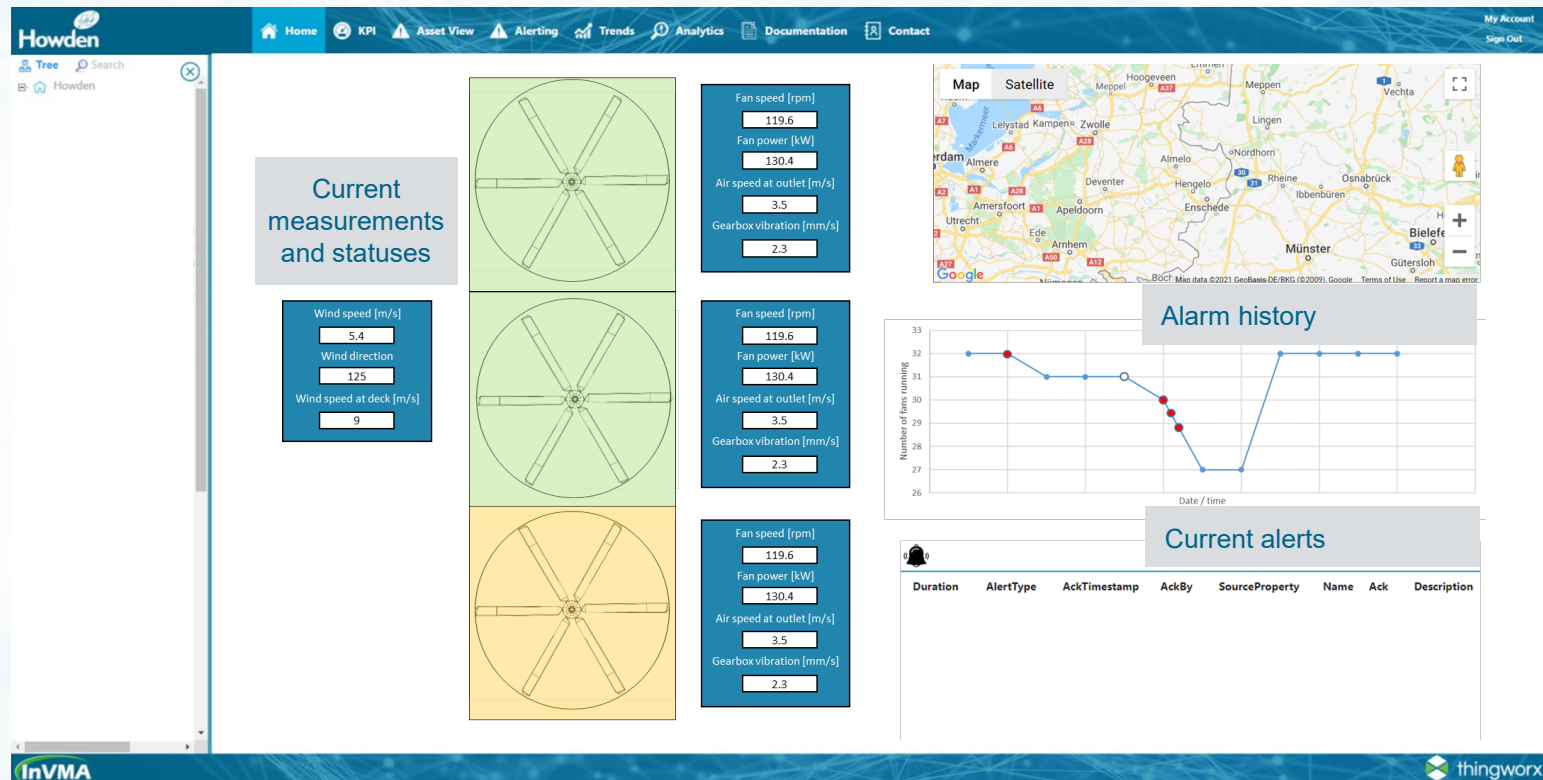
From data to added value

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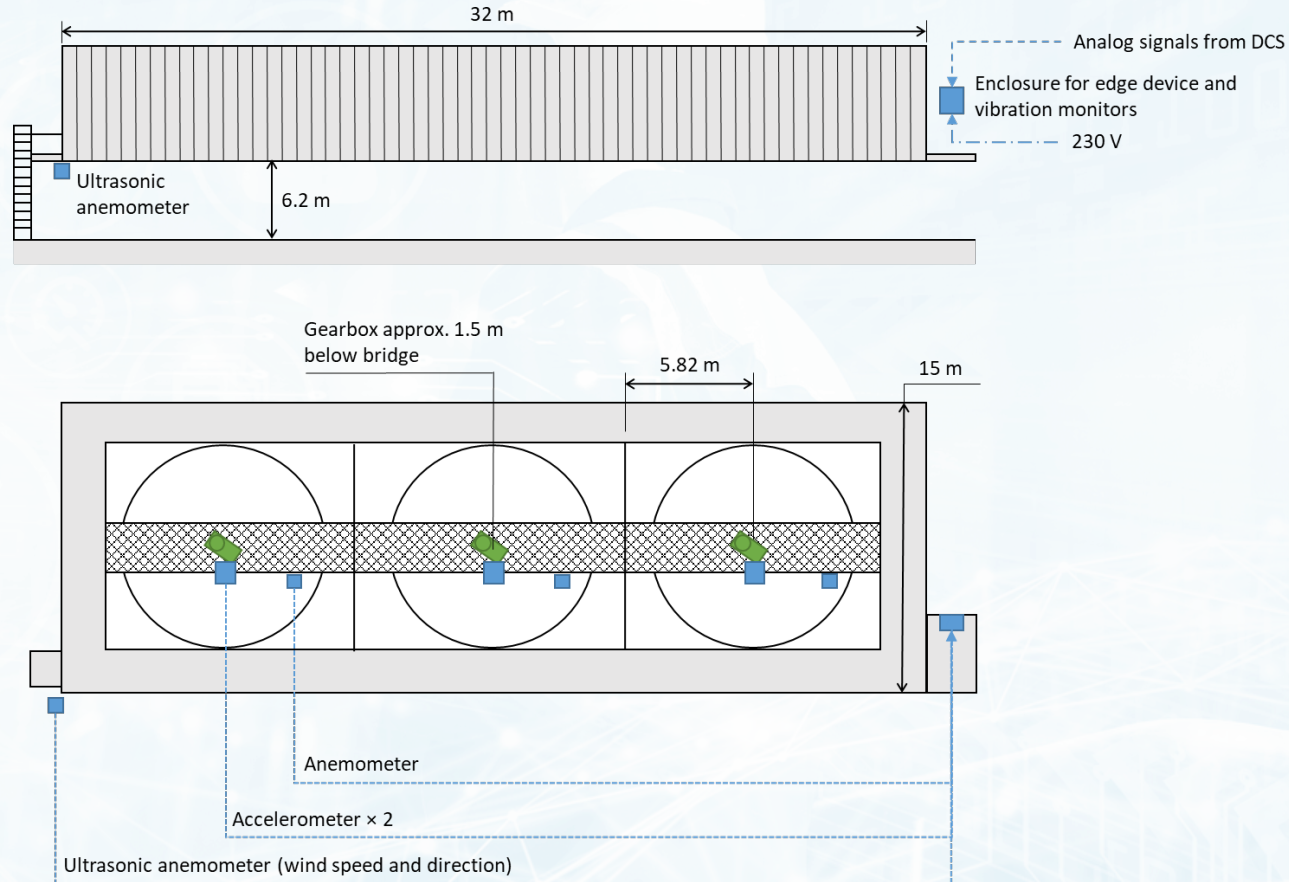
Fan-specific overview

Howden Uptime hardware

Cooling fan

Howden Uptime

First cooling fan project

- Accelerometers placed on gearbox to measure radial and vertical vibrations (spectra).

- Vibration monitors specifically configured for the frequencies of interest.

- Additionally, a combination of propeller and ultrasonic anemometers are used to measure air flow and side winds.

- First cooling fan Uptime system will be installed in Q2 2022.

32 m

Analog signals from DCS

Enclosure for edge device and vibration monitors

230 V

Ultrasonic anemometer

6.2 m

Gearbox approx. 1.5 m below bridge

5.82 m

15 m

Anemometer

Accelerometer × 2

Ultrasonic anemometer (wind speed and direction)

Reliability

Reduce unplanned downtime by predicting failure before it happens, reducing maintenance costs and extending outage intervals

Energy Savings

Optimize equipment, process and plant performance resulting in substantial energy savings and reducing environmental impact

Trusted Advisor

Supports proactive maintenance strategies tailored to equipment needs with direct link to Howden product experts