AMPERON

Technologies

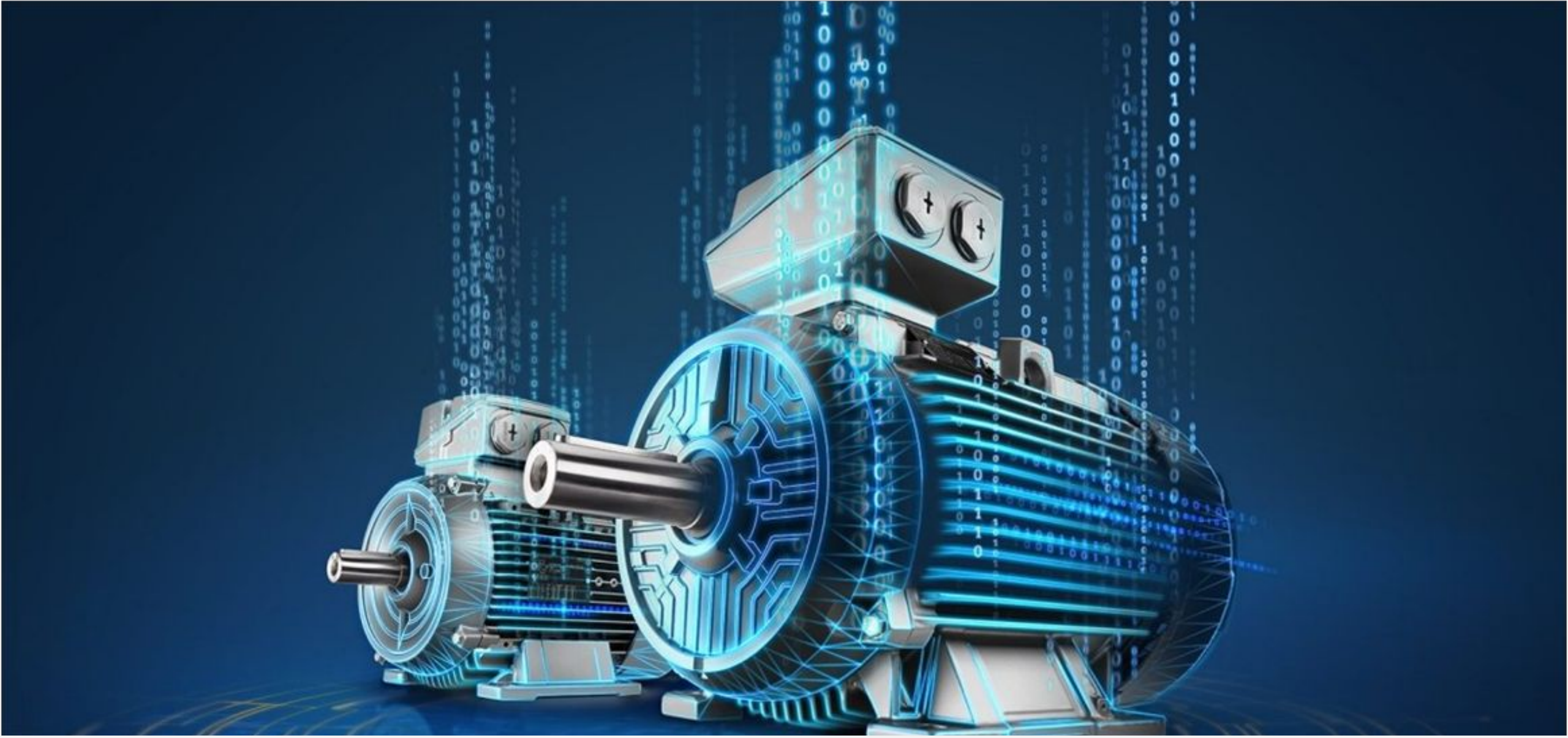
Simplifying manufacturing excellence

Presentation
Predictive maintenance using Electrical Analysis

What's the Predictive maintenance based on **Electrical Analysis** ? How does it work in practice ?
Find out how this technique helps industrials **to diagnose faults and predict failures before they** occur using only **low-cost electrical sensors**.

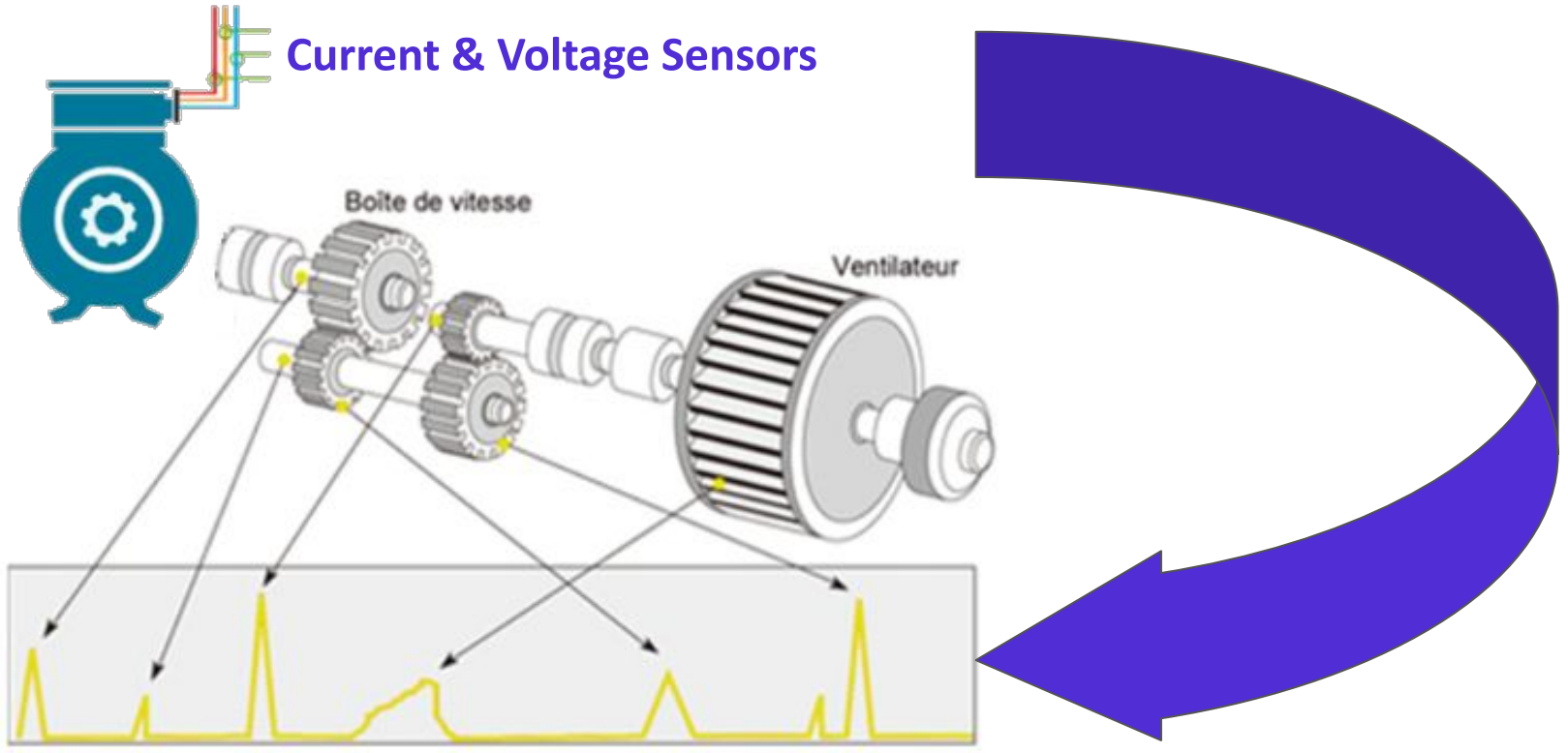
Major challenges with the old ways

- Costly expertise (2 visit / year = 3000 $)
- Costly hardware (analyzer + several sensors / motor): 20,000 $ per unit
- Require deep expertise to correctly diagnose and make recommendations
- Impossible / Dangerous in several situations
- Subject to malfunctions due to harsh industrial environment



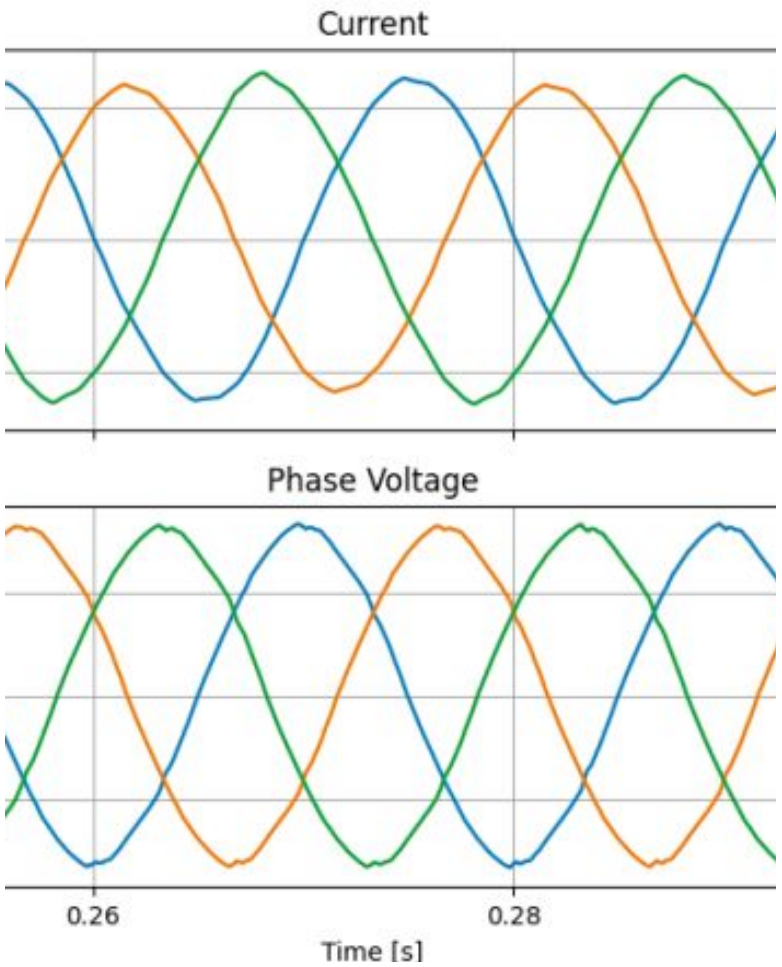
Motor as a sensor: all mechanical and electrical fault symptoms are reflected to the motor shaft which vibrates at a specific rate related to the faults. this shaft vibration is reflected in the current and voltage signals of the motor

Motor as a sensor



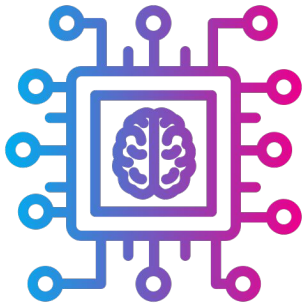
Each fault (supply+ motor + transmission + load)
has a unique signature in Electrical signatures

Electrical data as the unique source of truth



Electrical signature

Intelligent Algorithms



Fault detection

detect health/ energy supply / loading anomalies in the system

Fault diagnosis

Identify the exact source of anomaly and its gravity

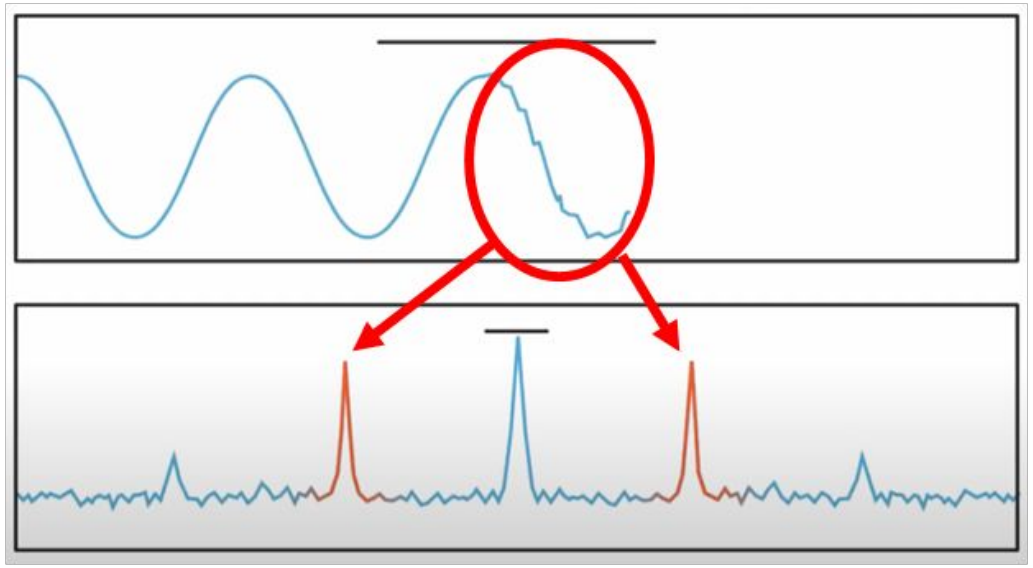
Prediction of Remaining Useful Life

make accurate recommendations to the customer based on the prediction of the anomaly evolution into a fault

Predictive Maintenance

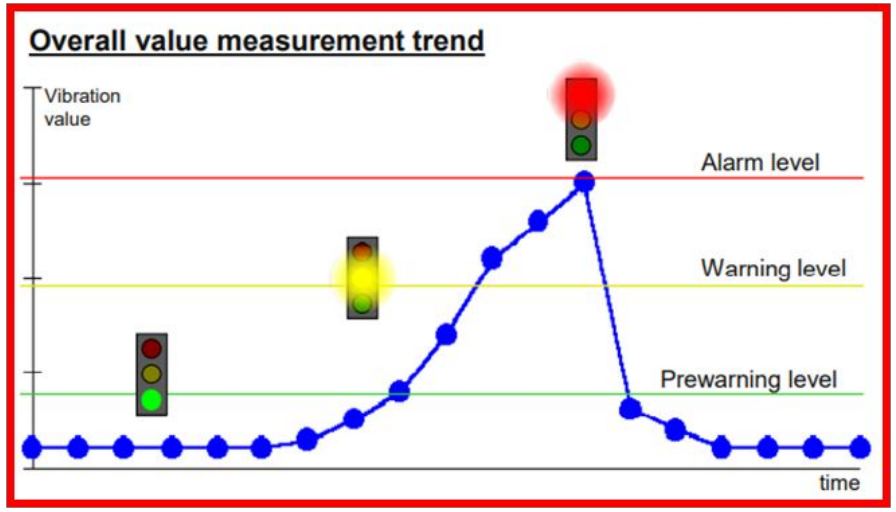
Electrical data as the unique source of truth

Fault appearence

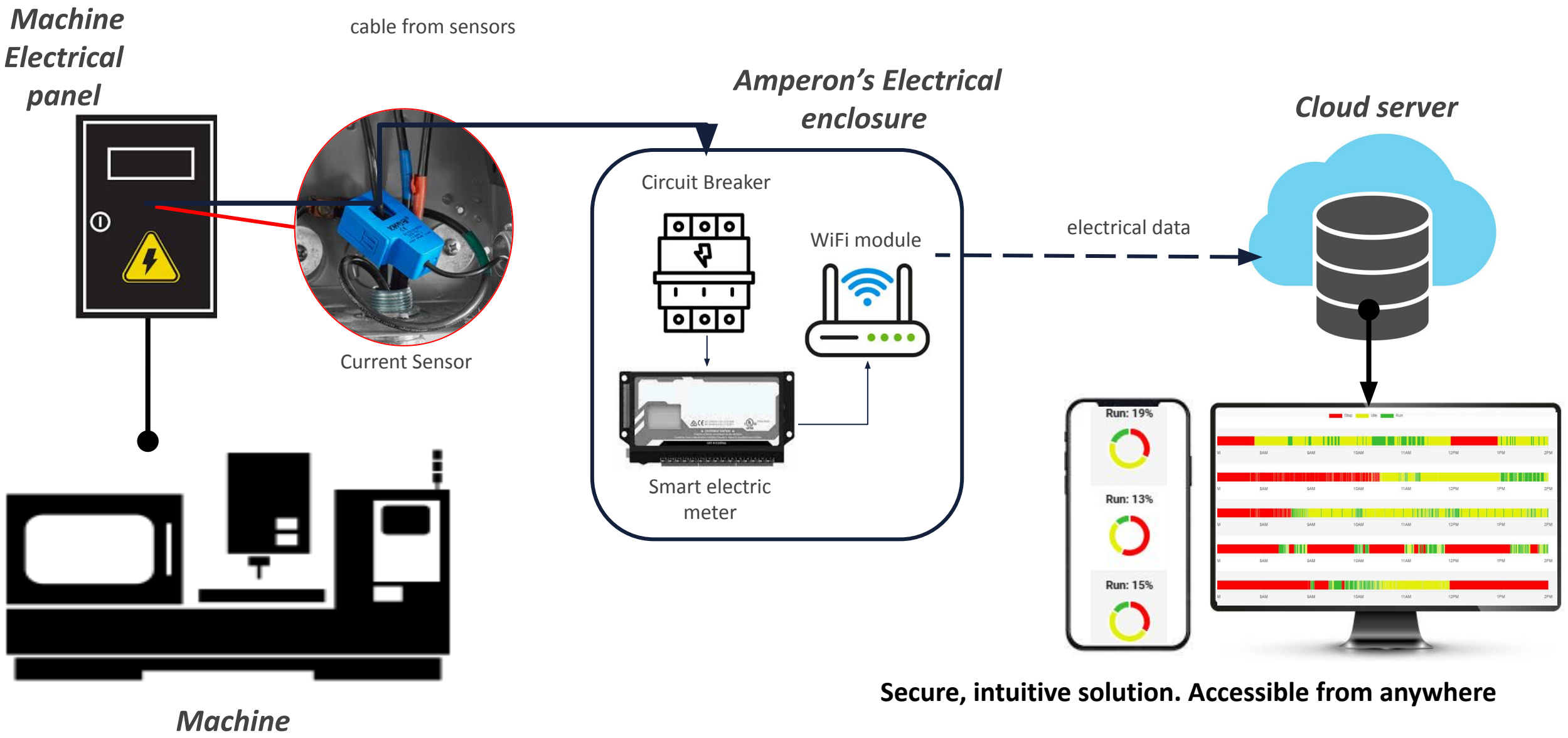


Time domain

Frequency domain



Hardware Installation



Secure, intuitive solution. Accessible from anywhere

Your machines health at a glance

Dashboard

Machine Name	Item Name	Status	Action
Compresseur 1	Moto-Blower	OK	
	Moto-Blower 2	OK	
Blasting	Moto-Blower 1	OK	
	Moto-Blower 2	OK	
Compresseur 3	Moteur	NOK	

Report: Machine: Compresseur 1 - Moto-Blower|Status: OK

Supply

- **Frquency:** 50 Hz
- **Voltage Unbalance:** +/- 10%

Motor

- **Power:** 5.5 kW
- **Nominal Speed:** 1480 rpm
- **NDE Bearing:** 6639ZZ
- **DE Bearing:** 6638Z
- **Rotor Bar:** 38
- **Stator Slot:** 42

Transmission

- **Pulley D:** 200 mm
- **Pulley d:** 100 mm
- **Belt:** V groove 478

Load

- **Fan:** 8 propellers

Current Status

Supply	voltage	OK
Motor	bearing	OK

Events Log

- **Date:** 28/11/2024 | **Details:** Periodic Maintenance
- **Date:** 27/11/2024 | **Details:** Water leak into the motor

Recommendations

Comparative Analysis

EA vs ALL

	EA	VA	OA	IRA	TA	AA
Unlocalized sensor	X			X		X
Remote/ inaccessible assets	X					
Harsh condition	X					
Structural defects	X	X				
Mechanical faults	X	X	X	X	X	X
Bearing fault	X	X	X	X	X	X
Electrical faults	X	X		X		X
DC motor		X	X	X	X	X
Thermal motors		X	X	X	X	X
Low cost	X				X	

VA: Vibration Analysis; OA: Oil Analysis; IRA: Infrared Analysis; TA: Temperature Analysis. AA: Acoustic Analysis.

ESA can be coupled with on-line Vibration Analysis for very early stage Bearing faults and DC motors

Table 2. Vibration Severity Chart ISO 10816-3.

ISO 10816-3		Machinery Groups 2 and 4		Machinery Groups 1 and 3	
Velocity		Rated Power			
CMVP 40 in/sec eq. Peak	CMVP 50 mm/sec RMS	15 kW – 300 kW		Group 1: 300 kW – 50 MW Group 3: Above 15 kW	
0.61	11.0	DAMAGE OCCURS			
0.39	7.1				
0.25	4.5	RESTRICTED OPERATION			
0.19	3.5	UNRESTRICTED OPERATION			
0.16	2.8				
0.13	2.3				
0.08	1.4	NEWLY COMMISSIONED MACHINERY			
0.04	0.7				
0.00	0.0				
Foundation		Rigid	Flexible	Rigid	Flexible

Frequency [Hz]

EA allows for non-intrusive monitoring of the motor's health condition without the need for physical contact with the motor or its components. This minimizes downtime, maintenance costs and even hazardous mounting operations.

EA detects the vast majority of mechanical and electrical problems up to several months in advance, before they cause a breakdown. So you can schedule maintenance and spare parts purchase in advance, minimizing downtime and reducing costs.

EA is a able to detect all mechanical problems in the drive train before several weeks from failure.

EA is the best suited technique to detect electrical faults at a very early stage.

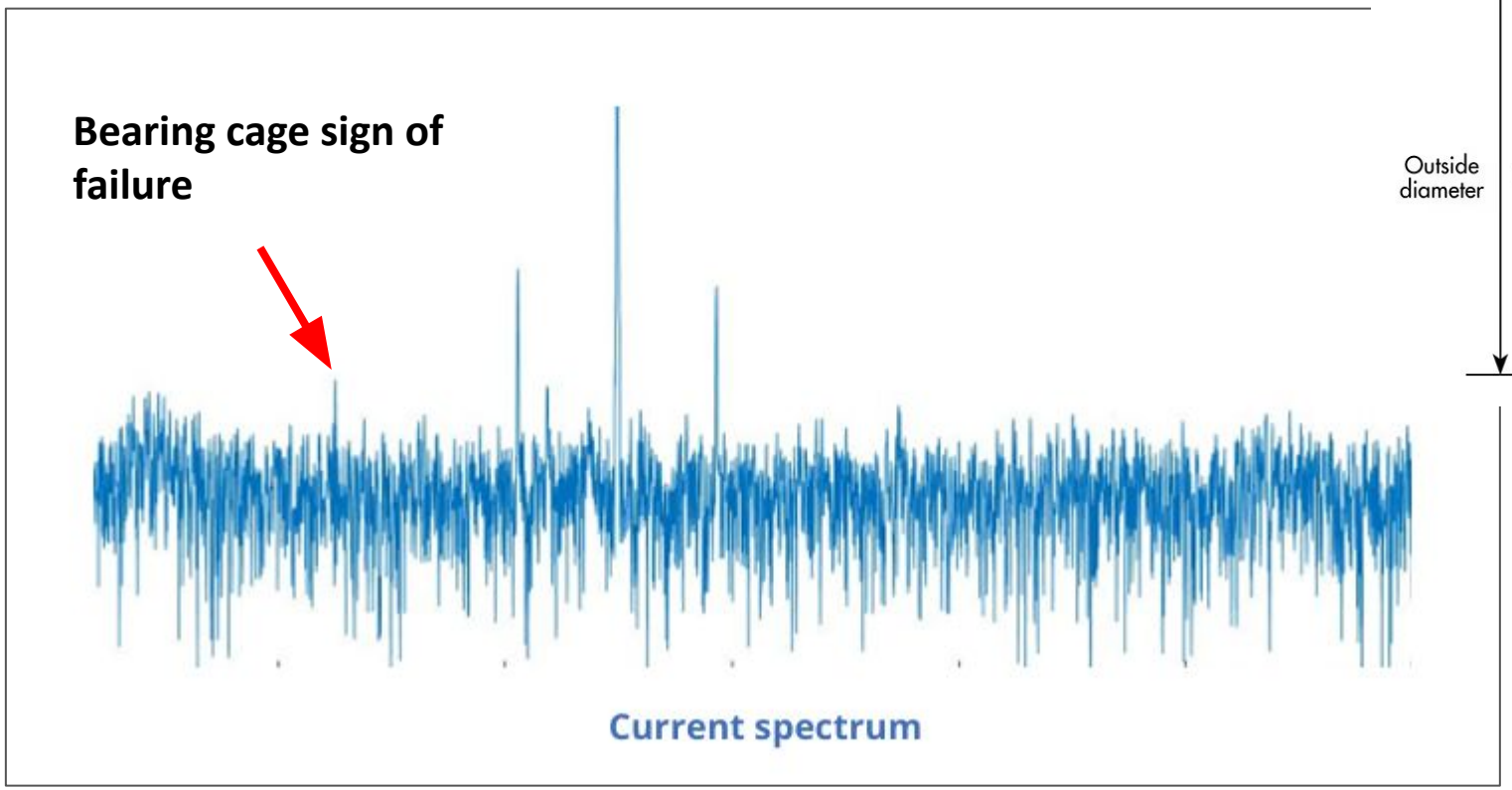
Use case Predictive Maintenance from Metal sector

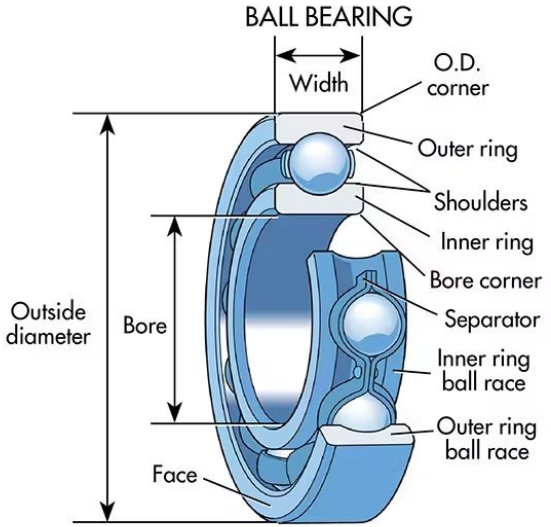
Shot Blower System

Early stage looseness in belt detection
(Loss of Blower performance and risk of belt break)

In just few days from installation, the customer was informed by the developing anomaly with belt and replaced the faulty belts **thus avoiding 2000 DT losses from direct and non-direct costs** of machine downtime, **increased** energy consumption and loss of blower performance which affects **product quality**

Use case Bearing fault detection





After 3 hours from installation, the customer was informed by the existing of advanced bearing fault and advised to shutdown the machine to **avoide 10000 $ losses from direct and non-direct costs** of machine failure. The customer wanted to cross-validate our diagnostic with hand-held vibration analyzer he found a critical value of velocity vibration

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Conclusion

With the growing interest in Industry 4.0 and the increasing demand for smart maintenance solutions, EA is becoming an increasingly important tool for predictive maintenance of industrial machines. As a Manager which care about machines availability, this E-book provided you the arguments behind adopting a predictive maintenance approach using the EA.

If electrical analysis is among your selection, we'd be happy to tell you more about this service in Amperon Technologies through **FactoryOps platform** solution. Please contact us to book a meeting at your convenience

Contact

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