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DISTRIBUTED INTELLIGENCE

Condence monitoring concept: Gearbox

CONDENCE

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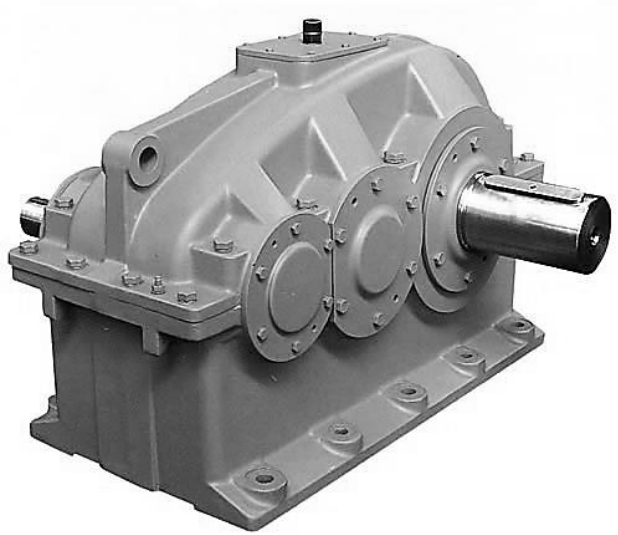
Holistic view of monitoring metrics



Examples of monitored metrics

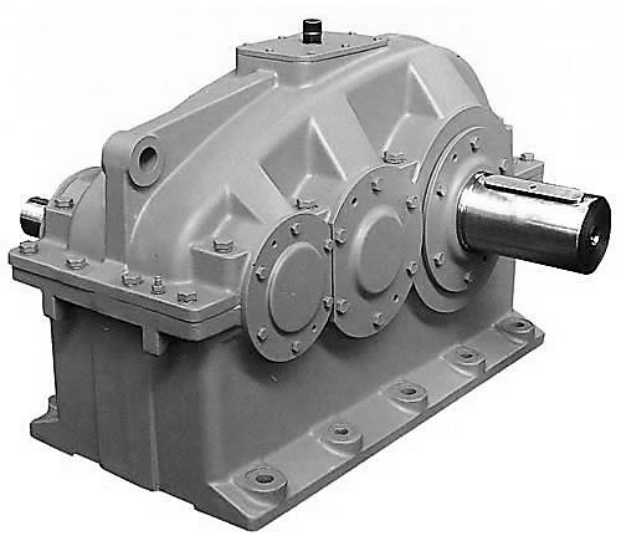
- Vibration
- RPM
- Temperature(s)
- Torque and peaks
- Oil Quality
- Oil Contamination

What can we detect by monitoring these metrics?

- Bearing failures
- Gear issues
- Mechanical
    - Imbalance, Misalignment and looseness
- Temperature changes
- Performance decrease
- Potential lubrication issues (e.g. oil aging)
- Over load
- Internal wear issues
- Running times, optimization of asset use

Condence monitoring concept: Gearbox

Richest health metric: Vibration or Oil*



Accuracy = time

Uses IEPE sensing technology to capture high frequency vibration
Wide frequency bandwidth translates into time, **time to react**

Continuous & online

Based on continuous sampling (e.g. every 5 min) and edge computing technology Maximised **time to react** even with fast evolving failures

Eliminating surprise / risk

- Unplanned work is more expensive
- Unplanned downtime is expensive

Enable condition-based maintenance

Decisions and maintenance based on actual asset condition

- Know when you need to clean the blades
- Know when you need to add lubricant to bearings
- Remove unnecessary manual work (inspection & repairs)
- Eliminate human error via automatic alarms and data availability

*case dependent, optimal solution is to combine

Monitoring view: Default dashboard structure

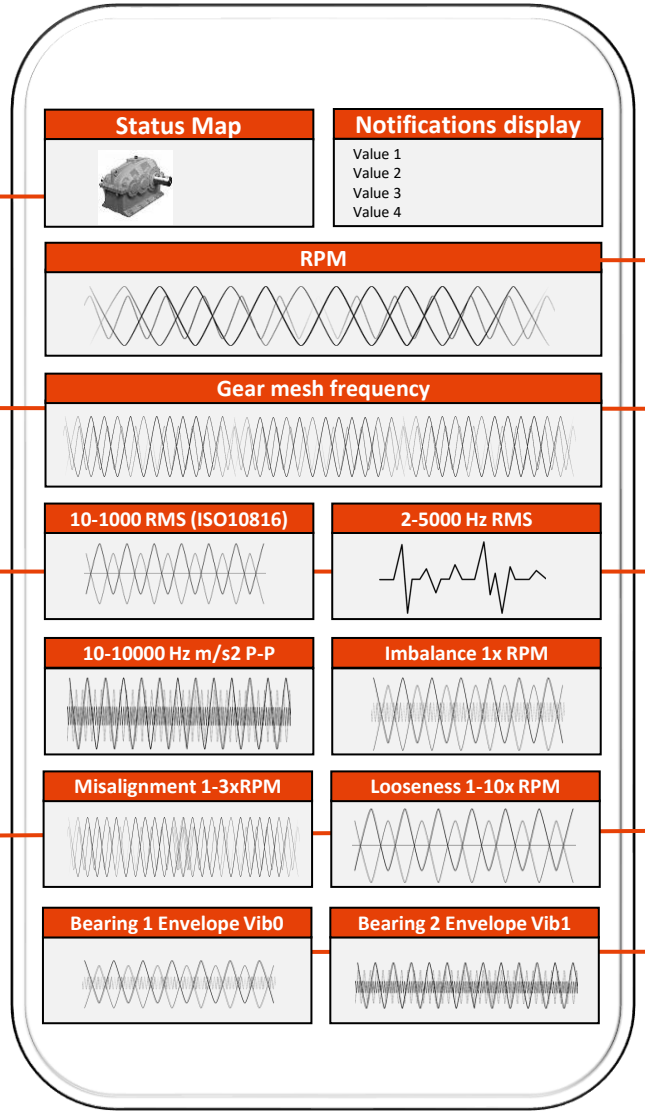
Condence components

Status Map
Image of what is being monitored, e.g. sensor placement and direction

Notifications Display
Displays what has happened / triggered thresholds during the selected time period. Easy configuration and adjustment of notifications in the cloud UI

Trend view widgets
Trend widget displays the calculated / sourced data as a line chart (one or more). Trend widget has plenty of tools available for further analysis and exports.

Other widgets
There are also other options to visualise sourced data in Condence such as period widget which can be used to monitor running hours of assets.



Default concept metrics

RPM
Mandatory and important information in variable speed assets.

Gear mesh frequency
Monitoring the changes the rate at which gear teeth mesh together in a gearbox

General vibration analyses
- Various frequency ranges
- Acceleration and velocity (e.g. ISO10816)

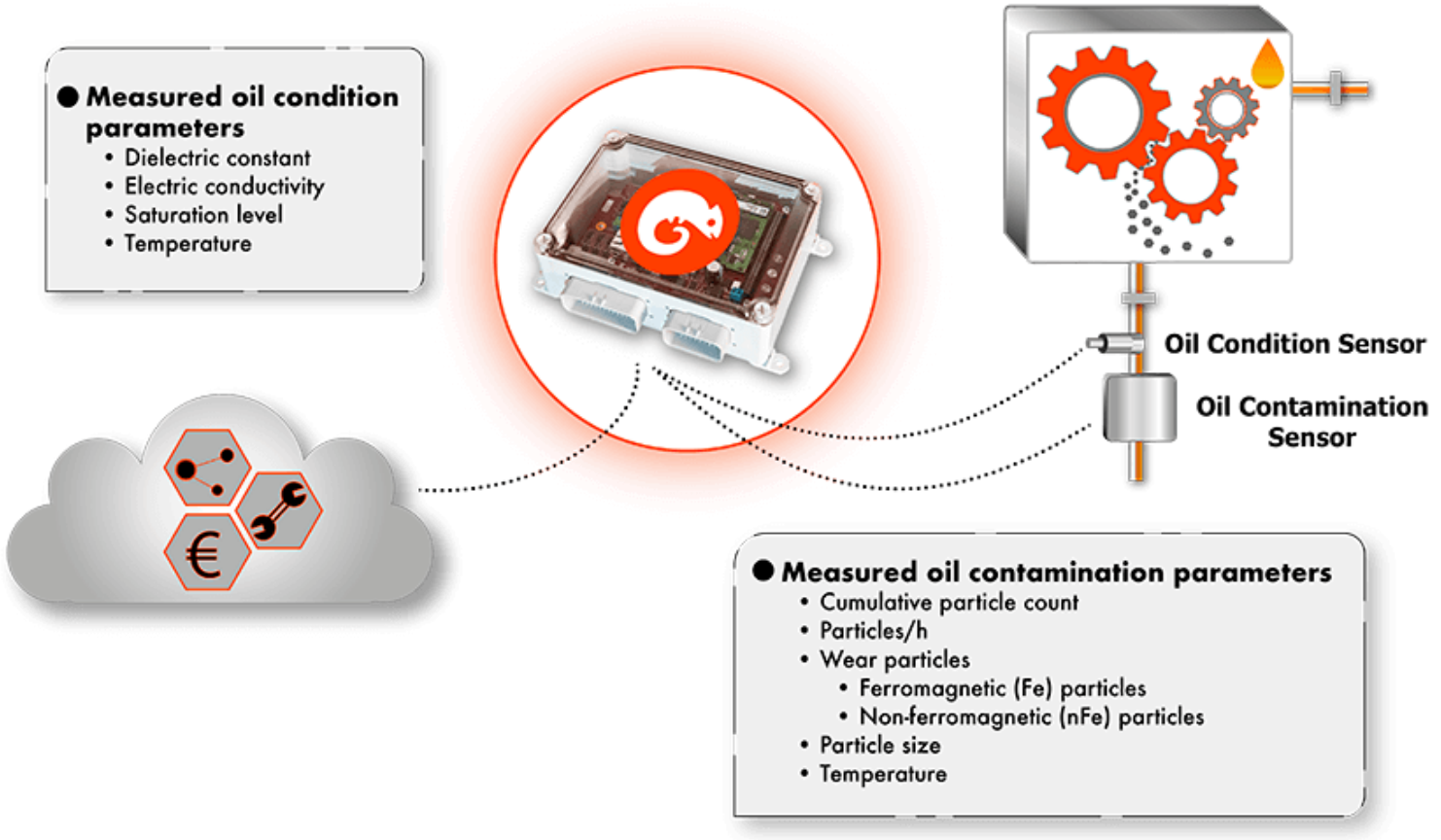
With Condence you can easily build your preferred measurements and analyses in the cloud UI

Mechanical
Multiples of RPM to detect mechanical phenomena's like imbalance, misalignment and looseness

Bearing failures
Early detection of bearing failures via enveloping high frequency vibration. Failure stages 1-4

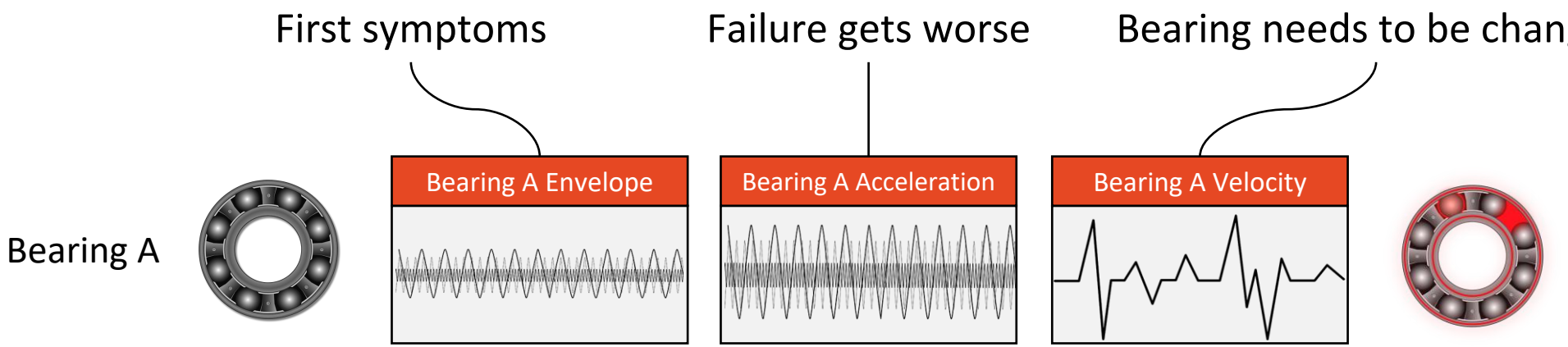
Monitoring of oil condition and contamination

When assessing machine health via oil monitoring there are two main categories to focus on. The condition of oil itself and the possible contamination particles in the oil.



Monitoring of bearing failure stages

Bearing monitoring



Stages 1 & 2

Bearing status:
The first signs of lack of lubrication or minor bearing damage appear on very high frequency levels, over 10 kHz

Failure capture:
Only high frequency techniques such as enveloping acceleration will reveal the fault

Stage 3

Bearing status:
When the bearing fault reaches stage three the damage is more severe and will be visible if the bearing is removed

Failure capture:
The velocity spectrum (low frequency) can be used to detect the fault

Stage 4

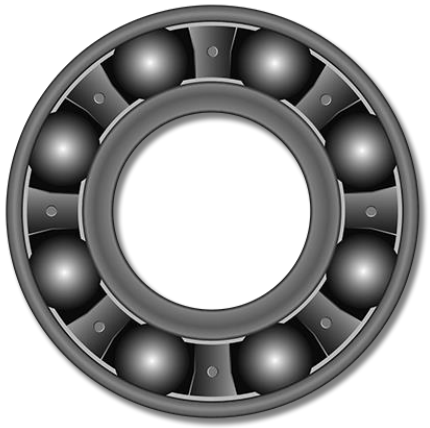
Bearing status:
When the bearing fault reaches stage four the bearing has significant damage and should be replaced

Failure capture:
Overall levels will increase, and the velocity spectrum (low frequency) will show the fault clearly.

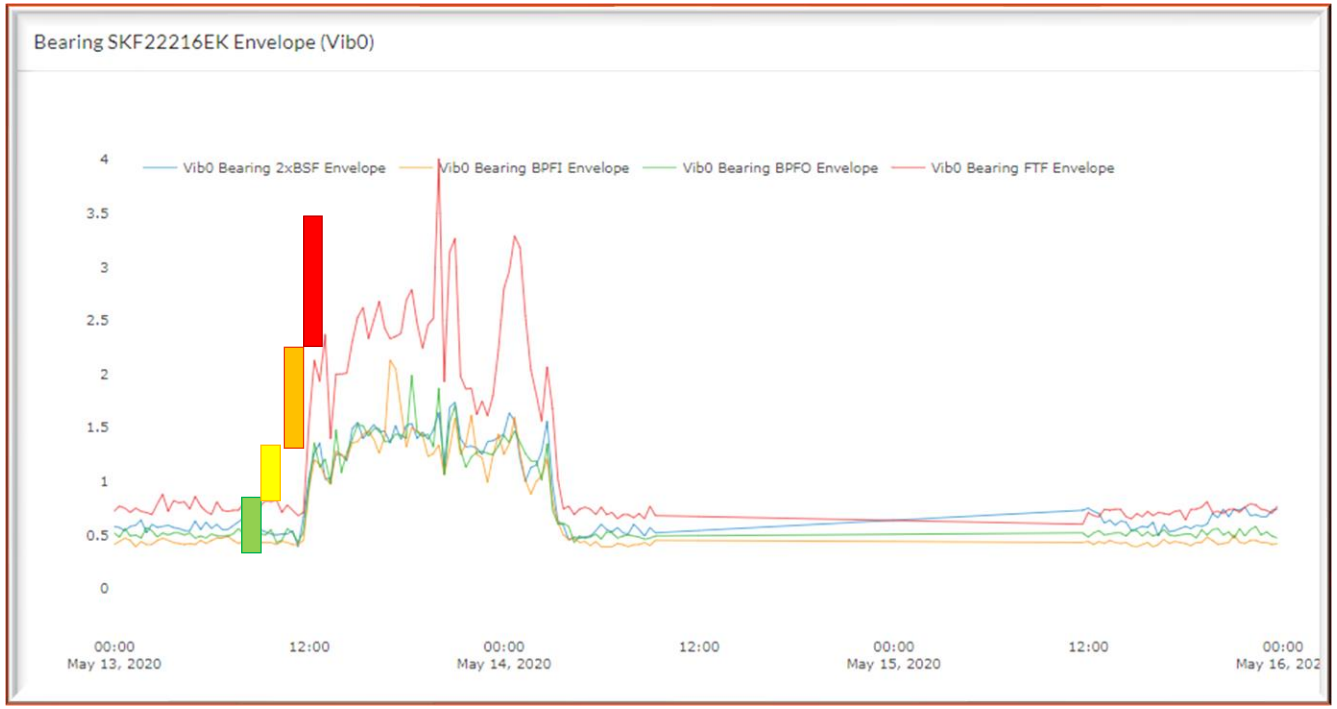
Condition based maintenance

Create suggestive notifications

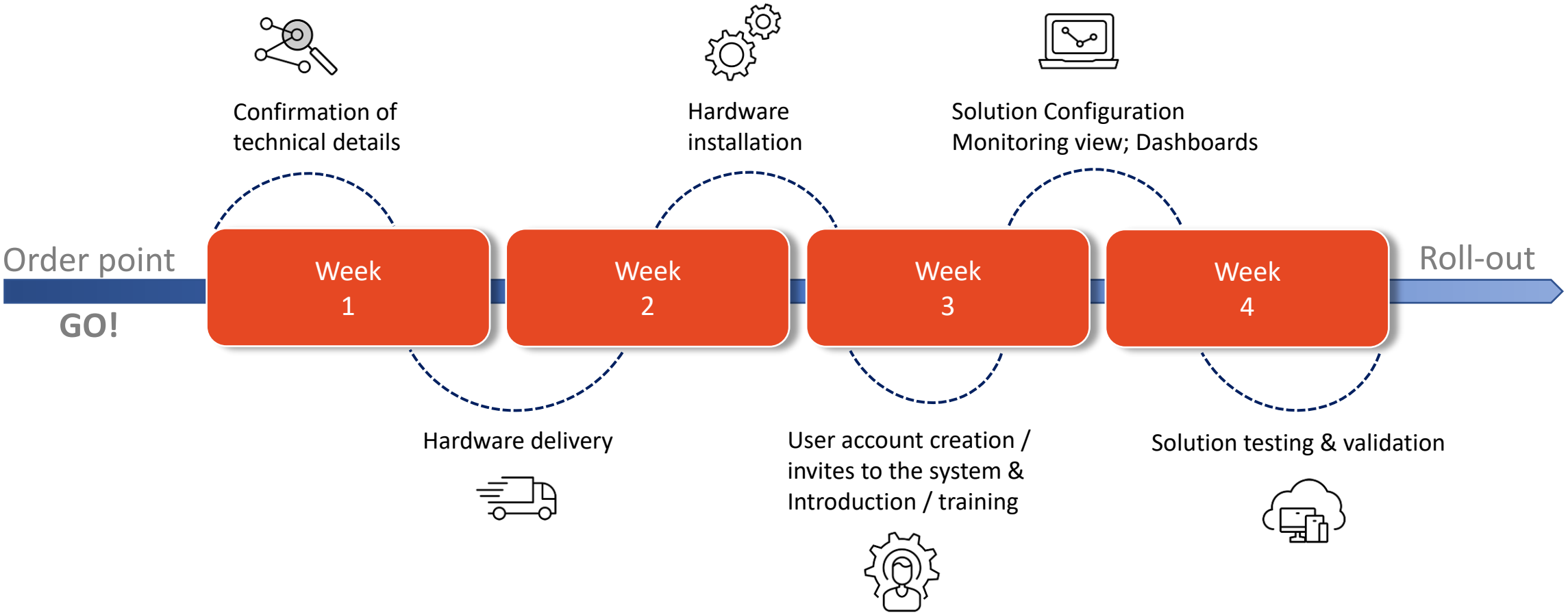
1. Set suggestive severities and thresholds for them
2. Automatic system notifications to trigger workflows
3. Notifications based on actual asset condition
4. Condition based maintenance (CBM)



- Maintenance action needed
- Plan for bearing check and lubrication
- Follow elevated vibration levels
- Normal vibration range



Delivery timeline



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Read more at:
condence.io/condence-gearbox/

Condence is a product of Distence Oy

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