



Lean Manufacturing

4 Must-Know Simulation Trends in Lean Manufacturing

Julie Sullivan | Aug 08, 2017

What You Need to Know

Simulation software can help manufacturers map the best machining, cutting and design routes for their shop.

About one-third of shops currently implement simulation technology into their processes—although more than half know the tools exist.

Simulation technologies are growing in four areas: DIY, additive manufacturing, factory floor planning and fluid structure analysis.

Determine a customer's needs before adopting specific simulation software.

Practice makes perfect may be a cliché, yet the agile and time-to-market benefits of simulation in manufacturing are too great to ignore.

Always be improving. It's the central tenet of the Japanese business philosophy known as "kaizen" and a key element of the lean-manufacturing movement. At the core of continuous improvement is using technology to increase the rate of output, to improve the production precision and accuracy of a finished product, part or process.

For machinists and shop floor managers, today's simulation technology lets new designs or new cuts be examined and tested—often in real time before rolling out to the production floor. Simulation software lets manufacturers be agile with their computer numerical control (CNC) machines and other programmable operations.

"The goal is to streamline manufacturing process development time, largely by catching bugs and inefficiencies in the simulation instead of in real life," *notes* Modern Machine Shop on the benefits and costs of process simulation. "The technology applies to more than machining. Manufacturers facing high-capital equipment costs also use it to optimize assembly, welding and other processes before tooling, machine motions and machine placement are finalized."

Before simulation arrived in the shop, experimentation and testing on machines in production could be risky and costly—especially for large-scale manufacturing. Advanced simulation software in manufacturing lets shop managers more efficiently design the most optimal machining routes possible and help detect problems before they occur.

"Adoption of numerical simulation at an early stage leads to optimized designs and reduces the number of physical prototypes, all of which points toward a shorter time to market," *relays* Valerio Marra, Ph.D., marketing director at Comsol Inc., in a *Machine Design* interview.

Naturally, this kind of preparedness directly affects productivity and profitability, ensuring that downtime is limited and tool life is extended.

Despite the plethora of benefits associated with simulation, its adoption is not as widespread as its awareness, according to the **2016 Global CAD Trends** report from Business Advantage. A majority (55 percent) of design users are aware of simulation capabilities in their work, yet only 34 percent actually use them.

Why the disparity?

"While simulation has always provided significant value to the engineering of products and manufacturing processes, it has often been an exclusive luxury, accessible only by the largest companies," says Seth Hindman, senior product manager of simulation at CAD maker Autodesk, in an interview with *Machine Design*.

The cost to implement and maintain undoubtedly is an issue. Yet, the variety and options available in today's simulation software market are also a factor. To help cut through the noise and steer the shop in the right simulation direction, here are four major simulation software trends worthy of attention.

Simulation Software in the Cloud

Simulation software can be both costly (and confusing) to implement. Manufacturers of these tools know this and have spurred arguably the most sizable trend in simulation because of it: inclusivity and customization.

"A major trend in simulation is an expansion of access to companies of all sizes," Hindman says. "Cost has also been a significant inhibitor to widespread adoption, whether in the form of software, hardware or maintenance costs. Cloud-based subscription offerings often have the benefit of being reimaged during their development and often target ease of use as a key objective."

For manufacturers, this means their shop doesn't have to rely on a one-size-fits-all simulation software. They can customize the tool to meet their specific project's needs and goals. Additionally, these tools help to build a sense of community in the manufacturing industry, with several of the apps leading to YouTube demonstrations and other forms of social media sharing, Hindman points out.

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Seth Hindman

Senior Product Manager of Simulation, Autodesk

Simulation Software with Additive and Subtractive Hybrid Manufacturing

Although the type of technology differs from provider to provider, many of the newer and emerging tools include data-driven optimized toolpaths, including modules that receive input values directly from cloud-based tooling, which helps streamline and optimize feed rates and boost productivity.

"New numerical control (NC) simulation software is being adapted to accommodate these additive processes, making it much simpler to calculate and simulate the time required to build parts in

additive's layer-by-layer processes for both prototyping and to build production metal parts," **writes** Patrick Waurzyniak in an *Advanced Manufacturing* article. "In more traditional subtractive machining, manufacturers are also continuing to focus on an ongoing trend toward spreading the wealth with higher-end simulation tools, with 'democratizing' and spreading the use of simulation including computer-aided engineering (CAE), typically used mainly by highly trained specialists, throughout the manufacturing design/production chain."

From CGTech's Vericut to NCSimul from Spring Technologies, additive (and subtractive) capabilities are making considerable headway in simulation, helping to verify and improve processes.

Faster Factory Room Design

For manufacturers, the push to design factory room layouts quickly (and error-free) has never been stronger. Luckily, several simulation producers have taken note of this as well, designing products that help to design factory floors and simultaneously spot-check all design areas in the process.

This can ultimately be achieved by 3D-based simulation software that allows for precise production visibility. Having this kind of oversight all but ensures agile, self-sustaining factory floors.

"Software solutions are leading the way to these complex applications, giving the operator the necessary programming and simulation environment to make applications that were previously represented through a manual teach-in or would not show the necessary process quality," says Lee Van Every, an account manager for Cenit North America in an interview with *Advanced Manufacturing*.

Fluid Structure Analysis

As manufacturers know all too well, the process of machining corrosion-resistant metals can be hard on drills. But by determining the coolant flow distribution through structural analysis software, tool life can be extended.

This was an **epiphany** the Technical University of Dortmund's Institute of Machining Technology found when they employed analyses tools from Ansys Inc. for finding methods to extend drill life. While the technology is still in a developmental phase, the ability to predict and prolong the cutting tools could have a big impact on productivity and profitability for shops.

What Does the Future Hold for Simulation?

Simulation technologies are sure to evolve in the coming years. The key challenge for manufacturers will be to determine which type of tool will best suit the needs and challenges of their customers and shop.