

Automotive and transportation

## JK Machining

Automation helps a machine shop thrive in a competitive marketplace

### Product

NX

### Business challenges

Maintaining competitive advantage over global competition

Delivering high-quality molds faster so that customers can get to market faster

Ability to accommodate frequent design changes

Reducing production costs

### Keys to success

Use integrated NX CAD/CAM software to develop and machine molds

Leverage mold-specific development tools

Use of high-speed machining methods

Automate design, NC programming and machining with NX

Save and re-use best machining methods

Use of 5-axis machining to improve quality and reduce machining time

**NX enables JK Machining to increase efficiency with a digital thread throughout the entire mold design and manufacturing process**

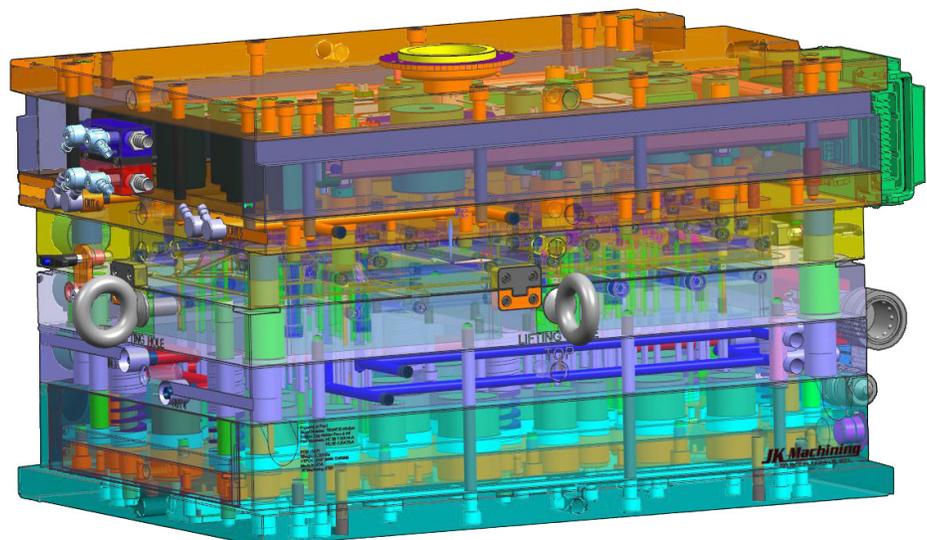
### Class 101 mold experts

Founded in 1980 and located in Kalamazoo, Michigan, JK Machining specializes in the design and manufacturing of plastic injection molds. The company primarily serves the automotive and medical device industries. JK Machining's automotive customers are Tier 1 and 2 suppliers producing mostly interior components – air conditioning outlets, trim bezels, cup holders, and other interior components.

JK Machining focuses on class 101 molds – extremely high-production molds with fast cycle times, made from the highest-quality materials and designed for one million or more cycles. The industries served by the company share some of the same trends: their demands for higher quality require better mold parting lines, better finishes and tighter tolerances. The underlying issues for both automotive and medical customers are quality, delivery time and cost.

### Shrinking delivery times, improved quality and lower costs

"We used to have 18 to 22 weeks to build a tool for automotive," says Henry Kalkman, president of JK Machining. "Now that's down to 10 to 12 weeks. All of our customers want



## Results

Seamless mold making process – from design to finished molds

Reduced average mold development time from 20 weeks to 11 weeks

Automated the entire mold manufacturing process

Reduced programming time from hours to minutes

Efficient design change management

Reduced machining time by up to four times using 5-axis capabilities



to get to market faster. Offshore moldmakers have an advantage in cost, and are bringing up their level of quality – they are our main competitors.”

JK Machining meets these challenges head-on with state-of-the-art technology and a team of 15 dedicated employees with deep expertise in mold design and manufacturing. The company operates a manufacturing shop with advanced-capability machine tools including high-speed machining centers, grinders, mills, and electrical discharge machines (EDMs).

### **Gaining an advantage with leading-edge technology**

Several years ago, JK Machining sought to upgrade its computer-aided design and manufacturing (CAD/CAM) capabilities to

improve efficiency and competitiveness.

The company selected NX™ software from Siemens Digital Industries Software, which includes leading-edge CAD and CAM capabilities and specialized mold design tools.

Formerly, JK Machining had used separate software systems for mold design and manufacturing. To move from design to production required the company to export data from the design system in a neutral exchange format, then import the data into the CAM system for numerical control programming. This transfer and translation of data introduced additional steps and errors in the process that hampered productivity. Furthermore, the data translation and transfer steps complicated the handling of inevitable design changes, which are difficult to track and implement correctly through the convoluted process.

*“Automation and continuous improvements using NX helped us build a reputation for delivering highest quality molds on time. That’s how we stay competitive and grow our business.”*

Henry Kalkman  
President  
JK Machining.

JK Machining's previous NC programming software solutions lacked key capabilities that limited the types of jobs the company could undertake. When JK Machining acquired high-speed, 5-axis machines, the NC programming software proved to be difficult to operate and to customize to better address its specific requirements for speed and efficiency.

JK Machining selected NX based on several key characteristics of the software. With its fully integrated capabilities, NX offered automation of the entire mold development process, from design through manufacturing. The CAD tools of NX include powerful functions for working with geometric models provided by customers, as well as mold-specific capabilities that support an efficient best-practice workflow for mold design. For NC programming, NX CAM software delivered leading-edge tools for 5-axis and high-speed machine programming that would enable the company to take full advantage of its advanced machine tools. With this integrated system, JK Machining established a digital thread that enabled process automation throughout design and manufacturing.

#### Developing molds with NX

The typical mold design process at JK Machining begins when customers send CAD models of the parts they want to create and a request for a quote on the project. The CAD models are usually in the STEP neutral interchange format, and JK Machining imports the geometric data into NX. To prepare the quote, JK relies on its extensive experience in mold design.

"I know intuitively what a mold base or a hot runner will cost from past knowledge," says Kalkman. "Our expertise allows us to quickly prepare accurate bids, which is critical in our business."

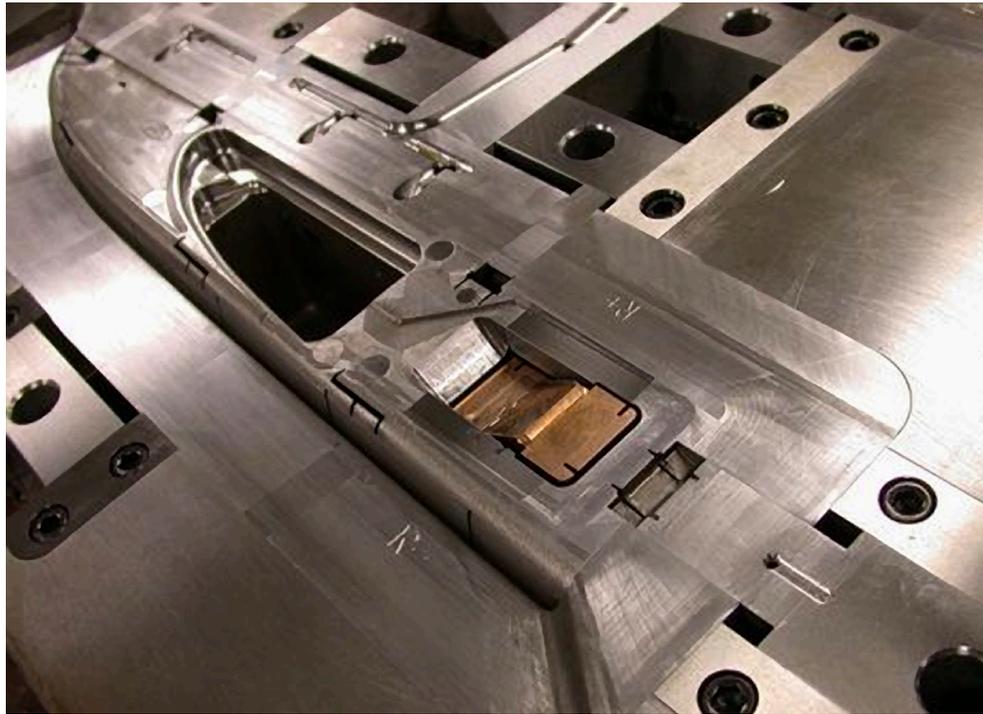
Mold design begins immediately when JK Machining is awarded a project. The company makes extensive use of the specialized mold design tools of NX Mold Wizard to create the mold base and design cores and cavities, runners, cooling lines and other mold features. "Using NX is light years beyond how I used to design molds in 2D," says

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Brian  
Mold Designer  
JK Machining



Brian, a mold designer with 30 years of experience who has used NX for more than 10 years. "The mold analysis tools are great – I can easily identify undercuts or places where we need more draft. I can look for thin or thick walls, and automatically determine the total weight of the mold and its center of gravity."

Brian is enthusiastic about the other automated NX mold design capabilities. "The mold design libraries are real time savers, and we have added to them over the years," he says. "NX Mold Wizard has simplified and automated design changes – when we get a revised part model we can just drop it in, add shrink, compare the old part to the new one, determine what's different and quickly make the needed updates."

"Bill of Material creation is also automated, so I don't have to spend a day compiling that," Brian explains. "We also save time by automating a lot of repetitive tasks using the journaling and macro capabilities. I can do a task once, record it with journaling and save it as a macro to use on my next projects, which can speed up the design process dramatically."



#### Mold manufacturing with NX

JK Machining uses NX CAM to program all milling operations involved in mold manufacturing. The company's production facility includes two Milltronics machines that are used primarily for drilling cycles and roughing, and two high-speed Rödgers vertical machining centers, one 3-axis and one 5-axis, used for finishing mold cavities and cutting electrodes for electrical discharge machining.

The numerical control (NC) programmers at JK Machining work directly from the CAD model of the mold and use NX design functions extensively to prepare models for machining and to design electrodes. The CAD tools are used frequently to extrude,



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unite, and close up gaps. "There's a lot of history in the mold model that we can take advantage of," says Rick, a senior programmer at JK Machining. "For example, if we want to remove all the water lines or bolt holes, we can do it with a single click. Synchronous technology in NX is very easy and intuitive. We use the optimize face capability to heal questionable part geometry we get from customers, and it's a lot easier than going through a multi-step healing process. We can easily move, replace, and offset faces."

The fully integrated mold design and machining of NX can save hours of time on most projects. "We can easily edit in CAD, easily go back and forth between CAD and CAM," says Mitch, a CNC programmer at JK Machining. "With our previous software, we would design a mold, export it from the CAD system, import it into CAM, and when things would go wrong, we would have to do it again."

The advanced NC programming capabilities of NX help make JK Machining more competitive. "With the capabilities of our old software, when we were shown a part, we often doubted whether we could handle it," Rick says. "But capability is not a question anymore. We can address any challenge now – complex parts, deep pockets – we know we have the capability to program them."

### High-speed machining

High-speed machining is a key technology for moldmakers, because higher machine spindle speeds and feed rates can more quickly achieve milled surfaces with a near-mirror finish. "NX is tailored for high-speed machining," Rick says. "With automatic radii and the approaches and exits of toolpaths, it lends itself to very fast and smooth cutter paths. The machine can keep the RPMs and feed rates high, while eliminating sharp corners, sudden stops, and pauses on the steel or graphite."

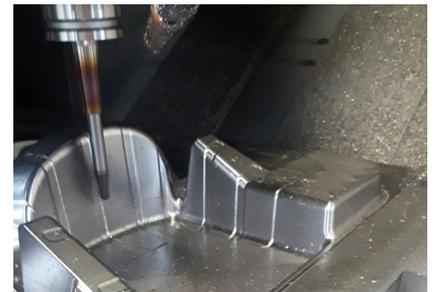
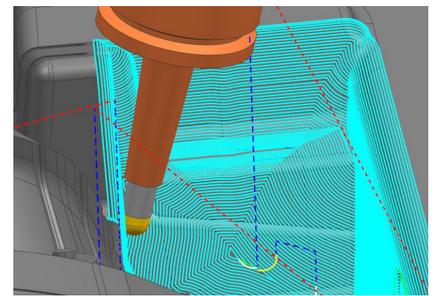
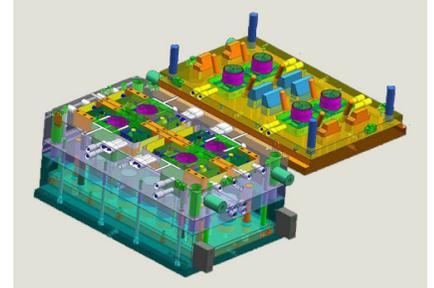
"The finishes are just awesome," Rick continues. "Using the Rödgers machines we can achieve great surface finish on every job. When we get a mold machined, there's no benchwork needed. That saves a lot of time, and it improves the customer acceptance rate."

### Easier 5-axis machining

JK Machining's NC programmers especially appreciate the tool tilt controls in NX CAM, which make it easier to take advantage of 5-axis machining. It automatically converts 3-axis tool paths to 5-axis to efficiently machine molds with deep cavities. With tilted tools, JK Machining can use shorter tools to reduce vibration, minimize tool deflection and improve surface finish. "Without tool tilt, we would have to take the cutter to the grinder and relieve the neck," Rick says. "When you're cutting an electrode with a .032-inch diameter cutter that's hanging out an inch and a half, you have to slow down the feed rate by a third and take smaller cuts. Everything's slower using the traditional machining. But with the 5-axis tool tilt method in NX CAM, we improve molds quality while reducing machining time by up to four times." Mitch likewise appreciates the capability: "Tool axis tilt is unbelievable. It makes a world of difference in what we are able to do, and we can take on a lot of projects now that we couldn't take on before."

### Powerful, flexible, versatile NC programming

With high levels of user control and many options, the advanced 5-axis milling of NX gives JK Machining's programmers greater flexibility to maintain high feed rates and fine finishes. "The flow cutting method, which we use for rest milling, is just perfect for mold machining," Rick says. "There are so many options to get the right tool-path – you can start from the top or work your way from the bottom; work outside-in or inside-out. We could not achieve the same results with our previous software. With NX, we can always get a good cutter path."



## Solutions/Services

NX  
siemens.com/nx

### Customer's primary business

JK Machining designs and manufactures plastic injection molds. Since 1980, the company has served the automotive, medical and electronics industries. JK Machining specializes in hardened, inserted, close-tolerance class 101 molds and is ISO 9001:2000 certified. [www.jkmachining.com](http://www.jkmachining.com)

### Customer location

Kalamazoo, Michigan  
United States

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### Automation saves time, improves programming efficiency

NX includes many tools that JK Machining leverages to automate and customize mold design and manufacturing. Process templates help the NC programmers ensure the use of proven cutting methods and tooling. "With process templates I never worry about having to enter the same parameters for every job, like the diameters or depths of cut, or feeds and speeds," Rick explains. "I can re-use saved templates to kick out a tool path in a matter of minutes, instead of an hour when I have to think about the depth and the side wall and the scallop size. We have a library of templates of proven machining cycles, including roughing, semi-finishing and finishing, so the NC programming is automated. It makes machining much faster."

### Customization tailors capabilities, automates repeatable tasks

JK Machining also values the open automation and customization tools that enable the company to tailor NX to its specific requirements. "I like the way that NX supports different programming languages," Rick says, "so if I'm writing a journal file to automate repeated steps I can choose my preferred language." Creating machine-

specific NC programs is another important aspect that Rick appreciates: "When we got the 5-axis machine, I couldn't modify the postprocessor with the previous specialized software. However, the NX Post Builder is totally open and I can easily tweak the post. Using the fine-tuned posts, we can get the right programs to make machining faster and better."

### Long-term success

Kalkman summarizes the impact that NX has had on JK machining: "NX works flawlessly. We have been using the software for a long time and we've seen a lot of changes over that time. In the past we were just using 3-axis machining and now we're using 5-axis machining. We are already looking into robotics to further automate the process. Automation and continuous improvements using NX helped us build our reputation for delivering highest-quality molds on time. That's how we stay competitive and grow our business."

## Siemens Digital Industries Software

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