

Automating Measurement Task

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Aim of the Project

The Aim of the project is to re-design and automate what it's a common process in the CNC manufacturing industry, measurements and documentation. Analysing the process of part production where measurements are constantly taken and documented by operator in a check-sheet as per as quality standards, this task creates human errors and poorly engineering documentation. This projects aims to combine CNC machines and computer to automate this task with the lowest level of human input possible.

Background

The use of CNC machines as a fabrication "tool" is well known by companies, however the possibility of using this type of machine as a measurement device isn't so popular. As a 3-dimensional workspace machine, CNC machines (Milling or lathe) can also replicate the work of a CMM machine. Using a combination of probe and macros present in the machine "brain", the parts once machined, can be inspected by an automatic probe operation, and the dimensions recorded and outputted as a computer text file through different communication ports. Once the text file containing the measurement results are created, a small software can be used to compare the results recorded by the machine with the parts dimension standards.

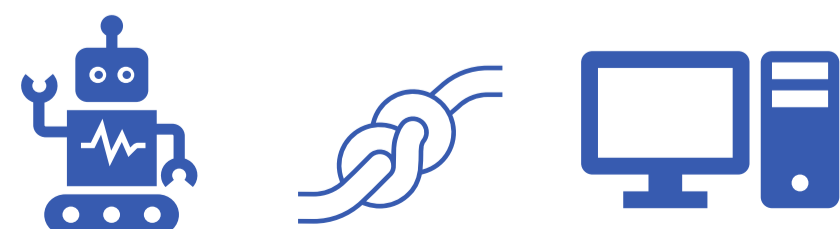


Image: Machine x Computer Connection

Probe

This project was performed using a 3D taster probe. Which it's not classified as an inspection device and does not give the possibility for full automation of the project, however it's a cheaper tool, and allows to explain the concept of the project as well as an inspection probe. Using the same process when setting machine datums, the probe is located at specific areas of the part, zero and that position is collected by the program (macros), using these positions as measurement inputs.



Image: 3-D tester Probe

Macros

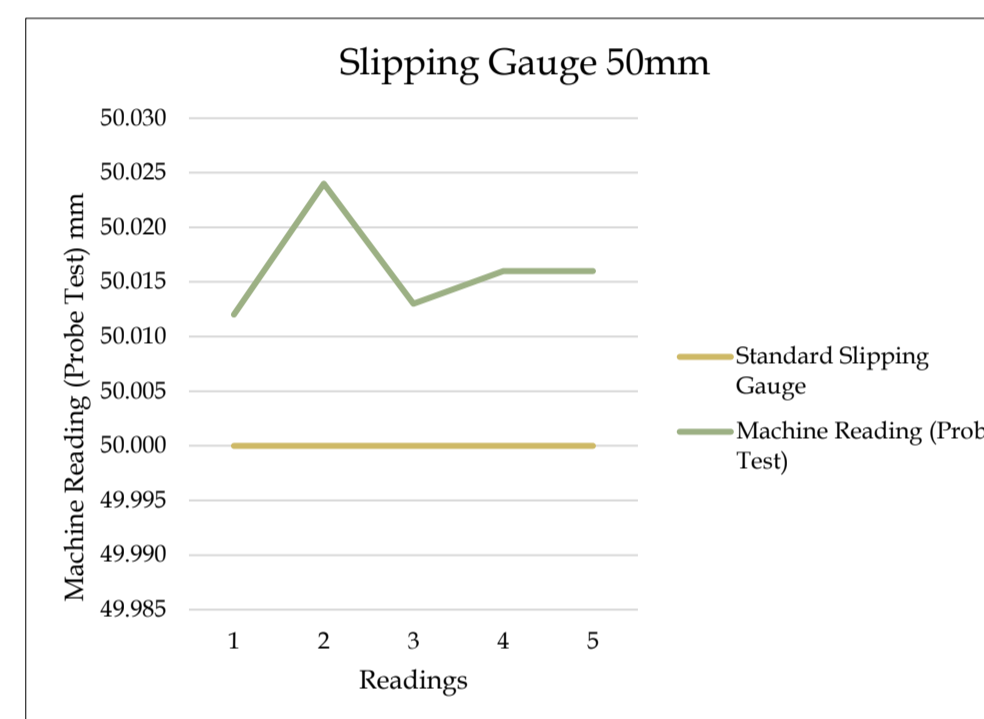
Macros are part of the machine functionality, they allow automation, data storage and communication between computer and machine without human interference for example. Follow below a piece of code that outputs information from machine through communication ports.

```
DPRNT[TEST*OUTPUT*#100[24]]
```

Image: G-Code Output MACRO

Accuracy

Looking to understand the accuracy of the project using a 3-d taster probe, a Test was performed using a 50mm Slipping Gauge. As can be seen, the results are considerable off in terms of production accuracy, however compatible with the accuracy provided by this type of probe.



Graph: 3-D tester Probe Test

Software

As mentioned, once the data is outputted from the machine, the possibilities are limitless. The data already presented in a computer file (txt.), can be analyzed by different statistical software's, or used to create an automated check sheet report. An automated check sheet report, provides a better standard quality, cuts down the possibilities of operator error and reduce drastically the paper waste in machine work-shops.



Conclusion

The project displays the idea of what automation can reach using the possibilities inside of a CNC machine and a computer. Although the project was performed using a tool (probe) that does not provide fully automation and has a lower accuracy in comparison to high-tech probes present in the market. It was possible to demonstrate the possibilities of using a CNC milling or lathe machine to it's fullest and combined to a computer, auto-generate a report, with no-human interference (typing) as shown below.



QrCode: Automatic Report 50mm Slipping Gauge

References

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Books:

GE FANUC AUTOMATION - (FANUC, 2001)
Fanuc CNC Custom Macros – Peter Smit (2004)