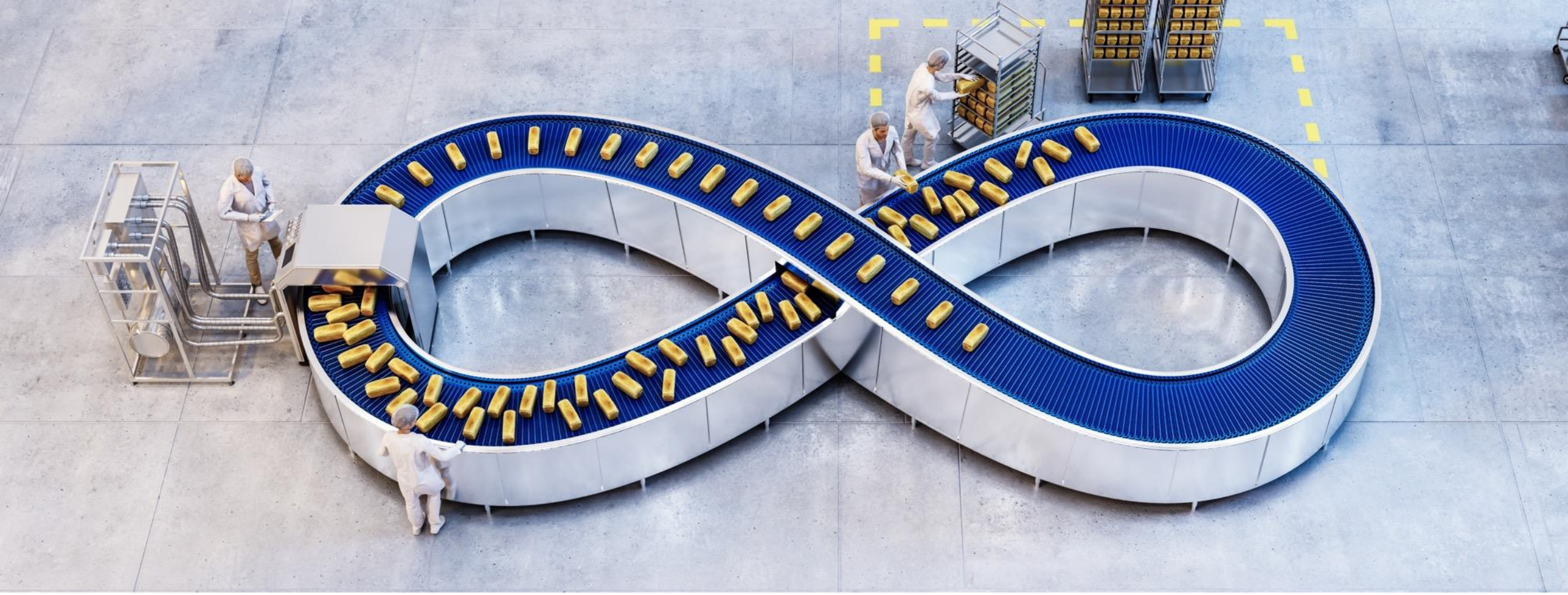


F&B CUSTOMER DAY 2018 | SURABAYA , SEPTEMBER 5, 2018

ABB Ability™ Smart Sensor

Motors that let you know when it's time for a service

CK Tan, Head of local business unit, Motors and Generator

The Internet of Things (IoT)

Global trend – Fourth Industrial Revolution

Industry 1.0 – 1712

First practical steam engine

Industry 2.0 – 1870

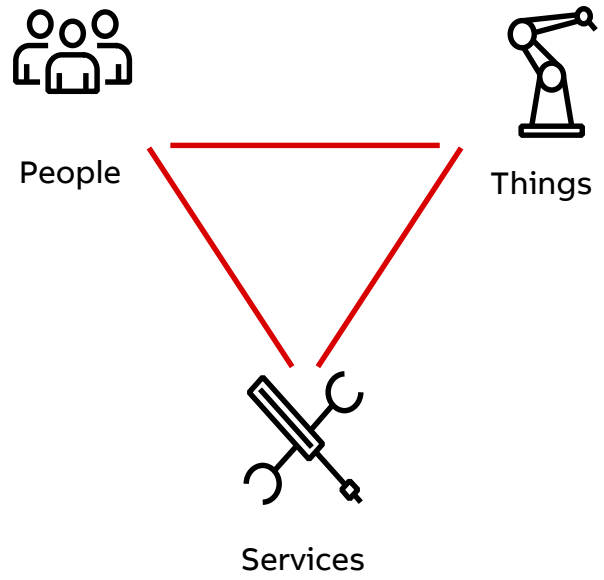
First elevated conveyor belts

Industry 3.0 – 1969

Electronics / software based control

Industry 4.0 – today and tomorrow

Internet of …



The Internet of Things (IoT)

Global trend – Fourth Industrial Revolution

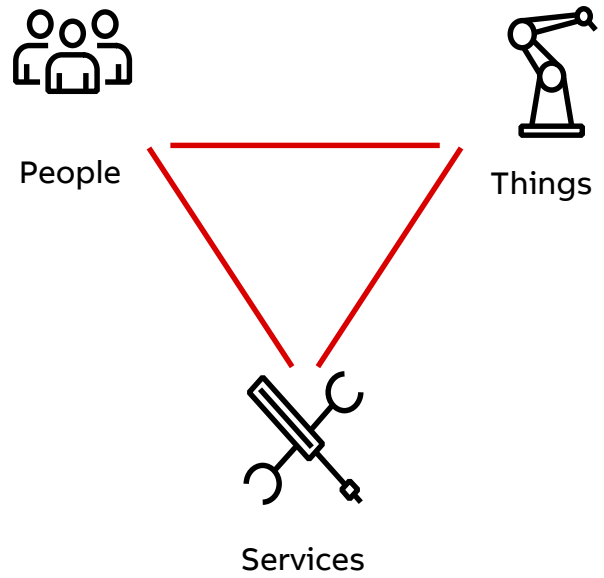
Interoperability

Information Transparency

Technical Assistance

Decentralize Decision

Industry 4.0 – today and tomorrow
Internet of …

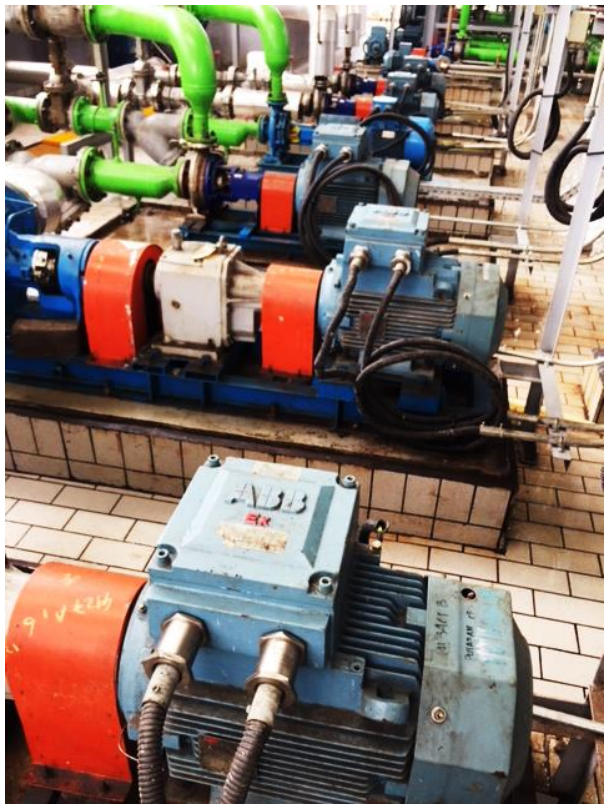


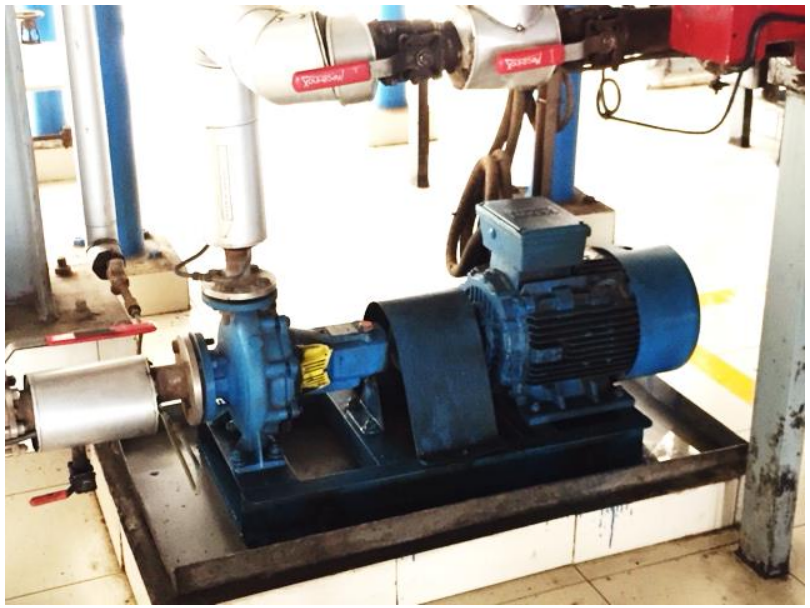
UP-TIME and RELIABLITY

ABB Ability™ Smart Sensor

What we have most in our factory ?

What is the highest energy consumption machine ?





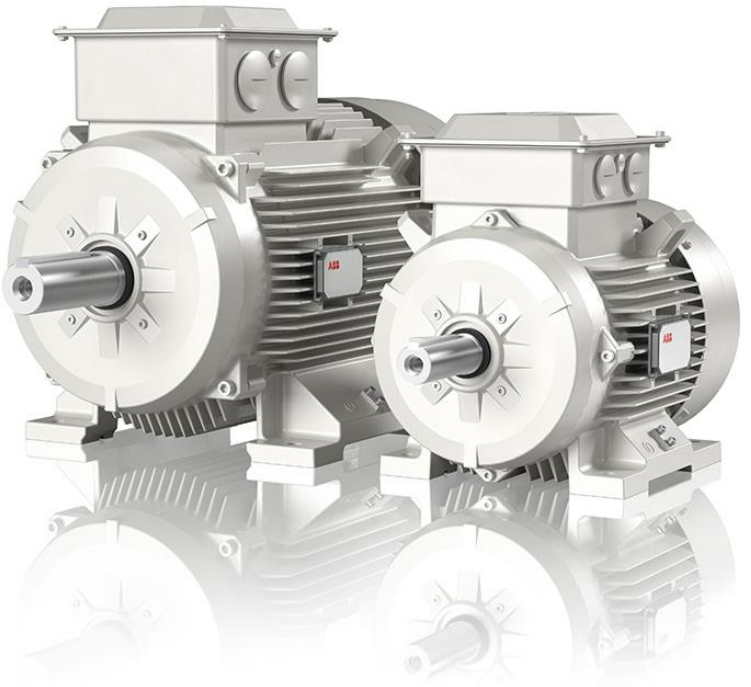


ABB Ability™ Smart Sensor

Will motors be included in the IoT?

Can a large number of motors delivered status information ?

Can monitoring equipment were affordable and easy to install ?

Can competent data analysis with a large volume of information were readily available ?

…then service engineers could provide advanced plant optimization at affordable costs

…and plant operators could save operating costs and increase productivity.

ABB Ability™ Smart Sensor

Monitoring and maintenance of LV motors today

Plant owners can boost their results with better monitoring and maintenance for their LV motors

Most LV motors are not monitored, and are only maintained when something goes wrong

In most cases, sophisticated monitoring of LV motors does not make economic sense today

- A significant infrastructure is required, which typically costs more than the motors themselves
- Specialist personnel are needed to install and maintain the monitoring equipment
- Without correctly installed infrastructure, the maintenance team does not have sufficient data to carry out optimizations

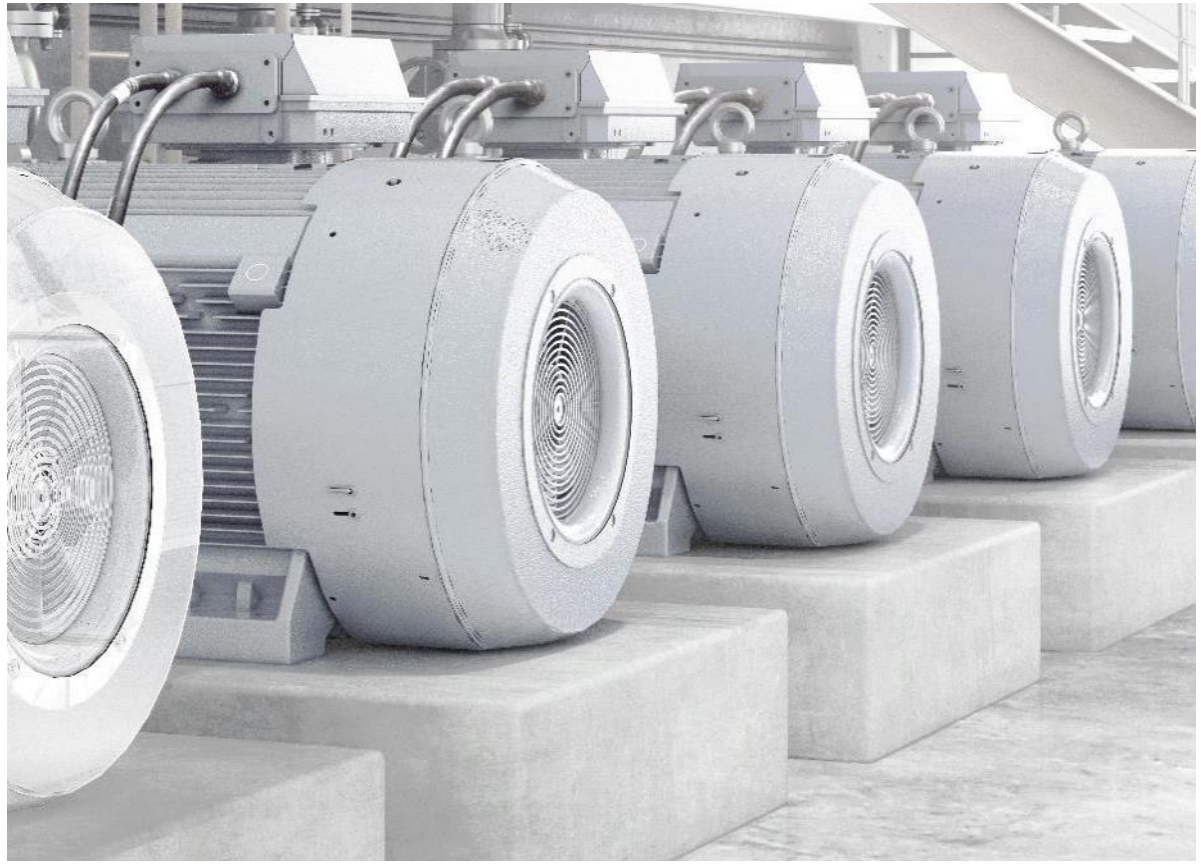


ABB Ability™ Smart Sensor

Monitoring and maintenance of LV motors today

Maintenance teams face several limitations

Maintenance is fragmented and unconnected, with a separate team for each site (or at most one team covering a few sites)

The teams do not have the motor manufacturer's know-how and expertise

The teams cannot get contracts to service a significant part of the installed population due to the large number of motors

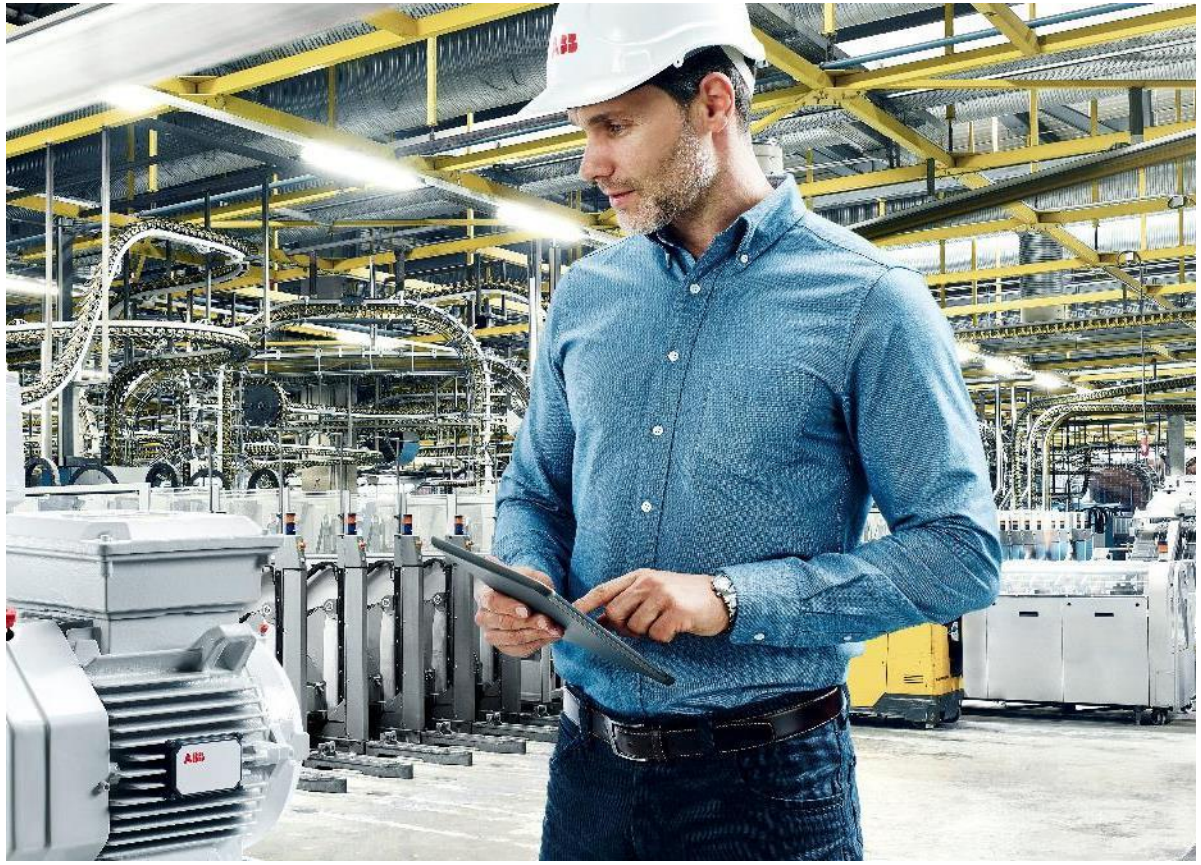


ABB Ability™ Smart Sensor

Gateway to tomorrow’s smart factory

ABB Ability™ Smart Sensor

How can this solution help to save money?

This solution can help to ...

Reduce downtime by as much as 70%

- Service or replace motors before they break down
- Shift unplanned maintenance to planned outages

Extend lifetime by up to 30%

- Avoid motor failures by timely servicing
- Prevent secondary damage by avoiding breakdowns

Increase energy efficiency by around 10%

- Create better loading profiles based on energy consumption patterns
- Rationalize the installed base (replace less efficient and over-dimensioned motors)

ABB Ability™ Smart Sensor

How we want it to be ?

Cost effective

Easy and simple to install

Wireless

Automate

User friendly internet interface

ABB Ability™ Smart Sensor

System layout

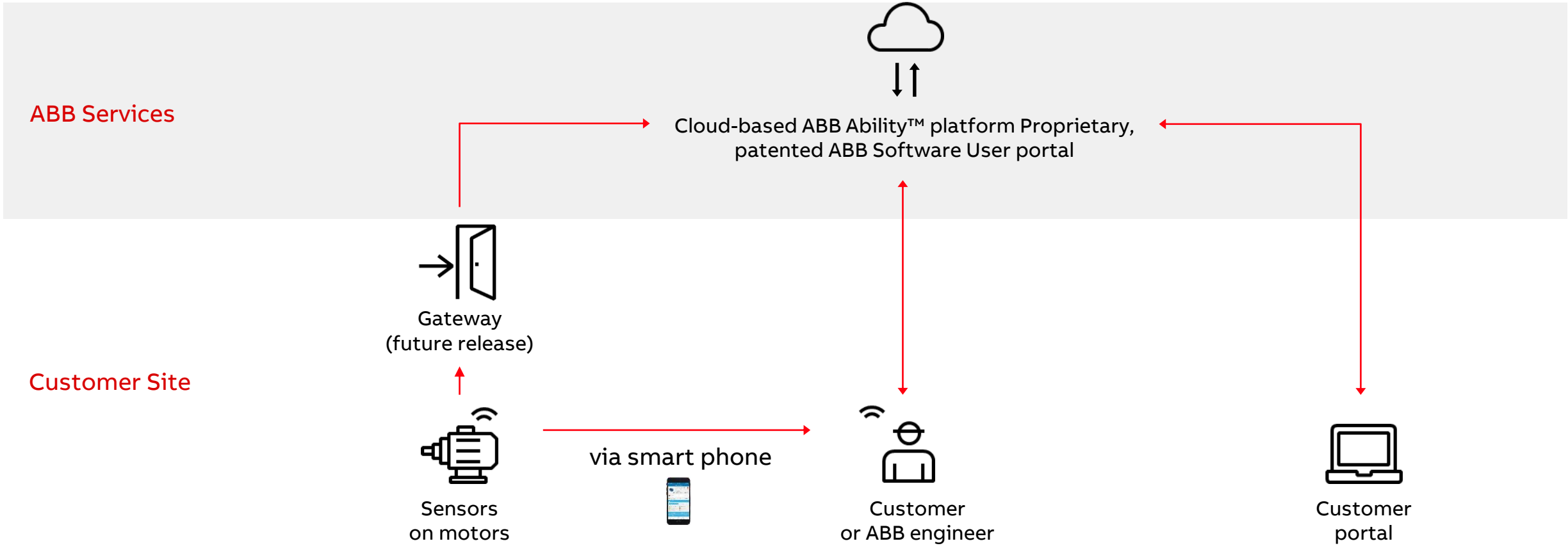


ABB Ability™ Smart Sensor

Three elements: Hardware, Apps, Web portal

Hardware kit (for field upgrade)

Sensor

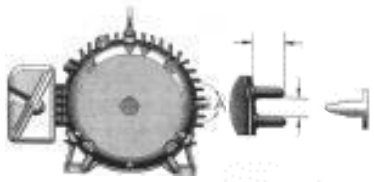
Bracket

Sensor mount

Adhesive putty

Three screws

Quick Start Guide



Smartphone apps

Sensor / motor registration

Health parameters

Operational parameters

Web portal, packages

Maintenance package:

- Health parameters in the app
- Operational parameters in the app
- User registration
- Support

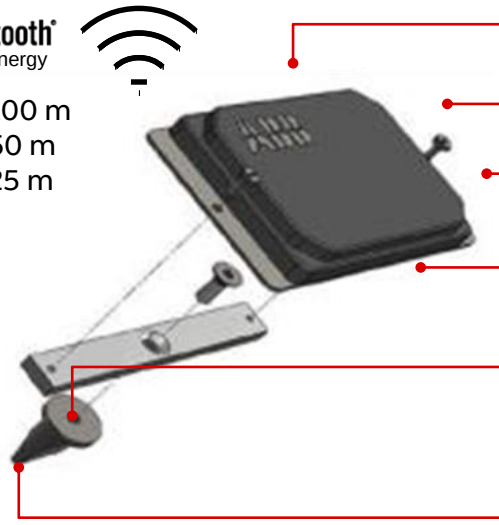
Analyst package as above, plus:

- Health parameters in the web portal
- Operational parameters in the web portal
- Trending

ABB Ability™ Smart Sensor

Hardware

Range:
- theoretical max: > 100 m
- realistic: ~ 50 m
- industrial environment: < 25 m



- MEMS **Multi-Sensor System** inside
- **Built-in batteries** (Not user exchangeable.)
- Firmware with FOTA (Firmware Over-The-Air, i.e. updates via smartphone)
- No electrical wiring required / possible.
- **UNF 1/4"- 28** as mechanical interface.
  “Future proof" for possible upcoming Smart Sensor of different design.
- The sensor mount is **permanently installed** on the motor using adhesive putty (Henkel Loctite 3463).
  6 sizes of sensor mount are available initially.

Initial certification logos:
CE, Bluetooth, WEEE "Wheelie"

ABB Ability™ Smart Sensor

Upgrade kit

Hardware kit (for field upgrade)

- Sensor
- Bracket
- Sensor mount
- Adhesive putty
- Three screws
- Quick Start Guide

Release labelling with certification logos

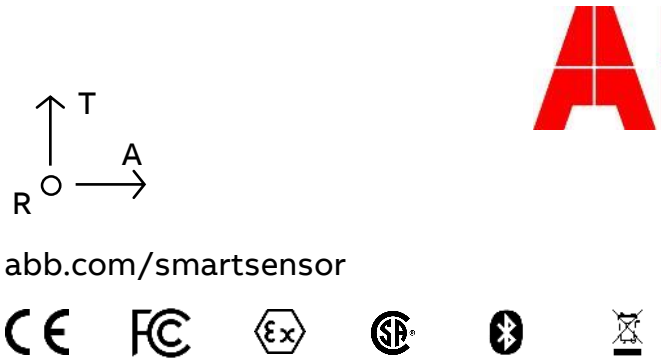


ABB Ability™ Smart Sensor

Future release dashboard high level view with drill down to parameter detail for specific motor

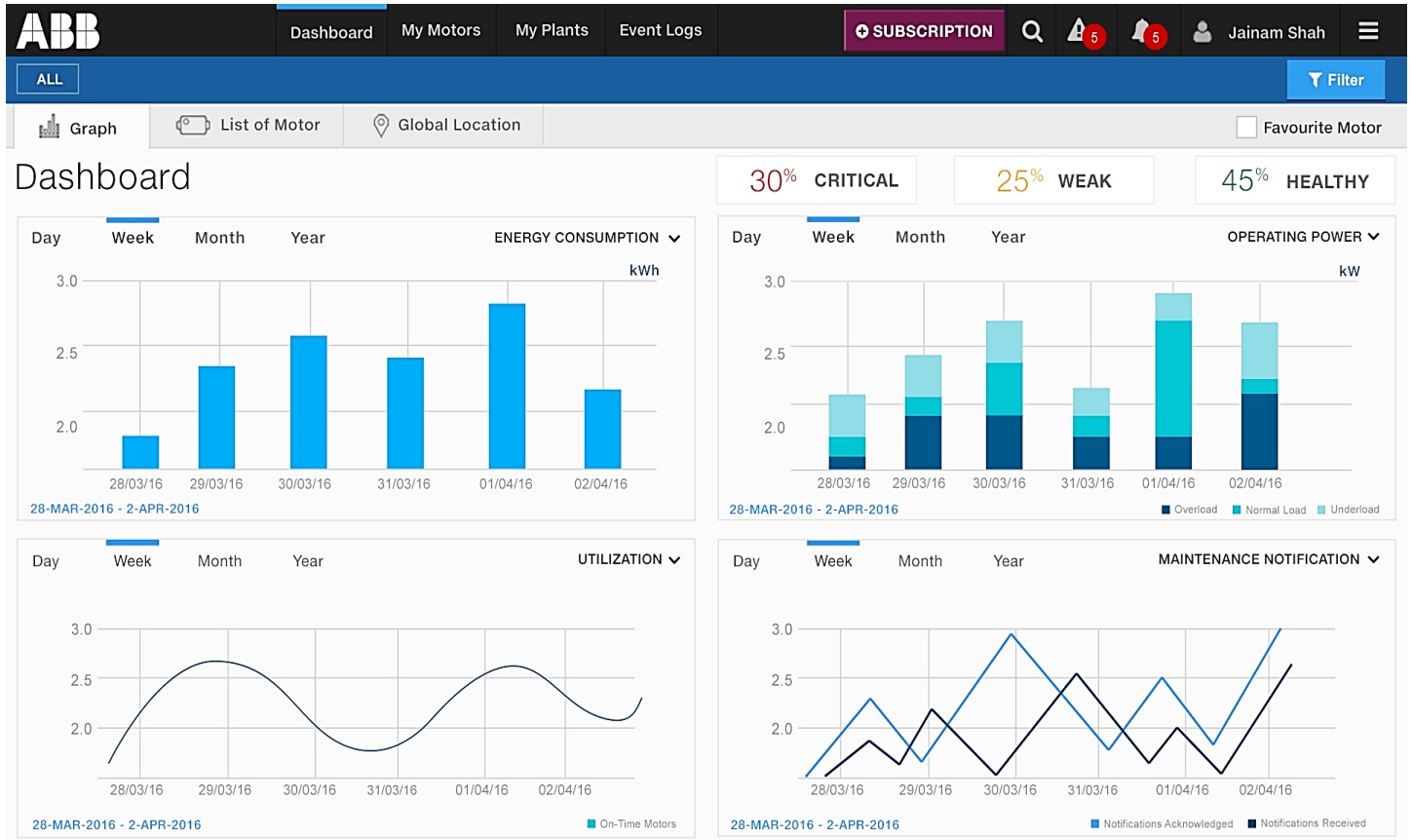


ABB Ability™ Smart Sensor

Evolution - LV motors covered, parameters measured

	Parameters supported	Problem or operating characteristic	DOL or Softstarter, S1 operation
Vibration parameters	Overall Vibration	Unbalance, loose mass, coupling management, load effects, soft foot, etc.	✓
	Axial Vibration		✓
	Radial Vibration		✓
	Tangential Vibration		✓
Health parameters	Bearing Condition	Bearing damage	✓
	Cooling Condition	Overheating due to blocking of air flow	□
	Airgap Eccentricity	Soft foot/bent shaft/thermal bow	□
	Rotor Winding Health	Cracked rotor bar/ring detection	□
Operating parameters	Skin Temperature / °C or °F	Operating information	✓
	Energy Consumption / kWh	Process change, replacement decision	□
	Operating Hours / h	Operating information	✓
	Operating Power/ kW and Loading / %	Process change, reliability (overloading)	□
	Number of Starts	Operating information	✓
	Speed / rpm	Operating information	✓
	Motor Supply Frequency / Hz	Operating information	✓
Maintenance Advice	Notifications		□
	Regreasing		□
Sensor unit Status	Battery indicator		✓
Certifications	IP 66		✓
	CE		✓
	FCC, UL, C-UL		□
	Class 1, Div. 2 / ATEX (Ex iA T4 -40 °C/+85 °C)		□

First release - ✓

Future release - □

Covered motor types (first release):

- Standard 3-phase LV induction motors
- Cast iron or Cast aluminium, finned frame, TEFC
- 140-449 NEMA, 160-450 IEC frames

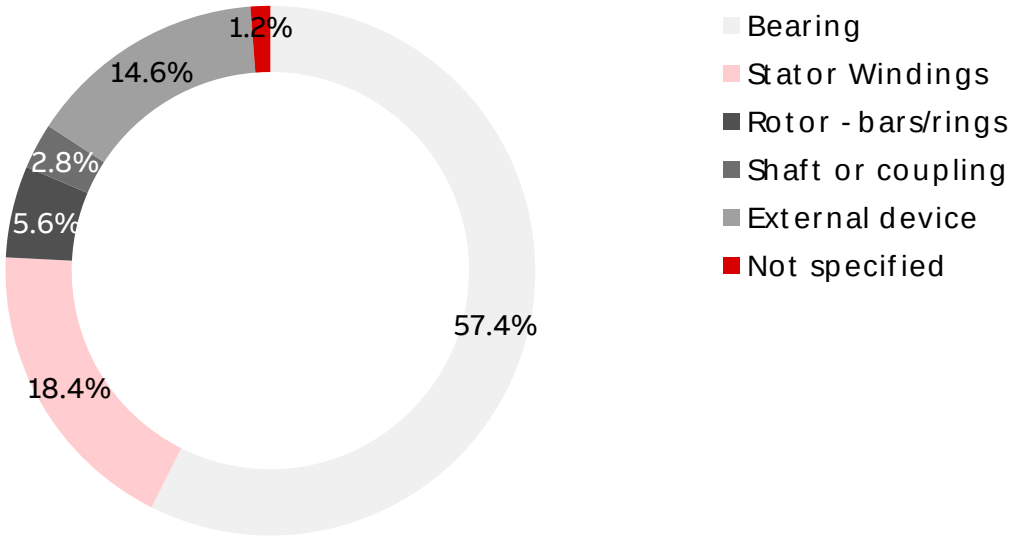
DOL intermittent and VFD operation available in future release (software update).

Failure statistics

Motors in the industry

Motors below 2 MW

Motors below 2 MW commonly use anti-friction bearings, which are more likely to fail.



Motors above 2 MW

Motors above 2 MW often use sleeve bearings, which are less likely to fail.

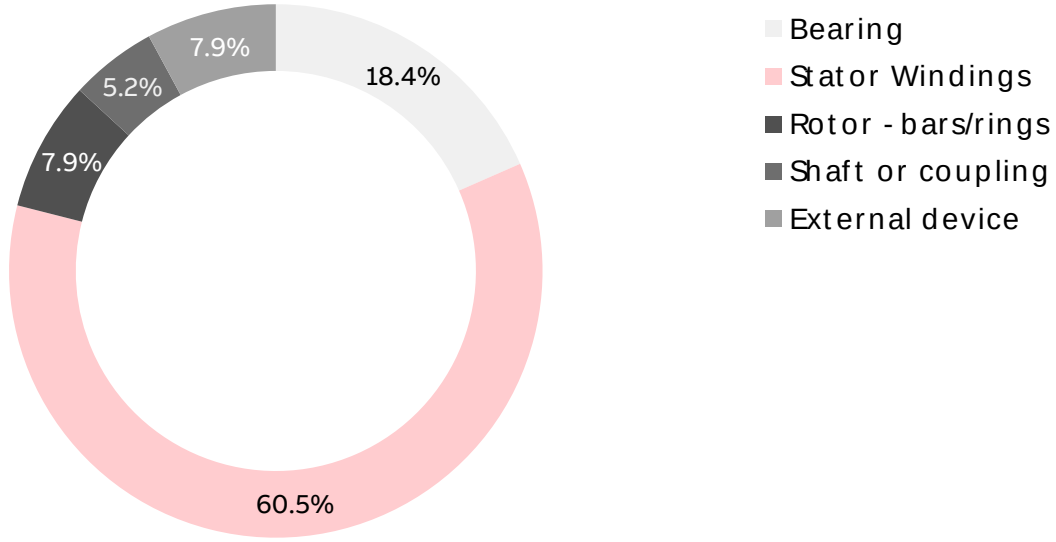


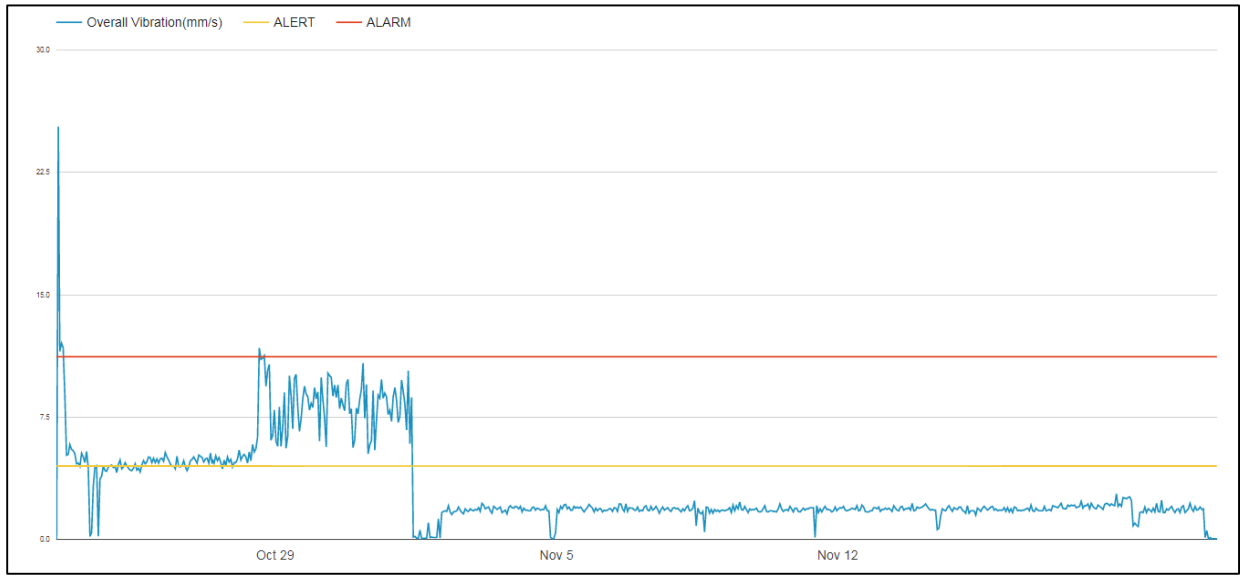
ABB Ability™ Smart Sensor

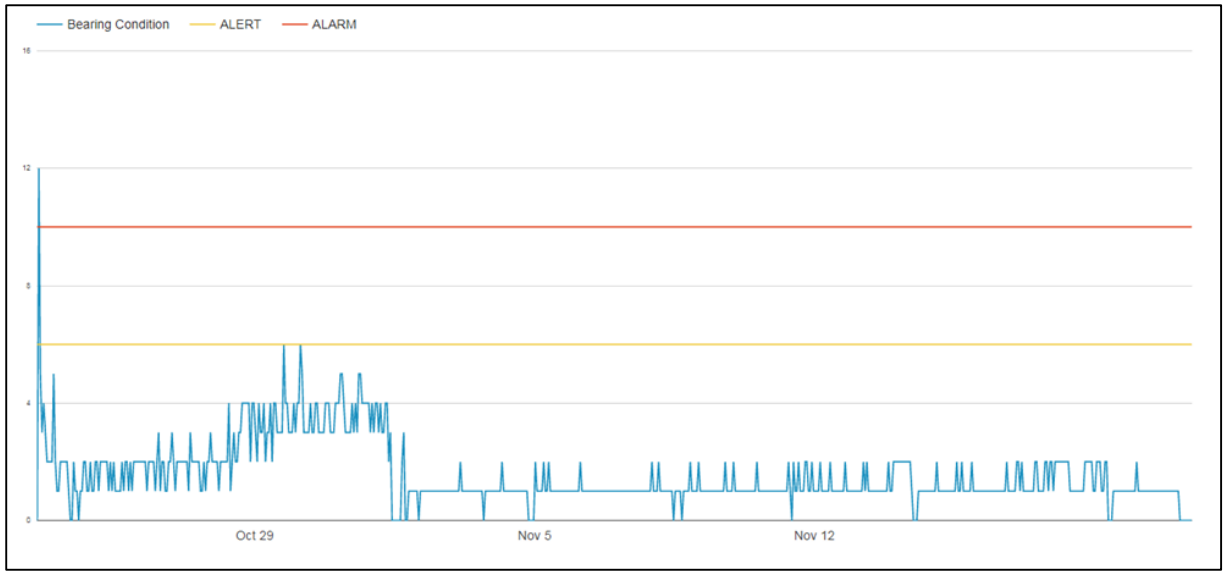
The Executive Summary

- ABB Ability™ Smart Sensor is like a fitness wristband for electric motors
- You fit it easily to the surface of a motor, and get operational data and health info of the motor
- Maintenance and operation can be optimised in a way that was not possible before
- The savings in downtime, reliability and energy consumption can be huge
- Payback time expected to be less than one year in most cases
- With IoT-technology the sensor does things at a low cost that was unthinkable a few years ago

Fulfilling the value proposition at Customer ‘A’

Smart Sensor prevents unplanned downtime

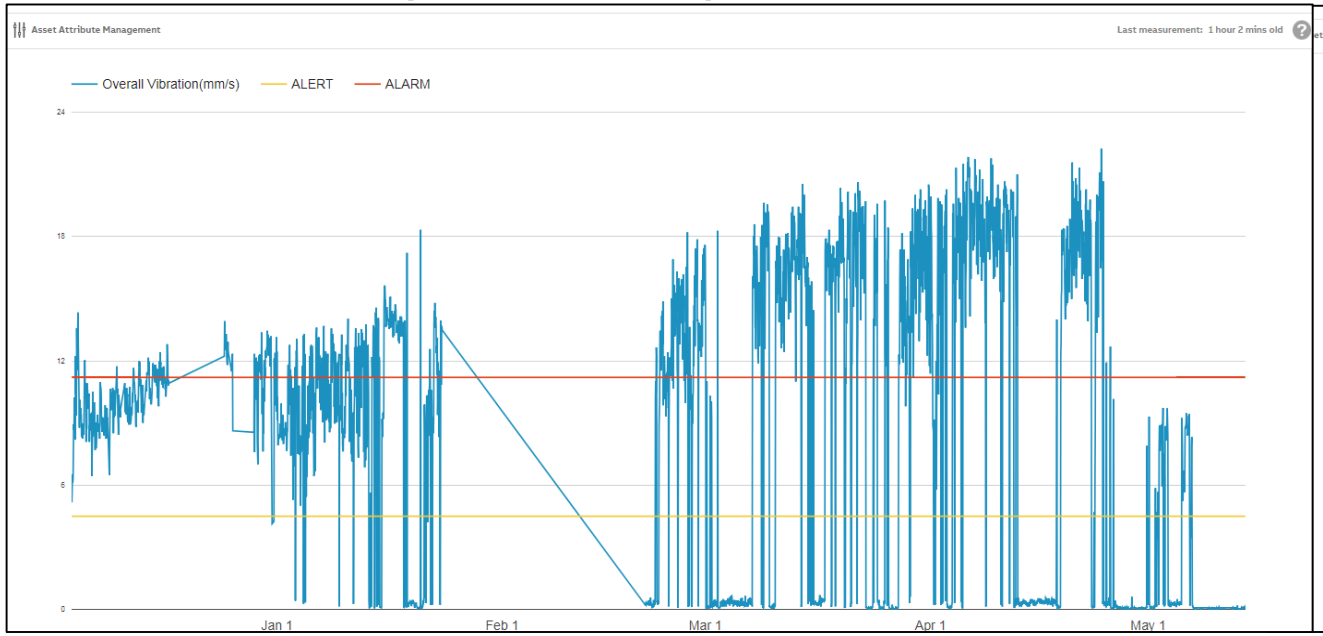


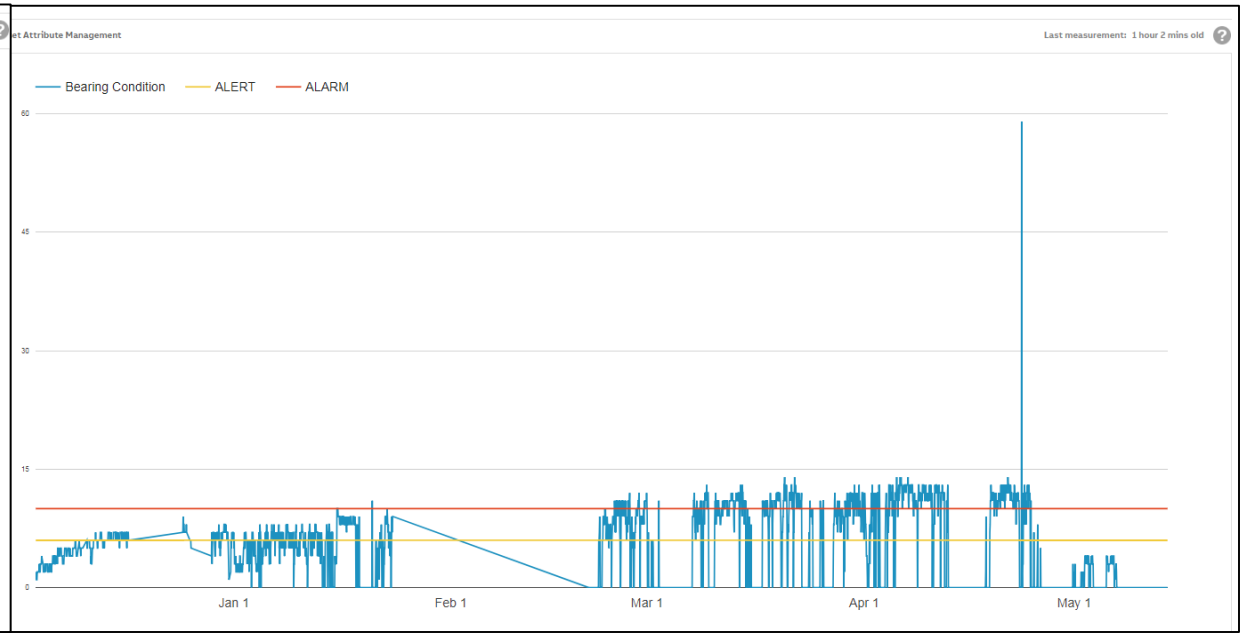


- Smart Sensors installation - 5 motors on 23 Oct 2017.
- One motor was exhibiting higher than normal vibrations from the time of installation. The levels were in the alert zone. Vibrations increased suddenly to near alarm levels on 28 Oct after noon.
- The vibrations and bearing condition was monitored and on 31 Oct 2017 a decision to carry out a smooth planned change out of the motor was taken. The motor was replaced with a spare motor. The sensor was shifted to the newly installed motor. The vibration levels of the newly installed motor have been good.

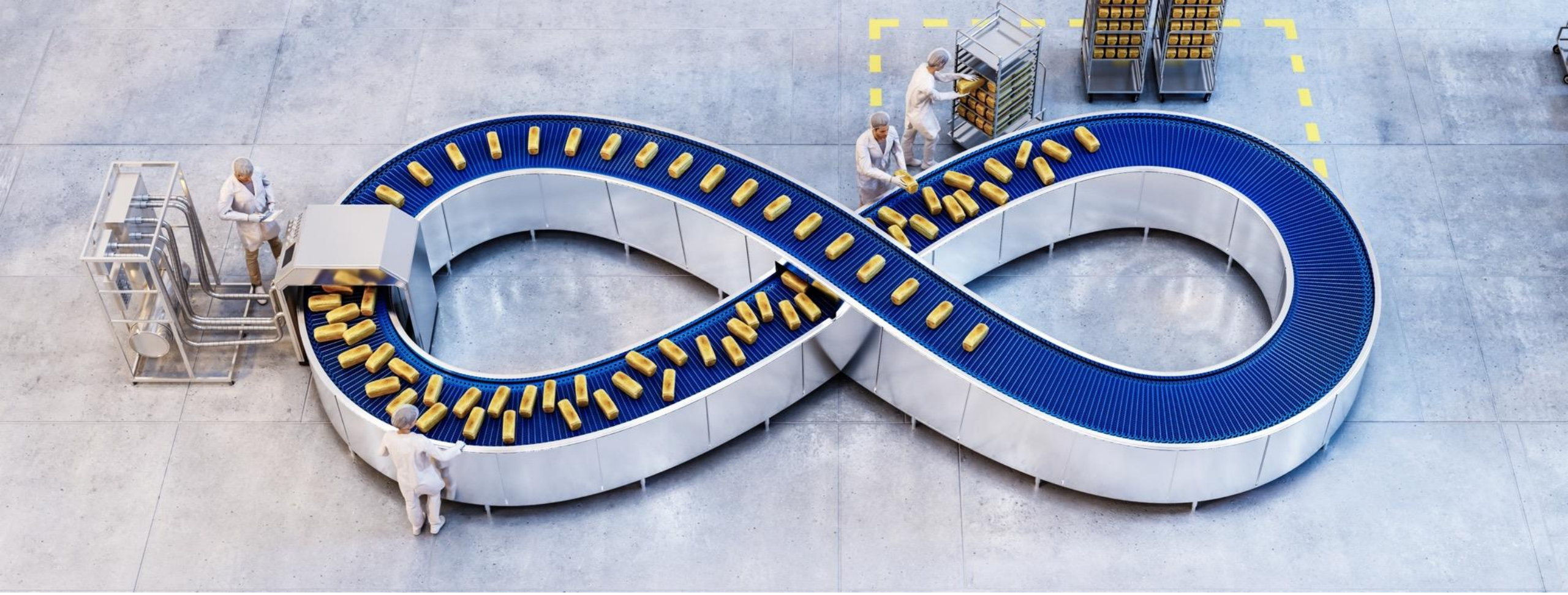
Fulfilling the value proposition at Customer ‘B’

Smart Sensor prevents unplanned downtime





- Smart Sensors installation – 19 Motors in Dec 2017.
- The Compressor motors (reciprocating compressor) exhibiting high vibrations from the time of installation. The levels were in the alert zone. Vibration trend monitored over 5 months. Decision to replace bearings taken on 01 May. Vibration reduced after bearing change. Catastrophic failure prevented.
- Case brings out a major advantage – Sensor helps identify developing problems that can be tracked. This reduces risk of catastrophic failure and therefore risk in offering reliability packages.



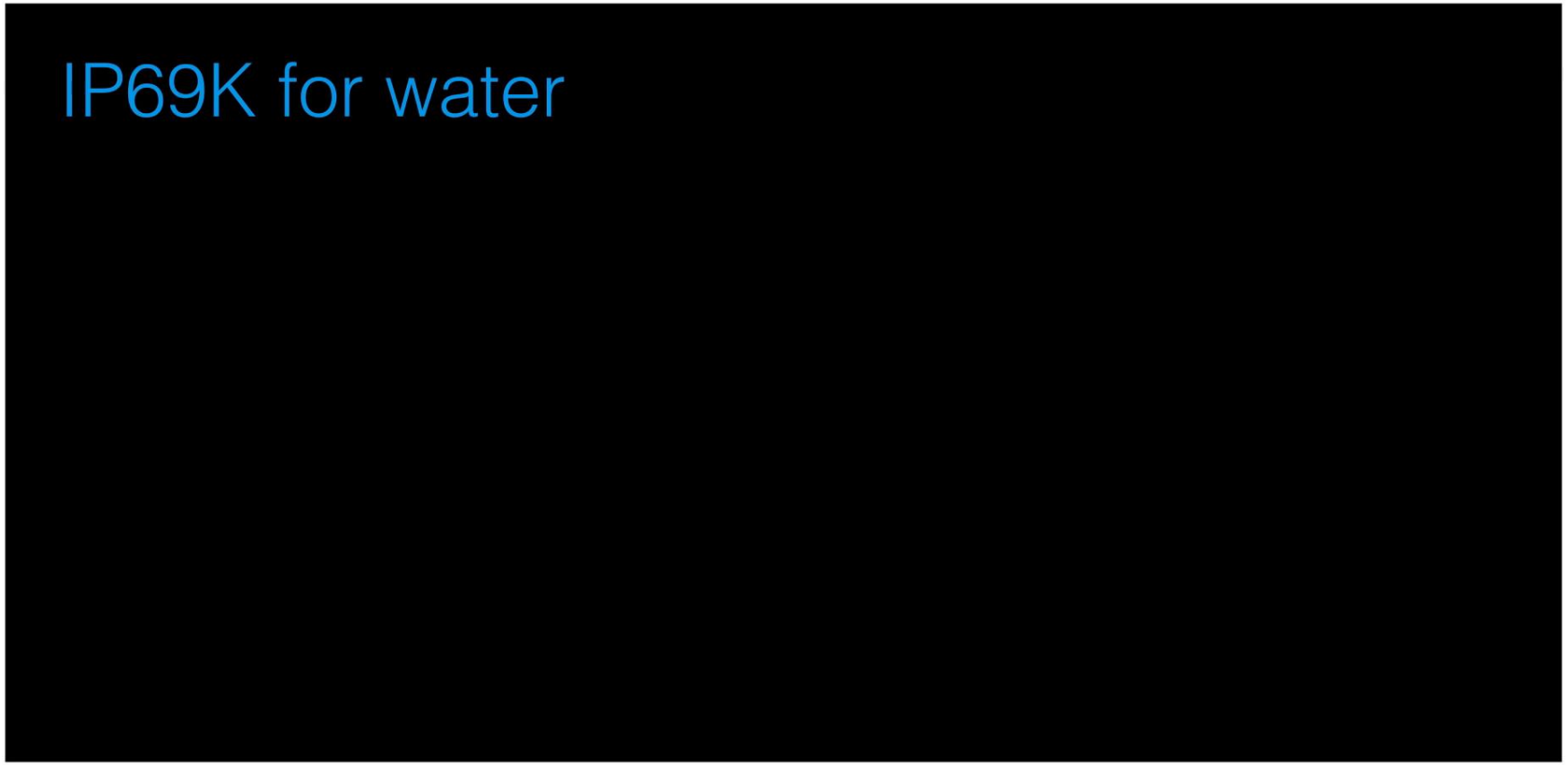
F&B CUSTOMER DAY 2018 | SURABAYA , SEPTEMBER 5, 2018

ABB’s Solution for Washdown Application

Where Reliability & Efficiency Really Matters

CK Tan, Head of local business unit, Motors and Generator

ABB’s Solution for Washdown Application



ABB