

Project PreMac

Increasing competitiveness by robot machining

The conclusion of the latest research is that robot machining generally is too unprecise to machine complete parts within the required tolerances. Thus, the project PreMac seeks to investigate if part of the roughing process can be machined with a robot and then finished in a traditional CNC machine. The aim is to reduce the total production cost. A robot arm is cheaper and more flexible than a conventional CNC machine and thus reducing the total cost of milling a part.

The main purpose of the project is to gather knowledge and conduct experiments to determine whether an economical benefit can be achieved when machining with a robot, towards implementing robot machining.

During the exhibition, "Spånligaen 2016" at DAMRC, a demonstration and testing of robotic machining was carried out. The aim was to explore the capabilities and exploitability of robots for machining operations. It was important to clarify if the robot was suitable for milling as a first stage in aluminum. After the test, the conclusion was:

- The accuracy for the milling process was $\pm 0,6$ mm on all the axis (XYZ)
- The roughness was Ra 6,4 μm and Rz 35 μm

The tolerance for a conventional CNC machine can be expected to be about 0.04 mm on all the axis (XYZ). Compared to a conventional CNC machine it is quite good, the roughness is in the same values, depending on the tool at this machining parameters.

The stability is important for knowing if the robot is suitable for rough machining in metal. The accuracy for knowing how much material can be removed in the process.

The overall conclusion of the test was that the stability and accuracy was more than sufficient to continue with the goal of robotic machining. The robot is rigid enough to sustain the stress induced on the structure from the milling operation.

There is a great potential in milling with a robot, when combining the flexibility and price of a robot with large-scale parts that need machining. It is a possibility that in the near future, robot machining could replace some conventional CNC machines, especially components requiring several hours of roughing.

The next step is to investigate the potential of milling with a robot in materials such as steel and cast iron.

The picture below shows the testing of robot milling in aluminum at the DAMRC "Spånligaen" exhibition in January 2016.



Picture 1 - Testing during the "Spånliga" exhibition

Link to test at the DAMRC Technology Centre: <https://www.youtube.com/watch?v=fFlzgXB1inI>