ABB DATA CENTER FORUM 2017, 11 JULY 2017, TUESDAY

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

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Agenda

Introduction – Industry 4.0 and Electric Motor as part of IoTSP

ABB Ability Motor Smart Sensor

What does the sensor do

How does the sensor work

Information provided to customer

Sensor packages

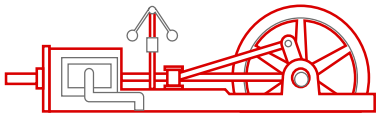
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Industry 4.0 and the Digital Twins

ABB leads proactively with new connected offerings

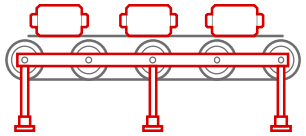
Industry 1.0

- First practical steam engine



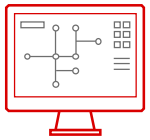
Industry 2.0

- Mass production based on Electric Power



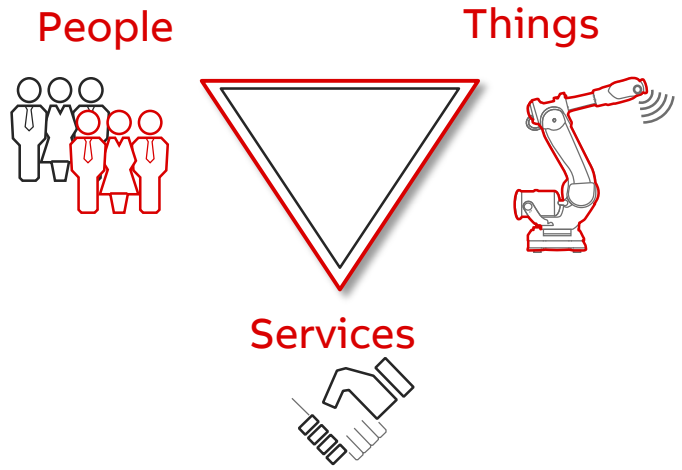
Industry 3.0

- Electronics / software based control
- The digital revolution



Industry 4.0

- Internet of Things, Services & People (IoTSP)
- "Smart factory" – Virtual copy of the physical world and make decentralized decisions



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Electric motors as part of the IoTSP

- If a large number of motors delivered status information …
- If monitoring equipment were affordable and easy to install …
- If competent data analysis with a large volume of information were readily available …
- … The service engineers could provide advance plant optimization at affordable costs
- … And the plant operators could save operating costs and increase productivity

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The ABB Ability™ Motor Smart Sensor



Power and productivity
for a better world™

Sensor and Attachment to Motor

MEMS Multi-Sensor System inside

Built-in batteries
(Not user exchangeable…)

Firmware with FOTA
(Firmware over-the-air, i.e. updates via smartphone)



Bluetooth SMART

Size: 130x77x16 mm



What does it monitor

Regular and accurate monitoring of key condition parameters

Health parameters

- Rotor health
- Temperature
- Air gap eccentricity
- Cooling condition
- Bearing condition
- Overall vibration

Operating parameters

- Energy consumption
- Loading (power)
- Operating hours



How does it work

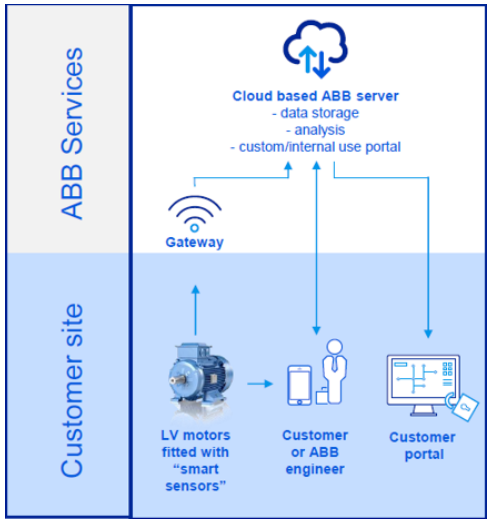
- Selected ABB motors will be factory fitted with smart sensors
- Sensors can also be retrofitted on motors
- You can check the monitored data on your smartphone screen
- The results can be integrated into your plant’s other systems

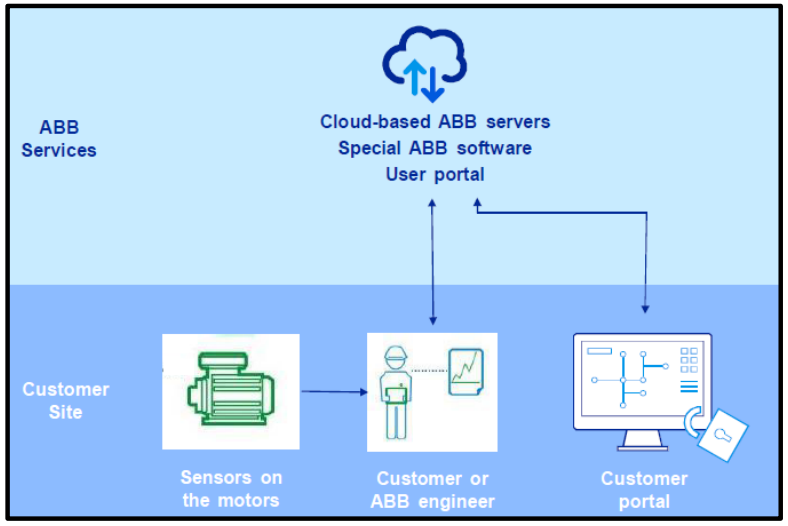


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How does it work

- Motors are fitted with smart sensors. Sensors can be fitted during manufacturing or afterwards
- The smart sensor wirelessly ‘talk’ to each other and to the internet
- A gateway or smart phone sends data over the internet to a secure ABB server
- The server analyzes the data and translates it into useful information
  - The server sends information on motor condition to your smart phone and customer portal
  - The data is tracked over time for trend analysis. It is visualized on your PC and can be supplied to other systems at your plant
  - If a problem is detected, the system send an alert to you





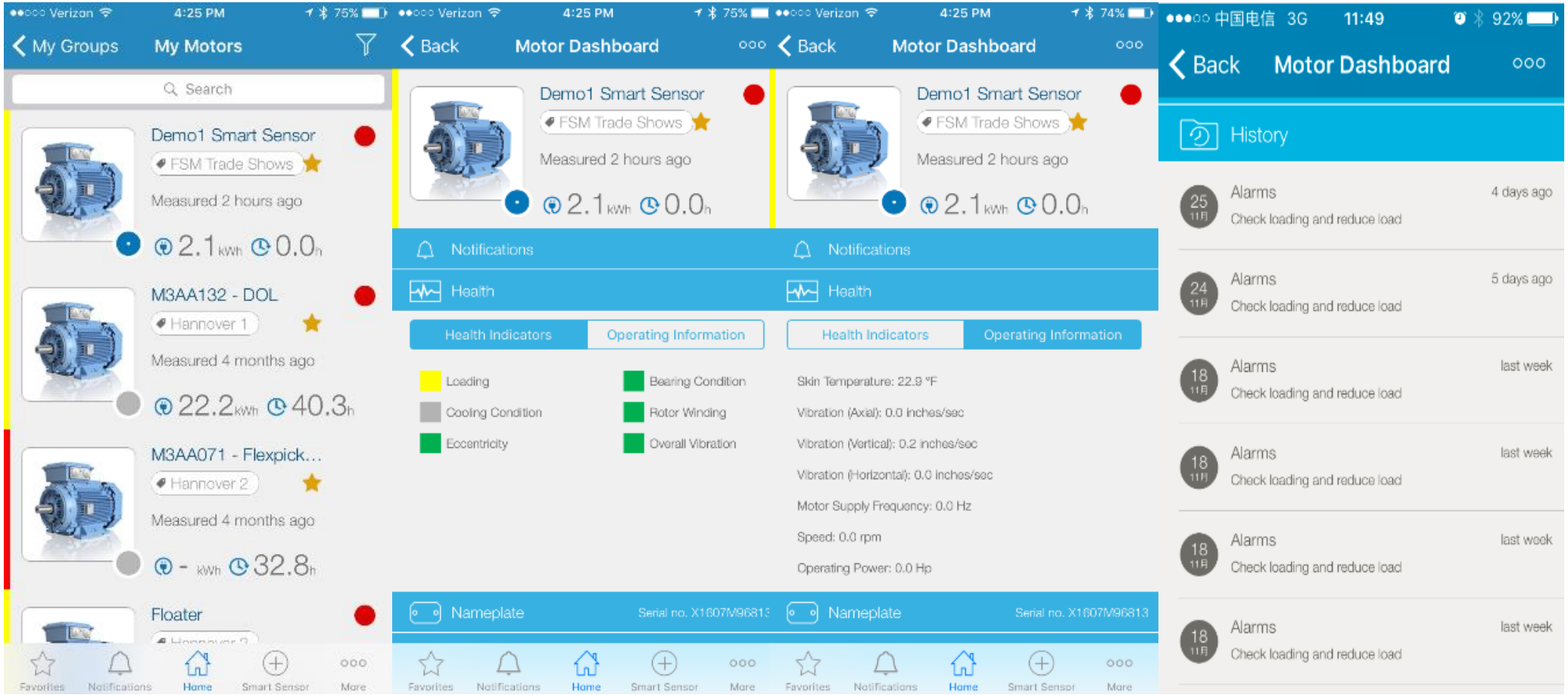
How does it work

Colour Coded Traffic Light System

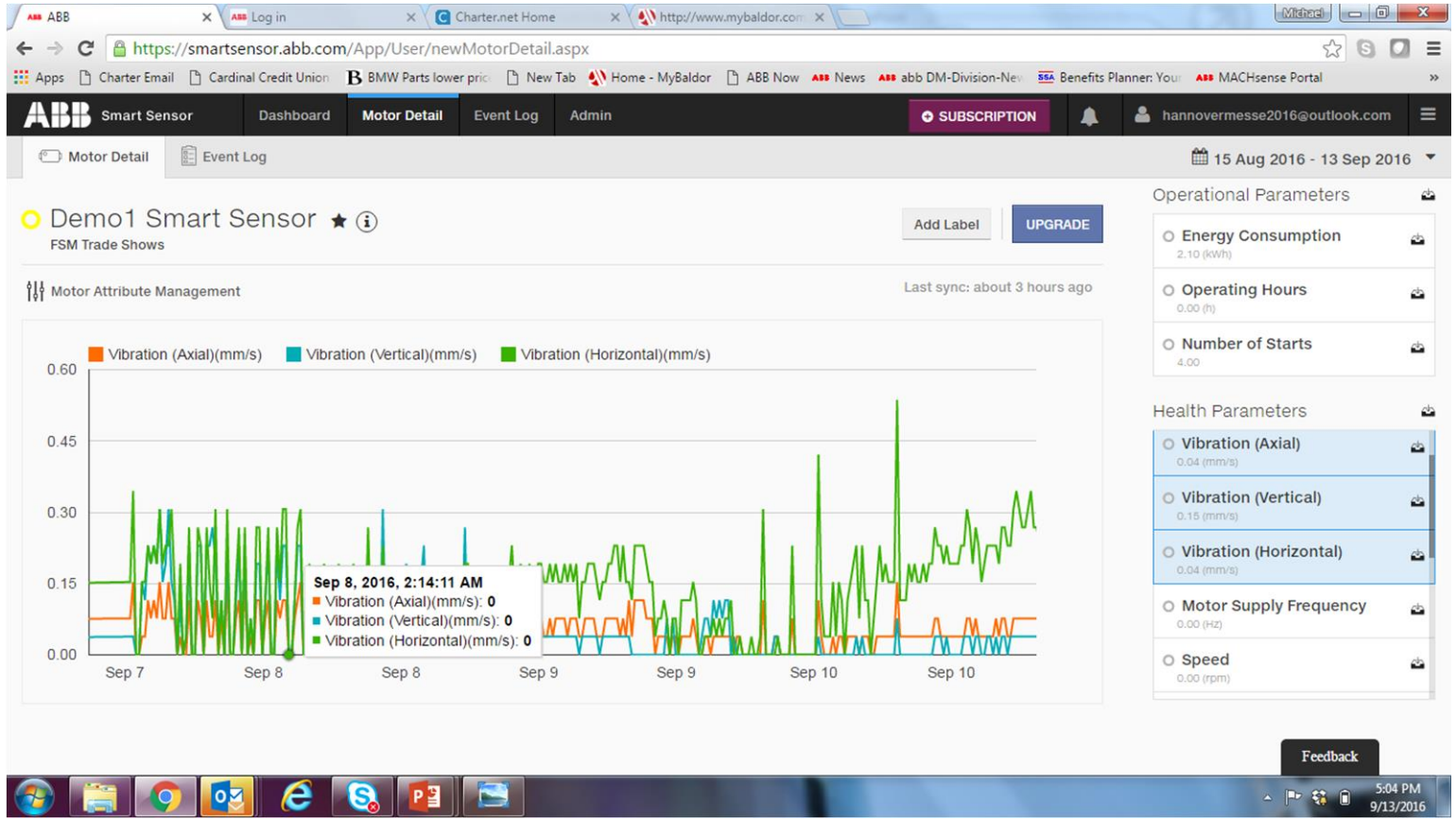
- **Green** – No issues detected.
- **Yellow** – No issues detected requiring immediate attention, but it is recommended that equipment should be inspected at the next available maintenance opportunity/planned maintenance (e.g. driven equipment or plant shutdown). Ensure that “yellow” motors are taken care of within three months. Failure to address “yellow light” motors may lead to permanent damage to equipment and could lead to property damage and/or personal injury.
- **Red** – An issue has been detected that could affect the functionality or operation of the motor. You should confirm the information provided by the Smart Sensor unit’s output by other diagnostic means and take necessary corrective action within a month.
- **Gray** – The app or the portal hasn’t received any data yet and no information can be given on the current motor at this time.

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Information on App



Information on Portal



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ABB Ability™ Smart Sensor

Release

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		○
NEMA Class 1, Div. 2		○
IEC Intrinsically Safe ATEX (Ex iA T4 –40 °C / +85 °C)		○

● = Available in first release

○ = Available in future release

(Software updates / certification process)

DOL intermittent and VFD operation available in future release (Software updates)

The Smart Sensor Application

Scope description in Q2/ 2017:

- Smart Sensor packages - Maintenance and Analyst – Includes hardware and subscription
  - Parameters monitored:
  - temperature,
  - overall vibration,
  - bearing condition (additional parameters in later releases)
- Types of motor supported:
  - standard 3 phase LV induction motors
  - Cast iron, finned frame, TEFC
  - 140-440 NEMA frames, 160-450 IEC frames
  - Motors used in ordinary locations (i.e. not hazardous) (Hazardous motors in later release)
  - DOL S1 operation (VSD and intermittent duty available later in 2017)
- Certifications:
  - IP66
  - CE, FCC, Blue Tooth, UL for ordinary locations

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Conclusion

"Motors are the workhorses of the factory/ industry and making them smart would go a long way in making the factory smart. ABB Ability™ Motor Sensor has just done that"

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