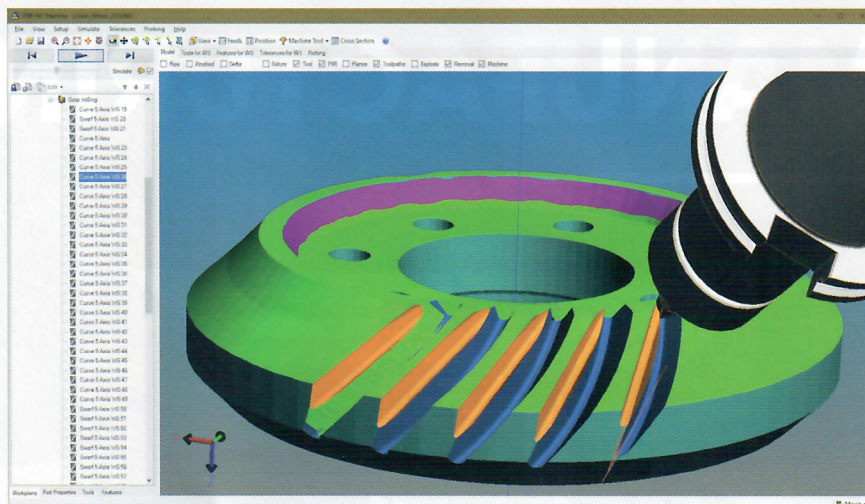


STEP file format makes strides toward becoming the PDF of machining and CAD data transfer. **BY RALPH GRABOWSKI**

Today, STEP consists of 800 standards, most of which compose a library of reusable definitions, but four are defined for end users. In addition to the original AP203 standard that defined solid models, AP214 added assembly data in 2003, AP242 added annotations in 2015 and AP242e2, released just last year, includes tolerances.



STEP for Machining

What's more, the addition of AP242e2 tolerances allowed STEP to be useful in automated manufacturing. When you know the tolerances

This change means a massive rewrite of CAM software, something not all firms can afford. Partly as a result of this industry change, many CAM firms

– like Cimitron, GibbsCAM, MasterCAM, SigmaNEST and Vericut – have in recent years sold themselves to larger companies, like Sandvik.

Since 2017, STEP-NC has been used to machine millions of 5-axis parts each year for commercial aircraft, such as the Boeing 787. Now STEP-NC is being prepared for direct-CAD-to-CNC 2.5-axis milling for features on airframes. As well, it is getting ready for 3D printing, leading Hardwick to call STEP-NC “the PDF of machining.”

ODA Expands to STEP

Yet, for all its advancements, integrating the breadth of STEP’s capabilities is beyond the resources of many CAD software developers. That’s a situation the Open Design Alliance (ODA) looks to remedy. The non-profit technology consortium is known

for open software development kits (SDKs), such as for reading and writing DWG and PDF files. With these SDKs, members can create CAD software that is able to access and exchange engineering design data. By developing the code on their behalf, the ODA’s 1,200 members don’t need to develop it themselves.

Five years ago, the organization expanded beyond offering individual SDKs to also developing complete technology packages for CAD and BIM, (e.g. web collaboration, version control, visualization) on any platform, supported by a natively developed solid modeler and constraints engine.

Earlier this year, the ODA announced it’s also taking on STEP support as a long-term organizational priority. According to ODA president, Neil Peterson, the move was driven by demand

from its members, since currently available STEP libraries are expensive and royalty-based. While some STEP software libraries have been released to the public domain, they suffer from insufficient development. As a result, there is no high-quality STEP library on the market that’s affordable for small CAD software firms, Peterson says.

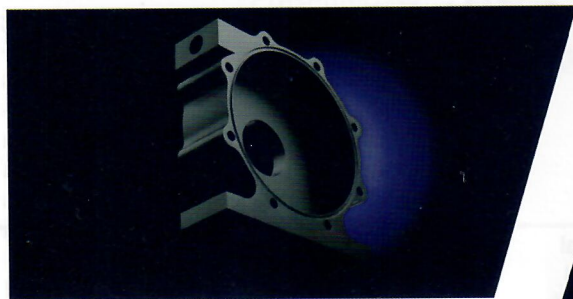
Some ODA members just want access to STEP files. Others – who use the APIs ODA provides for the IFC architectural data model – want both: IFC for buildings and STEP for the machinery inside the buildings. According to the ODA, it will develop a full set of STEP tools by the end of 2022, including visualization, a free STEP viewer and web-based libraries.

Considering that STEP files, and the EXPRESS programming language, are hugely complex, I

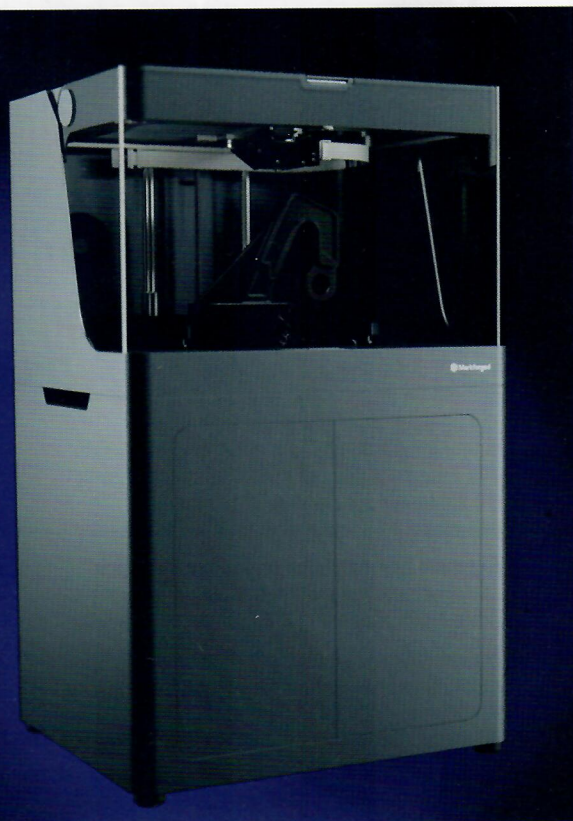
2022

The year by the end of which the Open Design Alliance says it will develop a full set of STEP tools.

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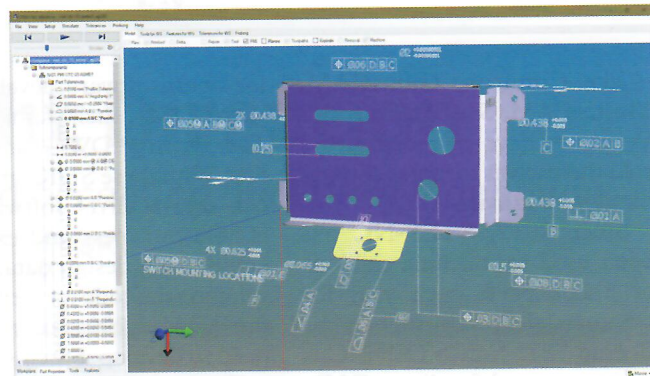


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wondered how the work could get done so fast. The PDES consortium, which maintains the STEP standard, had been working on the problem for nearly three decades.

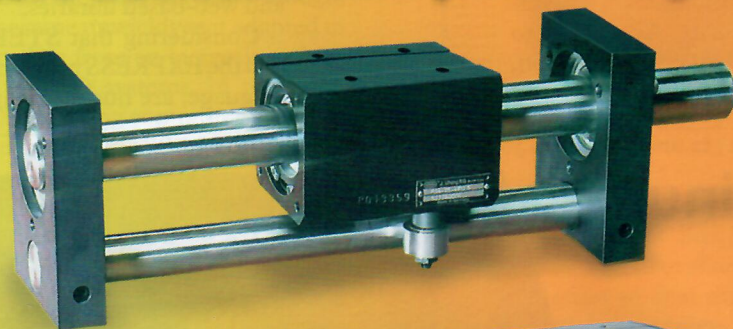
"We gained expertise by developing IFC," Peterson says. "Similar to IFC, STEP is defined using EXPRESS schema, and so we can reuse the automation framework we developed for IFC to quickly build a high-quality STEP solution." As well, the ODA says it's working with PDES, inc. just as it works with buildingSMART on IFCs.



A NIST-created test file with AP242 presentation and semantic geometric tolerances.

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In detail, ODA's timeline calls for the release of an initial STEP SDK with read/write for AP203, AP214 and AP242 (all conformance classes) by the end of 2021. By the end of 2022, it intends to release full visualization support for the three APs on desktop, mobile and web, as well as a free STEP viewer and the ability to convert to 2D/3D PDF, Navisworks, and DWG. Longer term, ODA envisions adding support for AP238 STEP-NC and the ability to convert to IFC and Revit. "Priorities in these areas," Peterson cautions, "will be based on requests from our members."

The cost of getting the STEP APIs from the ODA will be "free" to the ODA members who pay the annual US\$1,800 membership fee, but no royalty payments are involved.

The MCAD/CAM industry needs a universal file format to minimize the cost and inconvenience of translating data. Arriving at universality is, however, a terribly complex problem, as CAD vendors want to maintain advantages over competitors by sticking with unique file formats. Lip service is given to data interoperability. Data flows easily into CAD systems, but emerges reluctantly.

The 2020s find the STEP standard expanding in two directions, towards greater complexity with STEP-NC, and towards lower cost with ODA STEP. The toolkits provided by the ODA, one can hope, ought to make implementing data exchange universality in mechanical easier. **IDF**

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Ralph Grabowski is a CAD industry writer.