NEURON SOUNDWARE

Creating the New Possible with

Making machines intelligent

Pavel Konecny
Founder and CEO

Lack of Intelligence of Industrial Machinery

The problems we solve are a €120 billion-per-year opportunity to make machines smarter.

1

Creating a digital brain for machines

30t metal waste prevented

2

Machine unplanned downtime

Prevent 95% of failures

3

High maintenance cost

30% savings

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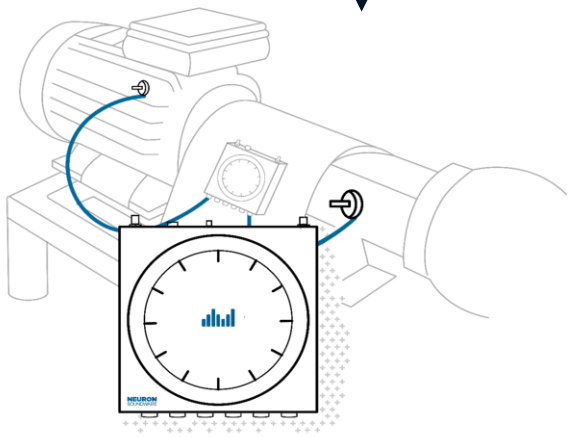
All-in-one solution: AI + IoT

End-to-end customizable monitoring platform for machine monitoring & intelligence

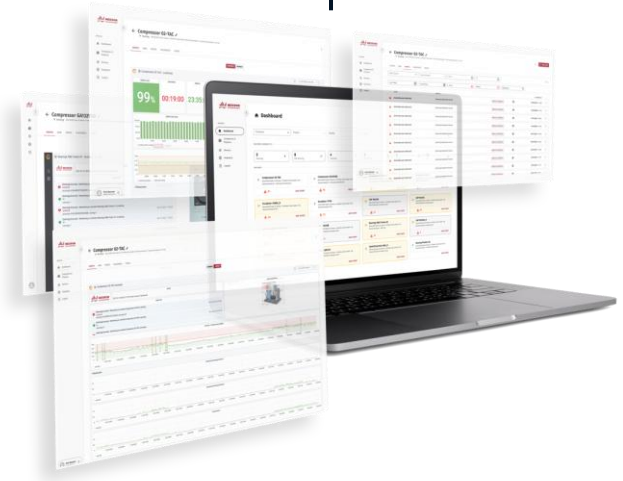


Sensor
LTE
Sensor

1.1 billion of recordings
Many machines

Continuous Learning &
Custom models training

ML model repository



Industrial IoT device nEdge

ML edge modes inference and training of standard models

Portal platform nGuard for machine control

Process step completion or process step anomaly

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Internationally acknowledged as an unparalleled innovator

Team of 20 Experts based in Prague in Czech Republic

nEdge™ IoT Hardware & Data

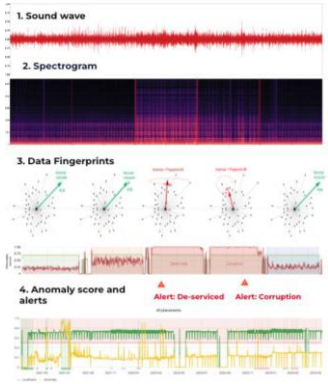
Edge computer

- Processes data locally - AI on the
- Instant machine health check
- LTE / LAN connectivity
- 4-16 sensor inputs
- Variability of sensors

nGuard™ SW Platform

Model training

- Variety of fundamental ML Models (MB – GB size)
- Anomaly detection/ Classification / Time-wise prediction
- Fully supported for end users including data labelling and training



7 Years of Development and Testing

1.1 billion recorded sounds

Own design IoT devices

Own data analysis platform

In the Top 5 in the World for AI Algorithm Design

10+ International Awards for Innovation

Top 5 innovators in the world in the IoT

The Best European Manufacturing Innovation & Technology Startup

The Best IoT Startup Central Europe

Top 5 in the world AI-powered audio diagnostics

ABB Open Innovation PDM Solution

Top 5 Digital Maintenance Solution Engineering Startup

Named as Mainstream in "Acoustic Deep Learning data processing"

Cool Vendor in Acoustic Technologies for PdM

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130 installations in variety of industries

The same technology brings three major recuring revenue streams: SAAS, Licensing, Activation fee (IoT)

General manufacturing (Robots, CNCs, Quality assurance, process monitoring)

Transportation & mobility, smart cities, Facility management

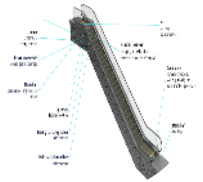
Energy, CleanTech, Power distribution

CNC metal working

Welding, additive manufacturing

Robots

HVACs



Escalators

Facility management

Transformers

Wind turbines

CHP Units

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Industrial IoT device

nEdge PRO – high end computing device

The next generation of **IoT device designed for edge inference**. It is equipped with **Nvidia compute modules Jetson Nano / Jetson Nano Orin** with up-to **40 TFLOPs and 8 GB RAM** of computing power.

The IoT device has a modular design and can connect **up-to 16 analog and variaty of digital sensors** via ModBUs interface:

- Up-to 2x CARD for 8x IEPE sensors for acoustics emissions of machines
- Up-to 2x CARD for 8x A/D HAT extension sensors (4-20 mA standard)
- Other CARDs can be designed on-demand (e.g. 2M Hz recording)

- **LTE capable** with easy accessible SIM slot connectivity + **secondary eSIM card** with Global data plan for the remote device recovery
- Advanced monitoring of the device with remote recovery option and **local storage data encryption**
- **Touch display** providing with basic information on device/machine

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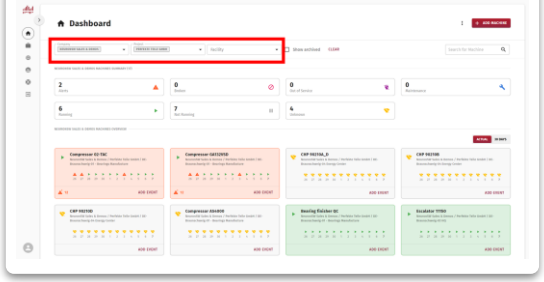
Features overview

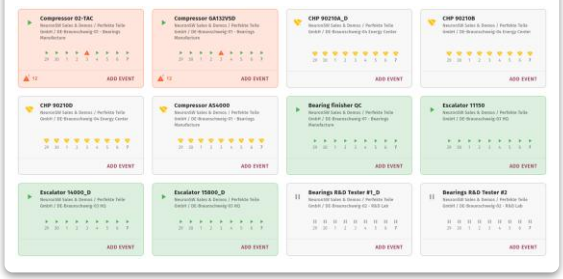
Customer Portal

Our solution is all-in-one (HW+SW+AI). The front-end portal provides simple to use responsive interface for our users.

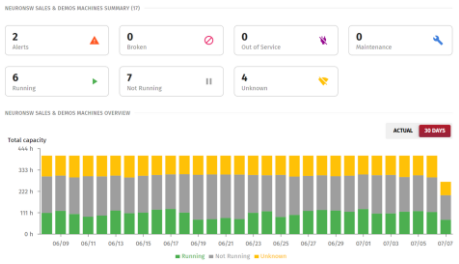
All machines in all plants



Machine health overview

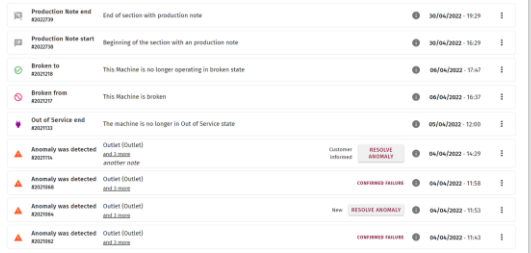


Fleet state overview

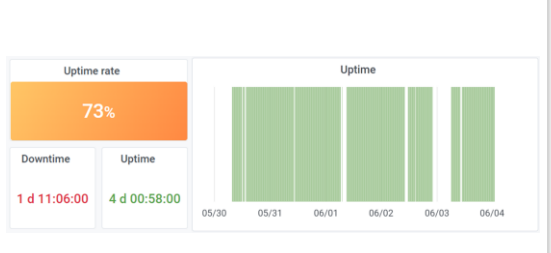


Machine alarms overview

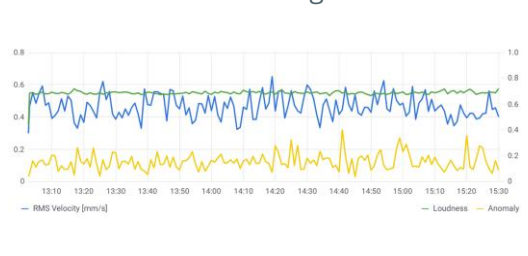
Machine events summary



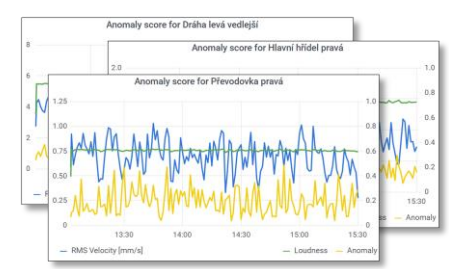
Machine uptime summary



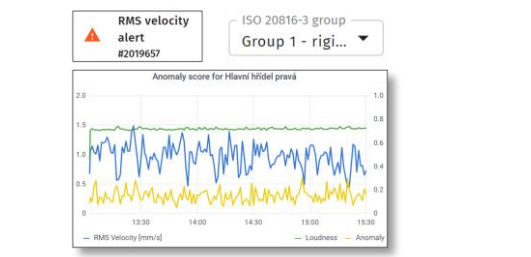
Realtime sensor readings



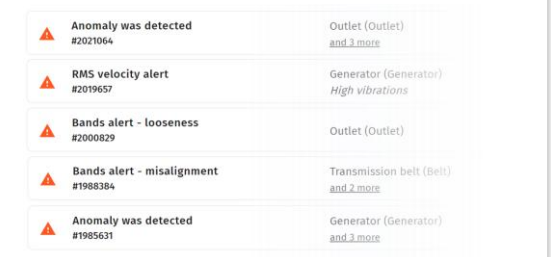
Machine sensor drill down



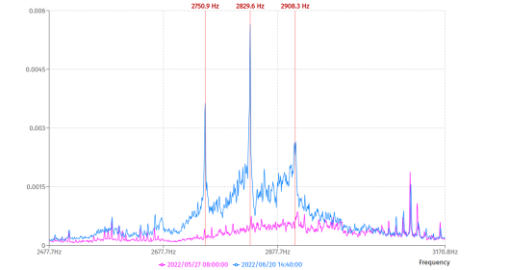
ISO measurement



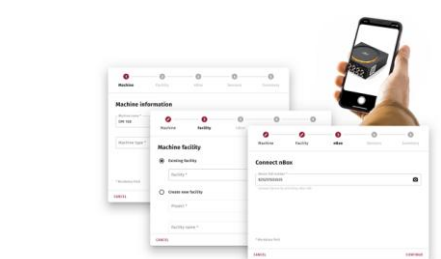
Important alert notifications



Analyze data at component



Installation manuals



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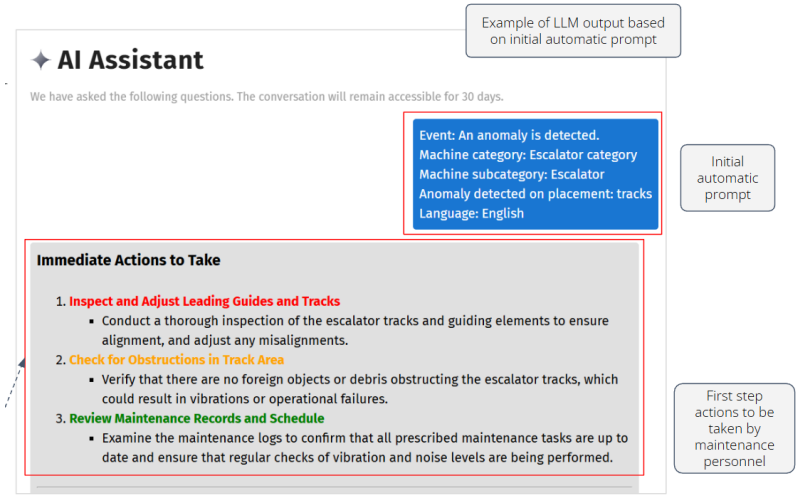
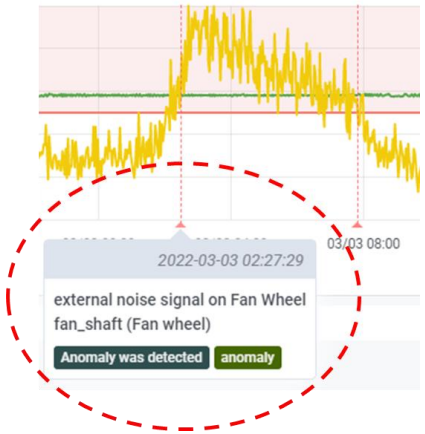
#AI is 4x more likely to detect a coming issue

- Client can observe in nGuard on **which machine part** the changes in sound occurred and **see the development of anomaly** as the time progress.
- In nGuard system the client can **label the test data**, manage **list of events** and use the **integrated analysis tools**.
- The system would be able to detect changes on particular components and advice the possible cause.
- AI Assistent allows instant consultancy using provided service and operation manuals.





Event labeling visible in both graphs and event list

Sensor data overview at 1 graph: Monitor the trend of different parameters on each sensor in real time – loudness (overall sound energy), anomaly score (deviation from nominal state) and RMS velocity (value of vibration) to have a basic knowledge of a machine operation in any given time.

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Big Trend: Shift towards AI & Edge computing

Neuron soundware is uniquely position to satisfy an increasing demand for operational efficiency across variety of industries or products.

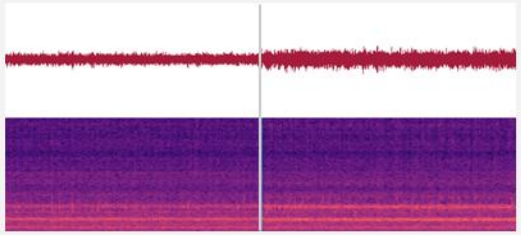
Key advantages

1 **Multi-parametric, real-time data processing**

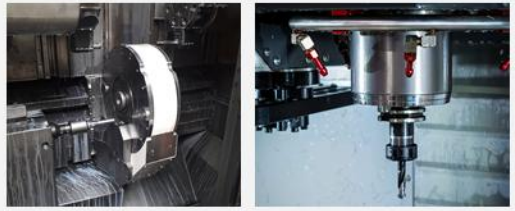
2 **Proprietary Edge IOT HW, Web based SW + Plug&Play integrations**

3 **Rapid AI Algorithms self-adjusting to machine state monitoring**

CNC Maching Health

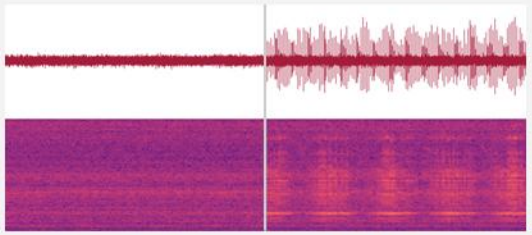


ORIGINAL STATE | DEFECT STATE



THE MOST COMMON PROBLEMS:

- misalignment
- imbalance
- looseness
- insufficient lubrication
- bearing failures



ORIGINAL STATE | DEFECT STATE

THE MOST COMMON PROBLEMS:

- Imbalance
- misalignment
- overheating
- bearing failures,
- pump cavitation

Linear Axes/Guides Monitoring

OK STATE | DEFECT STATE

THE MOST COMMON PROBLEMS:

- Insufficient lubrication,
- flaking,
- indententions,
- corrosion,
- damaged ball recirculation parts

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Case study

Milling process optimization – 120k EUR per station

Challenge

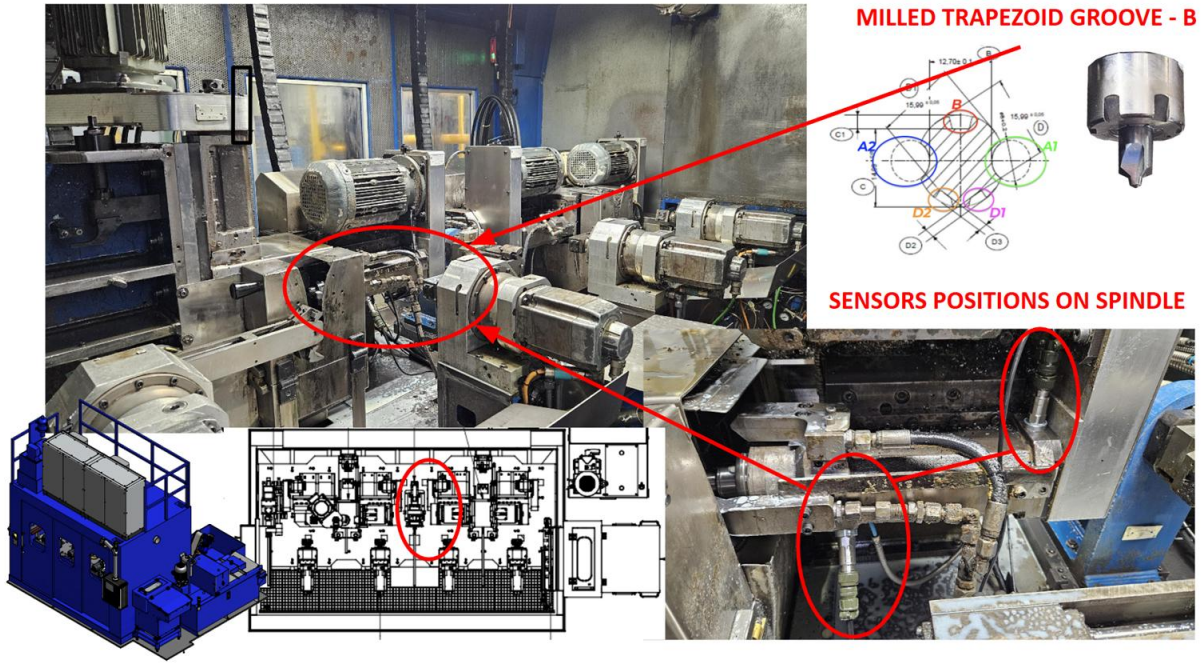
The aim was to p**redict the remaining tool life before the breakage of milling tools** used for SDS Max chisels/drill bits. Monitoring the surface quality of the milled groove, which reflects the sharpness of the milling tool, is crucial for maintaining production quality. The operators were to record the burr level on the products produced, using a scale from 0 to 5, based on their judgment. The data were used for the training of the model predicting tool deterioration - Burr level.

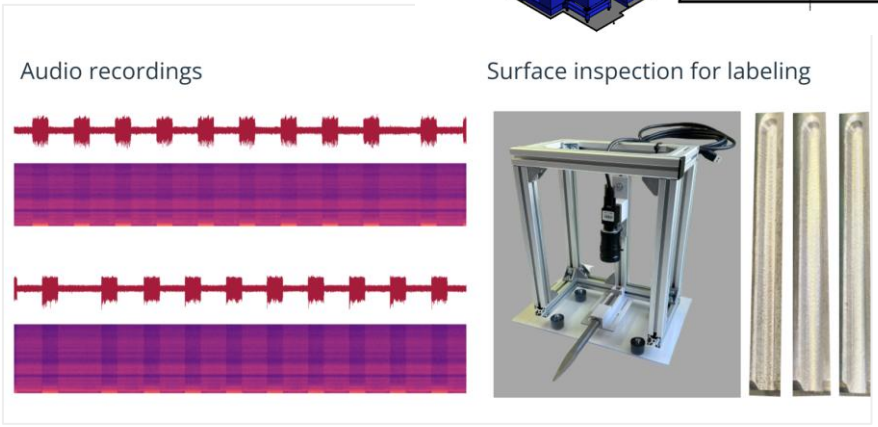
Solution

The models can currently be used to **standardize the tool change,** without the need for operator judgement. The first model detects when milling is taking place by the sound, the second model detects the condition of the burr and the third model detects the occurrence of the broken tool.

Benefits

Reduced reworks and boosted productivity benefits **120k EUR per year/station.**





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Case study

Grinding process optimization – 15% faster

Challenge

Acoustic analysis can significantly **improve first touch detection accuracy,** potentially enhancing grinding process control and machine productivity.

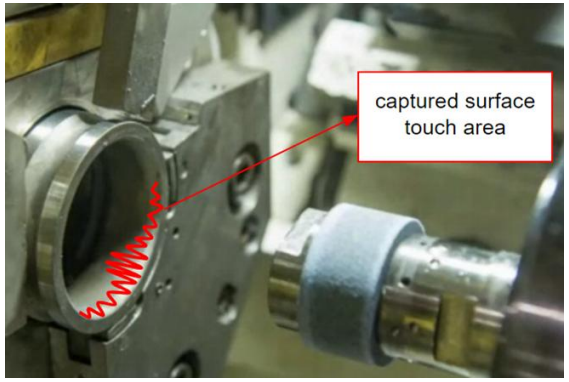
The reliable detection of the first touch between the workpiece and the tool in in milliseconds is key parameter to **optimally control the machine speed and save production time.**

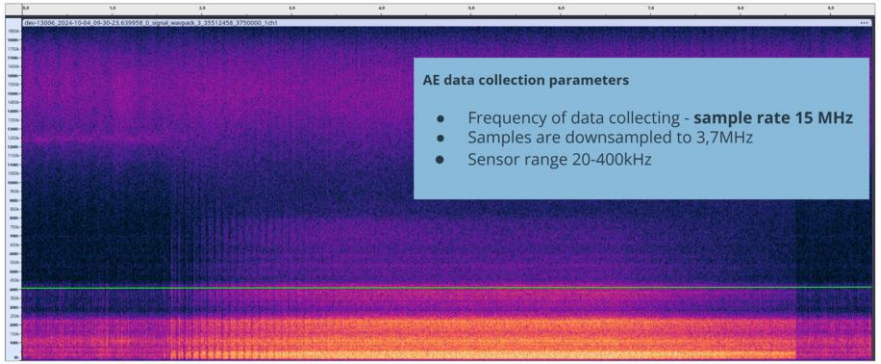
Solution

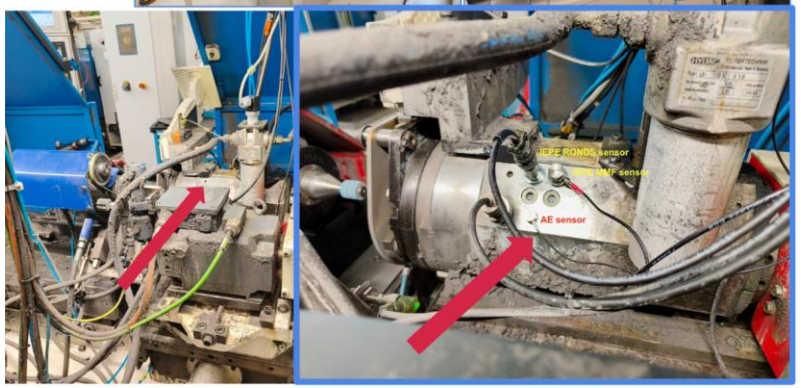
The reliable detection of the first touch allows to **speed-up the manufacturing process**. The further benefits are coming from the need of the **tools replacement and product quality optimization.**

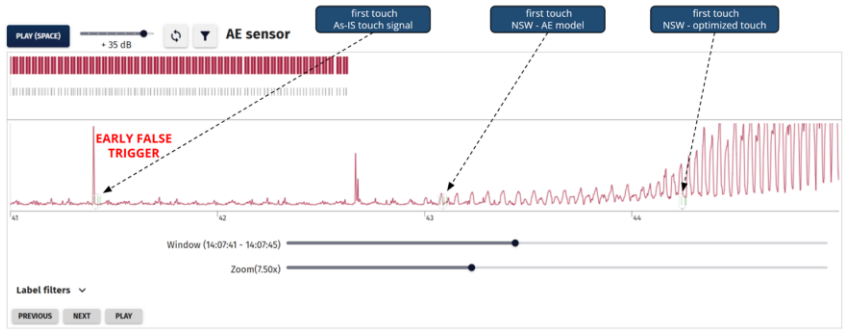
Benefits

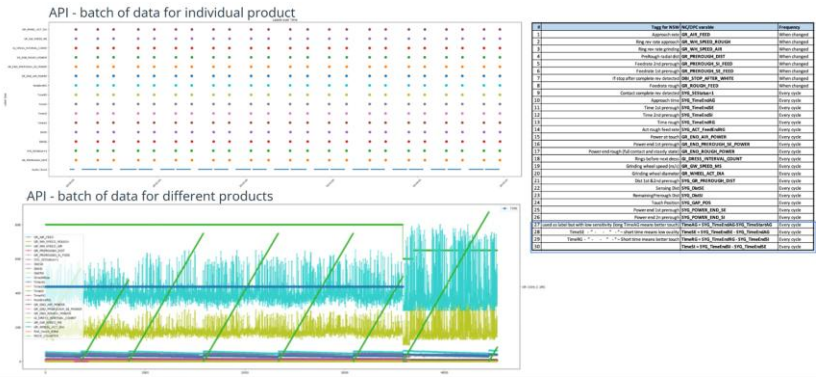
Production efficiency increased by 15%. That brings about more than 1.2 million EUR worth of production.











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Case study

Wire drawing process – save 30.000 kg of material

Challenge

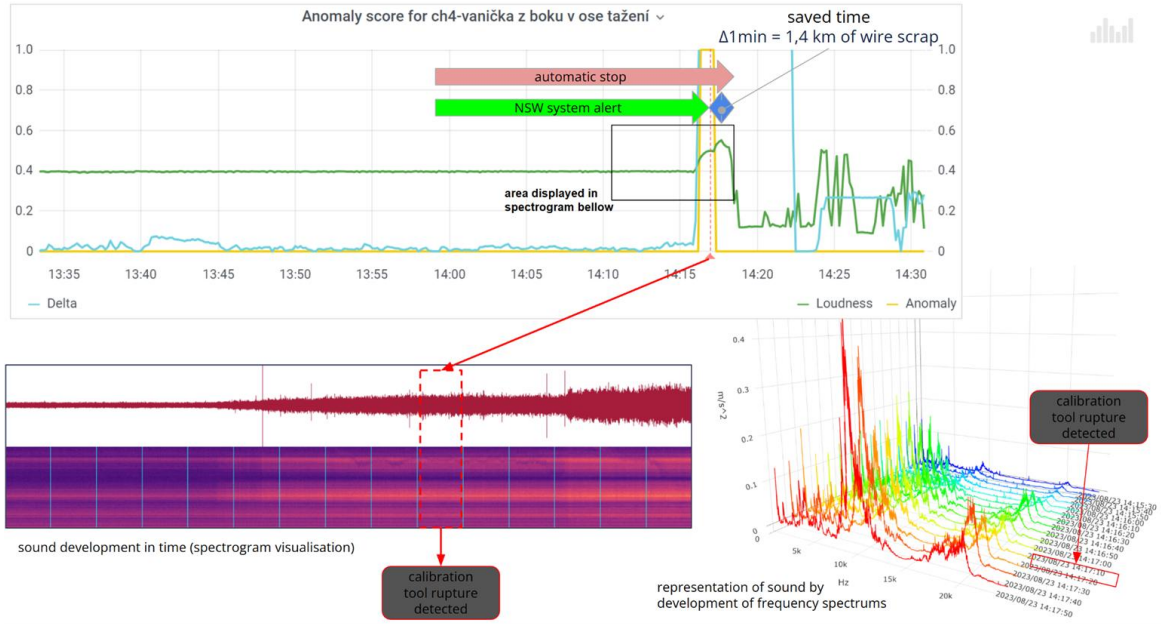
Welding wire coated with copper is pulled through a drawing die at a speed of 24 meters per second.

This **drawing wire is extremely sensitive to damage,** and any harm inflicted upon it leads to the rejection of the entire production batch, resulting in **substantial losses of both time and materials.**

Solution

NSW solution **monitors the drawing mechanism and the integrity of the die.**

NSW correlates the data obtained with the production specification and in case of any deviations from the pre-set specification, **the line is stopped, and the problem areas are corrected.**



Benefits

Significant material savings (30t of material per year per production line). Dramatically reduced unplanned downtime. Improved productivity. Increased reputation as a reliable supplier.

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Case study

Cutting process optimization - 100% speed-up

Challenge

Improper cutting speed and inappropriate contact between the cutting wheel and the material can result in damage or burning of the workpiece. This necessitates heightened operator attention and manual monitoring to prevent material loss and scrap.

Solution

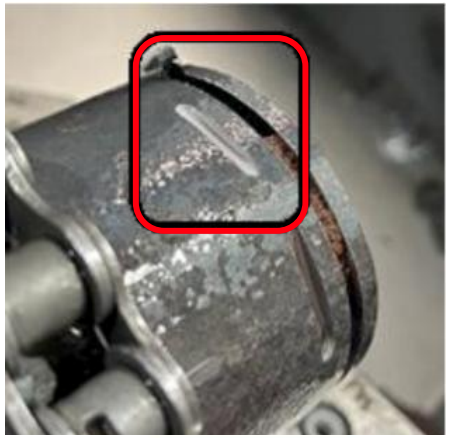
Automated **error-free touch detection, cut termination and ejection** system based on **acoustic monitoring** (Neuron Soundware nEdge IoT equipment) to **detect the point of contact** of the cutting tool (wheel) with the material/end of the cut.

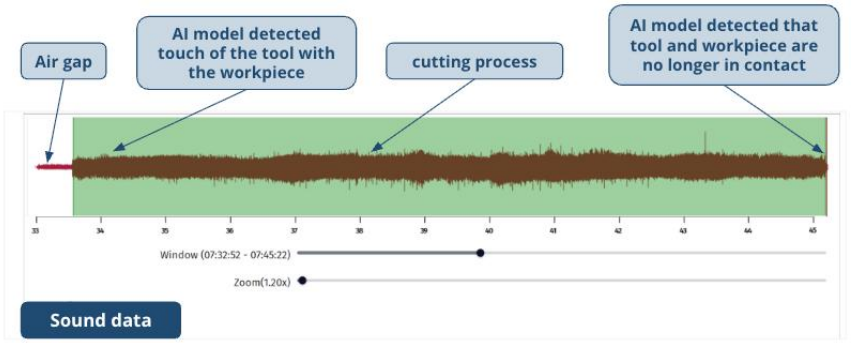
Benefits

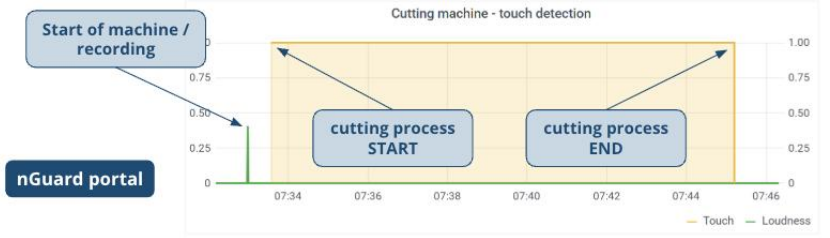
Process Optimization: Enable the **optimization of cutting conditions**.

Efficiency: Allow for the **acceleration of sampling**.

Automation: Enable the **automation of the cutting process** (specifically, touch detection and cut termination).







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Neuron Soundware: AI + IoT for CNC optimization

Goal: **Optimize CNC machining in real time** by application of an advanced **Artificial Intelligence** (Reinforcement Learning, Anomaly detection, LLM ~ Techniques) + **IoT edge computing device.**

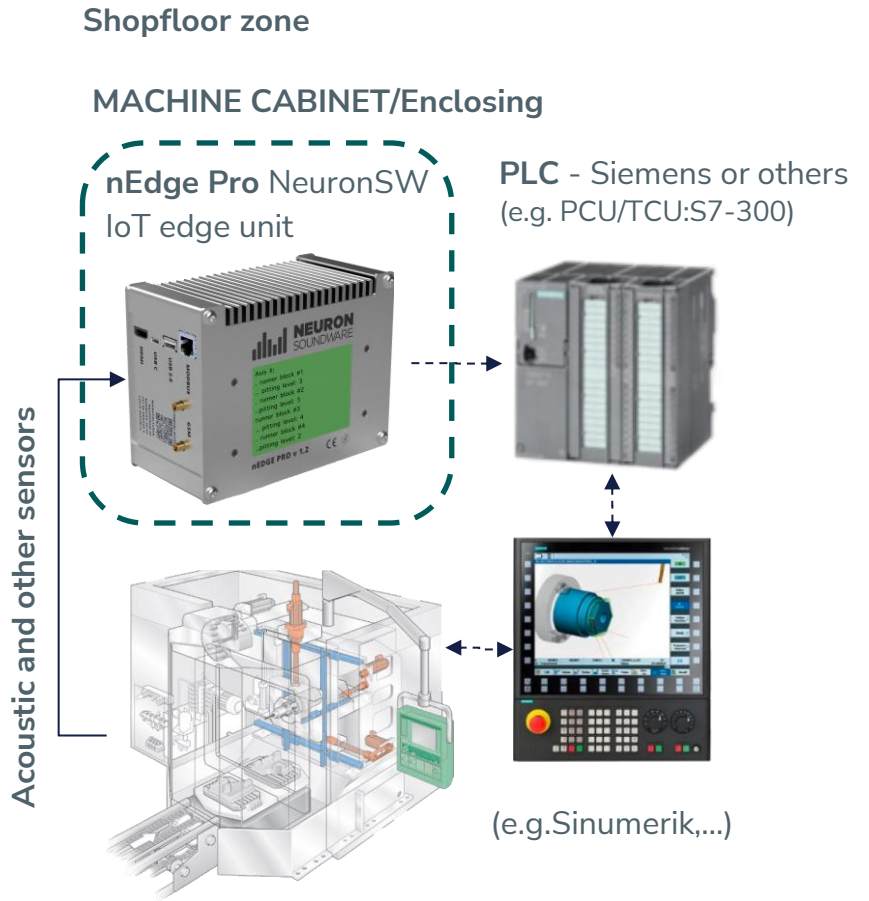
Core pillars of the technology:

1. **Automated process planning & G-code generation**: Heuristics + LLMs to speed up CAM prep (up to ~90%) and optimize sequences (15–25% faster).|

2. **Real-time anomaly detection & correction** — acoustic/vibration monitoring to detect chatter, collisions; ms-level reaction to prevent damage and cut downtime (~50%).

3. **Adaptive real-time control (Reinforcement Learning)** — dynamic sensor feed/speed adjustment to shorten cycle times (≈20–30%), reduce defects and extend tool life.

Expected impacts: Faster setups, fewer rejects, energy/material savings (5–10%), scalable modular platform for broader industrial adoption.



AI in manufacturing Twist grant
of **1M EUR** (2025-2027)

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We are looking for partnerships

We are looking for a strategic partner **with a focus on industrial AI and IoT**, who will help us with to expand our international reach.

Interested into the following areas:

Global Reach:

Geographic growth and distribution channels

OEM:

Deployment of the solution for key assets monitoring

Large Operators:

Monitoring of variety of assets

ISO 45001: 2018

ISO 27001: 2022

ATEX

European Commission

CE

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NEURON SOUNDWARE

Making Machines Smarter

Contact us to learn more

Pavel Konecny
Founder & CEO
pavel.konecny@neuronsw.com
www.neuronsw.com

> This is a vital tool that will be very helpful in the future for Maxion, the cost savings of using the predictive analytics
>
> **John Harper,**
> **Industrial Controls Specialist, Maintenance, Maxion Wheels**

> Every fault of the pump was successfully discovered in an early stage
>
> **John Lim,**
> **CEO of Worke Group**

> Optimizing the maintenance process of operated or serviced equipment leads to a significant reduction in costs
>
> **Aneta Formánková,**
> **Product and Innovation Specialist, ČEZ ESCO, a.s.**