

STEP-Manufacturing Meeting Summary – February 12 and 13

Attendees

David Odendahl, Boeing
Sid Venkatesh, Boeing
Martin Hardwick, STEP Tools, Inc.
Joe Fritz, STEP Tools, Inc.
Larry Maggiano, Mitutoyo
Bengt Olsson, Sandvik Coromant
Tom Raun, Iscar Metals
Shogo Nakashima, Makino
Graham Hemingway, Vanderbilt University
Dan Finke, Penn State University (web attendee)

Overview of STEP-Manufacturing

STEP Manufacturing meets twice per year and is a sub-committee of ISO TC184/SC4 which is developing an integrated model for the complete product life cycle. The model is commonly known as STEP and SC4 has recently released an extension that adds Geometric Dimensions and Tolerances (GD&T) to the previously defined nominal geometry and assembly data. There are STEP interfaces for all of the major and minor CAD and CAM systems, and these interfaces are being extended to include the new GD&T information. The new interface is known as ISO 10303-242 or AP242.

STEP-Manufacturing is a team that is developing enhancements to STEP to enable digital manufacturing. The standards it manages include:

- ISO 10303-219 Measurement and Inspection
- ISO 10303-224 Process Planning and Manufacturing Features
- ISO 10303-238 Integrated Computerized Numerical Control
- ISO 10303-21 e3 File format for distributed product models

Collectively these standards are known as STEP-NC and they enable the direct control of manufacturing machines using digital product, process and resource data.

The key advantage of STEP is that the digital process data is associated with the design requirements so that process solutions can be shared and optimized more easily. The team is projecting that when STEP-NC is fully deployed it will lead to a 15% or better reduction in machining costs through the deployment of more intelligent control applications, a 35% or better reduction in process planning costs through the development of cloud services, and a 50% or better reduction in supplier errors through the sharing of virtual machining and virtual measurement results.

Purpose of this meeting

The purpose of this meeting was to continue work on the following projects.

- The Virtual CMM. A Coordinate Measurement Machine that predicts machining results by measuring machining simulations for conformance to the GD&T of a product model.
- Machining Cloud Services. New services to enable third party development and optimization of machining solutions.
- Robot Machining. Integration of machining and measurement to enable manufacturing using less rigid devices
- Networked Manufacturing. New protocols to enable safe, seamless sharing of product model data across the supply chain.

Meeting Summary

The following items and outcomes from the meeting may be of interest.

- Mitutoyo America demonstrated a Virtual CMM prototype that measured the results of a STEP-NC machining for conformance to the GD&T defined by an AP242 product model.
- Sandvik Coromant and Iscar Metals showed the automated assembly of highly accurate 3D cutter models from ISO 13399 data.
- Vanderbilt University demonstrated a very fast web viewer for product model data. They were able to reduce the data volume and download times of an XML viewer by a factor of 100 by replacing the XML technology with JSON.
- Penn State University is using the results of the DARPA Advanced Vehicle Make (AVM) program to implement a cloud service for NC Generation.
- STEP-NC output translators exist for CATIA v5 and Mastercam and one is being developed for NX.
- STEP Tools, Inc. demonstrated an MTConnect interface and showed virtual machining results in Orlando for a part that was being machined in Troy, NY.
- Makino is developing an interface which may make it possible to track the coordinates of in-process machining jobs to one thousandth of an inch.
- Penn State is going to develop a manufacturing plan so that Sandvik and Iscar can recommend best-in-class cutters for machining.
- STEP Tools is going to share the source code of its STEP to XML translators with Vanderbilt so that they can build a very fast, web based visualization system for product model data.
- Mitutoyo America is going to test the accuracy of its Virtual CMM by measuring virtual and physical results for the Circle Diamond Square (CDS) part.
- Boeing and GE are going to test the inter-operability of STEP-NC by sharing process model data for an engine bracket on the 737.