

## Solving the challenges of robot machining

TEKS are one of the industrial partners in a major pan-European collaborative research project, which aims to develop industrial robots into cost effective, accurate and reliable machining solutions.

The objective of the COMET project is to improve the effectiveness of European manufacturing industries by developing innovative robot-based machining systems that are flexible, reliable and predictable and which could provide an average of 30% cost efficiency savings in comparison to machine tools. A second equally important objective of the project is to increase the accuracy of a robotic machining system well beyond current standard and make them comparable to current CNC milling machine tools.

The project is testing the view that industrial robot technology could provide an excellent base for machining being both flexible (due to their lay-out) and cost efficient (robots typically cost five times less than machine tools). The proposed approach is however not without challenges to be overcome; robots are a compromise between a comparatively low dynamic accuracy, and unrivalled handling flexibility. This means that whilst robots are very agile, this agility results in a reduced stiffness compared to conventional machine tools.

The project consortium will shortly have several robotic cells available, for development and demonstration purposes. The TEKS cell based at the Advanced Manufacturing Park (AMP) in Rotherham cohosted a general assembly meeting of the project, was the first one operational and during the first trial a logo was engraved into a model block. The trial was highly successful and surpassed expectations;.

Since then TEKS have developed the robotic cell further and with consortium partner, Artis of Germany, has conducted force measurement tests while machining aluminium. The forces generated by the cutting operation have been recorded in great detail with a Artis prototype data acquisition solution, at a high sampling rate of 500kHz.

This level of detail in the measurement has been used to establish a correlation between force measurements and surface quality of the cut. This data will in future be used for several applications, firstly a unique “robot finger print – vibration signature” will allow the machining software to model and compensate adverse cutting conditions. TEKS have also started work on more complex test pieces. Whilst the original test part was essentially a shallow engraving with fairly low cutting forces, the higher cutting forces to be used with the new test piece will allow the system to be improved further.

Roland Krain, R&D manager, from TEKS explains the potential benefits of this approach:

“Traditionally robots are used as handling solutions for assembly. If machining is required in a robotic line or cell, the robot typically would place the part in a conventional machine tool. Such tools range from the high tens of thousands pounds to several hundred thousand pounds.

“A robotic machining cell could provide a cost effective machining solution. A second hand robot can typically be purchased for £15k, along with a good quality high speed spindle for £20k, giving the end user multi axis machining capability for a fraction of the cost of a comparable conventional machine tool. Obviously the second hand robot has to be in as new condition, be well maintained and have a compatible controller otherwise the accuracy required might not be achieved.

“The challenge is to overcome the current issues with robots around reduced stiffness and dynamic accuracy, but TEKS and its consortium partners are well on the way to achieve this.”

COMET stands for “plug-and-produce COmponents and MEthods for adaptive control of industrial robots”, i.e. a novel control platform to enable high-end machining with robots, obtaining cost effective, flexible and reliable manufacturing solutions.

The project involves 14 technical partners from 8 countries across Europe coordinated by UK-based manufacturing software specialists Delcam. The €8M COMET project is part of a wider European Commission funded project including research to support the development and innovation of new enabling technologies for the EU manufacturing sector.

For more information [www.cometproject.eu](http://www.cometproject.eu)

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*For further information please visit:*

*[http://ec.europa.eu/research/industrial\\_technologies/lists/factories-of-the-future\\_en.html](http://ec.europa.eu/research/industrial_technologies/lists/factories-of-the-future_en.html)*