

Optimizing Tool Utilization by AI-Supported Monitoring in Machining

Our Latest Solution to Reduce Downtime and Rework in Your Machining Process

Your Challenges in Complex Machining Processes

Machining processes with high complexity and quality requirements require constant quality inspection. Early detection of tool-wear or defects is currently ensured by the following:

- Frequent in-process quality testing
- Preventive exchange of tools to avoid low surface quality due to tool wear

This leads to:

- Low degree of automation, suboptimal yield, machine utilization and avoidable downtime
- Non-optimal utilization of tools and avoidable costs

We Offer You Condition Monitoring in Machining as a Solution

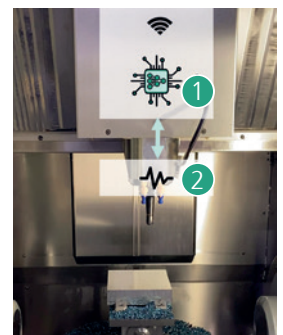
To enable customized solutions, we install a sensor system for condition monitoring in machining. With the continuous measurement of the process variables combined with machine learning (ML) algorithms, we pave the way for high-quality detection and prediction of tool wear, surface quality and imminent tool faults. For this purpose, an on-board feature extraction and prognostic ML algorithms of non-invasive measurements, such as acoustic emission, vibration or supply current, is integrated.

Our Key Features:

- Retrofittable installation of non-invasive measurements with standard components
- Interoperability with existing industrial fieldbuses
- Edge-computing in existing automation and monitoring systems to ensure flexible connectivity, real-time control, data optimization and intelligent decision-making
- High-speed data recording at moderate transmission bandwidths thanks to local and real-time processing of short- and long-term data, which is essential for real-time decision-making and execution control
- On-board prognostic ML algorithms



Our sensorbox with acceleration sensor attached to the milling spindle for condition monitoring



Front view of milling setup where sensorbox is attached behind the spindle

1: Edge AI-Enabled Data Processing Unit
 2: Sensor Unit

Smart Sensors Looking Ahead of Time

We Are Looking Forward to Improve Your Machining Process!

Benefits:

- Optimal tool utilization
- Reduced downtime and risk of rework
- Increased safety
- Secure, highly available industrial IoT
- Improved plannability

Application Scenarios in Machining and Beyond

Condition monitoring	In milling processes	Of screw conveyor	For electric drives	In food industry
Installation place	Spindle	Spiral conveyor of screws	Power cable	Auger feeders
Measured variables	Vibration	Acoustic emission	Supply current or voltage	Structure-borne sound
Sensor systems	Acceleration sensors (x-, y-, z-axis)	Acceleration sensors	Current sensors	Structure-borne sound sensor
Sensor signal processing	Edge-AI enabled system on chip (SOC)	Edge-AI enabled micro-controller	Edge-AI enabled micro-controller	Edge-AI enabled micro-controller
Features	Residual tool life prediction	Condition monitoring and fault prediction (e.g., jamming)	Fault detection and predictive maintenance	Easy retrofit solution for real-time food contamination detection
Benefits	Enhanced tool utilization	Throughput increase in downstream process	Reduction of downtime and carbon footprint	Enhanced food safety

Contact

Business Unit Industry
sales@ims.fraunhofer.de

Fraunhofer Institute for Microelectronic Circuits and Systems IMS
 Finkenstraße 61
 47057 Duisburg
www.ims.fraunhofer.de/en.html

