

ABB MOTORS AND GENERATORS SERVICES, 2019. EXTERNAL PRESENTATION

ABB Ability™ Smart Sensor

ABB Ability™ Smart Sensor

What are we looking at?

- ABB Ability Smart Sensor is like a fitness wristband for electric motors.
- Fit it easily to the surface of a motor, without wiring or machining, and collect operational data and health info of the motor.
- Maintenance and operation can be optimised in a way that was not possible before.
- The benefits 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.



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How does that translate to a motor?

Motor health manifests as:

- Bearings condition
- Cooling condition
- Rotor condition
- Airgap condition



Motor activity shows as:

- Energy consumption
- Vibration levels
- Temperature
- Operating hours



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What value does it create?

1. **Safety** - Smart Sensors can improve safety because maintenance inspections can be done from a distance
2. **Reliability, the cost of NOT running** – Smart Sensors help to reduce downtime by moving towards proactive maintenance.
3. **Energy Savings** - Smart Sensors help to reduce the energy consumption for a fleet of motors by up benchmarking rewind motors.
4. **Maintenance Savings** - Smart Sensors help to save time and effort of maintenance technicians
5. **Net Working Capital** – Smart Sensors reduce the need for spare inventory and redundant installations, motors live longer.
6. **Secondary Risks** - Smart Sensors help to mitigate liabilities, such as warranty, availability guarantee, transportation damage, etc.

ABB Ability Smart Sensors will fit right into your digital strategy and your service strategy.

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How does it work?



The sensor takes a measurement every hour, and has a memory for a month.



Within that month the data is collected, either manually with a smart phone or automatically via a gateway.



The data is analysed by the powerful algorithms of ABB, the world's leading manufacturer of electric motors



The condition of the motor is shown as traffic lights in the smart sensor app.
=> This will tell the service engineer if there is anything to worry about.



Trends and historical data are shown in a web portal.
=> This can be used for plant optimization and advanced analysis.

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Monitoring and maintenance of LV motors

Compare good ol' Industry 2.0 with new Industry 4.0

Imagine a case of traditional maintenance, e.g. in a small factory

- Every second week a service engineer does a plant walk,
- He goes around the factory and touches all the accessible equipment, he listens and smells.
- Everything is OK if all sounds normal and there is no smoke

Most industrial motors are maintained like this, if at all.

With the smart sensor it could be like this:

- The engineer still does a plant walk every second week
- When he comes to a motor with smart sensor he collects the measurements

Immediately he will have the condition of the motor shown with traffic lights on his smart phone.

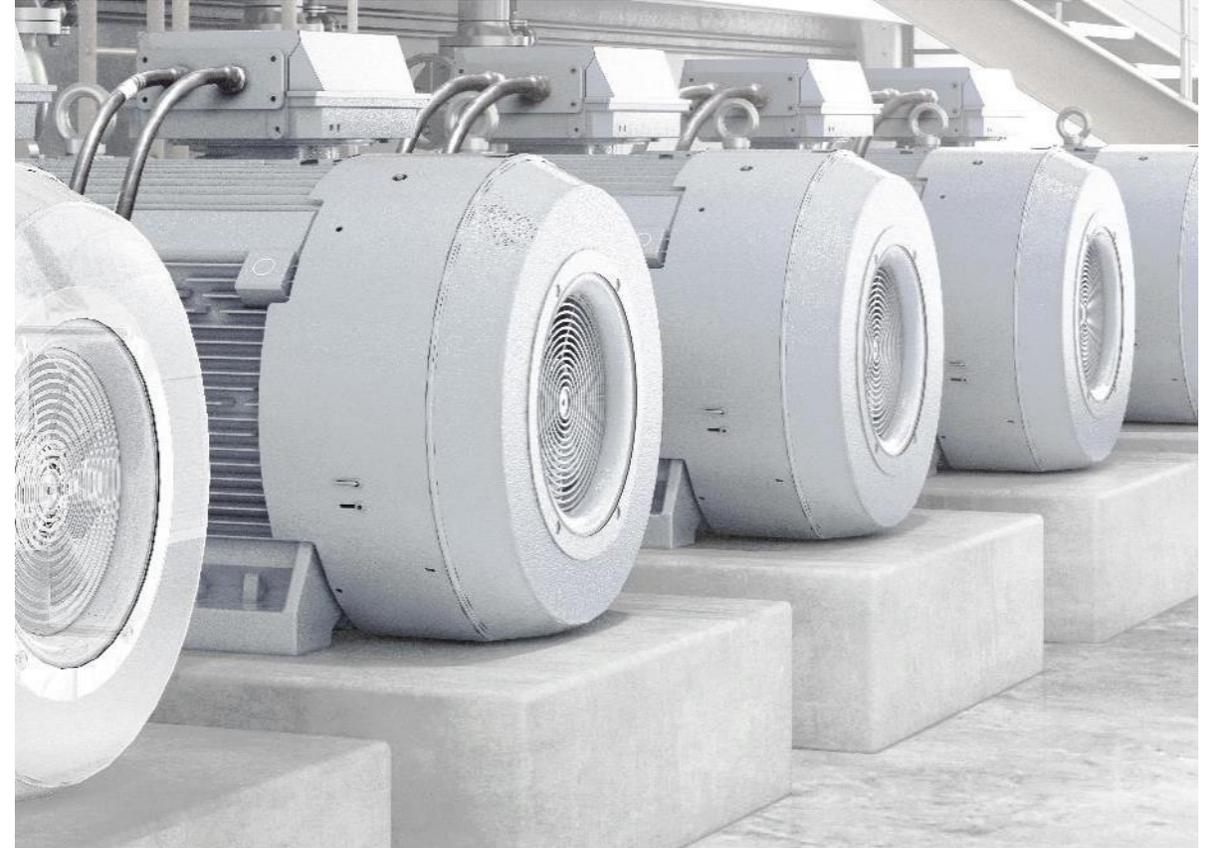


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Monitoring and maintenance of LV motors

The fourth industrial revolution

ABB Ability Smart Sensor does not do anything we could not do before - it just does it a lot easier and cheaper.

If you have the main motors on a paper mill where downtime costs 50'000 USD per hour, or similar applications, then you already have better condition monitoring.

All other motors, practically, can get real condition monitoring for the first time with an ABB Ability Smart Sensor.

Safe remote monitoring

Proactive maintenance

Fleet analytics

Less risk

Motors old and new, small and large, ABB and non-ABB

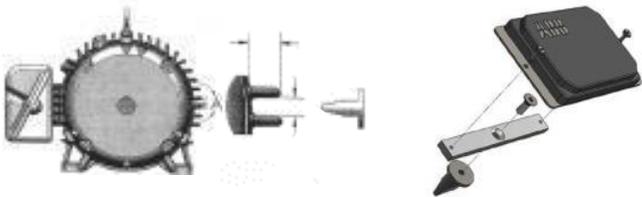


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Three elements: Hardware, Apps, Web portal

Hardware kit (for field upgrade)

Sensor
Bracket
Sensor mount
Adhesive putty
Three screws
Quick Start Guide



Smartphone apps

Sensor / motor registration
Health traffic lights
Latest operational data



Web portal

Maintenance package
– User registration
– User group management
– Settings for alert and alarm
– Support

Analyst package

As above, plus:

- Historical data
- Health parameters
- Operational parameters
- Trending

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Hardware

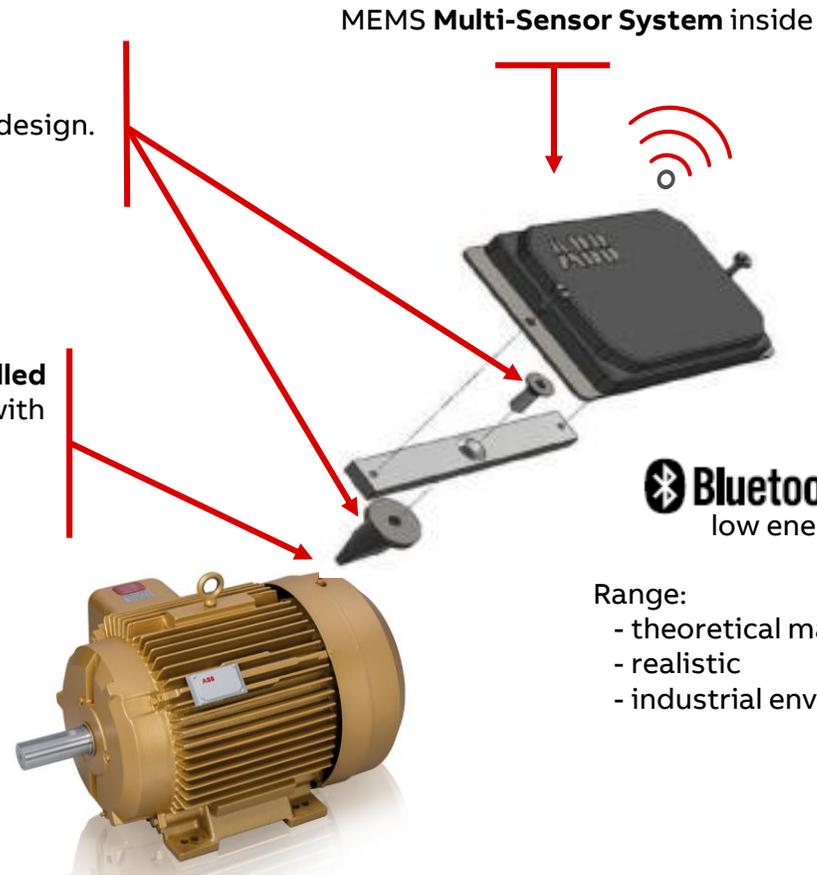
UNF 1/4"- 28 mechanical interface is "future proof" for possible upcoming ABB Ability™ Smart Sensor of different design.

No electrical wiring required / possible.

The sensor mount is **permanently installed** between the cooling ribs of the motor with adhesive putty (Henkel Loctite 3463). Initially 5 sizes are available.



Sensor in flight mode at delivery



MEMS Multi-Sensor System inside

 **Bluetooth**
low energy technology

Range:

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

Built-in batteries

Not exchangeable
Design life 5 years, realistically 3-5 years

Firmware with FOTA
(Firmware Over-The-Air,
i.e. updates via smartphone or
gateway)

Certified:

- IP66
- CE
- Bluetooth
- FCC ^{*)}, UL ^{*)}
- Class I, Div 2 ^{*)}
- Intrinsically Safe ATEX ^{*)}

^{*)} certification still in progress)

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System layout

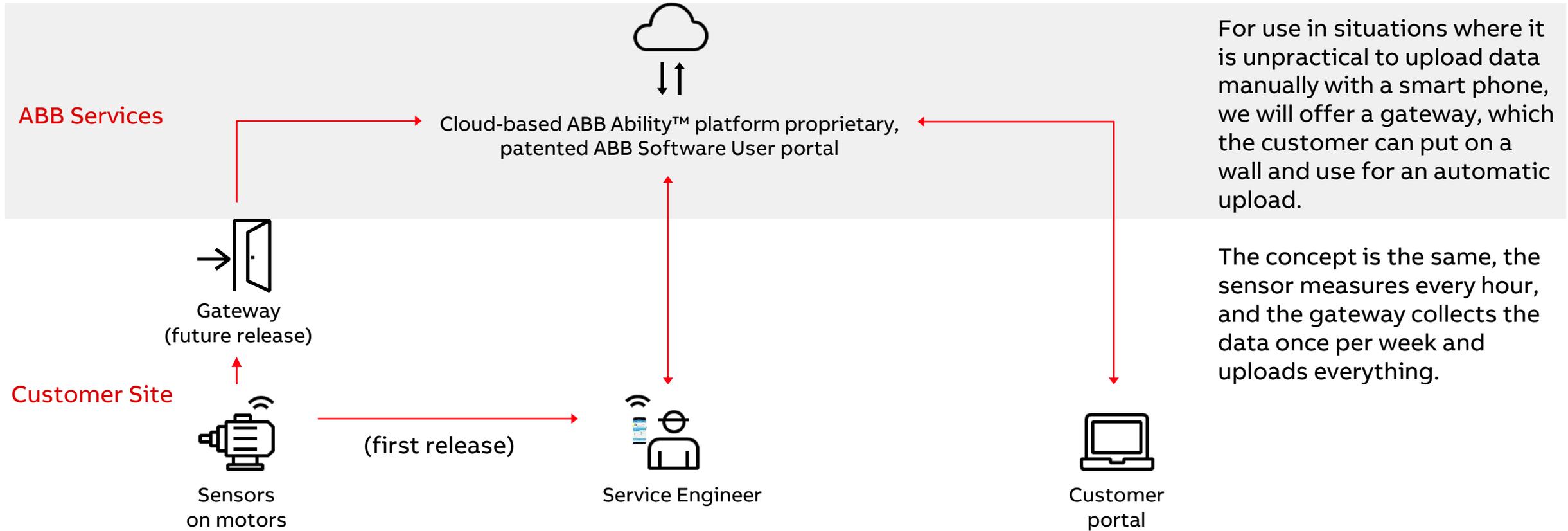


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What does it monitor?

Parameters supported	Problem or operating characteristic	Release
Overall Vibration		✓
Axial Vibration	Unbalance, loose mass, coupling management, load effects, soft foot, etc.	✓
Radial Vibration		✓
Tangential Vibration		✓
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	□
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	✓
Notifications		□
Regreasing		□
Battery indicator		✓

First release - ✓

Future release - □

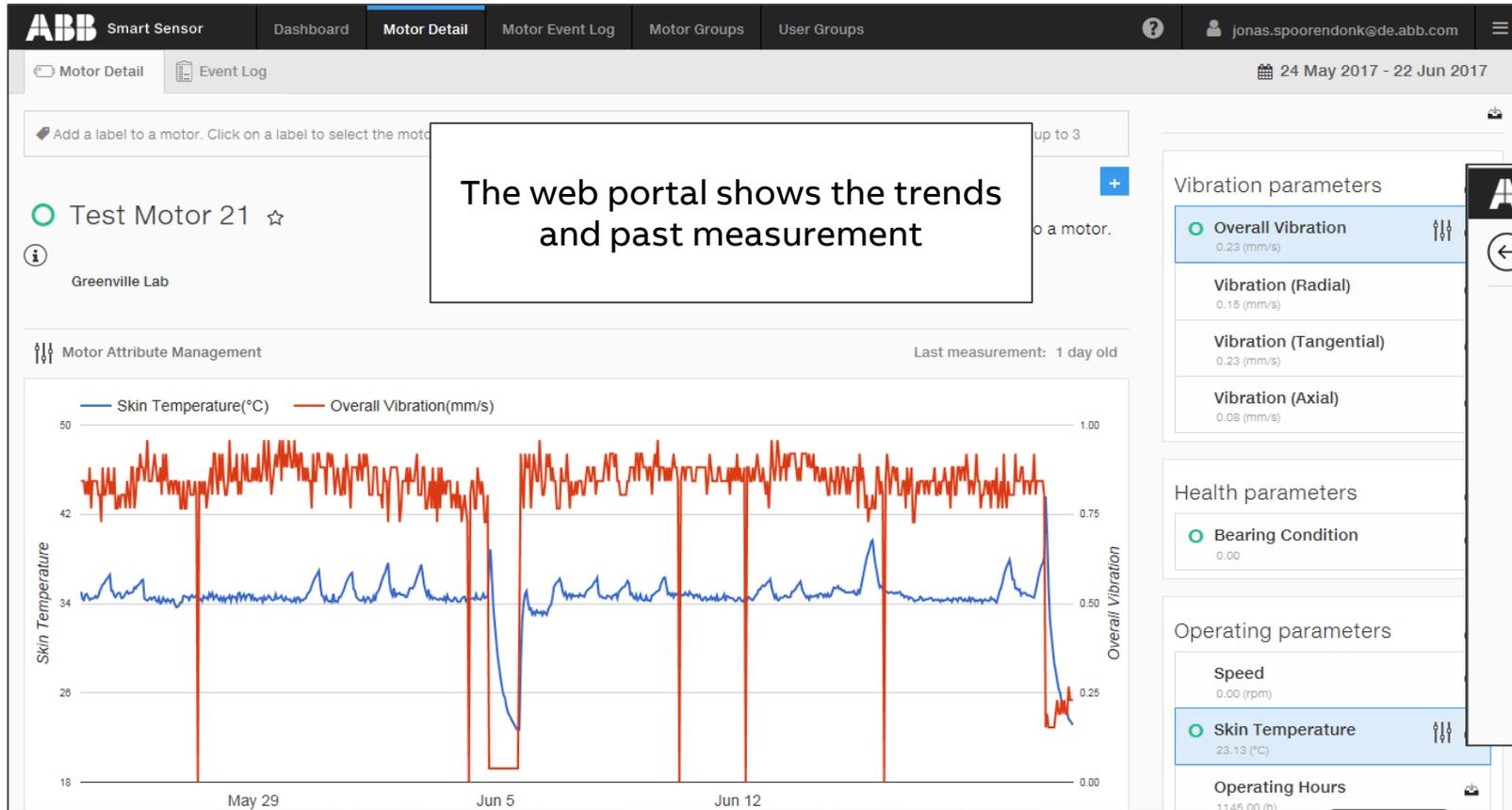
Covered motor types (First release):

- Standard 3-phase LV induction motors
- Rib-cooled frame, TEFC
- 140-440 NEMA, 160-450 IEC frames
- Safe area
- S1 duty
- Fixed speed, Low dynamic VSD supply

Many other types and duties will become available during 2019.

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Screenshots from the web portal



The web portal shows the trends and past measurement

The screenshot shows the 'Users' management page. It includes a search bar and a table with columns for NAME, ROLE, and DELETE. The table lists four users: jonas.spoorendonk@de.abb.com (User Group Member), kyle.r.davis@us.abb.com (User Group Admin), mwoffik@gmail.com (User Group Admin), and scott.collins@baldor.abb.com (User Group Member). There is an 'ADD USER' button at the bottom.

NAME	ROLE	DELETE
jonas.spoorendonk@de.abb.com	User Group Member	✕
kyle.r.davis@us.abb.com	User Group Admin	✕
mwoffik@gmail.com	User Group Admin	✕
scott.collins@baldor.abb.com	User Group Member	✕

Access rights and user privileges are managed via the web portal.

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What can you do with it?

Imagine that you have a fan and motor mounted in the ceiling

Without sensor

Nobody ever goes near that motor.

When it fails you will be surprised, then...

- Pull the spare motor out of your warehouse
- Find an electrician and beg her to come
- Get the skylift in place

It will take at least a day to replace, even if you have a spare on stock.

If the process or the driven equipment was damaged by the unexpected motor failure all times and cost can be multiplied by ten.



With sensor

Nobody ever goes near that motor.

You will get a warning before anything has happened, then ...

- Order a new motor from your nearest ABB Value Provider.
- Book the skylift for Tuesday
- Technician comes Tuesday with motor
- Run down and run up in an orderly fashion

Within two hours it is replaced.

Without a spare motor on stock, without an electrician on standby.

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What more can you do with it?

Imagine that you are a service provider with motors under contract

Without sensor

- Cover 5 end-user sites with the team you have
- Take care of the reactive maintenance
- Repair when something breaks down
- Tell your customer you work as fast as you can



With sensor

- Cover 10 end-user sites with the team you have
- Introduce proactive maintenance
- Make your customer happy because they have less downtime than before.
- Help your customer to save energy, and sell some drives and new motors in the process
- Help your customer to avoid accidents
- Reduce your own inventory of spare motors
- Mitigate the risk when you have to give guarantees or promise something
- Party Saturday and sleep long Sunday, because you don't have to fix an urgent breakdown.

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What more can you do with it?

Imagine that you are a machinery OEM, looking to grow your pump business

Without sensor

You produce a package of pump and motor and sell it.



With sensor and automatic gateway

You receive operational information in your cloud, through an interface from ABB Ability™. With this and other data you develop your business in two directions:

- 1) You sell uptime to your customers. The equipment still belongs to you, and you charge per cubic metre delivered. With remote monitoring you know that your equipment is working as it should.
- 2) You upgrade old pumps and sell services. Your new Asset Monitoring Centre calls the customer when there is an alert and dispatches technicians when needed.

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Wrap-up



An affordable, clever and easy solution

- Improve Safety
- Reduce Downtime
- Save Energy
- Reduce Maintenance Cost
- Optimize Investment
- Mitigate Risk
- Grow Digital Business
- Grow Service Business



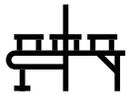
AABB

The Internet of Things (IoT)

Global trend – Fourth Industrial Revolution



Industry 1.0 – 1712
First practical steam engine



Industry 2.0 – 1873
First successful electric motors



Industry 3.0 – 1969
Electronics / software based control

Industry 4.0 – today and tomorrow
Internet of ...



People



Things



Services

ABB leads proactively with new connected offerings

Industrial markets primed to adopt digital technologies

Computing + connectivity + cloud + analytics set to unlock value

