Metalworking

Mitsubishi's MC5100 Grade Series Inserts Offer Next-Generation Cast-Iron Turning

Donna Behen | Jun 24, 2025

When it comes to high-volume cast-iron machining, tool performance is critical. *Cutting tools account for just 3 percent of total manufacturing costs*, while machine time, labor and overhead make up the rest.

That's why using inserts that run faster, last longer and reduce downtime delivers real value, says Brian Jewell, training and technical support supervisor with Mitsubishi Materials.

> **"The magic is in the science of the coating. That's what allows us to run faster for longer to reduce cycle time, and ultimately optimize cost per part for the end user."**
> Brian Jewell
> Mitsubishi Materials

"Our ***MC5100 series of inserts for cast-iron turning***, which we released in the spring of 2024, meets those requirements and is able to successfully machine all types of cast-iron materials and component geometries," Jewell says.

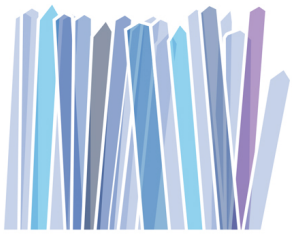
Inserts with Advanced Coating Technology

As with ***Mitsubishi's steel-turning inserts***, the multilayer aluminum oxide coatings are created with what the company calls "Super Nano Texture Technology"— an innovative process that increases tool life and resistance to wear and fracture.

"The magic is in the science of the coating," Jewell says. "That's what allows us to run faster for longer to reduce cycle time, and ultimately optimize cost per part for the end user."

The Super Nano Texture Technology developed by innovators at Mitsubishi in Japan involves growing the crystal structure of the coating straight up and down, rather than in an unorganized fashion, which is what helps the insert last longer, especially under high heat.

Conventional CVD inserts



Nano Texture

"Super" Nano Texture

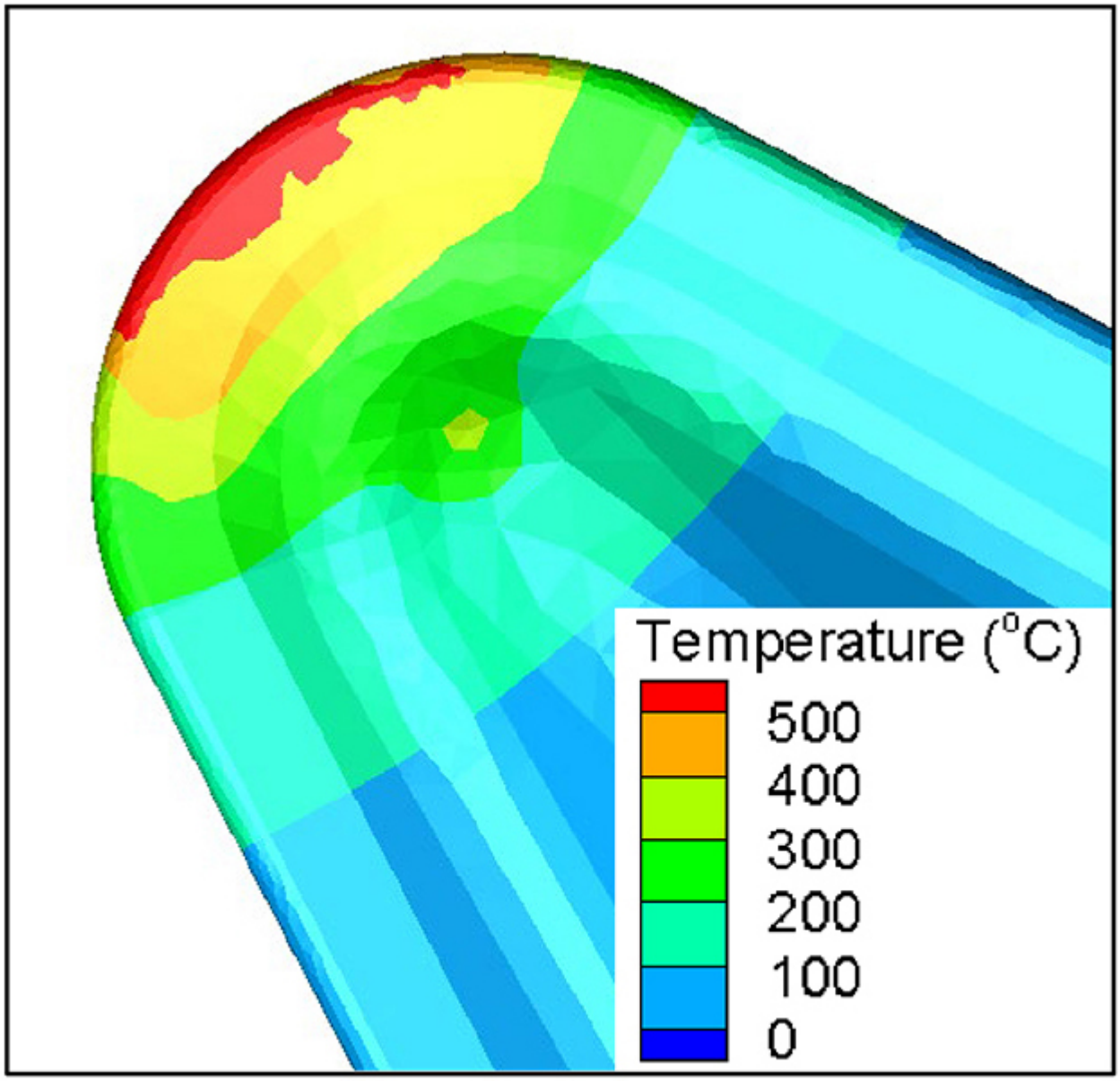
Super Nano Texture Technology is the highest level of crystal orientation control, which grows crystals more densely and uniformly. This dramatically improves wear resistance, leading to longer tool life.

“You can think of it as the difference between just throwing a bunch of items in a box and neatly stacking everything in a box,” Jewell explains. “You’re generally going to get more items in the box if you stack them than if you just throw everything in there, and that’s the way this works.”

The dense, uniform structure of the crystals is what creates a thicker aluminum oxide coating on the carbide substrate, he explains.

Three Inserts in the Series

The ***MC5100 series*** offers three grades that are built for resisting the heat and abrasiveness typical of cast iron and cover everything from steady machining to highly interrupted cuts, making them ideal for diverse cast-iron applications in ***automotive***, pump manufacturing and precision engineering.



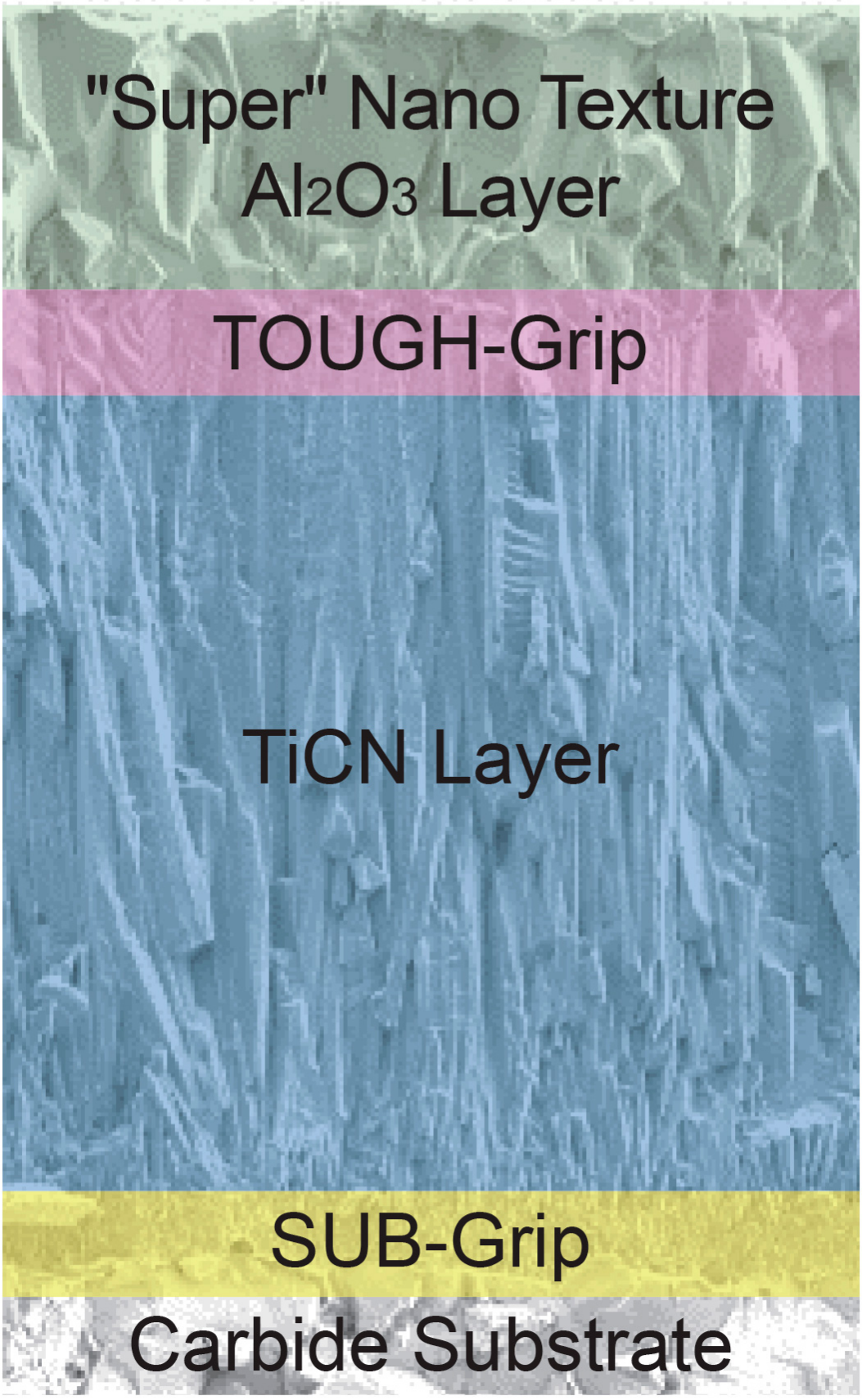
An example of insert cutting edge temperature distribution.

"The **MC5105** grade is ideal for the most steady applications," Jewell says, such as high-speed cutting of gray cast iron. "It's going to offer the most tool wear because it has the thickest layer of aluminum oxide for cast iron, since you're generating a lot of heat when operating at higher speeds."


"Super" Nano Texture
Al_2O_3 Layer
Super TOUGH-Grip
TiCN Layer
Carbide Substrate

MC5105, suitable for high-speed machining of gray cast irons, features a thick aluminum oxide layer for long tool life and a Super TOUGH-GRIP layer to prevent coating peeling.

Cast iron is a short-chipping material, he explains, meaning it breaks into smaller, more compact pieces when it’s machined. “So although chip control is important, it’s not quite as critical as it is in some other materials. So we’re really trying to target that heat resistance here,” he adds.


"Super" Nano Texture
Al_2O_3 Layer
TOUGH-Grip
TiCN Layer
SUB-Grip
Carbide Substrate

MC5115, suitable for low-speed cutting of gray cast irons, features a thick TiCN layer that offers high wear resistance in low-speed machining and two TOUGH-GRIP layers that increase the degree of adhesion by 1.3 times.

For general-purpose machining of ductile cast iron, the **MC5115** grade offers four layers of coating, including two gripping layers. “This would probably be your first choice in most cases, where you’re unsure of what an application is going to require or how difficult it’s going to be, but you know you’re going to need a cast-iron grade,” Jewell says.


"Super" Nano Texture
Al_2O_3 Layer
TOUGH-Grip
TiCN Layer
SUB-Grip
Carbide Substrate

MC5125, suitable for heavy interrupted machining of ductile cast irons, features TiCN and TOUGH-GRIP layers that have been optimized for unstable machining.

The third and newest grade, the **MC5125**, represents an expansion in the series since there are only two grades in the older 5000 series of cast-iron inserts, Jewell says.

Like the 5115, the 5125 also has four layers including two sub-grip layers, which improve the resistance to delamination. But in addition, those layers have been optimized for interrupted applications, such as machining ductile cast-iron gears, so that you can disperse the impacts in a nonuniform pattern.

"If we create a pattern where the impact disperses the same each time, then that creates a wear line and the insert can crack much faster," Jewell explains. "But the Super Nano Texture layer helps prevent that because it disperses those impacts nonuniformly, so it doesn't create a wear line as quickly."

Options for Chip-Breakers

The MC5100 series includes a variety of chip-breakers—the features on the top of the inserts that help control and break up chips during machining.

The main breakers for this line are LK, MK and RK, which stand for "light for cast iron," "medium for cast iron," and "roughing for cast iron."

Mitsubishi also offers a flat top chip-breaker, Jewell says, "because in cast iron, you're trying to run fast, and a flat top gives you the most edge strength since the thickness of the insert is the same on the corner as it is in the center."

Another innovation from Mitsubishi involves a small change to the mounting of its negative inserts. "We increased the face contact area between the insert and the screw from the traditional 9 square millimeters to 31 square millimeters," Jewell says. "That change in the breaker design allows the insert to sit flatter on the holder and be tightened down more securely. As a result, we get more clamping force, and the insert stays firmly in place without shifting."

Jewell says Mitsubishi is in the process of phasing out the older 5000 series cast-iron grades and replacing them completely with the new 5100 series. By September 2025, all previous 5000 series grades will be discontinued, and manufacturers will need to transition to the newer high-performance 5100 series inserts.

What's your biggest challenge when machining cast-iron components? Tell us in the comments below.