TC184/SC4 Industry Day

DIGITAL MANUFACTURING

October 21st, 2015, Baltimore, Maryland

Session 1 – 10:30AM to Noon

Selected industry leaders will explain why digital models make manufacturing processes faster to develop, easier to use and more efficient to operate.

- Models make machining 15% more efficient because they allow an application to run faster. It is like running a car. If the schedule is tight you put the pedal to the metal. If there is time you save gas and reduce wear on the engine. In order to do this you need a full model of what you are making that includes the required tolerances and dimensions.
- The alternative to models is codes as generated by CAM systems. These codes are ideal for paper tape, but they are now more than 50 years old, and they have no agreed upon definitions for curves and surfaces. A code is an instruction that must be met without question, but the real requirements are the geometry and finish of the final product.
- Models enable integrated machining and measurement. Real time tracking has been used for polishing advanced mirrors for many years. Laser scanners are able to measure and process surface geometries very quickly. Machining from models allows devices to analyze results and compare them to what you should be making.
- The robots are coming! The cost of an industrial robot is about 20% of the cost of a machine tool. CNC machines are very rigid and follow the instructions of the codes exactly. Robots will never match this rigidity but they can machine more lightly, they can move to the part instead of vice versa, and they can compensate for errors if you are machining from a model.
- Models enable cloud services and web interfaces. There is NOT sufficient information in codes to allow for remote processing, but models can be sent to third parties, and they can be edited and controlled from phones and tablets.

Session 2 – 1PM to 3PM

Selected solution providers will describe some of the applications that are enabled by model based digital manufacturing

- Tooling optimization. You may have a library of old CNC programs, or you may not be aware of the latest cutters. In either case your programs can be made much faster if you take advantage of a tooling optimization service such as the one being prototyped by Iscar Metals and Sandvik Coromant.

- Process monitoring. You may be using MTConnect to monitor the overall performance of your machining. If you use STEP-NC then you can monitor the overall quality of your machining by building virtual models of the machined parts as they are being machined. A comparison will then show if the source of an error was the machine or the program.
- Virtual CMM. You can measure your virtual machining results in a virtual CMM such as the one being developed by Mitutoyo America. You can then determine if the results of the machining are meeting the requirements defined by the design tolerances. If there is room for doubt then the virtual results can be supplemented by real results.
- Just-in-time simulation. When a machining process is complex and multi-facetted it may not be possible to run in the as-planned sequence because the cutters or machines are not available in the right order. If you are machining using a model then you can change the sequence and verify its correctness using a simulator such as the STEP-NC Machine simulator being developed by STEP Tools.
- Advanced machining. As machines get more advanced they will become more complex with multiple devices working concurrently. Upfront planning of all the possible machining sequences will become very, very difficult, but if all the moving parts are being modeled then there is no requirement for upfront planning.

Session 3 – 3:30PM to 5PM

Selected standards developers will explain how you can contribute to digital manufacturing by implementing the 5M's of digital manufacturing: Make, Machine, Monitor, Measure and Modify.

- You can make models from CAM data. Translators have been developed for CATIA and MASTERCAM and one is in development for NX. The Mastercam translator is at the following open source site: https://github.com/steptools/mcx8-stepnc
- You can machine models using the STEP-NC Machine system. This system will convert a model to legacy codes, or you can write a program to traverse the model and control the machine directly: http://www.steptools.com/products/stepncmachine/
- You can monitor your machining results by connecting STEP-NC Machine to your machining system using MTConnect. This will let you build a virtual model of your machining as a STEP file whose dimensionalities can then be verified using a virtual CMM.
- You can measure your machining results for conformance to their design tolerances. The measurement can be performed on a virtual model or a real model. The DMDII O^3 project is sponsoring the development of a cloud service, virtual CMM.
- You can modify models using the new web services being developed for the DMDII Mind the Gap project. These services will let you change the tooling and generate new, more optimal tool paths. They will also let you verify the machining process in a web browser on a phone or tablet.