EURO MAINTENANCE 4.0

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Session : 2.4.2

Smart sensing technology for LV motors and pumps bringing predictive analytics

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About the presenter

Jonas Spoorendonk

Global Product Manager

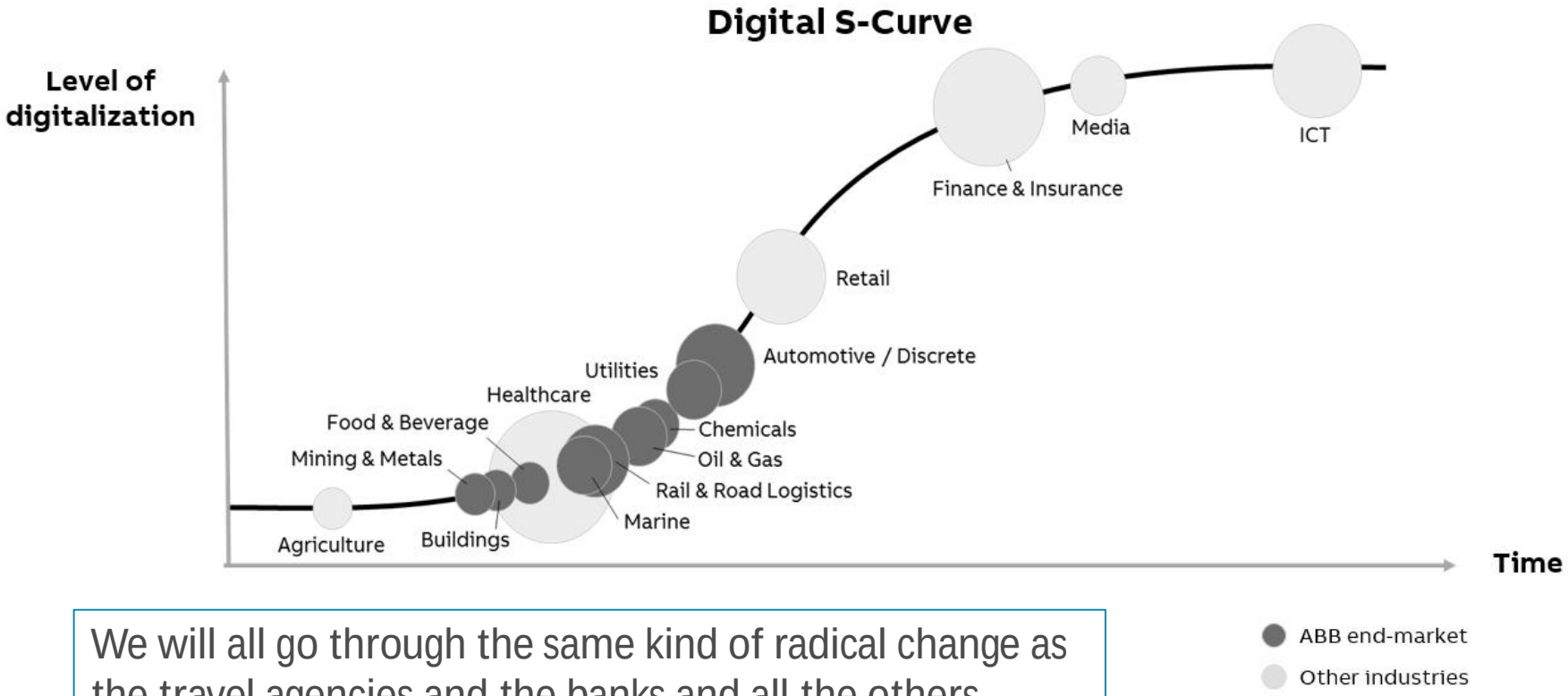
ABB Ability™ Smart Sensor

- Digital since 2016
- Motors & Generators since 1995
- A long career with ABB, in many countries and many positions in product management, sales and general management

Agenda

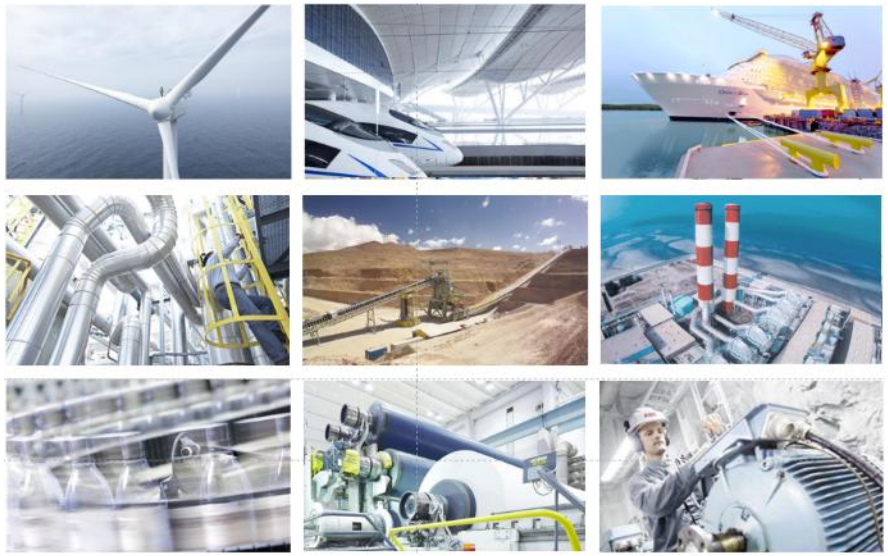
- The digital journey
- Value creation with Industry 4.0
- From one asset to “fleets of fleets”
- Wrap-up
- Questions & Answers

For most of us, the journey lies ahead



We will all go through the same kind of radical change as the travel agencies and the banks and all the others.
But it will be different in each industry.

Value Creation With Industry 4.0



When you manage risk,
you create inefficiency.

Your risk and inefficiency is
my opportunity.

- **Differentiation.** Bundling one's own strengths to offer them as a product or service.
- **Minimize risks.** Prevent plant downtimes, improve occupational safety, discover transport damage, avoid contractual penalties for delayed delivery etc.
- **Protect investments.** Accurately engineered plants requiring less redundancies and fewer spare parts and run longer.
- **Eliminate inefficiencies.** Optimization along the value-added chain.
- **Cut costs.** Continuous improvement of plants and processes thanks to better data, optimized maintenance costs and reduced energy consumption.

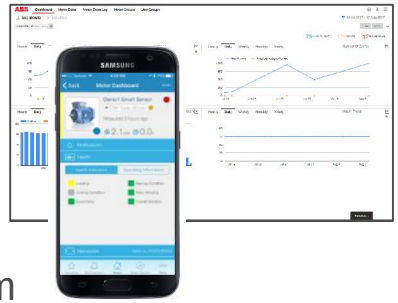
Key Elements of IoT Service Business

§ Hardware

Customers assets
Our sensors
3rd party sensors
Mounting kits
Router/Gateway
4G Modem + sim card

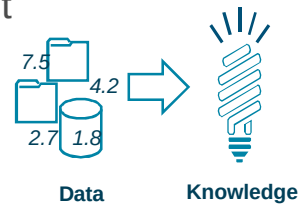
§ User Interface

Sensor / asset registration
Health traffic lights
Operational data
Access management
Settings for alert and alarm
Support
Trending & Historical data
Web Store



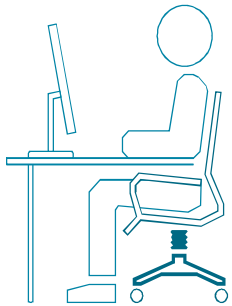
§ Backend

Authorization & Authentication
Subscription management
Cyber-security
Advanced analytics
Cloud interfaces (API's)
Partner functionality
Support

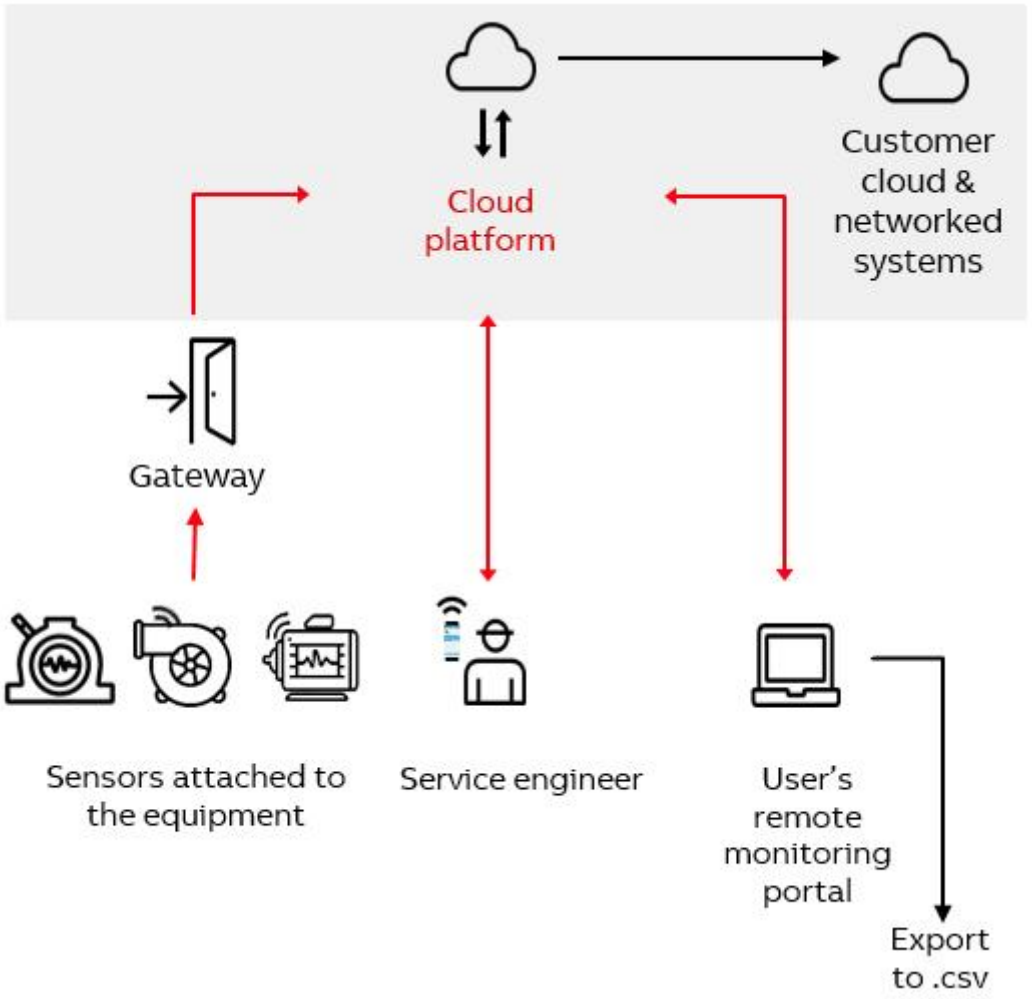


§ Adjacent Services

Physical services
Service Level Agreements
Energy Upgrades
Remote Monitoring Centres
Customized reports



Know more, do more business



- Service Provider evaluate the operating data and fault indicators from the pump stations.
- Customers' benefits will be:
  - Operation at optimal duty point
  - Remote monitoring
  - Uninterrupted operation
  - Needs-based maintenance
  - Reliability thanks to transport monitoring, etc
  - Optimized stocking of spare parts

- For example:

Pump OEM buys smart sensors with the firmware for motor and pump monitoring as well as cloud services and for the motors also the analysis of parameters from ABB.

Your business case

Take time to consider in which part of the value chain you want to create value.

- In ABB we often do workshops with our customers to find out what they have in mind.

What data do you really need for your business case?

- Measure what you can get in a cost-efficient way, calculate the rest

Don't forget non-technical functionality

- Your TICKET TO PLAY is cyber-security, authentication & authorization, testing, continuous development, infrastructure
- Your TICKET TO WIN is the user experience

No Change, No Gain

- Because value creation in Industry 4.0 is mainly about doing the same thing in a different way.

FOR EXAMPLE:

Measurements of ABB Ability™ Smart Sensor for Motors

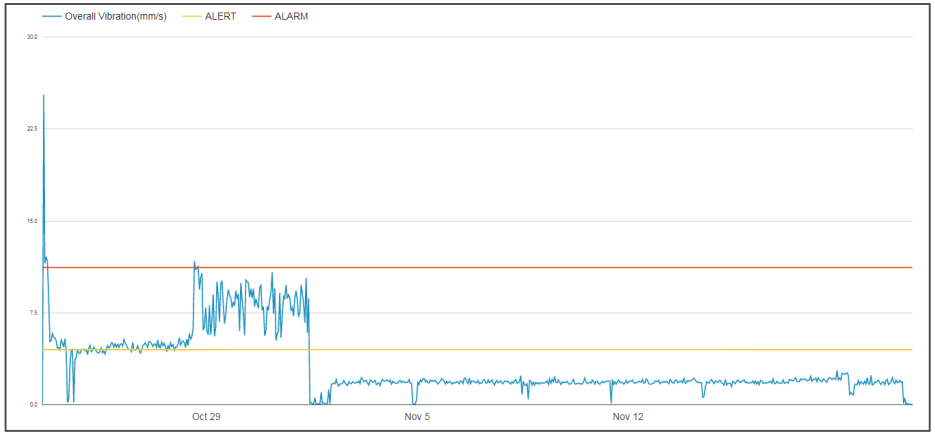
- Vibration (shown to users)
- Magnetic field (not shown to users)
- Temperature (shown to users)
- Acoustics (not shown to users)

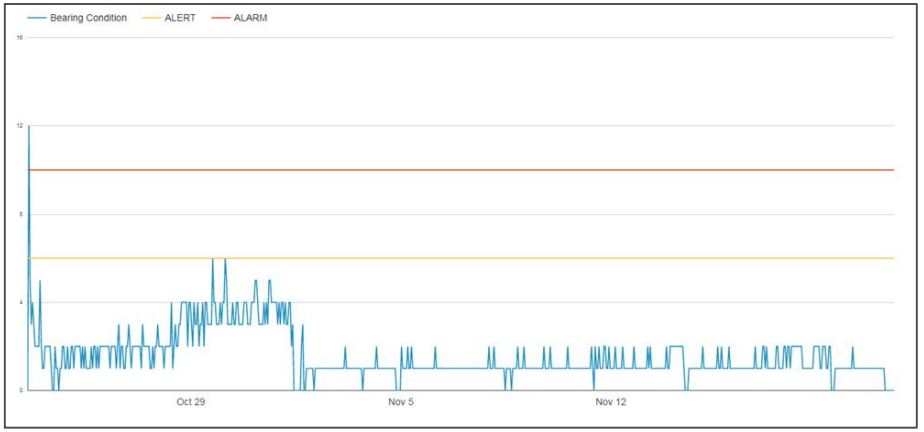
We select the data we need on the sensor and discard the rest. The selected data are uploaded to the cloud.

Calculations in the ABB Ability™ cloud

- Overall condition
- Bearing condition
- Output power
- Speed
- Supply frequency
- Operating hours / number of starts
- Misalignment
- And many more

Basic case, viewing one asset alone





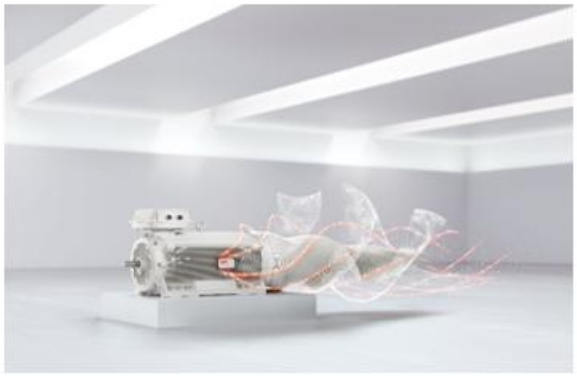
- Smart Sensors installation - 5 motors on 23 Oct 2017.
- One motor was exhibiting higher than normal vibrations from the time of installation. The levels were in the alert zone. Vibrations increased suddenly to near alarm levels on 28 Oct after noon.
- The vibrations and bearing condition was monitored 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.

Advanced case, analysis by specialist

MOTORS AND GENERATORS SERVICE

ABB Ability™ Smart Sensor

Condition monitoring detailed report

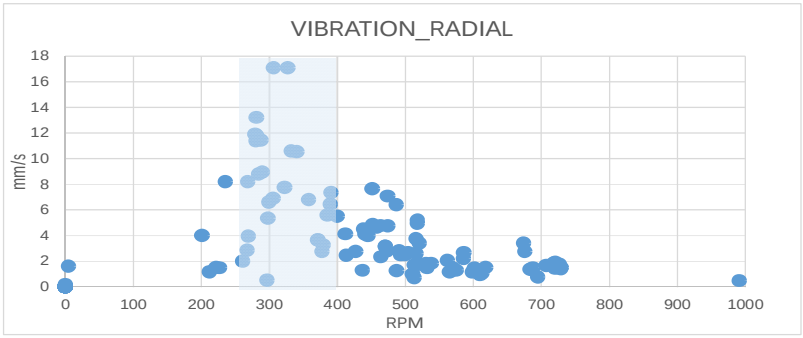


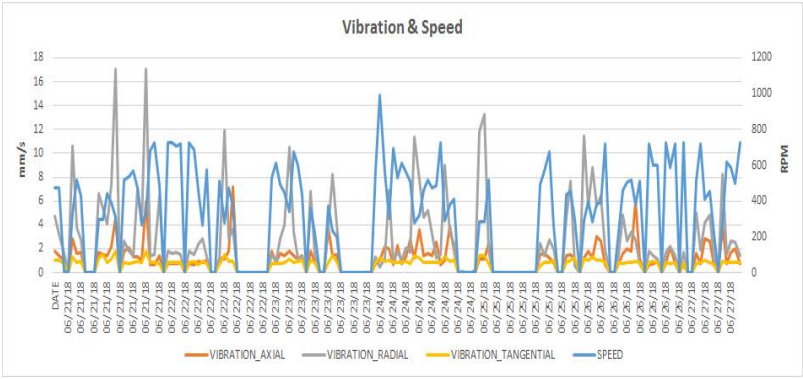
Report data

Report	
Date of report	20.07.2018
Prepared by	SIU India
Phone	
Mail	ravi.naiduk@in.abb.com
Approved by	Cajetan T Pinto
Measurement date	21.06.2018 to 27.06.2018
Asset name	
Serial number	#######
Tag No	#######
Asset ID	#######
Asset type	Motor

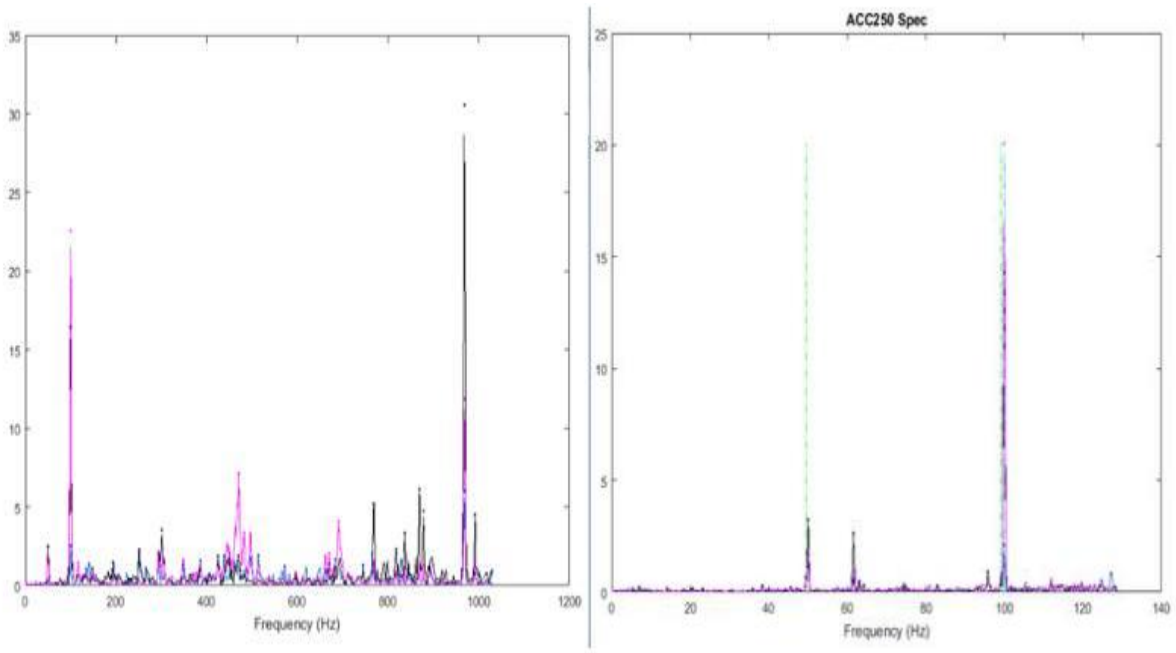
Customer point of contact	
Company	#######
Name	#######
Phone	#######
Fax	#######
E-mail	#######

- Still only looking at data from one asset
- Asset owner is not confident of own analysis and requests support from remotely located expert



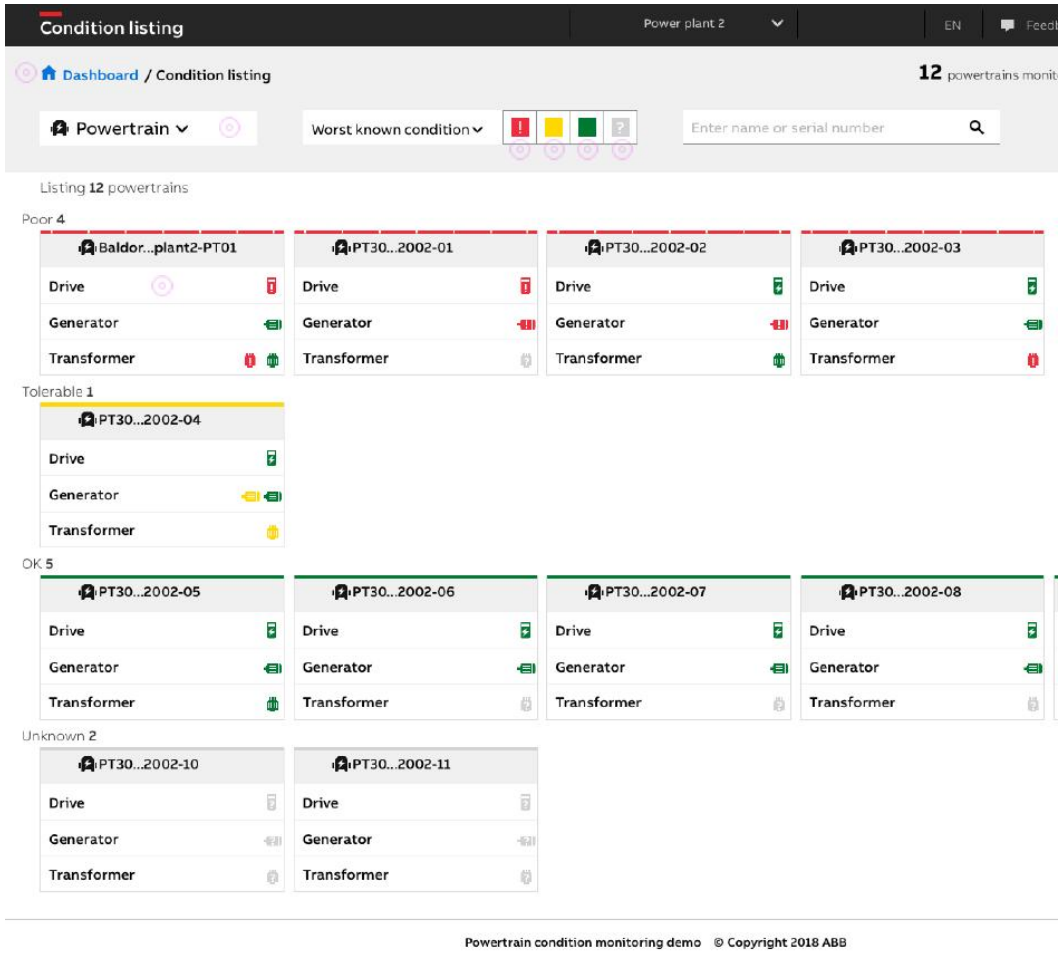


The road to predictive maintenance



- Advanced analyses will be done by software
- Today we can already upload a vibration spectrum through our sensors and use software to analyse it and point out interesting values.
- We can automatically generate statements about whether the interesting values represent a problem or not
- **Automatic analysis is not "artificial intelligence", it is still mainly textbook condition analysis based on the data of one unit.**
- It is necessary as a step on the way to predictive maintenance

Powertrains, assets belonging together



<u>Moving on from the analysis of just one individual.</u>

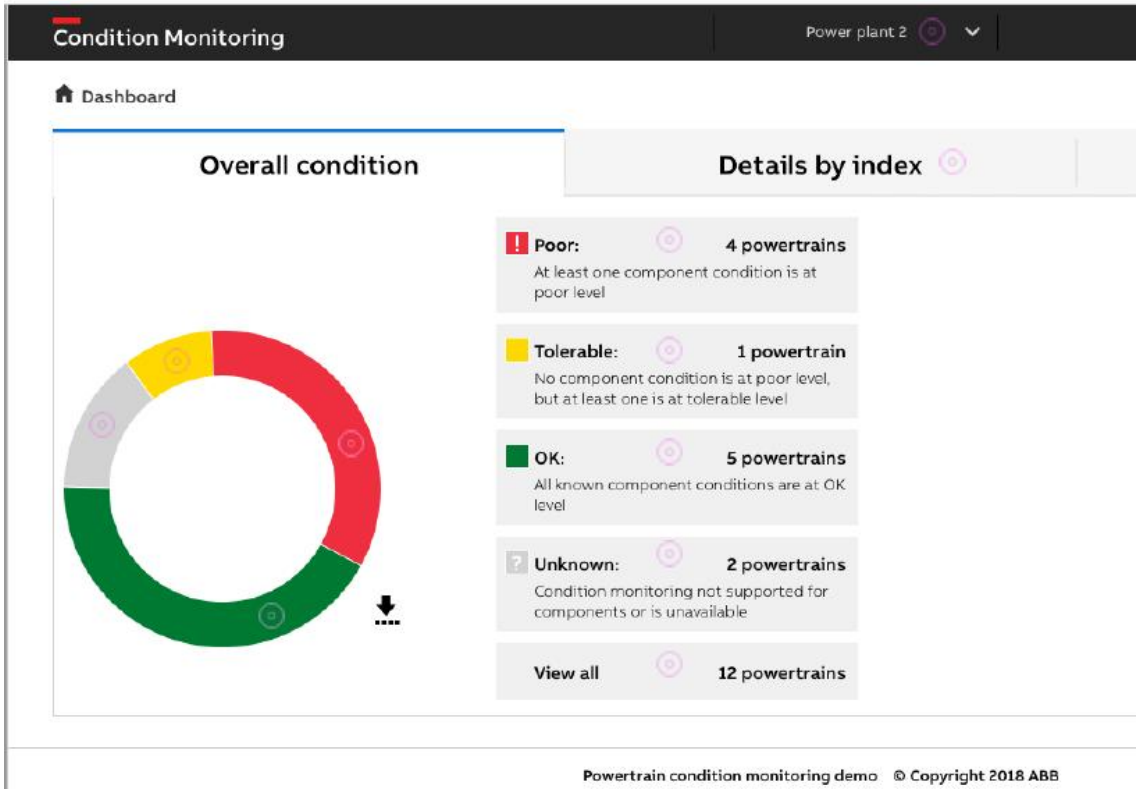
Conclusions should be drawn across different asset types in a related operation, e.g.:

- Using the speed of a motor to assess the condition of a pump
- Using the current ripple of the frequency converter to assess the condition of the motor

It is crucial for business to be able to add customized data sources

- Such as special sensors that are required by this particular customer and added to the system

The fleet view



This is as far as we have got until now.

"I only want to know is if the floor is dry or if there is a puddle of water somewhere. If there is a puddle then we have a problem that must be solved by the technical staff." (Quote from a chemical company executive at Hannover Fair 2017)

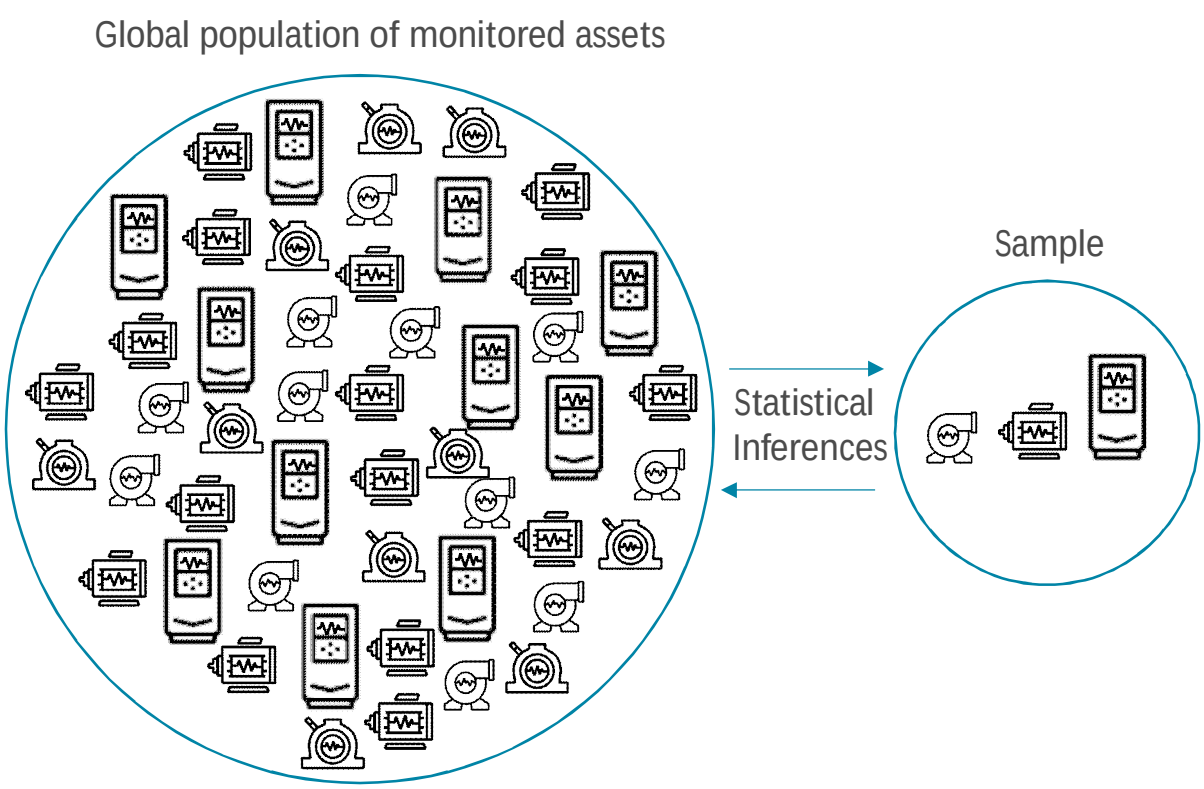
With the fleet view comes the possibility to draw conclusions across different powertrains, in order to asses the health of the fleet.

- Benchmarking departments and processes
- Efficient use of the company experts

This is a consolidated view of the status of different asset types.

The trick is how to make them comparable.

The global view of assets



- Identifying symptoms in an individual, based on data from millions
- The size of the global data pool is crucial.
- High quality Machine Learning and Artificial Intelligence require consistent data streams from tens of thousands individuals.
- When one player has achieved critical mass it will be difficult for others to catch up.

- **It is not a task for one individual site or factory, there is simply not enough data.**

This may be one-two years away.

The global view of fleets

- Optimising one fleet based on data from hundreds of fleets
- This is not done today, no one has enough data.
- Once it becomes feasible it will change the lives of the local maintenance teams
- "You are 7% less efficient than your peers in the industry"

This may be two-three years away.

Wrap-Up

- **If you are not yet convinced of the potential of Industry 4.0, just ask yourself: Why did Barak Obama and Angela Merkel think it was a good idea to visit ABB only to hear about the ABB Ability™ Smart Sensor?**
- The official challenge was this: „Show us how small- and medium-sized companies can benefit from Digitalization and Industry 4.0?“
- Practically everything we are doing today will be done differently in future
- Are you on-board, or staying behind?

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