



# Cutting Edge AI and IoT for **Industrial Optimizations**

Corporate commercial presentation, 2024-09

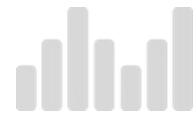
**Pavel Trojánek**

SVP Sales & Marketing

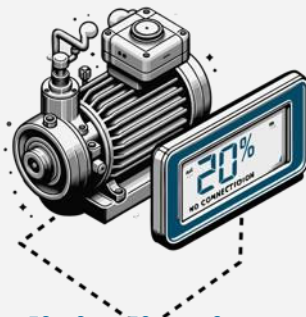


Neuron Soundware delivers AI, IoT & Edge computing solutions,  
specializing in sound analysis,  
to maximize industrial performance.

# The problems we solve



Process monitoring,  
Quality control



## Low digitalization of assets

Only about **20% of industrial machinery is digitized.**

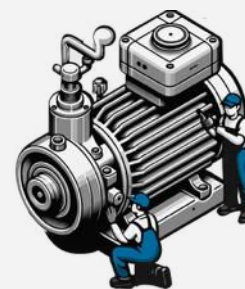
End-of-line testing  
R&D, Innovation collaboration



## Machine unplanned downtime

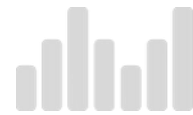
80% of companies experience unplanned downtime each year, yielding **€35 billion in losses a year.**

Condition monitoring,  
Predictive maintenance



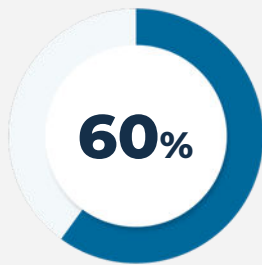
## High maintenance cost

About **30% of maintenance costs are** related to **unnecessary** expenditures.

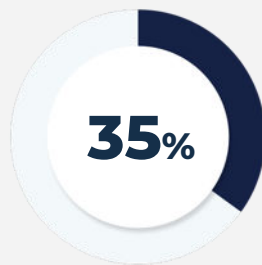


# Value proposition

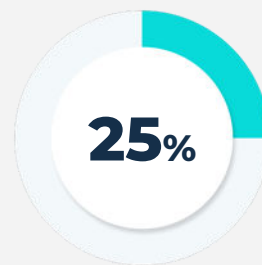
Achieved results with our customers on 130+ installations, 3 continents



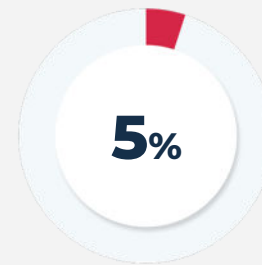
**Reduction  
in Breakdowns**



**Lower  
Manufacturing Cost**



**Productivity  
Increase**



**Energy  
Savings**

*"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.



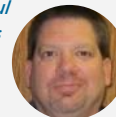
*"Every fault of the pump was successfully discovered in an early stage."*

John Lim,  
CEO  
Worke Group



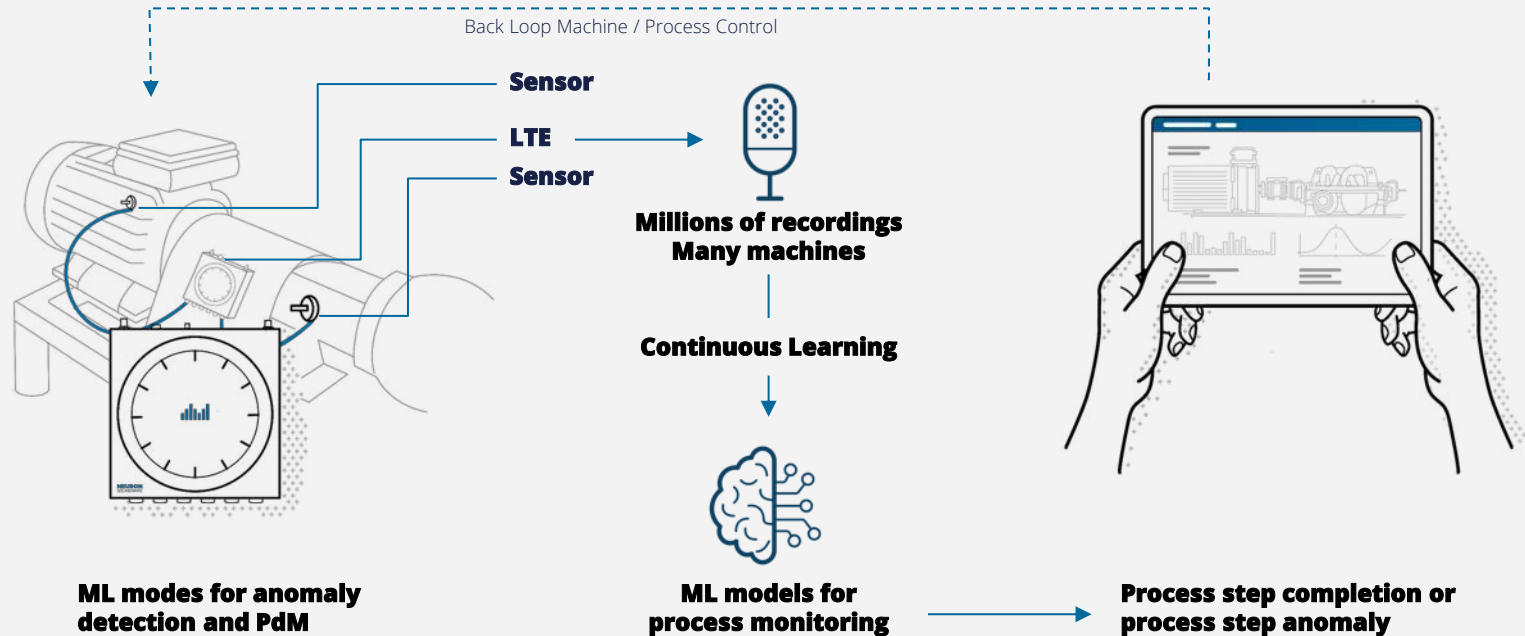
*"This is a vital tool that will be very helpful in the future for Maxion, the cost savings of using the predictive analytics"*

John Harper,  
Industrial Controls Specialist,  
Maintenance, Maxion Wheels



# End-to-end customisable monitoring platform

All-in-one solution using Artificial Intelligence for Predictive Maintenance, Process Control, and Predictive Analytics



***Our all-in-one solution: Hardware, SW, AI***

## nEdge™ IoT Hardware

### Edge computer

- Processes data locally
- AI on the edge device
- Instant machine health check
- LTE / LAN connectivity
- 4-32 sensor inputs

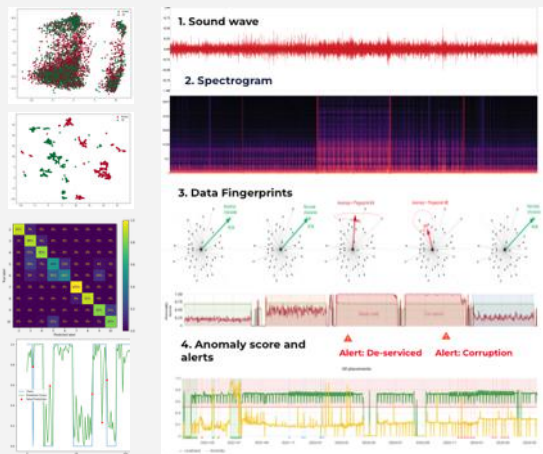


### Sensors

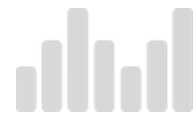
- Per use case tailored selection
- Data correlation - Multiple parameters analysis
- Certified for explosive environments



## AI & ML Algorithms



- 95 % accuracy on selected use cases
- One-click training for PdM
- Fast adoption to process monitoring or quality control



## nGuard™ Analytical Tool



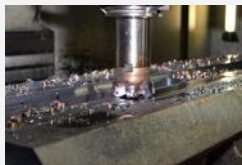
- 24/7 continuous machine diagnostics
- Installation videos and manuals and quick time-to-service
- Combined state-of-the-art AI with traditional diagnostic methods
- Possible integration into customer's systems

# Capabilities & Applications



## Process Monitoring & Quality Control

Research & Development on process supervision projects



CNC metal material processing optimization



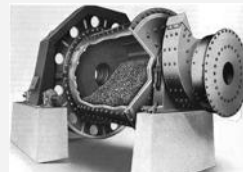
Welding process monitoring



Robotic painting quality control



Material handling monitoring



Milling & grinding: OEE



End-of-line quality control

## Predictive Maintenance & Condition Monitoring

Predictive Analytics, Anomaly Detection, Condition Based Maintenance



Transformers monitoring



Compressors



Pumps, vacuum pumps



Power generation units monitoring



CHP units



Power generation, transmission monitoring



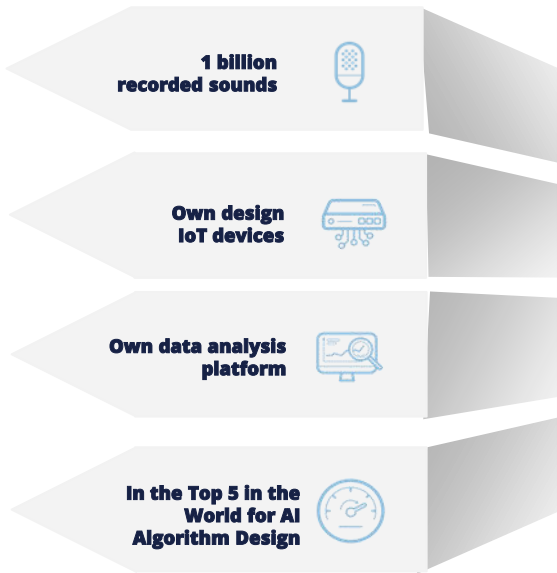
# Internationally acknowledged as an unparalleled innovator



**140+ Installations on 4 Continents**



**7 Years of Development and Testing**



**10+ International Awards for Innovation**

Top 5 innovators in the world in the IoT

The Best European Manufacturing Innovation & Technology Startup

Top 5 in the world AI-powered audio diagnostics

ABB Open Innovation PDM Solution

Top 5 Digital Maintenance Solution Engineering Startup

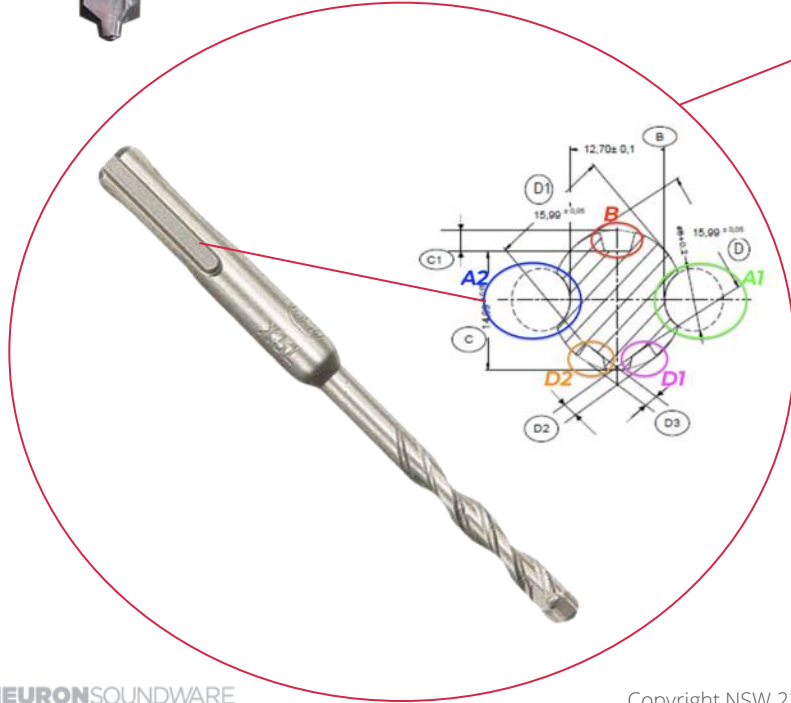
Named as Mainstream in "Acoustic Deep Learning data processing"

Cool Vendor in Acoustic Technologies for PdM



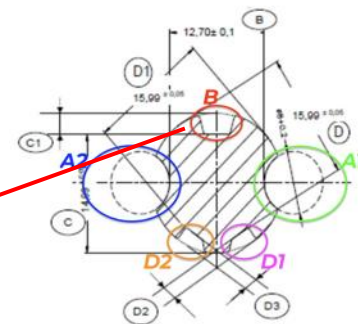
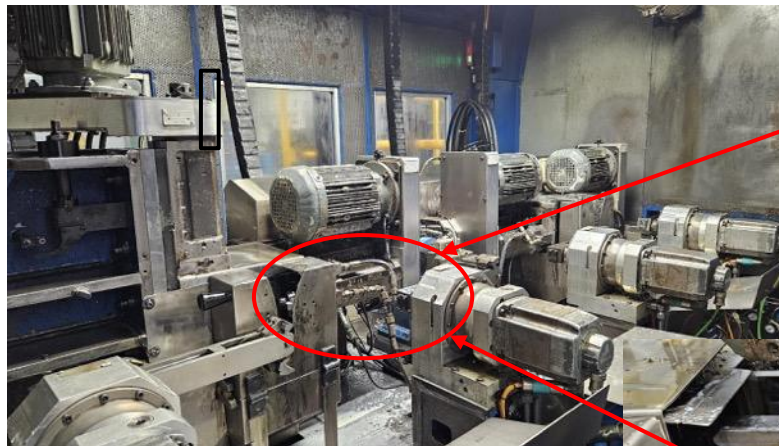
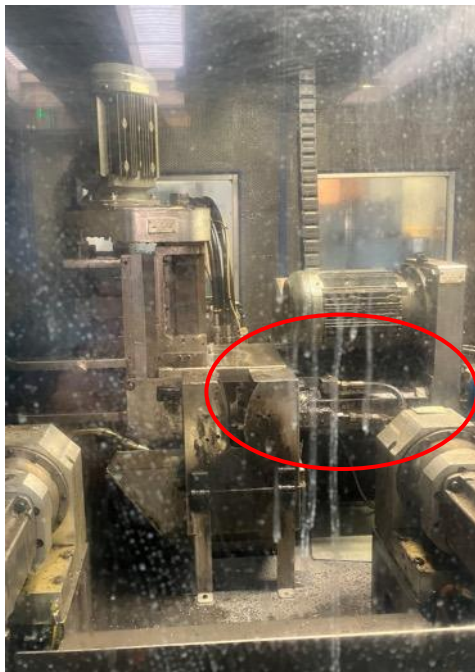
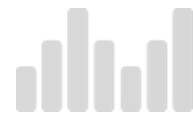
# Milling Process Optimisation

# HW SDS Plus Drill Bit Use Case

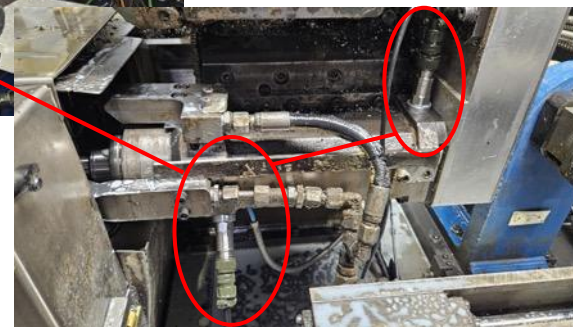
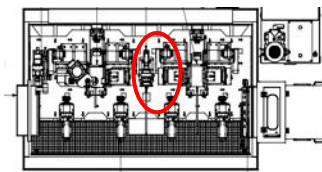
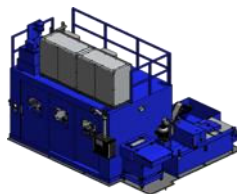


# HW installation

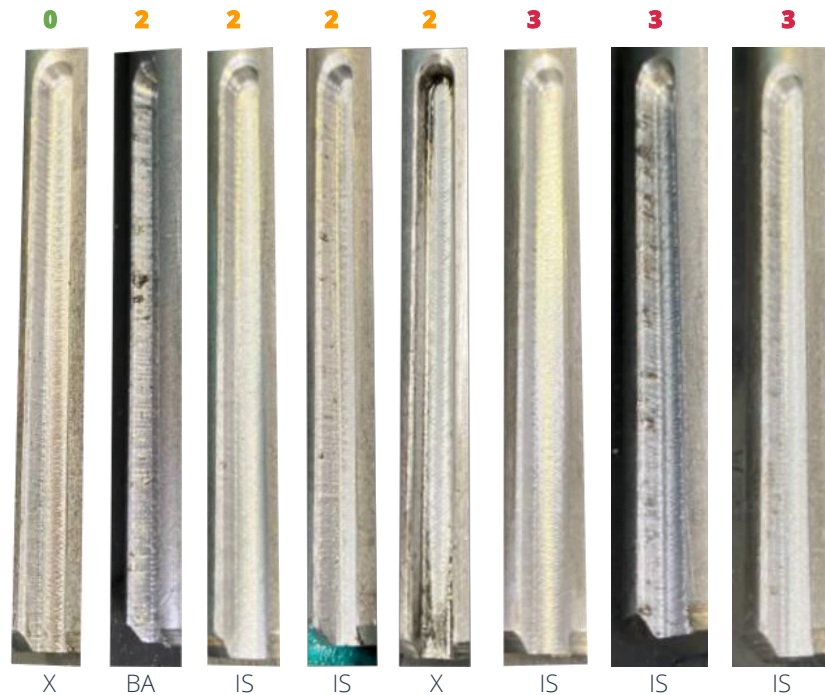
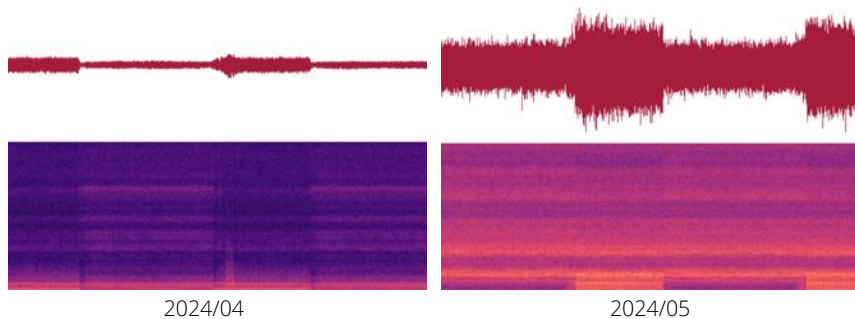
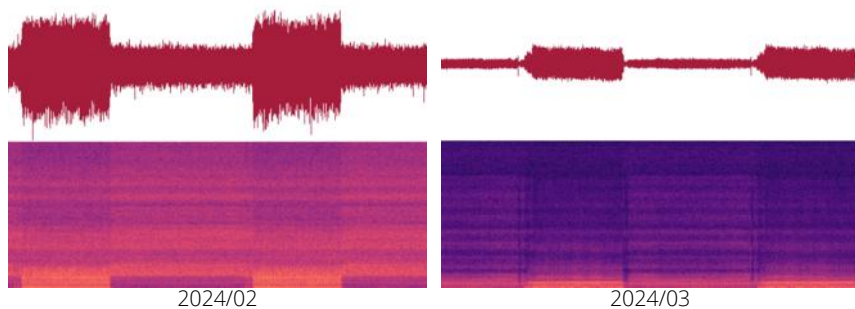
Installed NSW acoustic/vibration sensors on the tool spindle:



**SENSORS POSITIONS ON SPINDLE**



# Data collection







# Tool state control



## CURRENT TOOL STATE INFORMATION

The AI model is detecting each product and is assessing the tool state based on the machining sound. The results are displayed on this panel.

1



**0.5-0.9: tool is wearing out**  
**> 0.9: tool worn out - replacement needed**  
**(end of lifetime)**

## Sensor information

Basic information about the recorded data from particular sensor.

**Loudness:** General level of recorded energy  
**RMS velocity:** Average level of vibration (<1kHz)

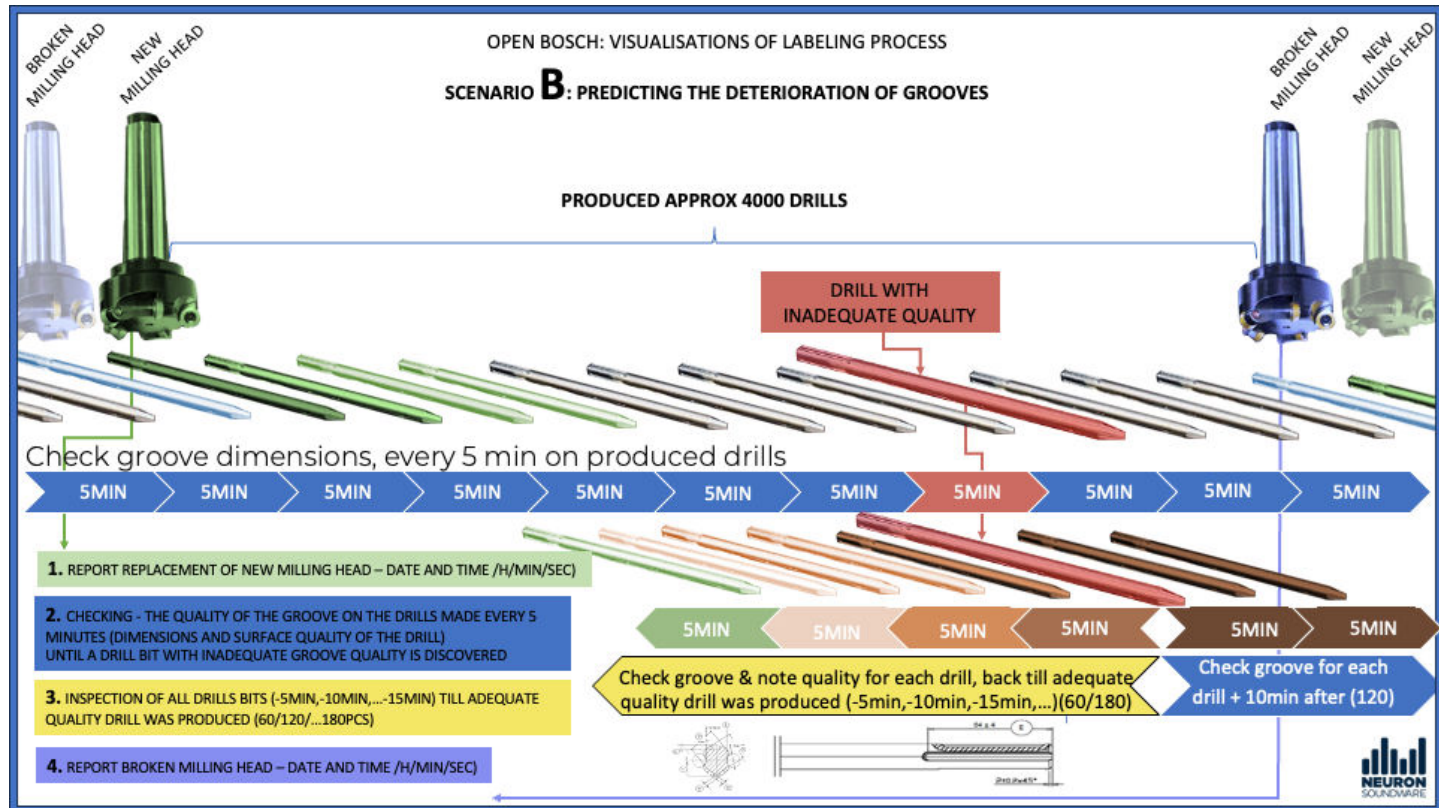
2

## Machine utilization

Shows distribution of time when machine was running/stopped for the displayed time interval.  
**(This section updates every 15m.)**

3

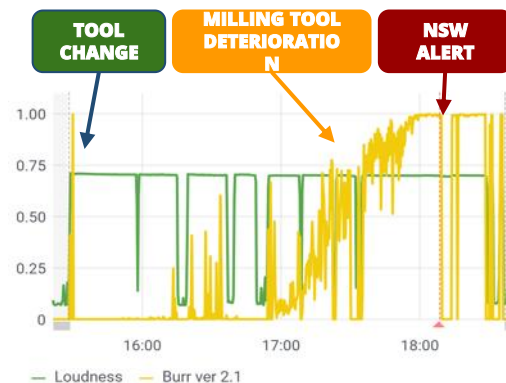
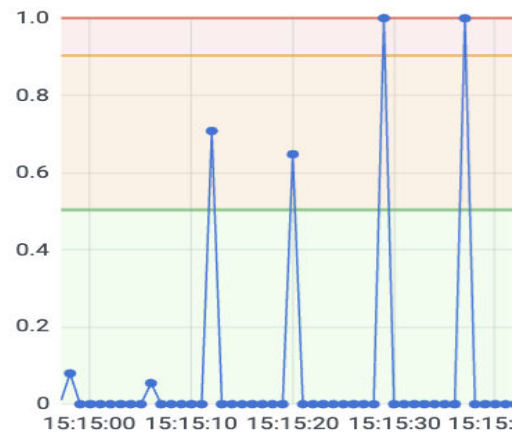
# Data labeling, Algorithm development



# Data Analysis Real Time Visualisation

The AI model detects each product and assesses the tool state based on the machining sound. The results are displayed on this panel.

- < 0.5:** **tool OK**
- 0.5-0.9:** **tool is wearing out**
- > 0.9:** **tool is worn out - replacement needed (end of a lifetime)**





## Key inputs affecting model results

Constant unchanging sound

0



X

2



BA

2



IS

2



IS

2



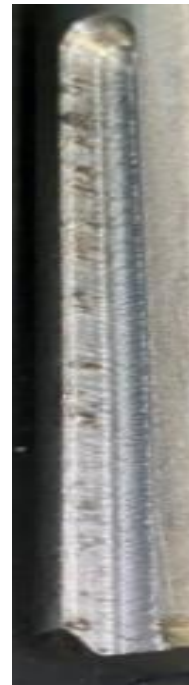
X

3



IS

3



IS

3

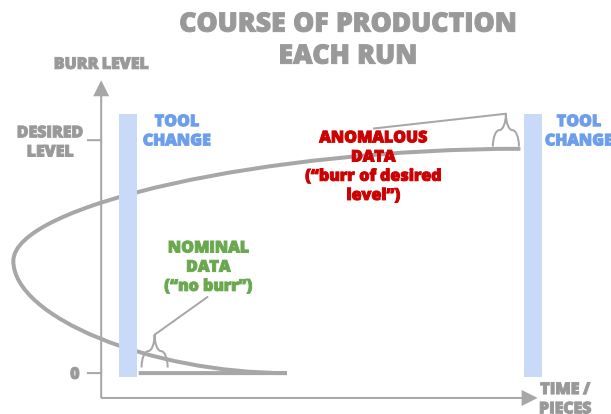


IS

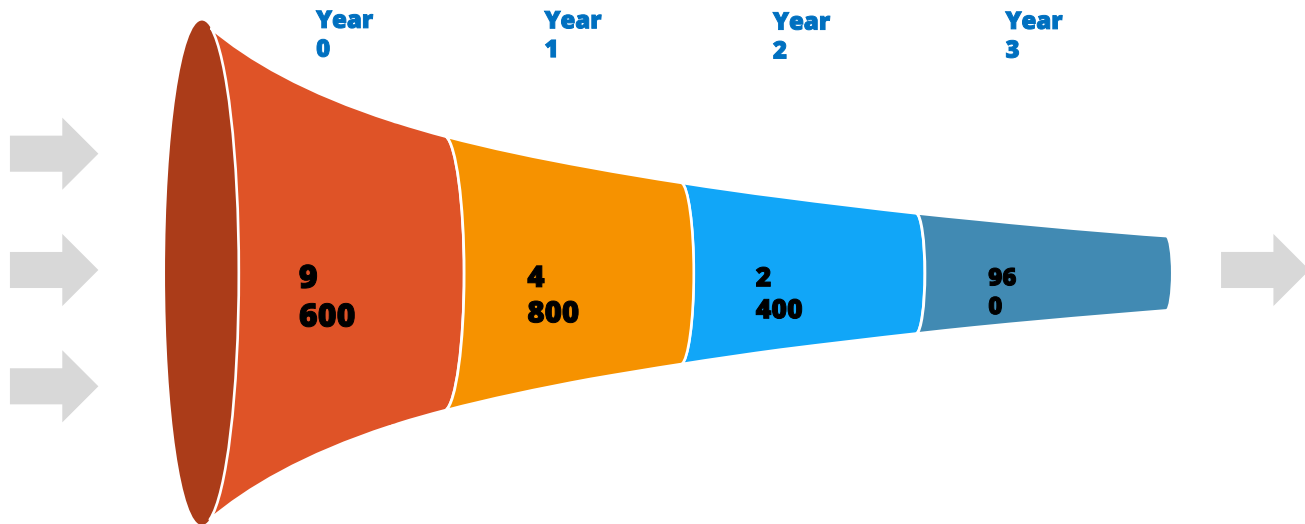
## Next steps

# Suggestions for next steps how to increase the model accuracy and reliability above 90%:

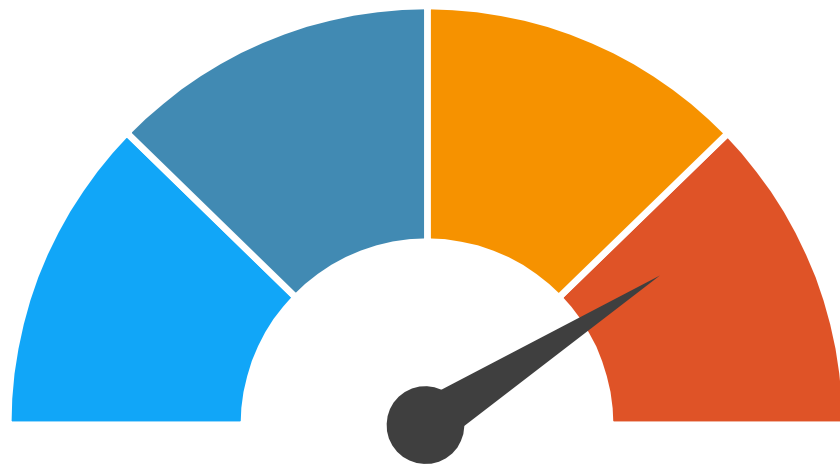
- The model would be trained in the same way as the last Burr model:
- **Nominal data:** Sound of production immediately after the tool was changed.
- **Anomalous data:** Sound of production immediately before the tool was changed. (Only runs where the designated quality controller would assess that the pieces had desired level of burr, when the tool should be changed, would be taken into consideration.)
  - Labeling process similar to current state:
    - Operator changes the tool and leaves some pieces for quality controller to assess.
    - Quality controller determines the level of burr on the pieces left by operator on scale 0-5.
    - Pieces with desired burr level would be used as model training data.
- **Other possibilities:**
  - Construction of device which will take photos of produced pieces with timestamp to match with sound data (most precise solution).
  - Use of "third-party" person who will be responsible for labeling the pieces (the best would be to precisely match the piece with sound recording.)



## Reduction in number of scrapped products/year delivered by NSW

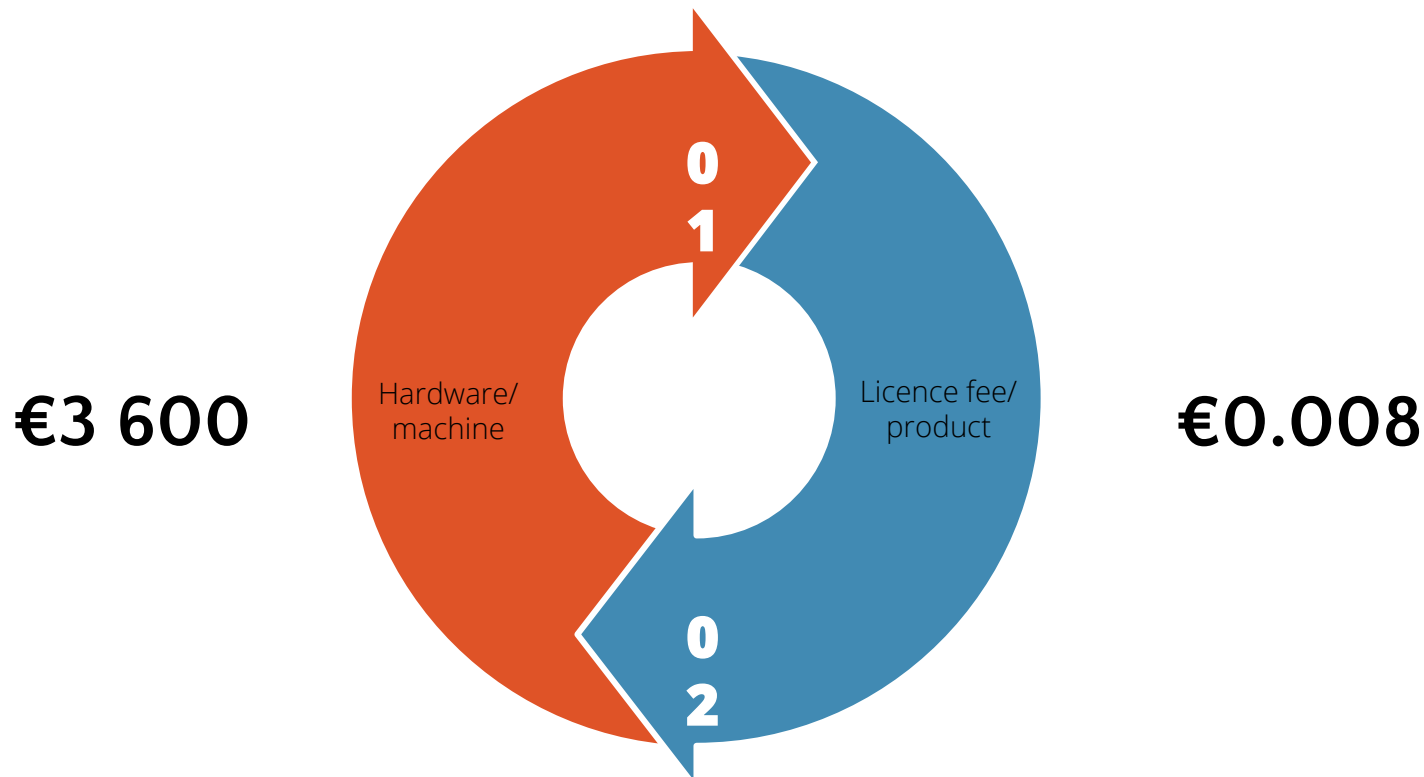


## Average ROI/CNC/year delivered by NSW solution



**€121 000/year**

## NSW solution cost





# Create the new possible with cutting edge AI & IoT

**Contact me to learn more**

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