

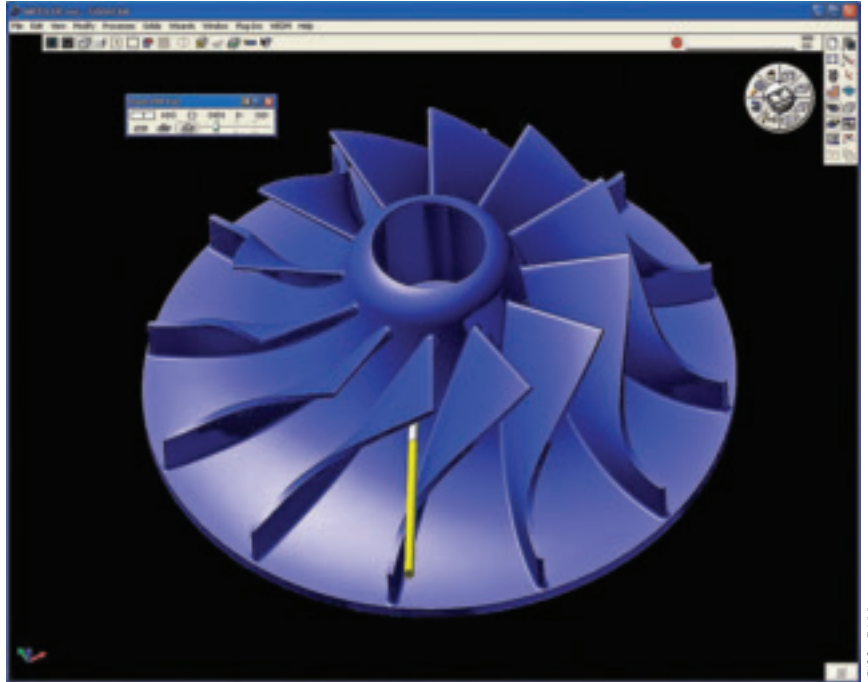
► BY BILL KENNEDY, CONTRIBUTING EDITOR

All Together Now

STEP-NC is a data-rich language designed to overcome the current standard for defining the movement of machine tool axes.

The Tower of Babel clearly demonstrated how nonstandardized communication practices can affect productivity. In contrast, the standardized machine control language commonly known as G and M code has facilitated metalcutting productivity for about 50 years. Back in the days of paper-tape CNC, the Electronics Industry Association developed the RS274D standard language that uses a series of G and M commands to define the movement of machine tool axes. It was a breakthrough language that became a worldwide standard.

However, CAD/CAM programs, controls and machine tools have increased in sophistication, power and diversity of application, turning RS274D into a language with limitations. For



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model for computerized numerical controllers” under application protocol 238 (AP-238) of the ISO Product Model Data (STEP) Standard 1303. Five-axis AP-238 programs are based on tool center programming (TCP) rather than machine movement. In

The Open Modular Architecture Control Technologies Group (OMAC), part of the Instrumentation, Systems, and Automation Society (ISA), advocates the adoption of AP-238.

OMAC Chairman Sid Venkatesh is an associate technical fellow at The Boeing Co., and OMAC Machine Tool Group Chairman John Michaloski is a computer scientist at the National Institute of Standards and Technology (NIST). Michaloski described AP-238 as a much richer, more descriptive CNC language than RS274D. That 1950s language is focused on machine movement and cannot fully communicate feature-oriented data from a CAM system because, he said, “there is no way to describe what you want to do in a standard way. Hopefully, AP-238 will backfill the connection between the CAM and the CNC.”

Sophisticated CNCs already possess the capabilities to handle more

Five-axis AP-238 programs are based on tool center programming rather than machine movement. In tool center programming, cutter movement data, instead of axis movement data, is sent to the CNC.

example, RS274D simply doesn’t have the vocabulary and syntax to translate all the product data from information-intensive CAD/CAM programs to relatively simple machine code, so a lot of product data is left out.

A new, more data-rich language called STEP-NC may help. It is described as an “application interpreted

TCP, cutter movement data, instead of axis movement data, is sent to the CNC. The programs also carry a large amount of part feature information useful in process planning, workpiece preparation and tooling selection.

After a long review process, ISO approved AP-238 as a published standard on April 30 of this year.

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complete product data, but postprocessor translations from CAM can't use all the CNC functionality because of RS274D's limitations. "I'm not saying you are going to get rid of posts—that's never going to happen—but it would be nice if the connection were stronger, and the current game in town is AP-238," Michaloski said.

Speaking from an end user's point of view, Venkatesh pointed out that the current business model for many large manufacturers involves outsourcing part production to a variety of partners. A common, data-intensive CNC language would first of all facilitate making the same part on a variety of machines. Venkatesh noted, however,

that the machines must be basically matched in capability for a seamless transfer between partners.

That is because the AP-238 programs are "data neutral" but are not necessarily "process neutral." Test exchanges of AP-238 programs between Boeing and NIST showed adjustments were necessary when moving from large, heavy-duty gantry mills at the aerospace manufacturer to smaller, high-speed 5-axis machines at NIST. The adjustments included changes in tool sizes and some cutting parameters and produced successful results.

The test exchanges were considered a first step in the application of AP-238. When the standard's software evolves, Michaloski said, users will be able to "describe part features to the smarter machine programming language, and it will determine the proper speeds, feeds and cutting depths. We don't want to get too far ahead of ourselves, but that's the goal you would really want."



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The following organizations contributed to this report:

The Boeing Co.
(206) 655-2121
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National Institute of Standards and Technology
(301) 975-NIST
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AP-238 will be widely adopted when it becomes a business necessity: when demand from paying customers makes it worth the investment required to change from current technology. "It's a game of chicken," Michaloski said. "Once somebody does it, once somebody flinches and puts out a product, then they all go." A good example of an application that became a global standard is the virtually universal acceptance of the World Wide Web.

Venkatesh said a key to the

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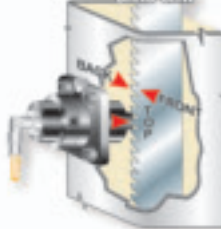
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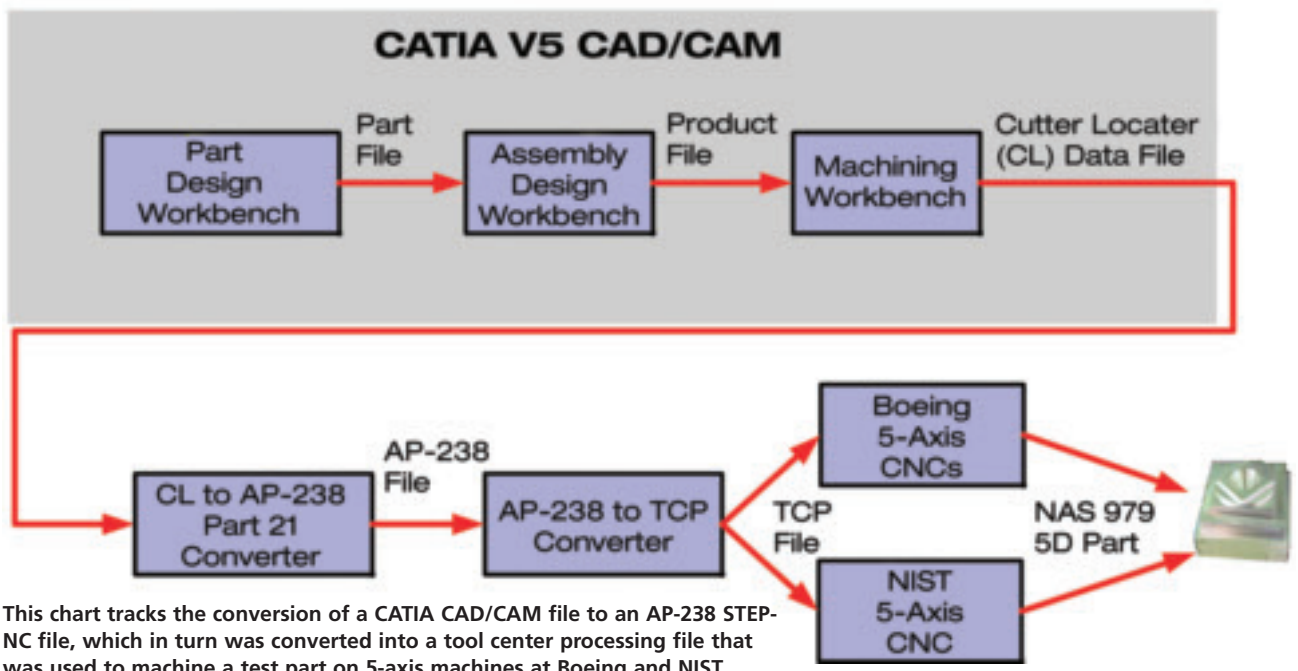
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adoption of AP-238 is vertical integration between CAD/CAM and CNC. The recent acquisition of CAD/CAM provider UGS by control maker Siemens is the kind of event that could be

a catalyst for greater acceptance of the standard. Horizontal integration among the participants will also be important. Venkatesh said that when it comes to CNCs, all manufacturers in effect “talk

the same language. We don’t have conflict of German to French or French to English in our CNC language. We can have all the Tier 1, Tier 2 suppliers do the same thing.” △

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