Limitations of Data Handling within the Machine Tool Service environment

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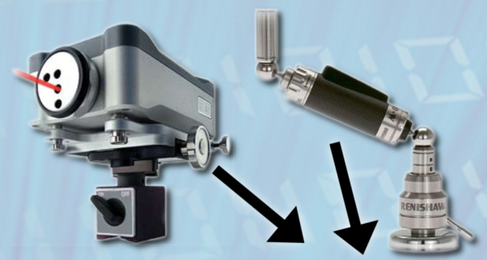
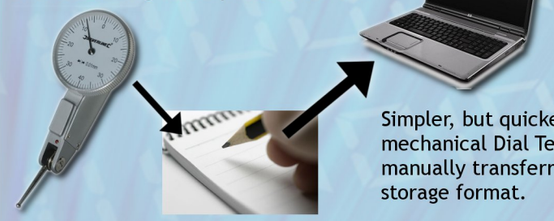
Sources

There are multiple information sources to be considered when measuring or calibrating a machine tool. More modern data acquisition by telemetry devices are becoming increasingly common, however older mechanical devices are still heavily used. This means that both electronic data capture and acquisition by operator input must be considered.



Modern, high precision measurement devices usually have the ability to export measurement data directly to electronic data files. This leads to faster data capture with fewer errors.

Combining electronic captured data and manually created paper copies is time consuming and is prone to errors.



Ideally, as much information as possible should be captured, or at least recorded, electronically. This will help reduce uncertainty, minimise human errors, and save time.

Simpler, but quicker measurements can be made using mechanical Dial Test Indicators. These results must be manually transferred to either a paper or electronic storage format.

Modern Machine Tools require extremely high accuracy measurements to ensure they are working at their full ability.

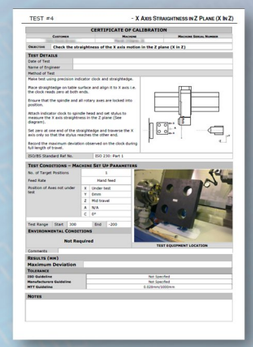
These measurements, however, require large amounts of data to be recorded, transferred, analysed and presented.

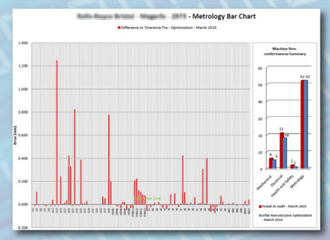
Presentation

The way in which the data is presented can also be a difficult problem. The correct amount of detail must be displayed for the chosen audience.

Managers may require a brief overview of a machine's condition with a quick Yes/No function.

Technical Engineers will have to rectify problems within the machine itself. This means they will need details of each non-conformance (to the manufacturer's specification) that the affects the machine.





Charts and plots of measurement data provide a quick way to compare results, but require correctly formatted, relatable data of similar magnitudes.

The eventual goal is to store all relevant measurement data in an easily accessible electronic format. This will greatly reduce the time required to produce differing outputs from the same data as the source remains the same. This will also further reduce the possibility of human error.

Transfer

The way in which data is transferred from point of measurement, to the analysis systems can prove to be a major bottleneck in the system. Conversion from multiple formats (manual and electronic) often cannot be easily automated.

Varying incompatible data types have to be converted and transferred. This takes time and effort.

Various file formats can be used to transfer data from one site to another, each with its pros and cons.

Actual file-transfer methods tend to favour email, as it is an accepted and easy to use technology, but this can lead to data loss. Improved systems could include handshaking abilities to ensure the integrity and receipt of transmitted data.

Human error and individual interpretation can lead to misunderstandings, stemming from one person's opinion regarding results and readings. Minimising these "fuzzy" areas will lead to more reliable and repeatable results.

"Massive" "OK" "Big" 0.0047 "Very Bad" "Alright"

A more suited approach would to be to transfer the data into an XML data structure before transmission. This would reduce the amount of data transferred and is flexible enough to incorporate any future data needs.

Notepads
Spreadsheets → XML
Text Documents

Analysis

Data processing and analysis can prove to be an extremely time-consuming task if incoming measurement data is incorrectly formatted or incomplete.

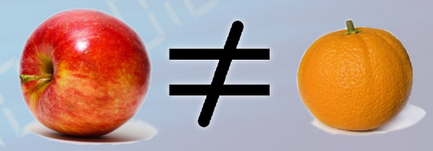
Multiple measurement formats can make comparison of readings difficult. Each measurement must be in the same format as the tolerance that is

? 10 µm/M = 2.062 arcseconds
Tolerance = 0.005mm/300mm ?

The magnitude of certain measured errors can have more of an effect on the machine tool's output than others. The correct identification and ranking of these errors depends on the accuracy of the initial machine description.

A method to allow quick and easy identification of the machine configuration and therefore the required measurements (with reference to international standards) will save time and reduce errors.

Ideally, all measurements of similar types should be converted to the same format before storage and transfer. This will avoid complication and make analysis and comparison much faster and more reliable. All other requested formats can then be generated from this single data source with repeatable results.



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