MACHINE TOOL TECHNOLOGIES

Case Study

Installation & Demonstration of the Capabilities of Sensor Toolkit

Industry/Sector: Manufacturing, Research & Development

Authored By: Charlie Allen

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Unit A1 Buckshaw Link, Ordnance Road, Chorley, Lancashire, PR7 7EL
Company Registration Number 4319272 – VAT Registration Number GB 779 8772 39

Introduction

The University of Huddersfield's *Centre for Precision Technologies* is an internationally renowned centre of machining excellence. Part of their mission is to better understand the capability and reliability of industrial machines. As Industrial Partners to the University, MTT deployed their Sensor Toolkit to four individual machines which are in frequent use, with live data displays and regular data analysis. Sensor Toolkit is designed to be modular and flexible to suit any type of machine tool or industrial equipment. In this case the system was implemented on Cincinatti, Geiss, Hurco & Robodrill machines.

Sensor Toolkit enables the customer to better understand their equipment and to take an informed pro-active approach to maintenance, whilst also enabling the detailed monitoring of each machining system over time.

Challenge / Opportunity

The first challenge of this project was to demonstrate the flexibility of the standard Sensor Toolkit across a number of different machining platforms whilst managing the required data handling processes. In addition to this, a key factor of implement Sensor Toolkit is to not introduce any new failure methods for the equipment being monitored. As such, the system does not fully integrate into the running of the machine, but shadows it by taking independent data during the machines operation.

There are many opportunities/advantages to this project. Initially the data generated from the continual use of many different machines was a key output which adds to the existing database, improving diagnostic capabilities of Sensor Toolkit. In addition to this, the system allows the user to determine 'how hard' they are pushing their machines and provides an indication of health of each machine.

One of the key aims was to be able to identify potential issues with the machines, diagnose it from the sensor data, then confirm the diagnosis and repair the machine. The main challenge of this is the nature of how machine tool errors occurs, "natural" errors are more useful than "induced" errors in teaching the systems diagnostics.

Furthermore, the benefits of collecting this data and plotting it over time allows the modelling of degradation over time. This facilitates predictive maintenance, allowing for scheduled downtime and repairing/replacing of the failed components before they result in a full system/subsystem failure that would be detectable to the operator.

Results & Impact

Following deployment, Sensor Toolkit detected an ‘event’ on the Cincinnati machine. The anomaly was detected through data analysis. The large volume of continuous data, made available via the system, made a detailed diagnosis quick and easy.

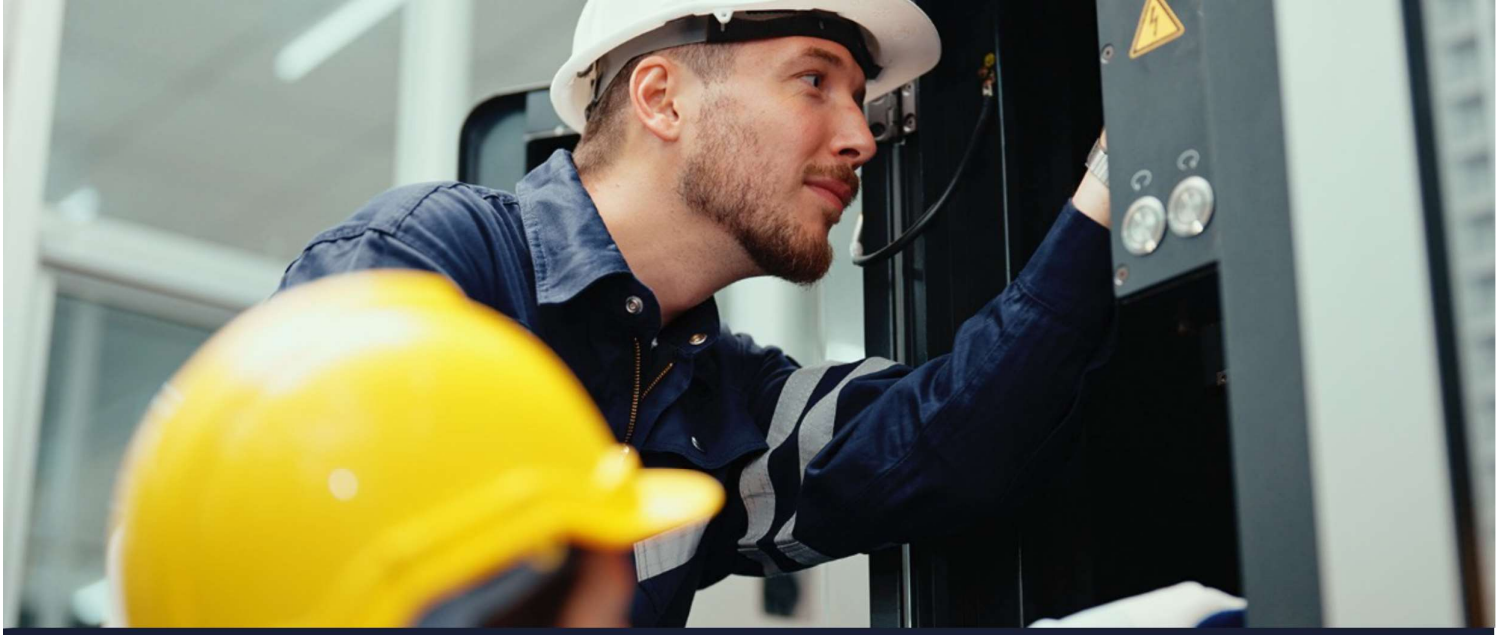
The two graphs (right) show the same operation on the Cincinnati machine, as represented in Sensor Toolkit. The top graph is “pre-event’ (healthy condition), whilst the bottom graph is “post-event”. This system shows that there was a significant vibration increase *above* normal when the spindle speed reached 1500rpm.

Further analysis showed that there was a small trend in the prior weeks which indicated a potential error. In combination with other data made available by Sensor Toolkit, MTT quickly ruled out a large number of potential failure modes, narrowing down the diagnosis process significantly.

Total diagnosis time was approximately 5 minutes and that original diagnosis was later confirmed to be correct during the repair.

The error was in fact a loose encoder connection, causing excessive vibration in the spindle. An engineer was despatched and fixed the problem within two hours. If left undetected, such vibration would cause significant increase in scrappage rates or decrease in accuracy and repeatability in high value machining operations. In addition, resolving the fault at an early stage prevented significant potential further damage / downtime from occurring on the asset.

Sensor Toolkit provides a wide array of high-fidelity data on up-time, energy usage…etc, along with key mechanical and thermal indicators as to the condition of the machine. This allows the customer and MTT to detect trends over time, identify anomalies, and resolve issues prior to them escalating or being detectable at the machine side.



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