APRIL 2020

Digital Solutions for optimum plant performance

ABB Ability™ Smart Sensors and Digital Powertrain

Bernd Heisterkamp, Digital Leader for ABB Motors and Generators

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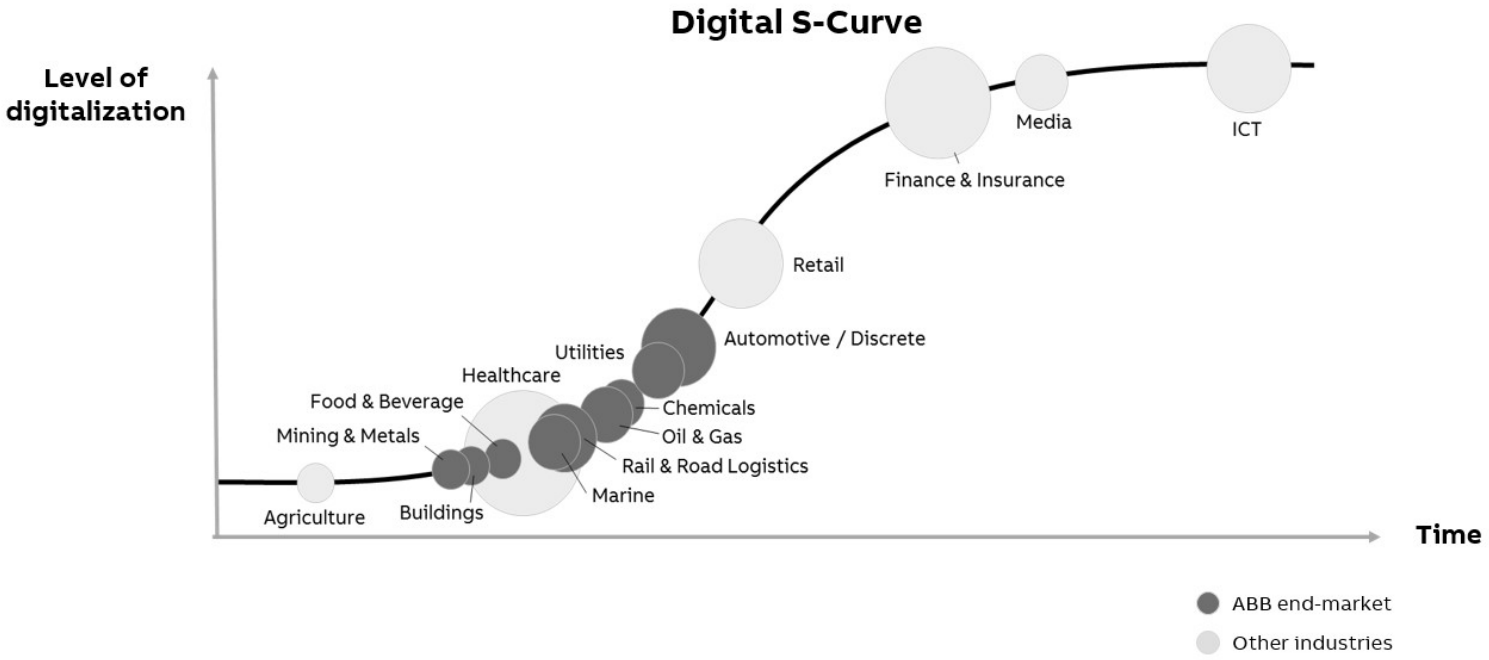
Why do we need to talk about this?

For most of us, the digital journey lies ahead



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The value of digitalization

Are you looking for predictive maintenance, or for something else?

- **Manage and minimize risks.** Prevent plant downtimes, improve occupational safety, resolve warranty claims and avoid penalties for delays.
- **Eliminate inefficiencies.** Save energy, reduce labour cost, use resources efficiently, manage lack of skills and generational gaps. Optimize along the value-added chain, what to purchase, how to use, when to replace.
- **Optimize investments**. Accurately engineered plants requiring less redundancies and fewer spare parts and run longer.
- **User experience.** Offer people a more satisfying way to do things. Flexible configurable functionality, easily scalable fleets, pay-per-use. Easy to use, easy to share.
- **Disruption/Defense.** Attack competitors by doing things in a different way with less risk, higher efficiency and better user experience. Alternatively, defend against someone doing it to you.

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Underlying requirements for IoT monitoring

Easy and affordable

- It has to be simple and univeral
- It should work on assets of all brands whenever possible (but we can provide extra value with ABB equipment)

Separate and cloud-based

- Full cost advantage and speed of roll-out are achieved when monitoring platform is separate from the plant IT/OT (instead integrate with API)
- On-premise software and data costs 10-100x more than cloud data

Scalable and adaptable

- Easy to increase and reduce the number of assets under monitoring
- API's must be available for easy integration with other systems

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Here is how we do it: ABB Ability™ Smart Sensors

Condition monitoring for motors, pumps, mounted bearings and gear reducers

- ABB Ability™ Smart Sensor, a fitness wristband for industrial assets
- It fits easily on the surface of the asset, without wiring or machining
- It monitors key operating parameters and provides information about the equipment's health and performance via a smartphone or dedicated web portal
- It allows users to plan maintenance activities in advance and avoid unexpected downtime
- The benefits can be significant, payback time expected to be less than one year in most cases
- Cyber-security and access management is top priority

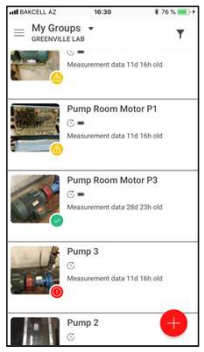

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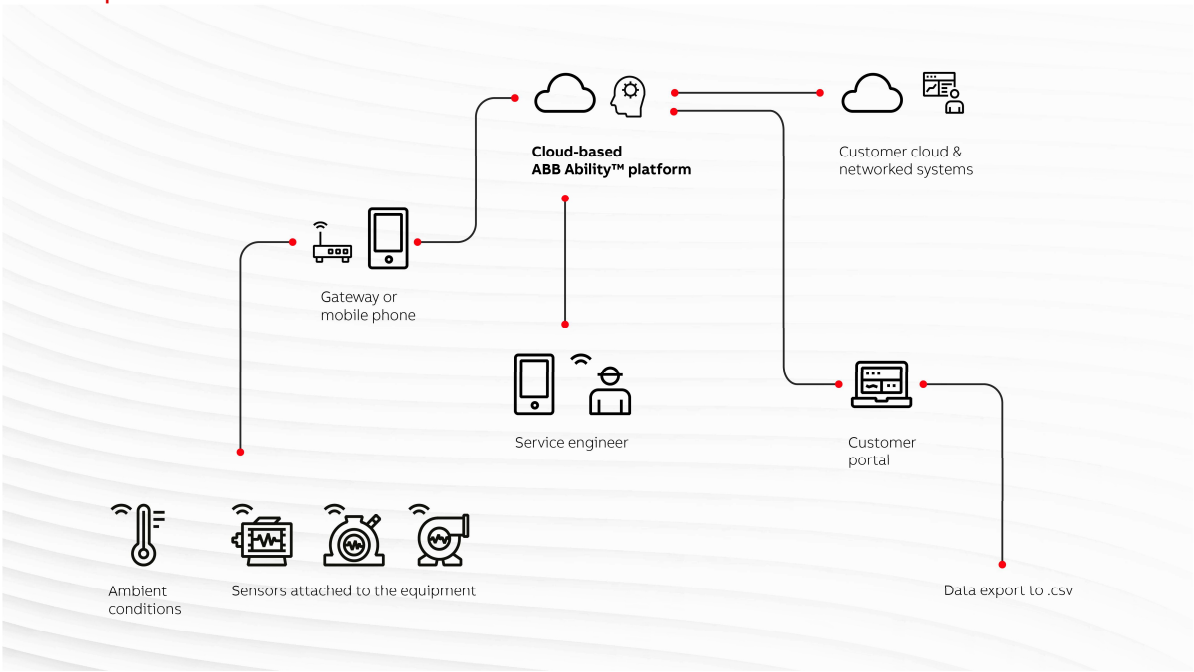
ABB Ability™ Condition Monitoring

Utilize your equipment's data to optimize performance and efficiency and predict maintenance need

- The ABB Ability™ Smart Sensor transmits data from the motors, mounted bearings, gear reducers and pumps via a smartphone or gateway to a secure cloud service.
- Algorithms analyze the data and convert it into meaningful information, which is sent to the user's smartphone and customer portal.
- The ability to gather and analyze the data can reveal information on the status and condition of the equipment, to intelligently maintain and manage the performance of the powertrain.

Click on picture to start video



Basic Use Case - the user value

Imagine having a motor installed at the top end of a conveyor, high above your plant…

Without smart sensor

Nobody ever goes near that motor.

You will be surprised when it fails, then you will:

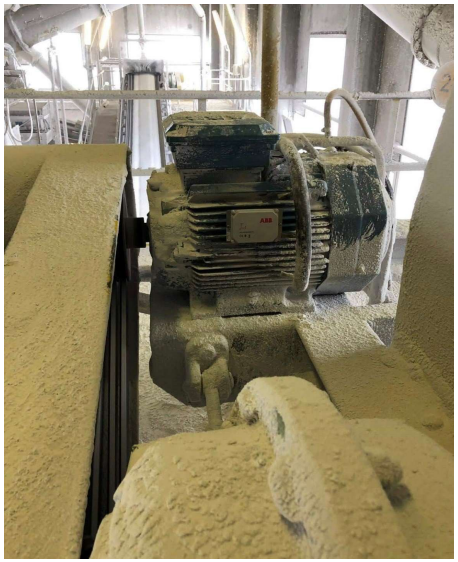
– Pull the spare motor out of your warehouse

– Find an electrician and beg him to come

– Get the mobile lift in place

It will take at least one day to replace the motor, even if you have a spare in stock.

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



With smart sensor

Nobody ever goes near that motor.

You will get a warning in your Smart Sensor app before anything has happened, then you will:

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

Within two hours it is replaced.

Without a spare motor in stock and without an electrician on standby.

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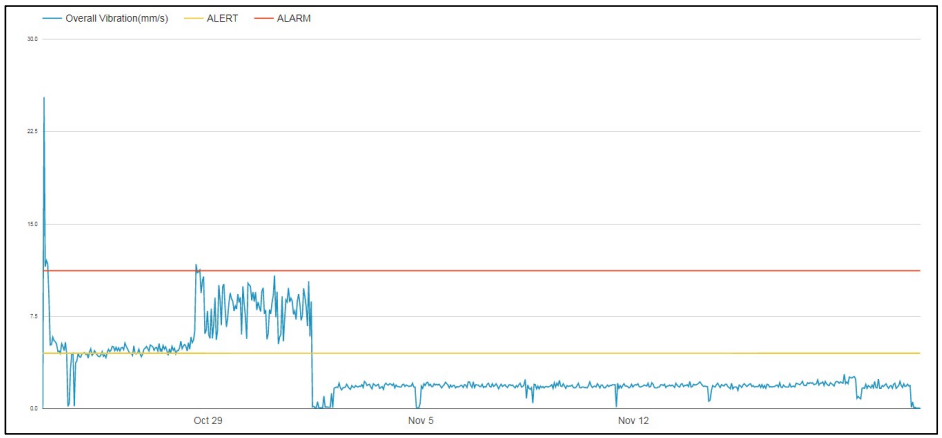
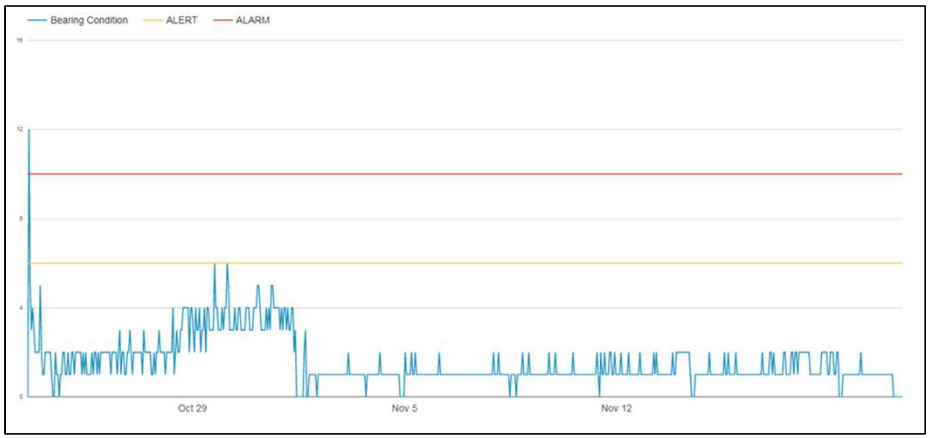
Basic Case – viewing one individual asset

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.

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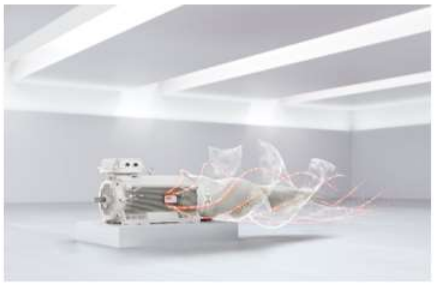
Advanced Case – viewing one individual asset

Additional analysis by specialist changes initial diagnose

MOTORS AND GENERATORS SERVICE

ABB Ability™ Smart Sensor

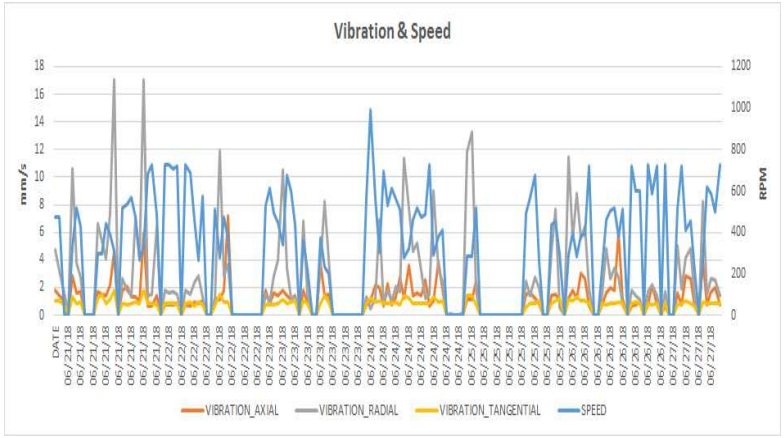
Condition monitoring detailed report

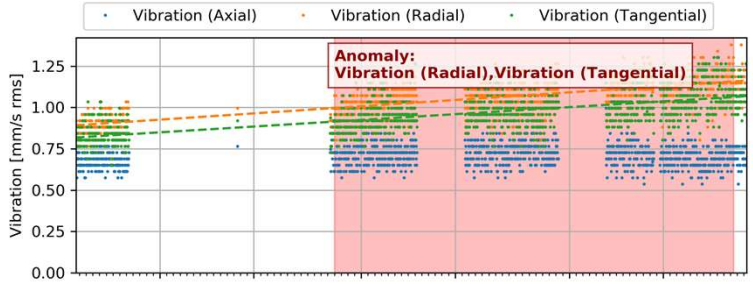


Report data

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	########



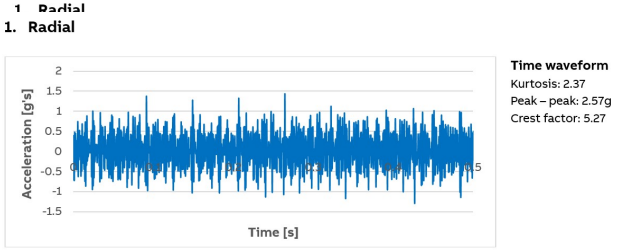


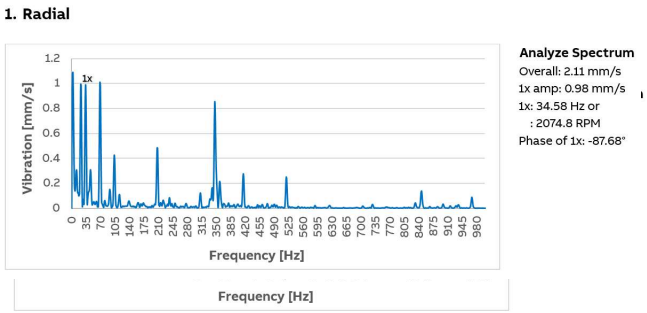
<u>Still only looking at data from one asset</u>

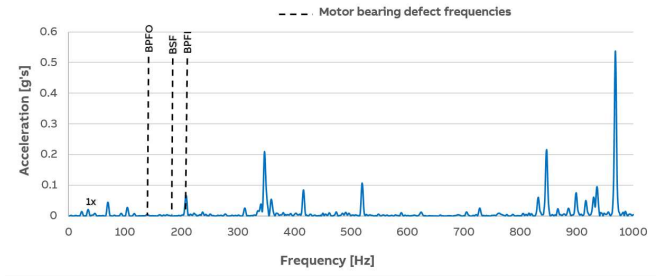
- Asset owner is not confident of own analysis and requests support from remotely located expert.
- The remote expert is given access to the data and prepares an analysis.
- The remote expert can be from your own company or from ABB or an independent service provider.
  - ABB offers this service.

Instant Reports

Automatically generated assessments, based on domain expertise





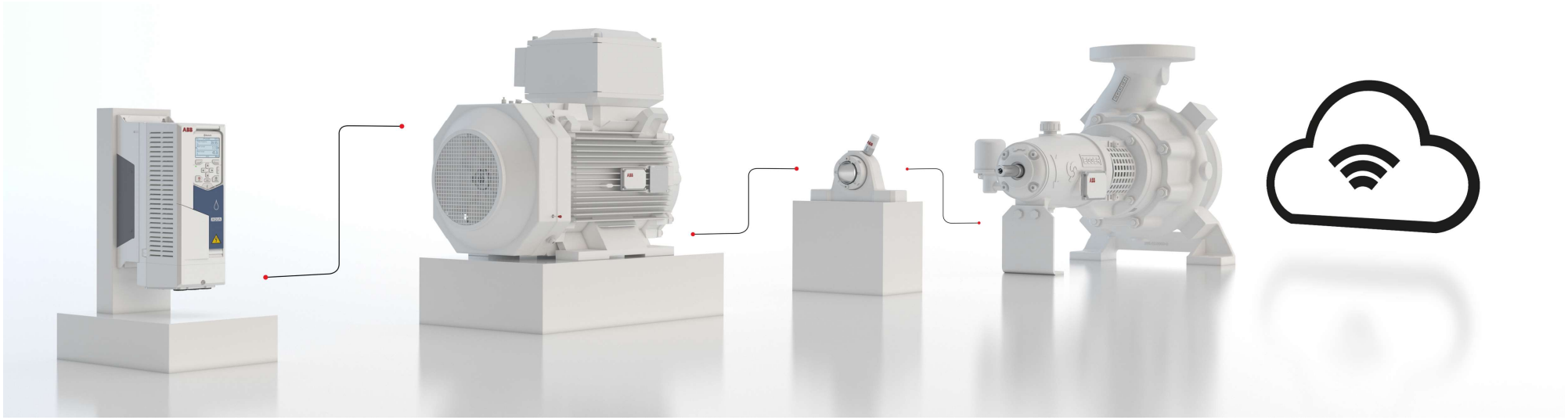


Advanced analyses will be done by software.

- 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
- It is necessary as a step on the way to predictive maintenance

ABB Ability™ Digital Powertrain

Assets that belong together



The ABB Ability™ Digital Powertrain is a suite of digital technologies to improve the performance, reliability and efficiency of all components within the powertrain: from **drives** and **motors,** to **pumps, couplings & gearboxes, bearings and other applications.**

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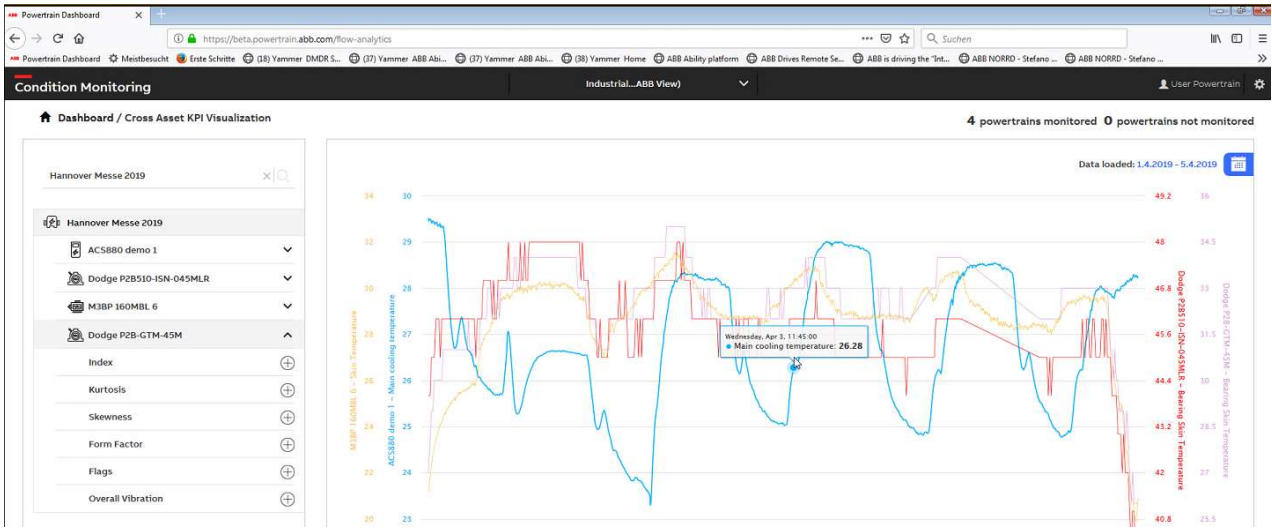
One portal to monitor the complete powertrain

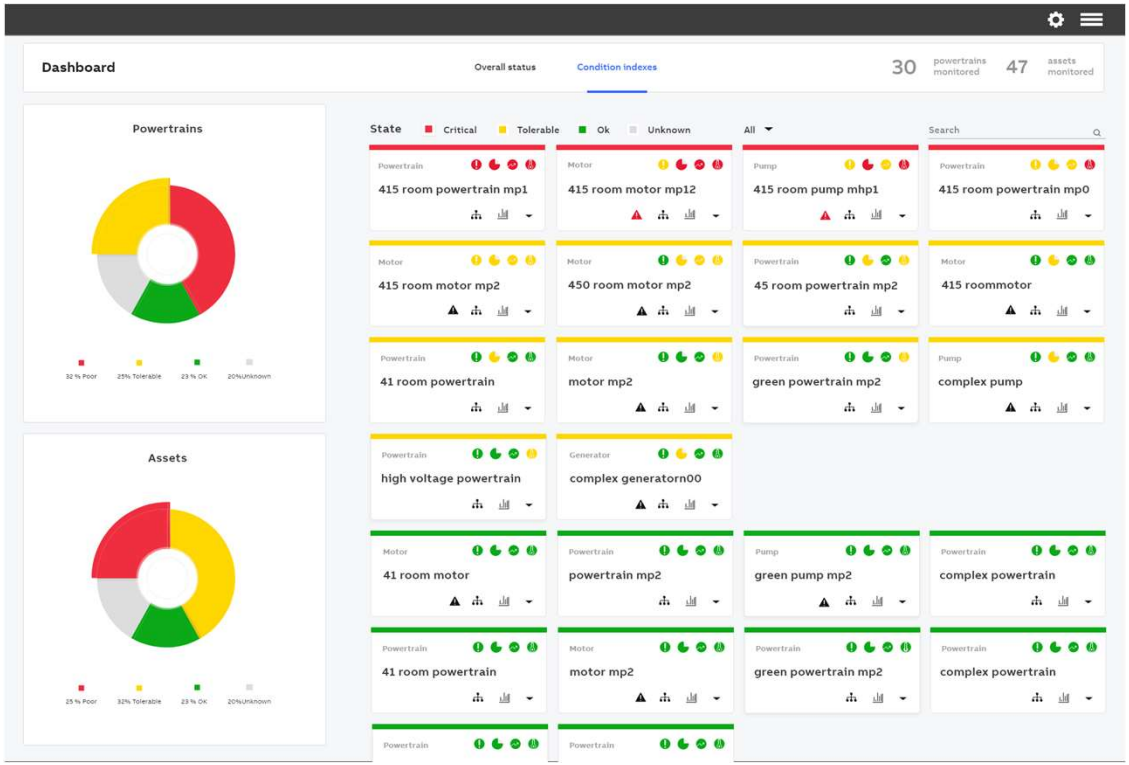
All components of a powertrain can be monitored via one portal; either individually or as part of the complete powertrain.

Benefits

- Transparency on how different powertrain assets work together
- Powertrain analytics of the complete powertrain
  - Process optimization possibilities
  - Potential for energy savings



The Digital Powertrain - Assets that belong together



Moving on, beyond the analysis of just one individual.

- A powertrain might be drive+motor+pump
- A powertrain might also be a wind turbine with main generator and many auxiliary drives
- Conclusions should be drawn across different asset types in a related operation, e.g.:
  1. Use the motor speed to assess condition of a pump
     - High accuracy due to magnetic field
  2. Detect motor/pump misalignment in the pump
     - High accuracy due to rotating blades.

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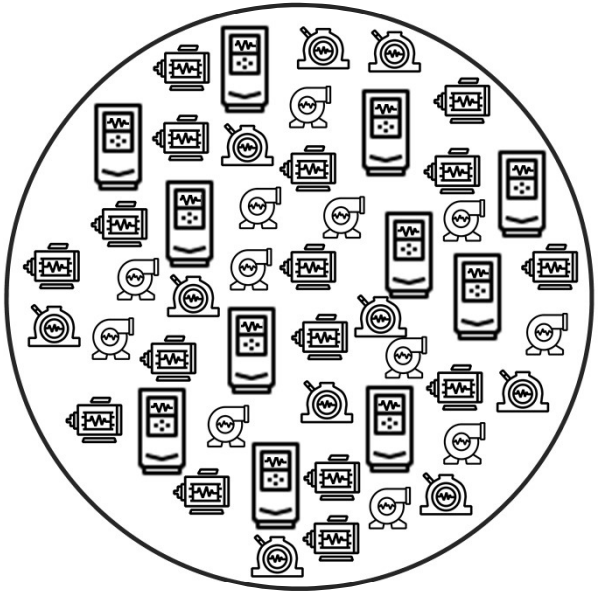
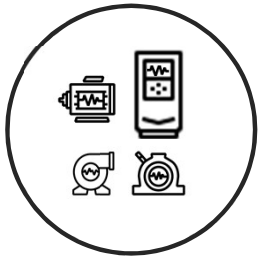
The global view of assets

Global population of monitored assets



Statistical Inferences

Sample



<u>Identifying symptoms in an individual, based on data from millions</u>

- 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.**
- **There will not be predictive maintenance without cloud-based IoT.**

We are just starting this. Full-scale functionality is at least a year away.

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Olam International, Asia

Supplier of food and industrial raw materials

Who is the customer?

Olam

- Olam International is a supplier of food and industrial raw materials
- Olam has around 30,000 motors across 70 factories globally. Their reliability and performance is critical for a smooth production

What did they buy?

- ABB Ability™ Smart Sensors for LV motors (nearly 100)
- Olam first installed the ABB Ability™ Smart Sensor for motors at its cocoa factory in Singapore, followed by its dairy processing plant in Malaysia and its sugar refinery in Central Java, Indonesia.

Why did they buy?

Productivity **Availability**

- In the past, the monitoring of a motor was a manual process, consuming time and labor
- The sensors monitor motors remotely, enabling predictive maintenance, substantially reducing downtime and extending equipment life.
- The savings from preventing only one motor failure has already recovered Olam's investment in equipping smart sensors on a number of motors at its factories

https://new.abb.com/news/detail/6529/global-agribusiness-reduces-motors-downtime-with-abb-smart-sensors

Limestone quarry

Objectives

- Contribute to safe quarry operation
- Identify potential drive train problems
- Avoid unexpected breakdown
- Create and provide necessary reports to quarry management related to equipment status
- Install 52 smart sensors on mounted bearings, gearboxes, and motors
  - 28 bearing sensors
  - 12 gearing sensors
  - 12 motor sensors
- Install 2-4 Gateways:
  - Signal strength and connectivity between sensor and gateway on real industrial application
  - Gateway durability
  - Plug & Play cellular internet access

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Limestone quarry

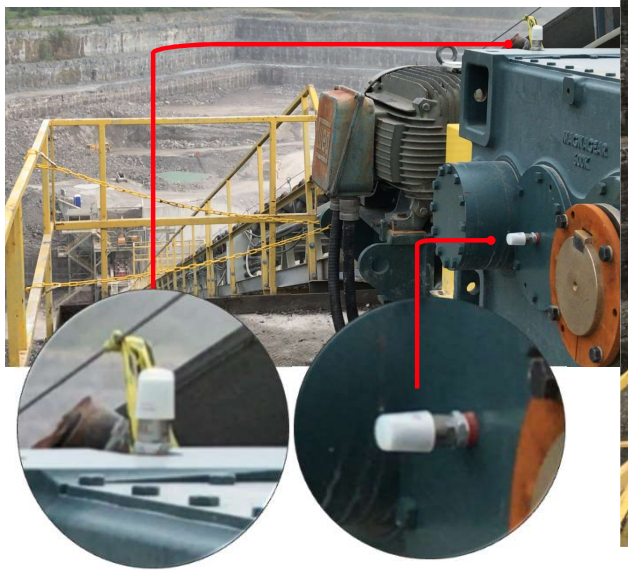
C2 conveyor

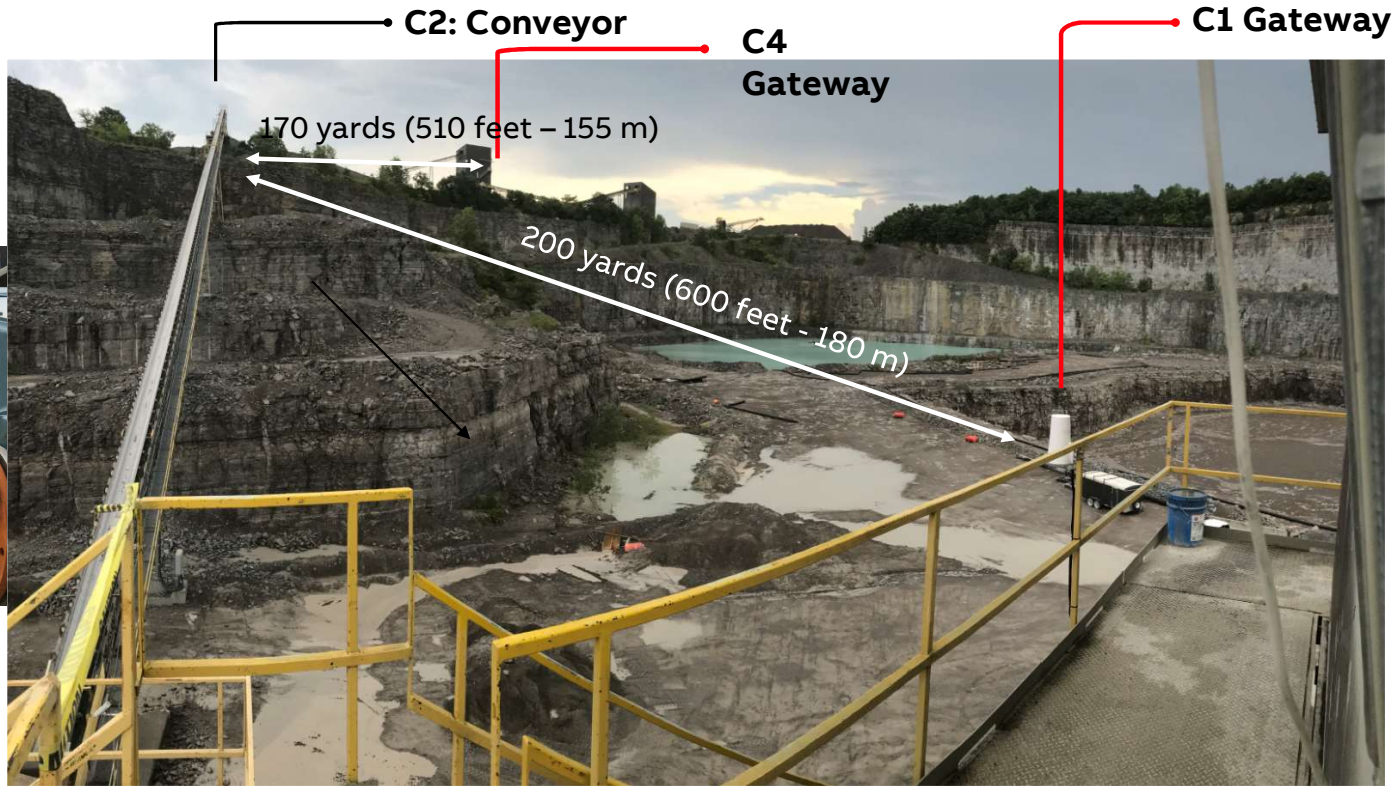
18 total sensors

15 near main drive, 2/3 up the conveyor

1 at head pulley, not installed

2 installed at tail pulley





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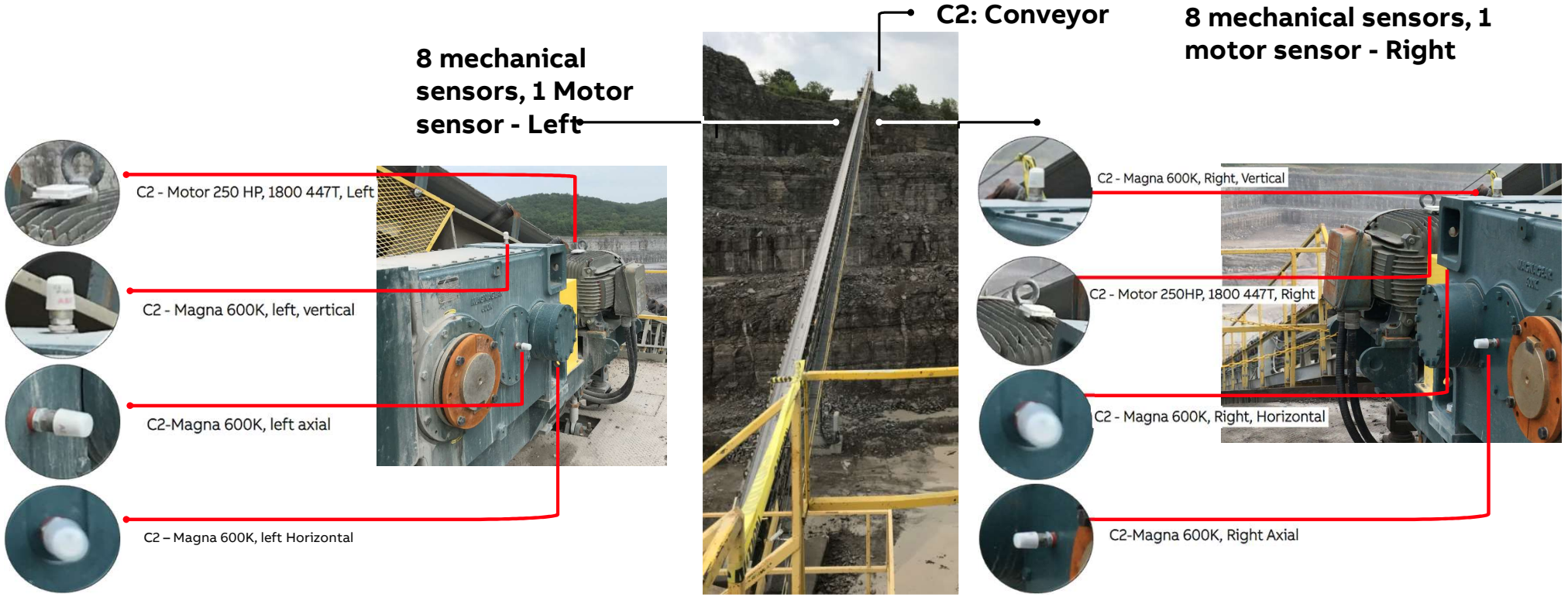
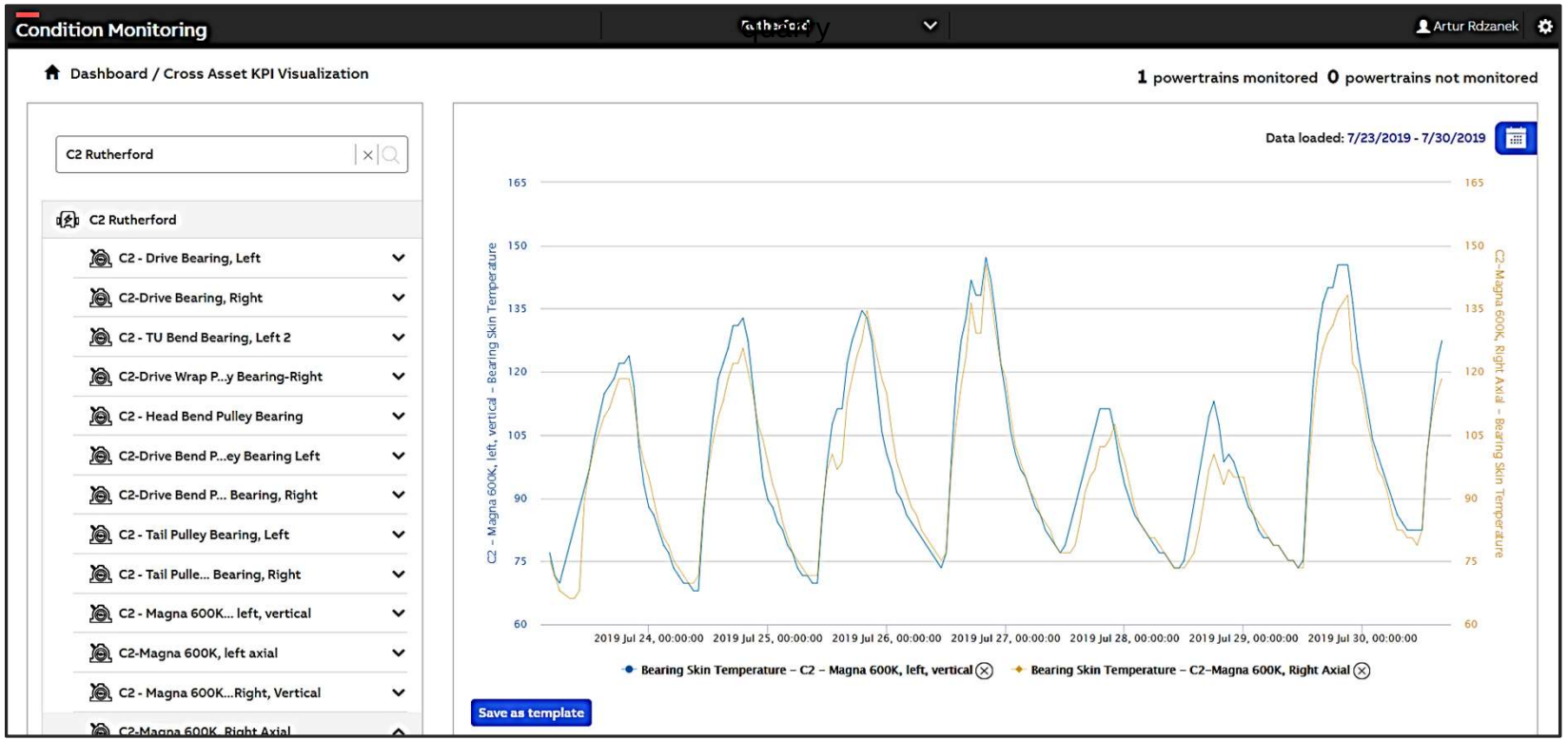
Limestone quarry

C2 conveyor



Limestone quarry

C2 conveyor: Digital Powertrain



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