

The Multifunctional Option Toyota's Gear Skiving Center Offers Skiving Alternative

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Toyoda's new GS300H5 Gear Skiving Center is the first in the world to equip a skiving function to a general purpose horizon-tal machining center (HMC), through which mass production of gear parts is achieved. CNC controls and a high speed rotary table were developed specifically to achieve high-speed, multi-functional machining, as a compact and lightweight product, simple in programming functions. The single-chuck machining of the GS300H5 Gear Skiving Center integrates all gear part machining processes for a more functional and cost efficient shop floor.

Will Terry, product manager- special purpose machines at JTEKT Toyoda Americas Corporation, says this machine is designed to replace your turning operation, replace any kind of hobbing or shaping that you're doing and also replace any kind of milling.

"We're going to do this all in one setup," Terry said. "There's no longer a stack-up of errors from chucking and chucking and chucking and chucking. It's really what we had to bring to the table. Our high synchronization speed is what makes this all possible."

The GS300H4 and GS300H5 offers a range from 30 mm and 300 mm diameter, a huge window based on the industry research Terry has done in the field.

"Furthermore, we're synching the work axis and tool axis at 3,000 rpms and 6,000 rpms, it's not just spindle capability, it's not just how fast they can turn, we can actually synchronize the cutting action at those speeds and that's where the skiving comes in. It's also what gives us the capability to go as low as 40 mm on the internal diameter for skiving which is a lot smaller than a lot of the big players in the market," he added.

Machine experience and construction is at the center of this technology from JTEKT. The machine is built on the company's reliable 500J platform, an HMC that can be found in many shops across the country.

"You want a super rigid, proven technology to work with for skiving, and this machine is built on these concepts," Terry added. "We spent 10 years using this process internally at

Torsen Traction before bringing it to market. These machines have seen a lifecycle of 10+ years in a high production environment before making their official debut at IMTS 2016."

These machines have been out in the field making gears in the United States as well as Japan during that timeframe. "The experience and success we've had internally gave us the green light to make the system available to the general public," Terry said.

They are currently working on some machines that will go up to 700 mm in diameter, specifically for the oil and gas and general energy market, attempting to develop the capability to make those bigger module gears.

Another selling point for the machine is for a manufacturing company that simply wants to test the waters in gear making or they have a ton of part families that are lower volume.

"Our customer can store programs like any other CNC machine tool, we could engineer up to 300 tools on this machine, we might have to change the fixturing, but we might not. So if a guy wants to get into gear-making, he doesn't have to go buy a lathe or a hobber or a shaper, I have one compact machine that will do all these things for you in a single machine footprint," Terry said.

Terry discusses a scenario where a manufacturer might be utilizing five pieces of equipment in a high-production environment. "You're going to have spare parts for each of these pieces of equipment. I only need spare parts for one machine! The spindles are all not going to go down at the same time. The hydraulic valves are not going to go down at the same time. I've possibly reduced your spare parts inventory by 80 percent," he said.

The other advantage is maintenance and training. If you're working with multiple pieces of equipment, you have to train employees on a lathe, milling machine, gear hobber, and so on. Here, a customer only has to train the maintenance personnel on a single machine tool. The same goes with operator training. They learn one machine and they know the whole line. According to Terry, this will likely result in fewer crashes and incidents.

Performance-wise how does this compare with dedicated skiving equipment? Terry said that the synchronization speed compares to most dedicated machines and the machine construction might give the GS300H4 and GS300H5 an edge.

"Some of the dedicated equipment seems pretty lightweight and delicate," Terry said. "We have a three point leveling system, Meehanite casting on this thing. We don't use the mineral epoxy some of the competition uses. My casting is strong enough to support it. It's a huge selling point if you have a foundation that settles."

As the gear industry evolves, Toyoda is striving to develop new processes and products that will enhance the manufacturing community. The gear skiving machine is just one example of this, and an example that Terry believes will help produce parts with more accuracy, less cost and less risk to the manufacturer. 

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In recent years, the energy saving needs of vehicles has led to an increase in demand for gears to be compound and compact in accordance with hybrid vehicles and multistage automatic transmissions.