Smart sensors **and**
Industrial
Analytics

Use Case:
Fan monitoring of electroplating production hall

Wie wij zijn

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Let's connect!

Onderwerpen:

- ❖ Use case explanation
- ❖ Pilot installation
- ❖ Integration of AI / machinelearning
- ❖ Project results

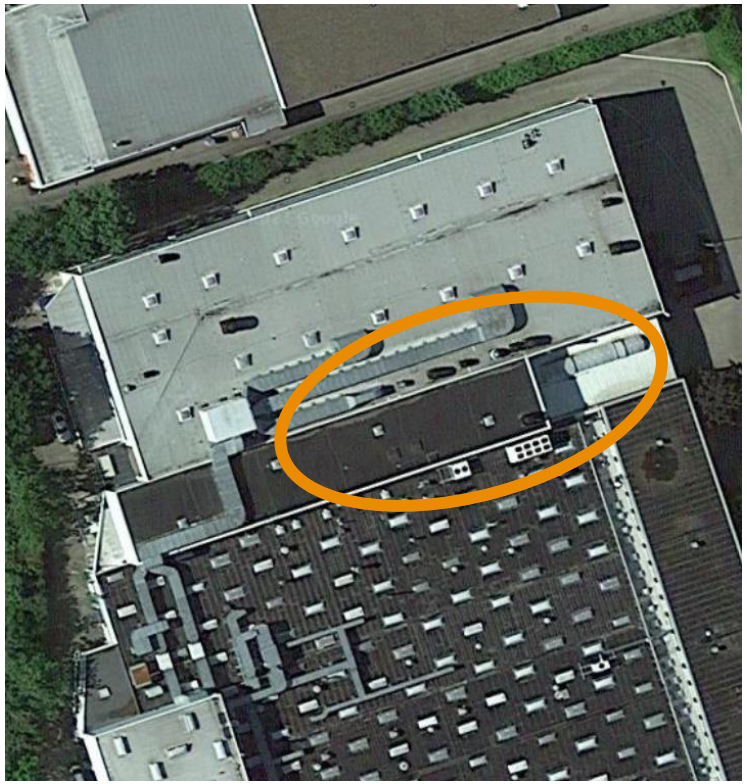
Initial situation

Initial situation

- Acidic substances in electroplating, ventilation = critical process
- Problem: Wear through continuous operation and aggressive media
- Fulfilment of occupational health & safety requirements
- Situation maintenance: Time based and reactive

Location / site overview

- **Roof of production hall**



- **Roof with set of fans**

- **Close-up view of fan**

Goal: Reduce maintenance costs

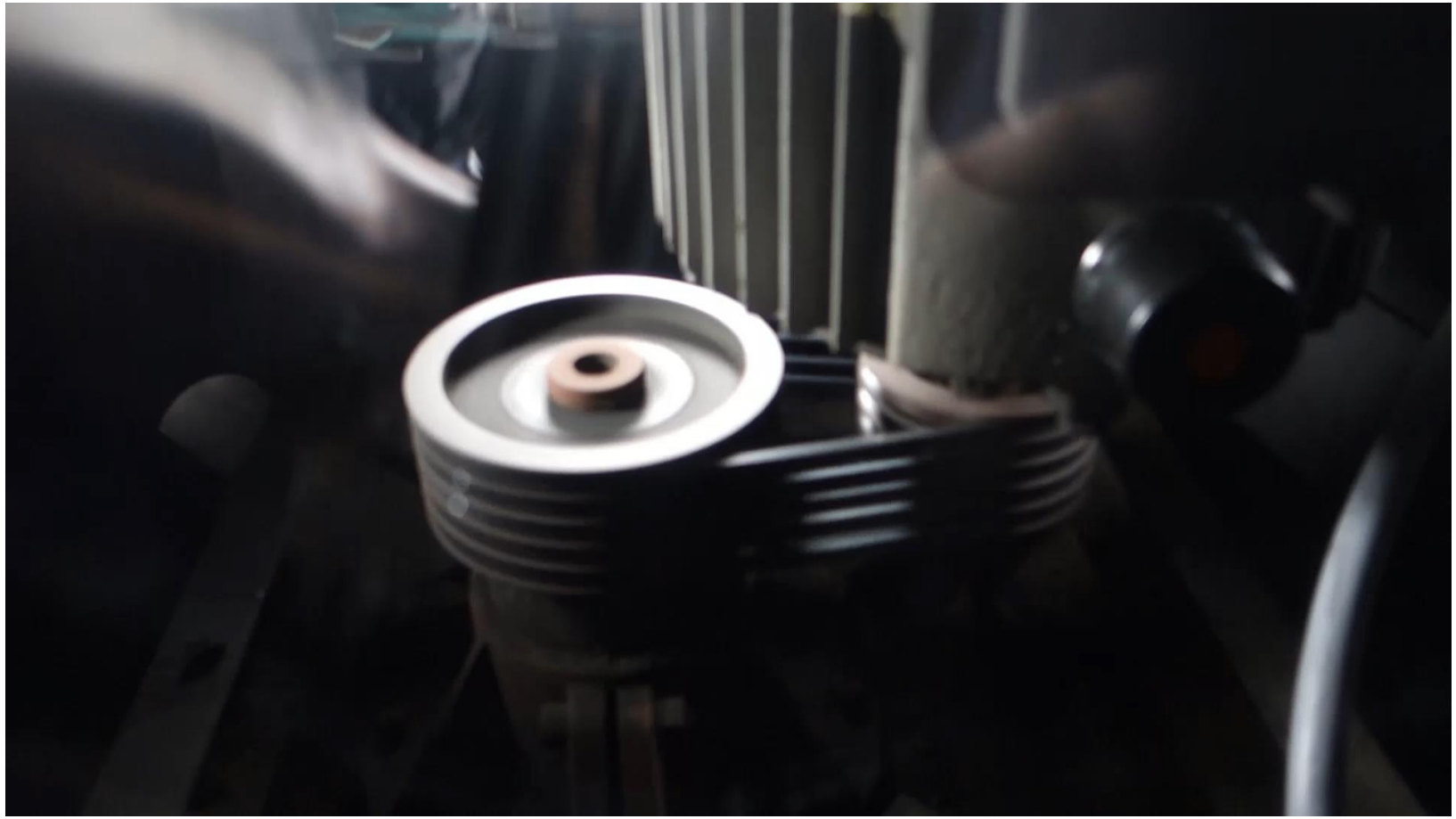
- **Task:** savings in maintenance costs
  - No unnecessary inspections
  - Increase the life-time of wearing parts by replacing them based on condition
  - Minimizing production downtime
  - Avoidance of extreme events
  - Minimizing maintenance costs
- **Changeover to:** Condition-based and predictive maintenance
- **Wish:** Continuous monitoring of fans using smart sensors & ML-based analytics

Typical wear elements

- **Drive belt**

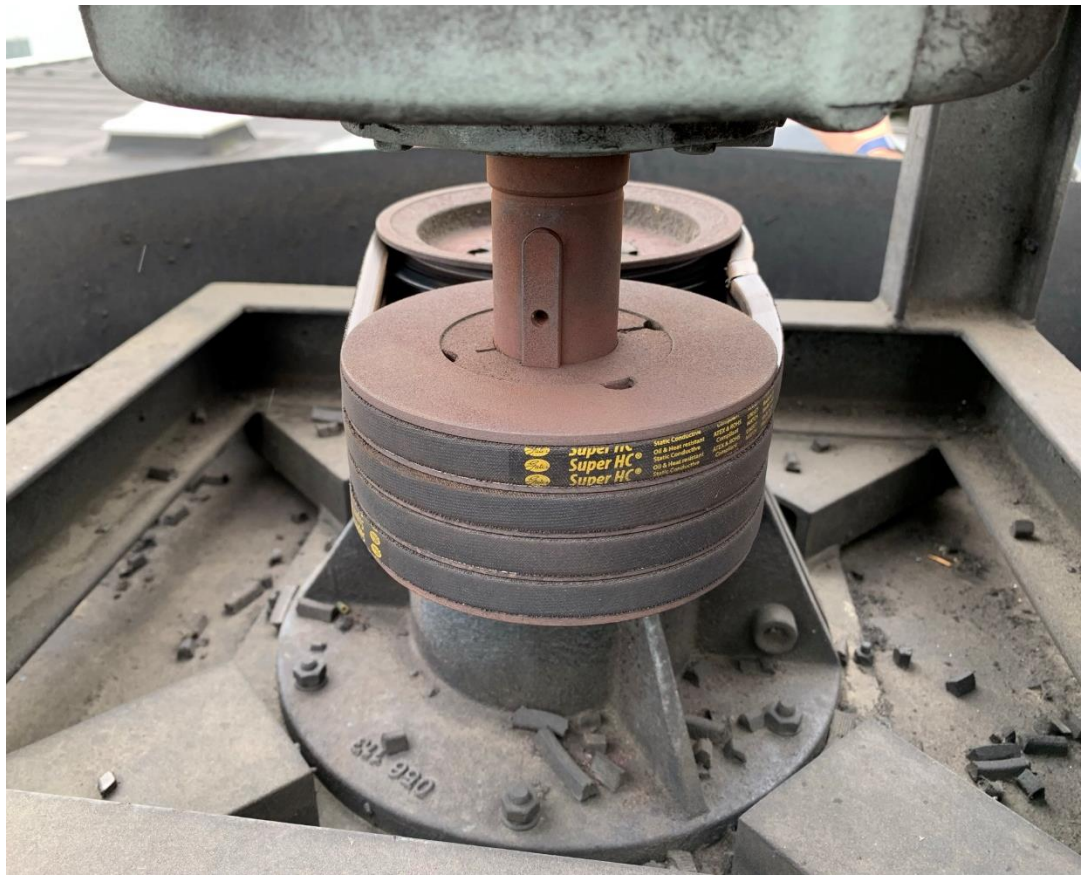
- **Impeller**

Typical error patterns with roof ventilators



Driving belt damages

Typical error patterns with roof ventilators



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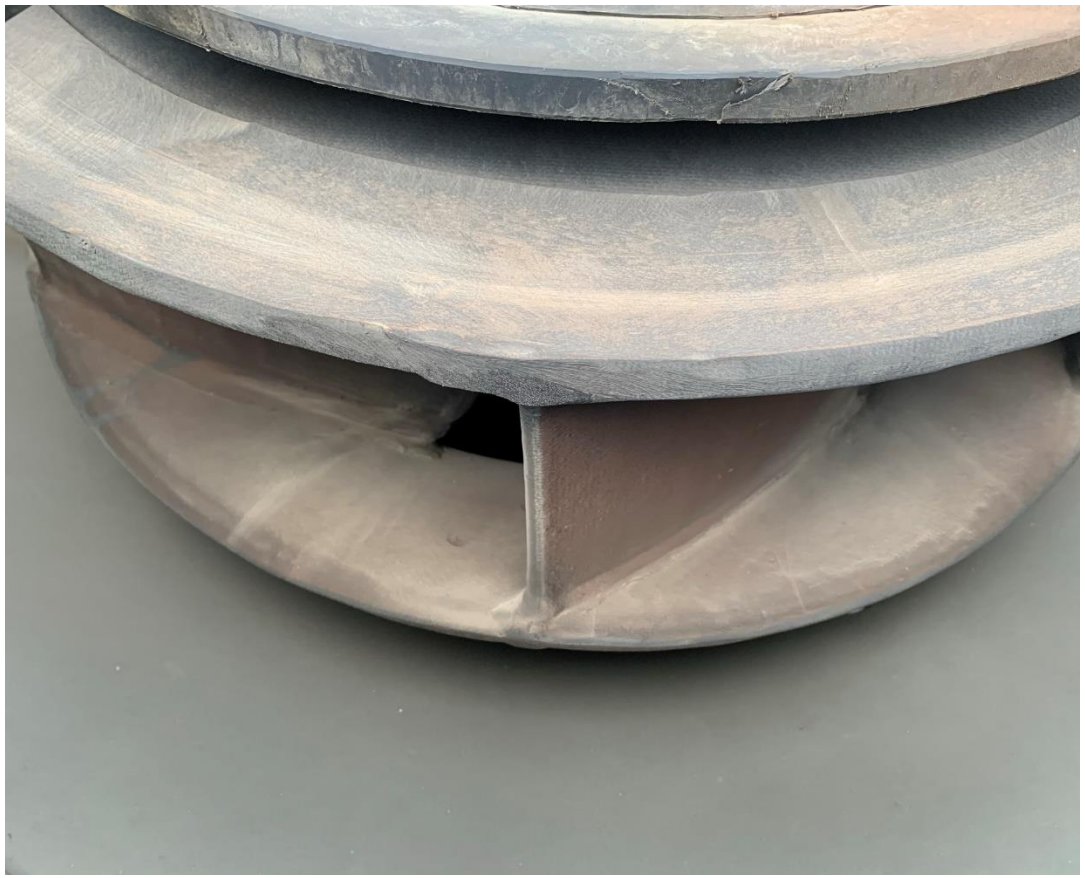
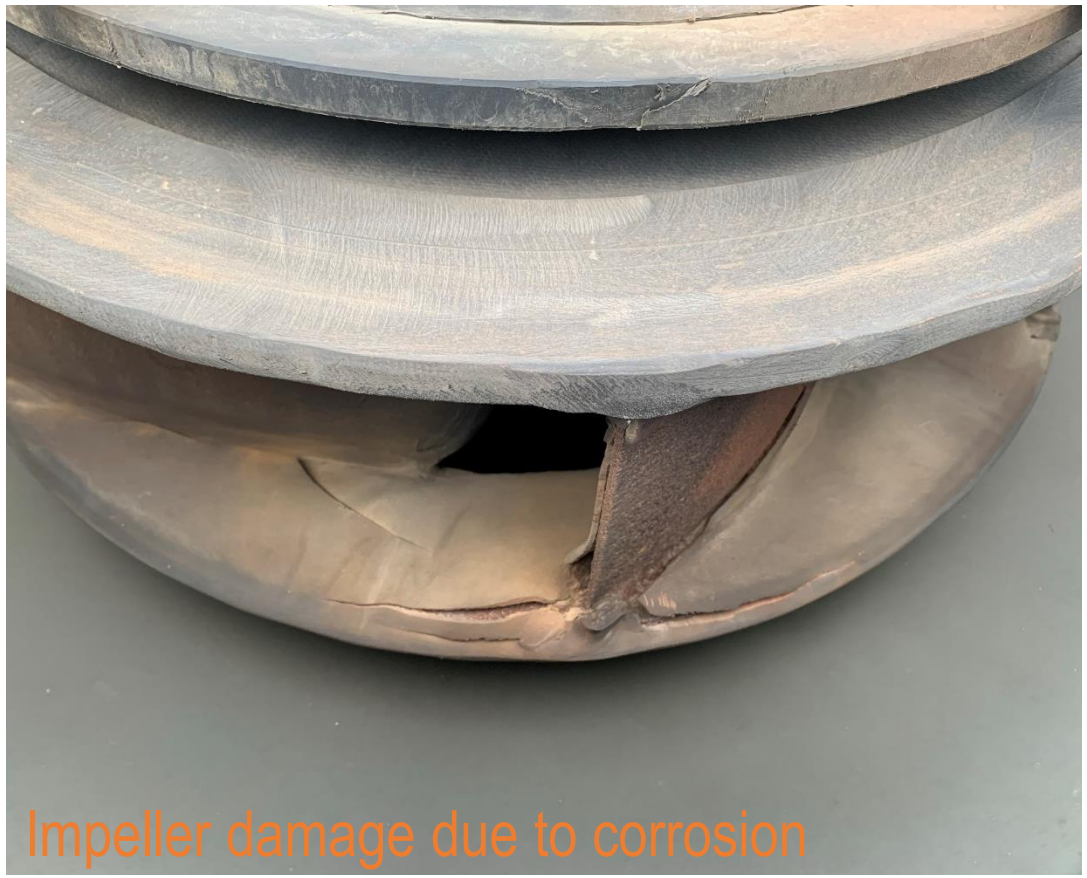
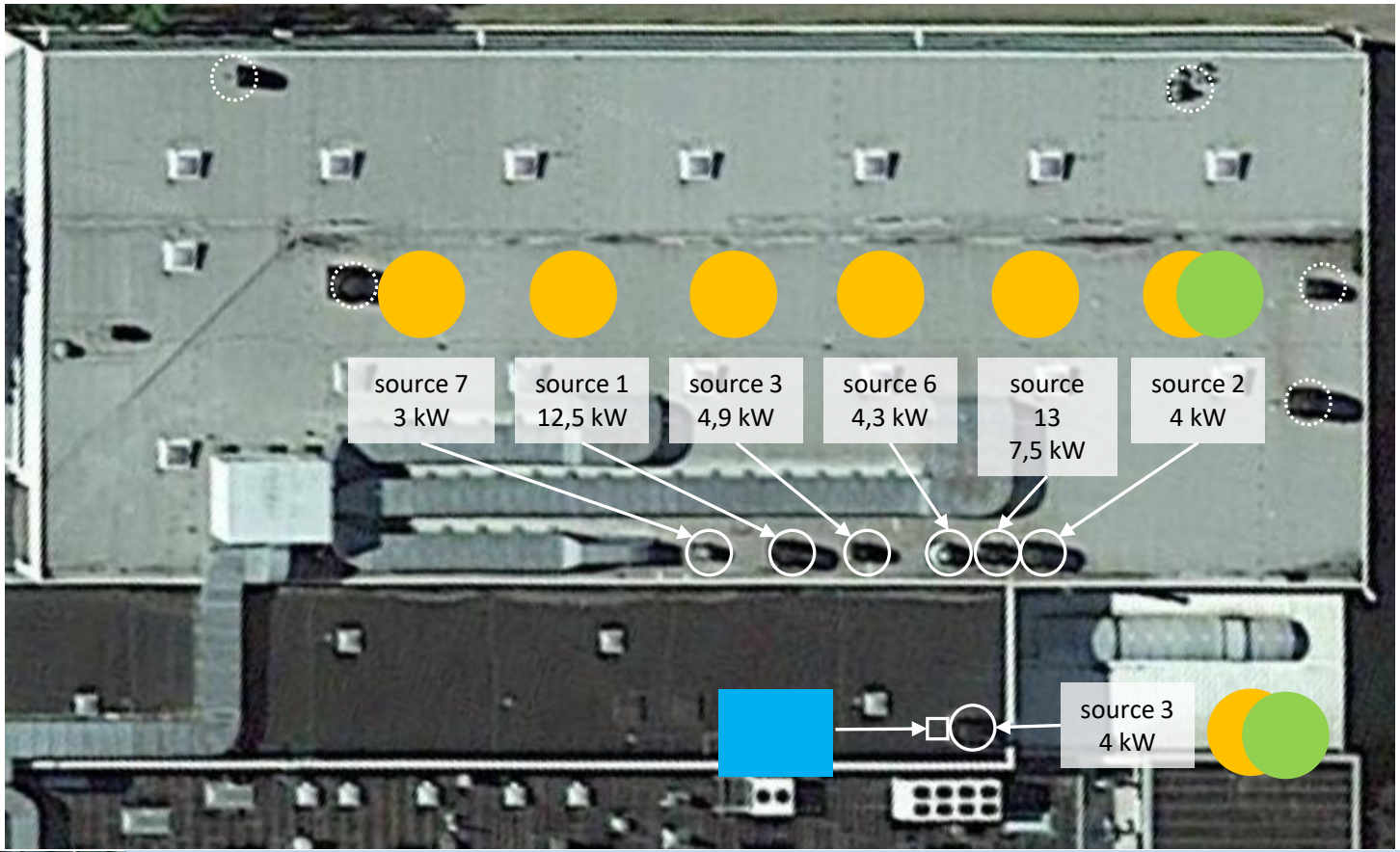




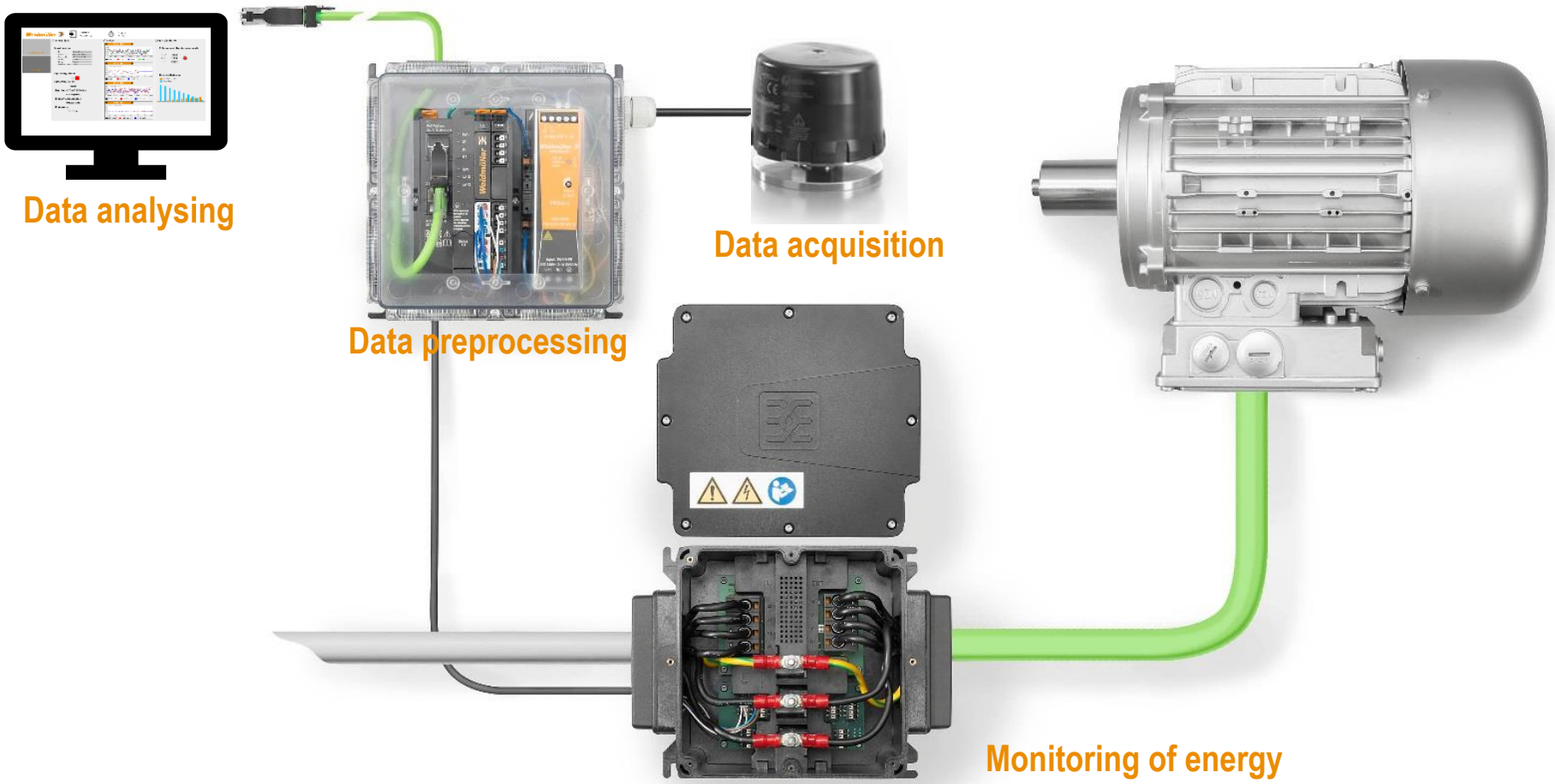
Impeller damage due to corrosion

Pilot installation

- Vibration **7x**
- Energy monitoring **2x**
- Gateway Box **1x**
  - Gateway
  - 4G Security Router
  - PoE Switch



IIoT Smart infrastructure



Use of smart Sensors

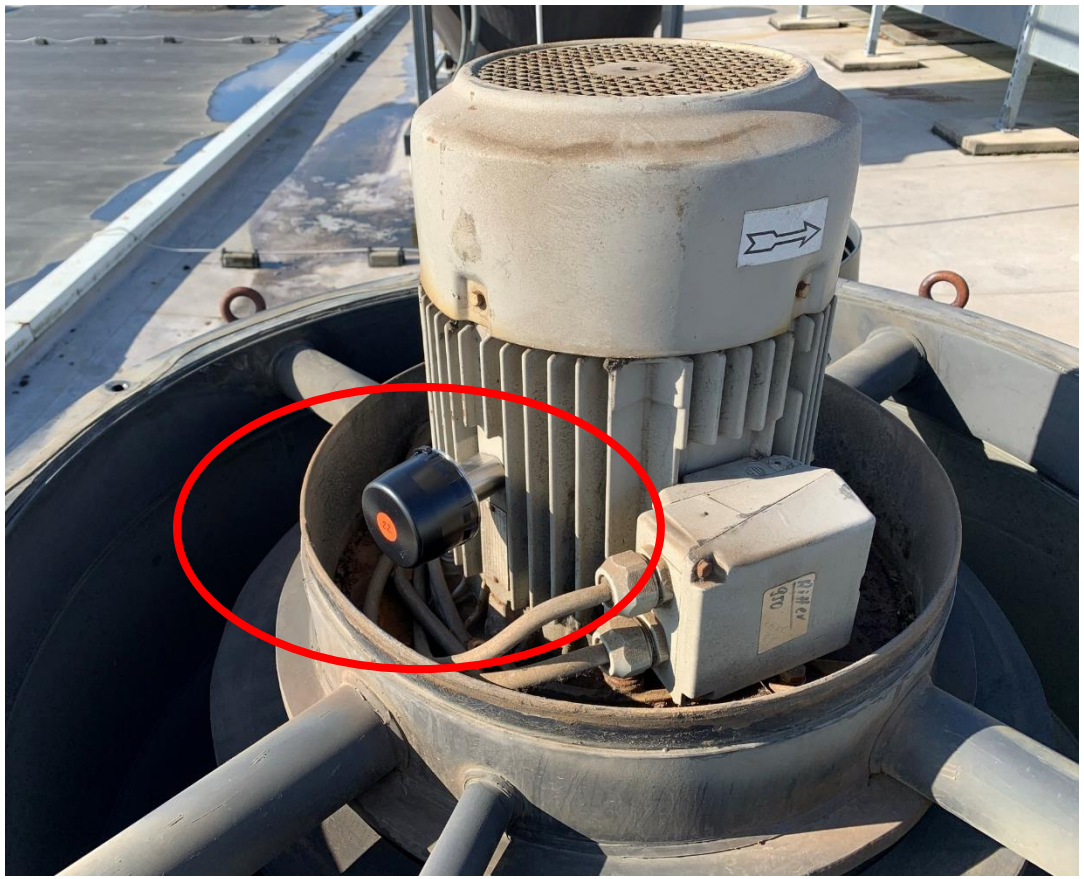
Vibration sensor

- Measurement: 3D acceleration & Temperature
- Connectivity over BLE
- IIoT Gateway with LAN/LTE, Node-RED
- Battery > 2 year

Energy drive monitoring

- Measurement : 3-phass current/ voltage
- Calculate electrical KPIs (Effectivity value, working-/ Blind voltage, Phaseshift, …)
- Connectivity by Modbus RTU

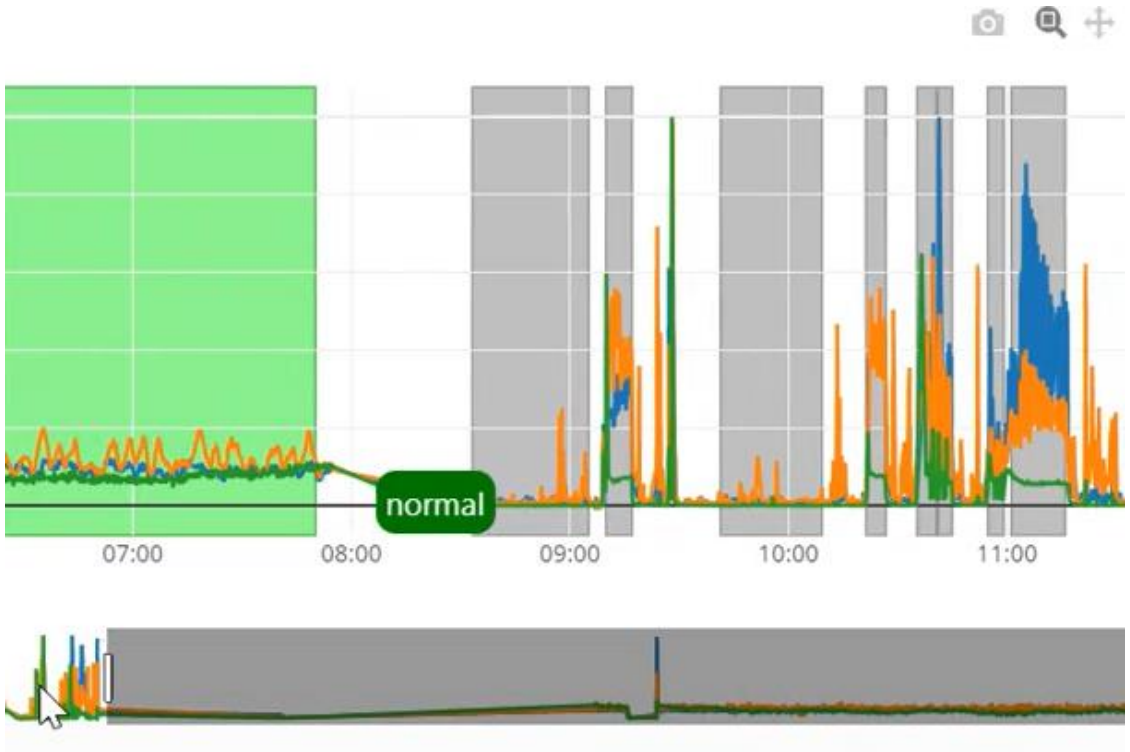
Retrofit with vibration sensors



Vibration sensor, measured data

- **Vibration sensor at the motor**

- **Vibration in 3 axes**



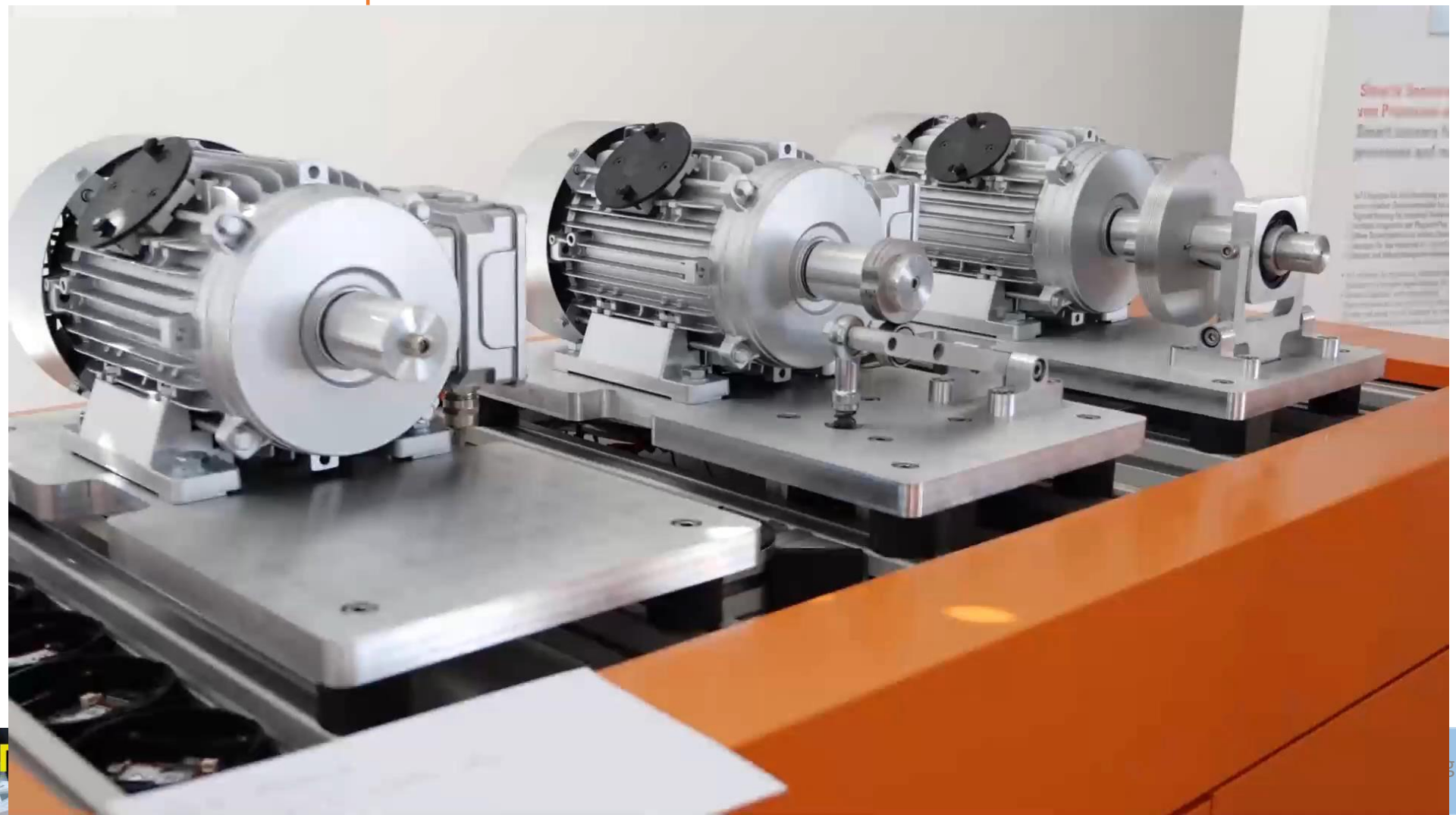
Vibration sensor, AI integration

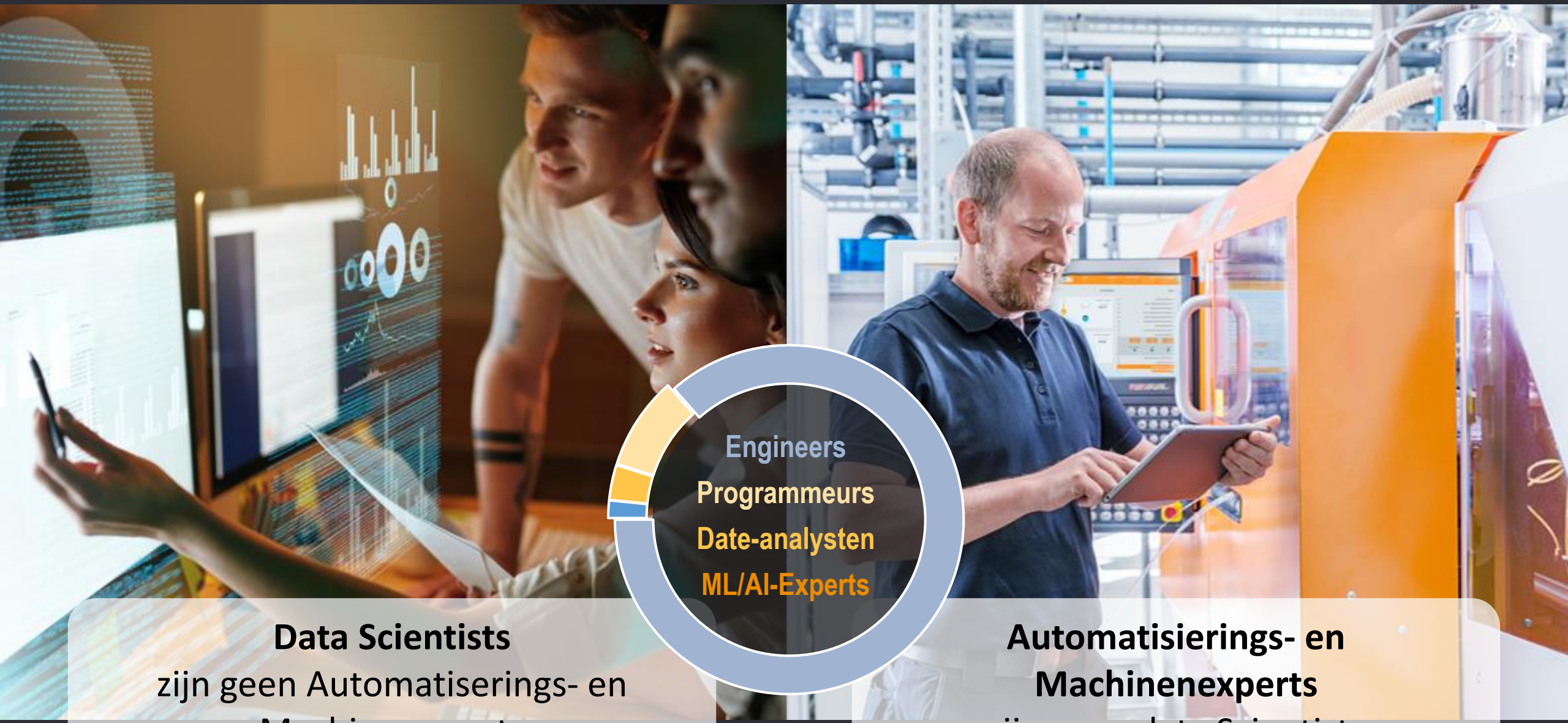
- **Vibration sensor at the motor**

- **Anomaly score**

Video what AI integration/ a model can offer

Simulation of motor problems





Data Scientists
zijn geen Automatiserings- en Machine experts

Automatisierings- en Machinenexperts
zijn geen data Scientists

Industrial AutoML Tool

Model creation

Model execution

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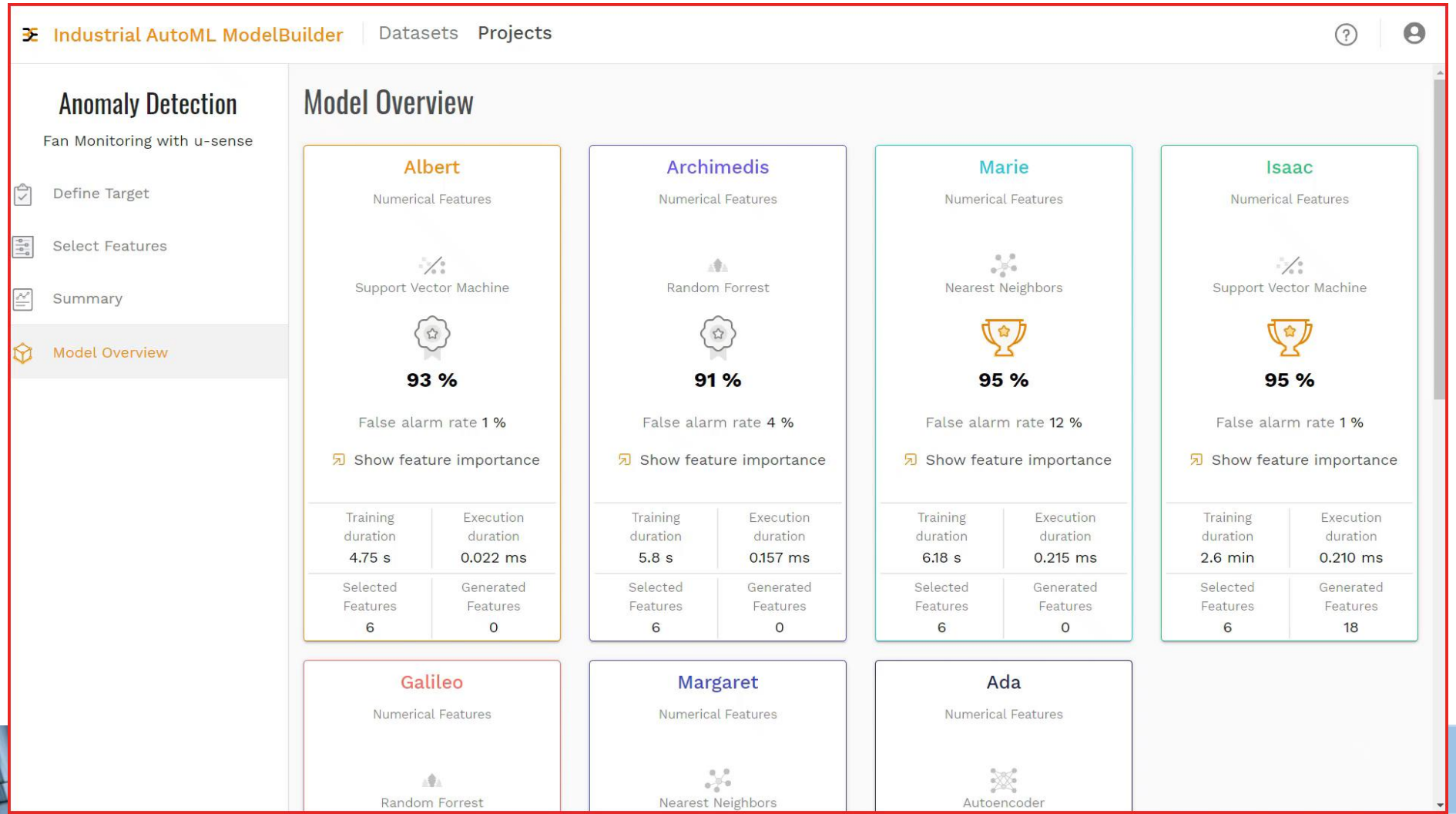
Video model creation

Tagging of the data

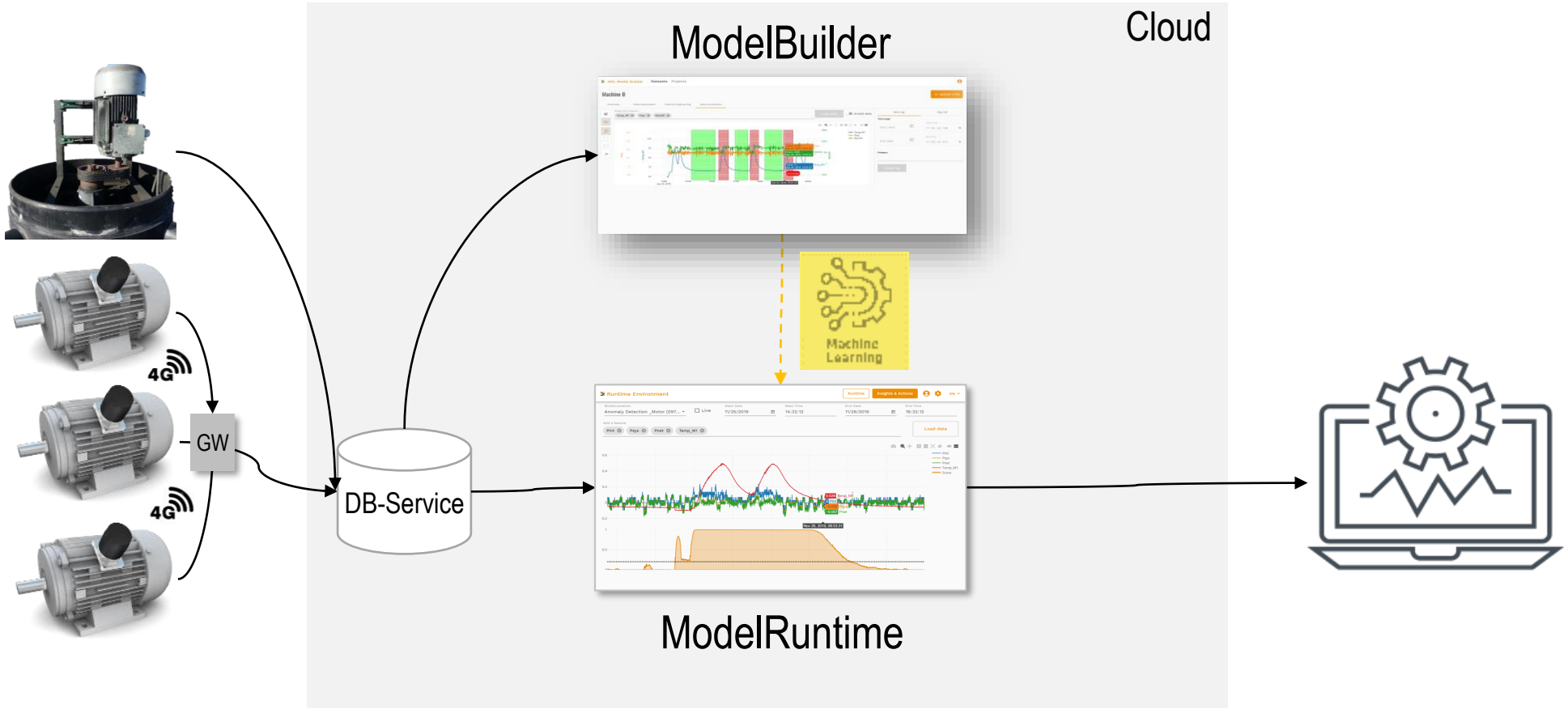
Video model creation

Choosing the right model



Ai in practice

How does it work?



Project Realization

- Realization in a period of 4 months
- Project-relevant time approx. 10 days for planning, creation, installation
- Hardware costs (€ 600)
- Implementation of ML solution (AutoML)
  - 2 days data collection - which data, sampling rate, access, storage
    1 day building & deploying ML models (€2000)
- Annual costs (operation, cloud, ...)
  - Annual costs for operation, cloud service,

  SW licenses: approx. € 4,000

Benefits learned from pilot project

- Inspection (1 hr./ 2 pers/ monthly) → 6-monthly inspection, saving -80% time
- Maintenance per fan (4 hrs./ 2 pers/ annually) → from periodic to demand-oriented maintenance, saving -25%
- Max. availability/ min. production downtime
- Minimized maintenance costs
- Enough advantages for initiating development of series solution

ROI Example calculation

- Calculation based on 30 units
- Reduce regular inspection by -80 %
  → 4h/month = 50h/year -40h = -5 days
- Reduce regular maintenance: condition-related, concrete values
  → Estimated -25% = -5 days
- Saving = 10 days a year

Attractive ROI of 3,5 year by scaling effects

- Minimize ‘too’ early replacement of devices
- Minimize downtimes because of condition-based monitoring 24/7
- Increase worst-case protection (total failure, gas accident)
- Maximize operational safety/ occupational health & safety of employees

Solving complex challenges easily

Machine bouw
12 april 2022
1931 Congrescentrum
Den Bosch

Weidmüller

Bedankt voor uw aandacht!
Nog vragen?

Let's connect