



Equipment Reliability Systems

Our Timeline

2001 → 2024



01

Maintenance

On multiple industrial sites using pen and paper

02

Ultrasound

- Leak detection
- Bearings inspection
- Annual training in our offices
- Official distributors

03

Industrial CBM

- WearDC & Maintnode
- Computerized inspections
- Connection with CMMS
- Custom reports

04

Maritime CBM

(Developing)

- Mechbase → PMS
- Complete CBM solution in accordance with Classification Society rules and guidelines

CBM Customers



Application Areas



Leak Detection

- Pressurized gas systems
- Heat exchangers
- Tanks and boilers
- Steam traps
- Covers
- Valves

Electrical Installations

- Electrical cabinets
- Transmission lines & insulators
- Transformers
- Circuit breakers

Mechanical Installations

- Bearing health
- Condition based lubrication
- Resonance
- Unalignment
- Unbalance
- Looseness
- Straightness and eccentricity of power transmissions
- Condition of sealing
- Pump cavitation
- Acoustic event detection

Detecting: Tracking, Arcing, Corona, mechanical looseness, current harmonics, voltage and current unbalance

Diagnostic Technology Matrix

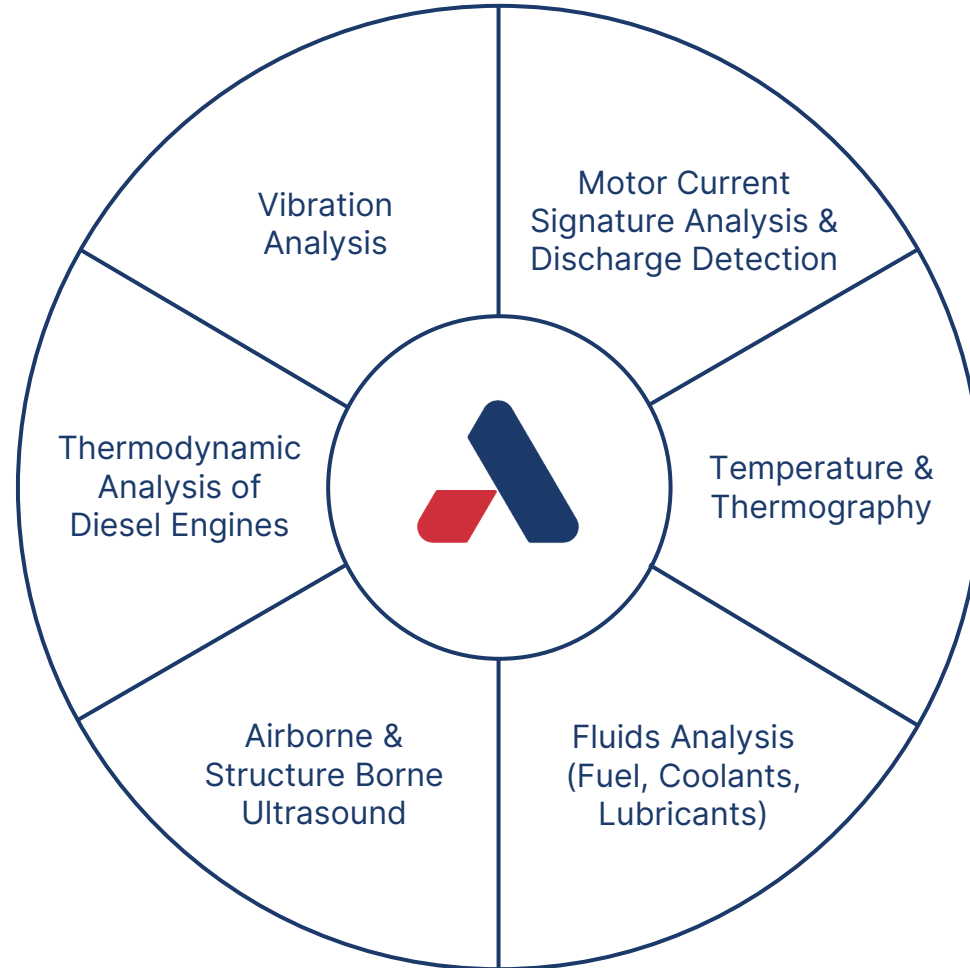


	Pressurized Gasses	Electrical installations	Power Transmissions	Fluid management	Seal of covers / boxes
Vibration analysis			•		
Thermography		•	•	•	•
Motor Current Signature Analysis			•		
Electric Discharge Detection			•		
Airborne Ultrasound	•	•	•	•	•
Structure borne Ultrasound			•	•	
Equipment liquids status estimation (fuels, coolants, lubricants)			•	•	
Optical inspections	•	•	•	•	•

A Complete System



- All measurements in one place
- Fewer tools
- Connection with other systems
- Advanced alarms



Maintnode



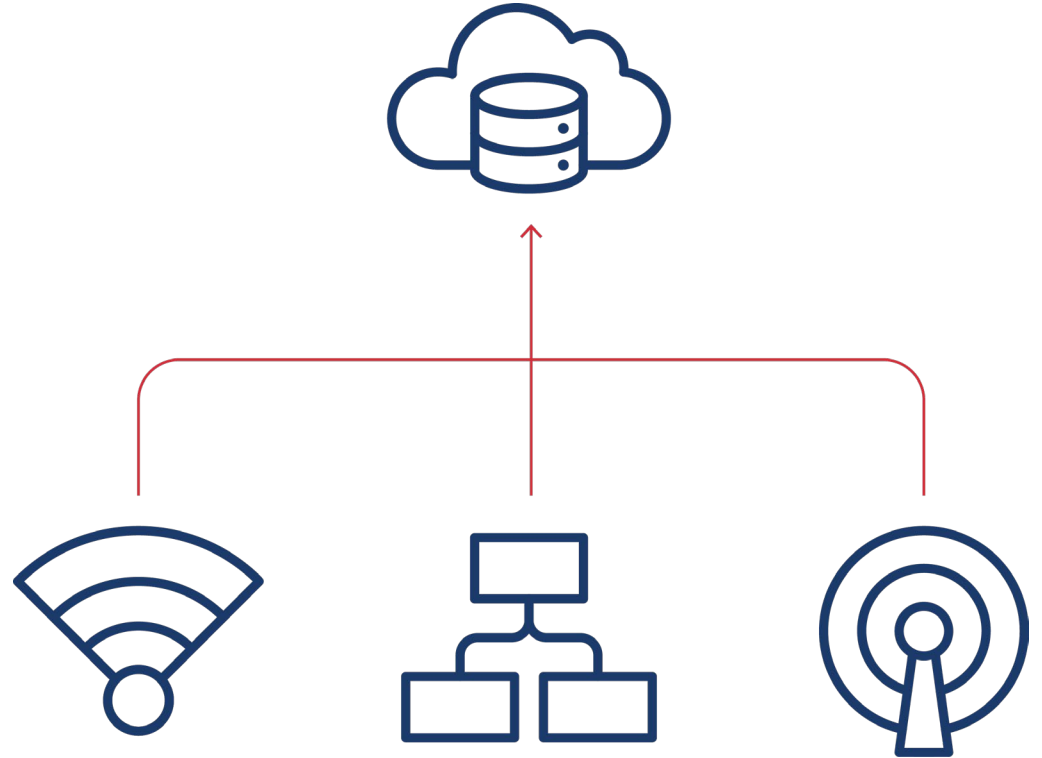
- Permanently installed sensors
- Continuous monitoring 24/7
- IEPE Accelerometers, Ultrasound, and any 0-10V/4-20mA sensor
(RPM, static and dynamic pressure, temperature, humidity, voltage/current, force, torque)
- Modbus, CANBUS, OPC-UA
- Connect with OEE software



Connection



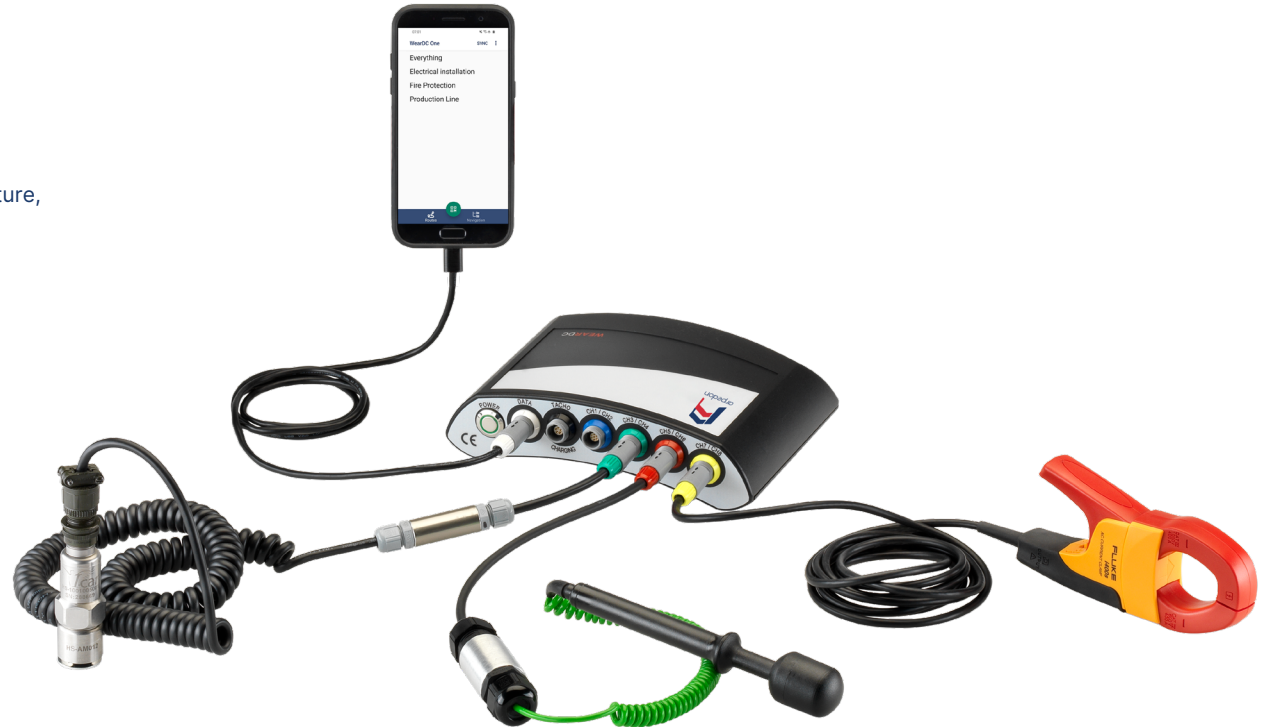
- Systems communicate using standard technologies like Ethernet and WiFi.
- Software can be installed on cloud or locally.
- In remote areas a 4G connection can be deployed.
- In case of connection loss data is retained for more than 6 months.



WearDC



- The platform incorporates a combination of sensors and a data collection device with a smartphone or tablet as the interface.
- Sensors from recognized manufacturers.
- IEPE Accelerometers, Ultrasound, and any 0-10V/4-20mA sensor
(rotation speed, static and dynamic pressure, contact temperature, IR, humidity, voltage/current, force, torque)



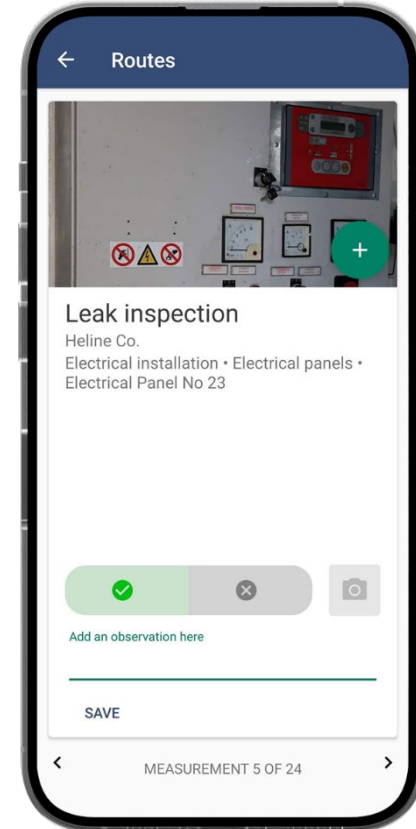
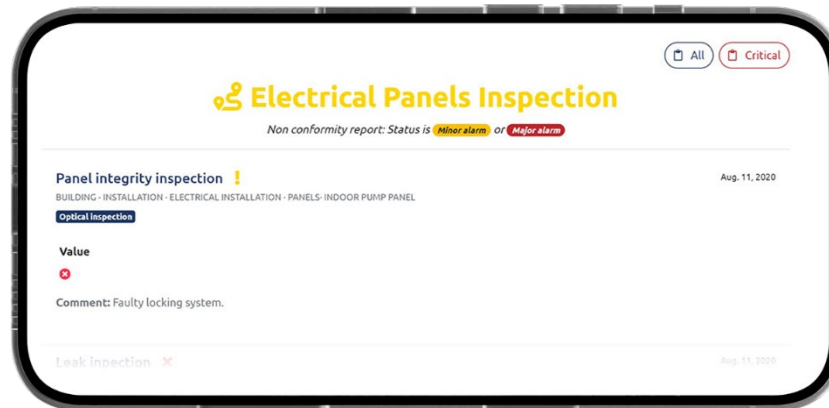
Optical Inspection



With the WearDC One application anyone can perform optical inspections only with a smartphone.

Reports are generated automatically and are available through our Mechbase software.

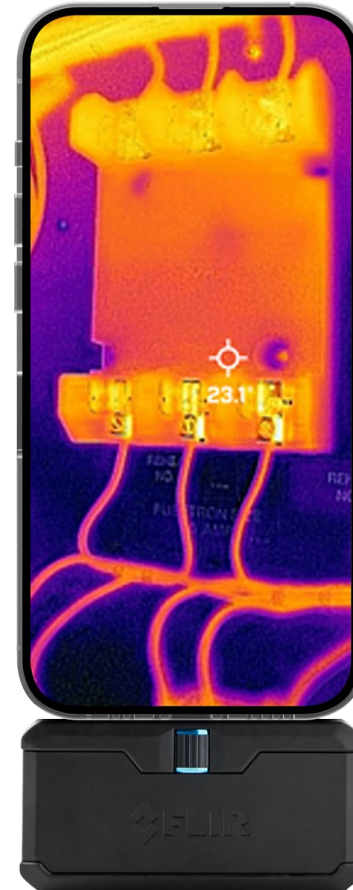
Paper forms are a thing of the past.



Thermography Measurements



- FLIR Thermal Cameras.
- Image and temperatures sync with the cloud.



Equipment Reliability Sensors & Devices



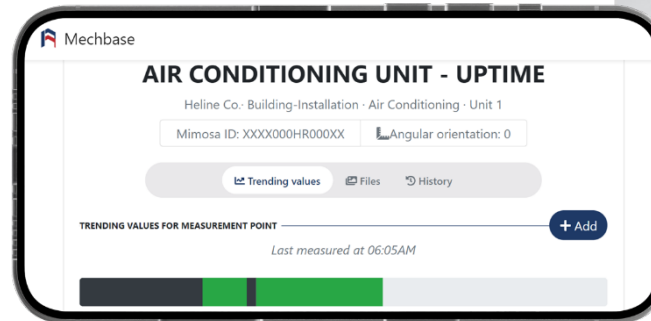
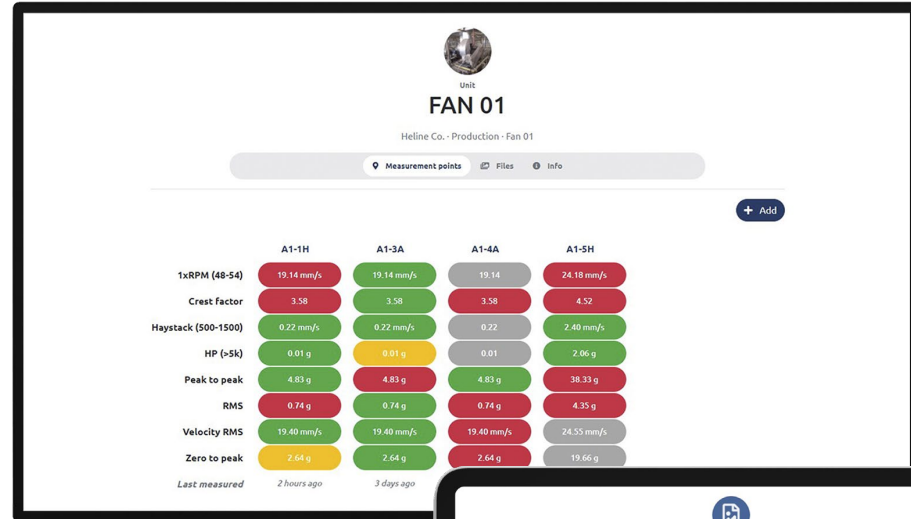
- Ultrasound Sensors
- Vibration Sensors
- Measuring instruments and transmitters
- Testers and signal simulators
- Installation Materials



Mechbase Software



- Visualize machine health
- Visualize Uptime
- Analysis tools
- Statistical alarms
- Organize your assets with standardized formats
- Asset condition overview
(all major measurements with alarms on one screen)



Data Stored & Analysis

Complete timeseries for each measurement is stored in PROTOBUFF format ensuring small file size

It allows for time series and FFT analysis of the measurement to output results
It is exportable to other industry standard formats (CSV, TDMS)

Historical data can be used to train Machine Learning models



Diagnostic Library

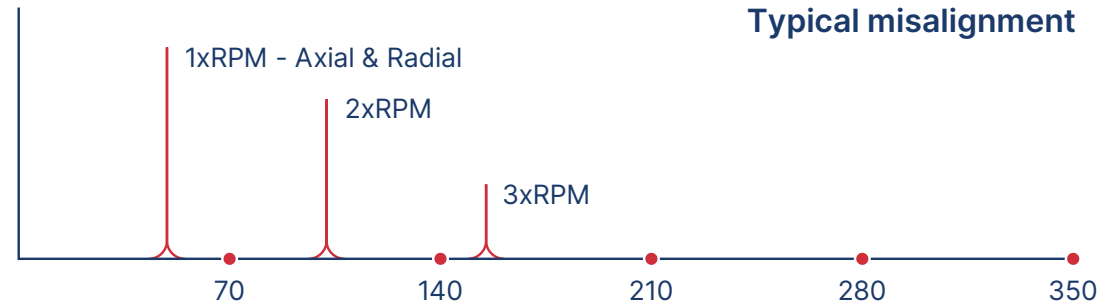
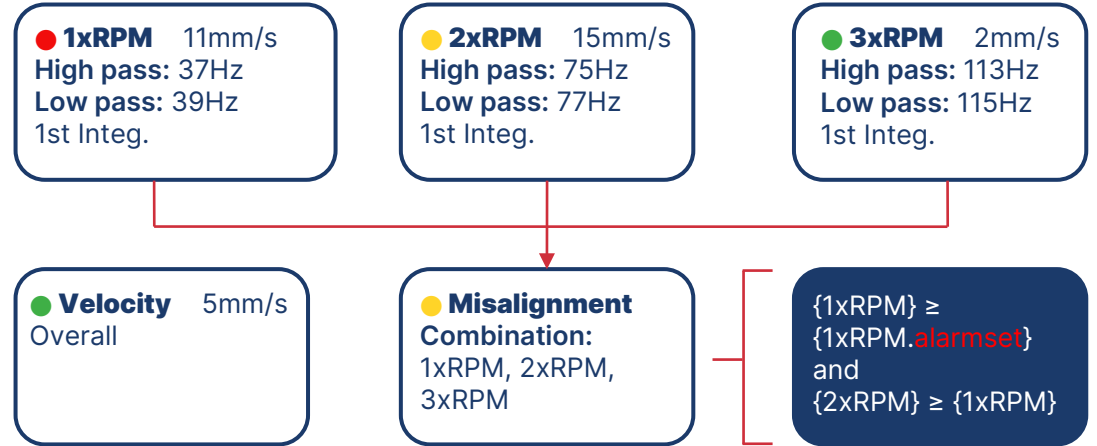


Users can have the ability to upload and create **knowledge base documents** per asset or machine type.

Using this knowledge, they can create and adjust trending values.

Trending values is automatic analysis that happens when a new measurement is created. Filters, integration and normalizations happen instantly triggering an alarm if needed.

Stochastic trending values will be included. The user can combine values to come to conclusions.



Integration with CMMS Systems



Use the software you already know.

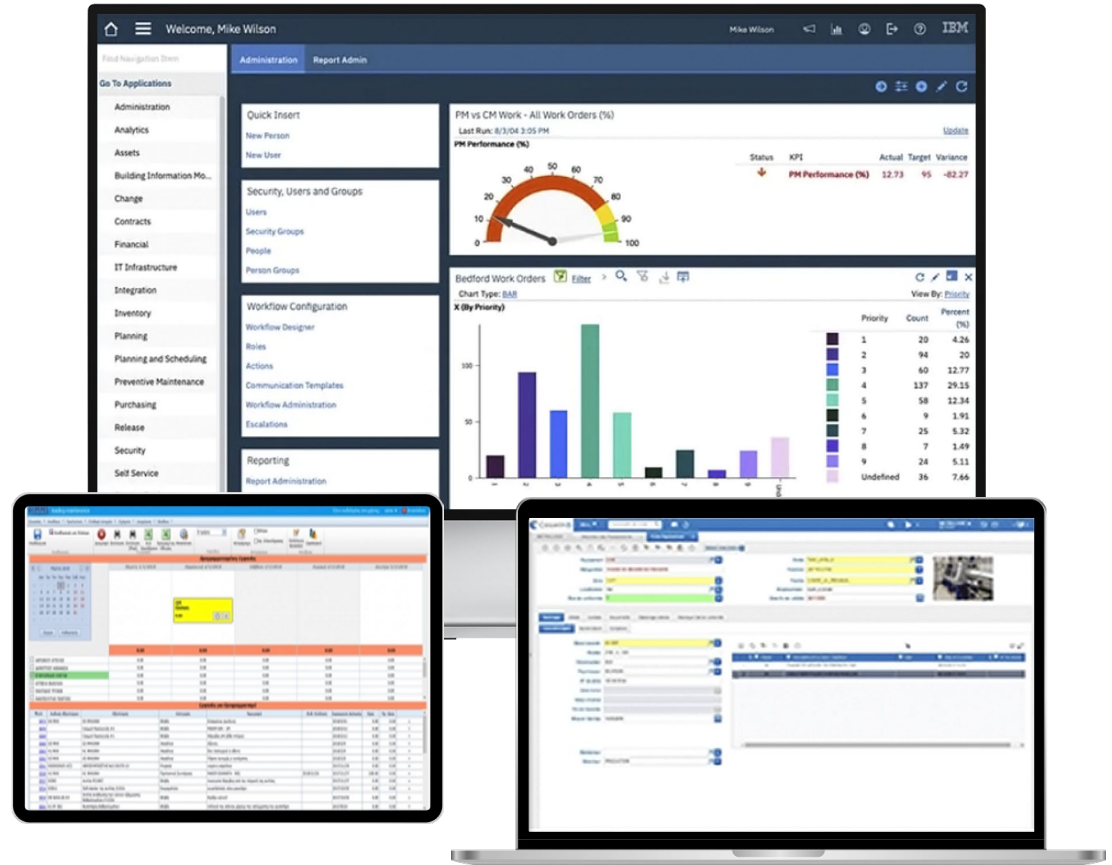
Work orders can be generated automatically on your CMMS software according to the condition of your assets.

Installations:

- Atlantis AIMMS
- Siveco Coswin
- Custom ticketing systems

Ready to install:

- IBM Maximo
- Fiix - Rockwell Automation



Custom Compatibility



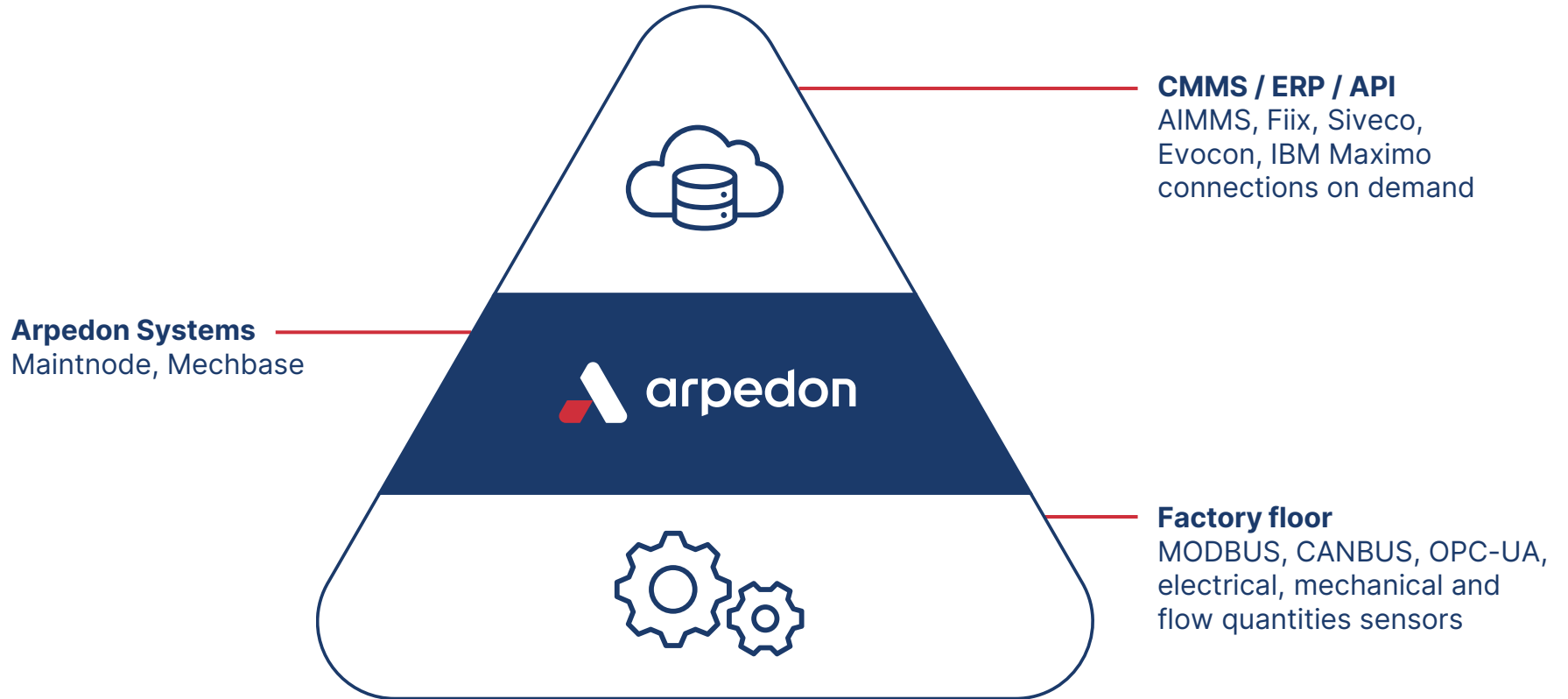
Bridges for collection / submission / ticketing:

- OPC-UA
- SQL
- REST API
- Microsoft Access
- Microsoft Excel
- Microsoft SQL Server from Windows
- Microsoft SQL Server from Linux
- Microsoft SQL Server from Red Hat or CentOS
- Microsoft SQL Server from Mac OSX

Export using:

- Microsoft Excel
- CSV
- PDF
- API

From Production to the CMMS



Setup Examples



Motor Monitoring:

- Bearing faults using accelerometers
- Slew bearing faults using structure borne ultrasound
- Bearing assisted lubrication using structure borne Ultrasound
- Current monitoring and MCSA
- Temperature monitoring
- Speed monitoring

Fluid Handling System:

- Motor monitoring
- Dynamic and static pressure monitoring
- Status of machine fluids
- Leak inspections with Air borne ultrasound
- Valves position monitoring (ON/OFF)

Electrical Installation Monitoring:

- Electrical parameters through Power analyzers
Vph-N, Vph-ph, Cur., Freq., $\cos\phi$, THD %V, THD %C
- Panel temperature monitoring
- Current waveform monitoring
- Panel arcing / tracking monitoring using air borne ultrasound

Process Parameter Monitoring:

- Modbus equipment
(PLC, SCADA, other) parameter collection
- OPC-UA equipment
(PLC, SCADA, other) parameter collection
- Equipment ON/OFF recording

Recent Maintnode Installations



Roller Mills

Fan & Air Separator measurements

- Vibration
- Current
- Pressure
- Temperature
- Thrust Roller Bearing Wear
- RPM



Recycled Materials Separation Plant

Conveyor belts, Ballistic separator, Rotary separator, Firefighting systems

- **Vibration** Measurement
- **Ultrasound** Measurement
- **Temperature** of Electrical Panel
- **Fire fighting system valves** position
- **Hour counter** and **visualization** of production
- Remote monitoring of automated firefighting systems



Pasta Factory

Substation transformer

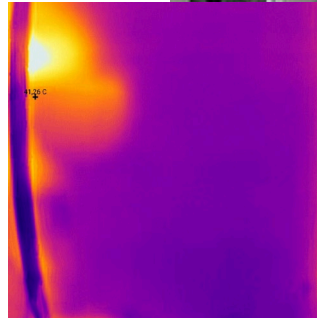
- Measure **Airborne Ultrasound**
- Measure **Coil Temperature**
- Gather **Power analyzer data**
- Measure **ambient Temperature and Humidity**



Pasta Factory

Thermography and optical inspections of insulation panels on a drying line and electrical panels next to it.

- Label panels with QR codes*
- Thermography with WearDC and Flir Camera
- Integrity inspection and inspections for looseness on insulation and electrical panels.



* Using QR codes we can detect easily the measurement point and the automated alarm helps schedule the repair

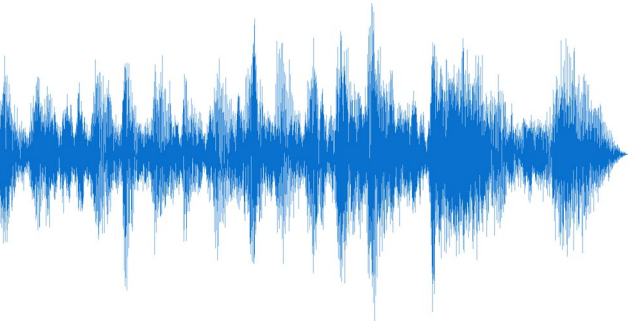


Acoustic event detection

Water Hammer

Impact events

Identification models using AI systems



Remote Cell Station Monitoring

Diesel Generator, Temperature control monitoring

- **Vibration** Measurement
- **Level** of fuel tank
- Environment **Temperature**
- **Main battery health monitoring**
- **Current waveform**
- Generator controller **MODBUS** monitoring



Activities



Design, construction and maintenance of E/M installations

electrical, industrial ventilation, dust suppression, deodorization, fire detection, CO detection, firefighting, energy savings



Complete diagnostic maintenance systems

choice of sensors, devices, measurement, analysis, integration with other systems



Precision maintenance

alignment, balancing, condition-based lubrication, finding and costing of pressurized gas leaks

Thank you.



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