

Technology

From CAD/CAM to Tool Assembly: Modern Times Require Modern Solutions

Brought to You by Iscar | Aug 03, 2020

New times dictate new demands for cutting tool manufacturers. Simply supplying tools and assisting in their application, including planning machining operations, is not enough – the modern metalworking industry requires virtual, non-material solutions that will be an essential feature of product lines tomorrow.

Digitizing of manufacturing industries, a clear trend of today's reality, is one of the distinct technological breakthroughs stimulated by the "fourth industrial revolution" – the implementation of Industry 4.0 standards. The wind of change has transformed already even a relatively conservative industrial sector: metalworking. As machining continues to be an essential method in metalworking technology, cutting tool manufacturing, which provides tools for this method, has faced a necessity to meet new requirements. Consequently, the information that specifies the tools should be unified and digitized in the same manner. Information interoperability is the key to ensuring a relevant data exchange between different components of today and tomorrow's smart manufacturing processes. The ISO 13399 standard specifies data representation for cutting tools and tool holders, in a manner that will ensure platform independence universally. The main target is to create a computer representation of the tools and the holders that is unified and understandable for various elements of metalworking technology, whether they are real or virtual, including computer aided design and manufacturing (CAD/CAM) systems.



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From technologists working on process planning, engineers designing tool assemblies or preparing the tooling part of a complex key project and CNC programmers checking a tool path in a CAD/CAM environment, to application specialists optimizing machining operations and even sales managers assisting in selecting a more effective tool – all might spend hours adopting tool manufacturers' tool data to the customer's software. Every CAD/CAM user needs to have immediate and simple access to digitized tool data, and this requirement has become of strategic importance in the service provided by a tool producer.

Data Transfer

Essential data transfer is conducted via a STEP file with .p21 extension, which stores text code related to the parametric values of the product. In addition, the .p21 file provides the name of the 3D file of a specific product. ISO 13399 stipulates the .p21 file which can be transferred between computer platforms for CAD and CAM users.

E-CAT Competencies

Recognizing the value of providing accessible and accurate tool data for pre-machining on the shop floors, ISCAR incorporated tool assembly options into "E-CAT," the company's comprehensive electronic catalog. This option enables users to build a tool assembly from various ISCAR products represented in

E-CAT and then easily integrate the tool assembly data into their CAD/CAM system, which allows users to continue the analysis of applying the assembly to specific operations with the use of simulation software functions.

E-CAT represents an effective instrument for solving several tasks that are encountered by manufacturers today. The program integrates an advanced filtering system to enable the selection of the most suitable tools for the operation, based on machining parameters. The tool assembly includes the tool, exchangeable inserts or cutting heads, a toolholder and, if necessary, a reducer or an extension – all of which will optimally meet assembly specifications. For example, the system recognizes whether the toolholder selected will ensure the exact position of a clamped cutter, or whether the position should be changed by the user.

A digital twin representation of the tool assembly is generated based on the ISO 13399 standard, which is a guarantee of successful communication between current and future software support in a digitized smart factory.

The assembly ensures ensure fast and reliable simulation of the operation as well as collision (interference) checking, tool path optimization, and the design of workholding fixtures. As the selected machining method results in the value of forces acting on workpieces, and a tool configuration influences the shape of workholding elements, simulating the operation with the use of the tool assembly model may be considered as an effective instrument for workholder design. The analysis is performed in a virtual manufacturing environment and not on the shop floor, which minimizes and even prevents possible errors during real cutting. The assemblies created are accessible for downloading in both 3D and 2D formats to facilitate the preparation of drawings, sketches, and other engineering documents.

E-CAT is simple and user-friendly, and even integrates a CAD function for creating a tool assembly from library elements that reflect standard items from the product lines. The tool assembly model is platform-independent and is intended to be integrated into the user's own CAM software, to prevent errors on the shop floor during machining.

The ability to plan and examine single and multiple tool assemblies in the early stages of manufacturing is an extremely valuable source of time and cost saving. ISCAR believes that ensuring such a possibility should be an integral feature of any cutting tool manufacturer's product mix. The tool assembly options offer an appropriate and effective answer to the needs of modern metalworking, and more E-CAT tool assembly applications are near at hand to assist metalworking manufacturers in the evolving world of Industry 4.0.

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