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Stay Lean, Invest in the Right Tools, Be Efficient

For this shop, the road to competitive success requires a lean organization, efficiency and investing in the best technology — technology that doesn't increase overhead but brings enhanced flexibility and efficiency

WESTON, ONTARIO, CANADA —

Hendriks Precision Grinding Ltd. was founded in 1964 and has grown to 13 employees and 10,000 sq ft. President A. J. Tersigni, P.Eng., took over the reins in 2000 with the vision to create a lean, efficient precision grinding operation that primarily served the mining industry. “We grind new and reconditioned rock drill components,” he says. “We specialize in precision grinding, and while our emphasis may be on internal grinding, we also do cylindrical, surface, and profile grinding.”

An analogy that works

Tersigni thinks of Hendriks Precision as a “tripod.” “One leg is our lean operating philosophy, keeping overhead low and eliminating waste. The second leg is operational efficiency.

The third is investing in superior technology to increase flexibility and create greater opportunity.”

Tersigni continues, “The goal is to remain a balanced operation that is flexible enough to meet our customers’ constantly changing needs. For example, when customers have an emergency—like a breakdown on a key piece of equipment—we need to be able to respond quickly. That’s the nature of this business. The key to survival is to remain lean and efficient while maintaining the flexibility to perform quick turnaround on short notice jobs. Pursuit of technological advancement is the only way companies can achieve this goal.”

Bolstering the technology leg

Tersigni says that when he took over, he wanted to get into production work, but Hendriks had mostly manual and semi-automatic machines. Entering the production arena would require more flexible technology. The change came in the form of a Studer S33 universal grinder from United Grinding (Miamisburg, OH). ”

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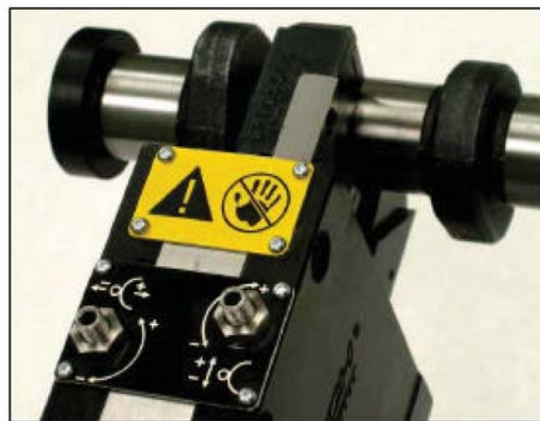
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Modular design for quick setup and changeover, state-of-the-art digital control and drive systems and user-friendly step-by-step programming make the S33 a flexible solution for a wide variety of internal and external cylindrical grinding applications.

Center height is 6.9 inches (175 mm). Between-centers grinding length is either 25.6 or 39.4 inches (650 or 1,000 mm). OD wheel size: 19.7 inch (500 mm) ϕ x 3.1 inch (80 mm) wide x 8 inch (203.8 mm) bore ϕ . Chuck capacity between centers is 287 lbs. (130 kg).



Joe tweaks in wheel clearance on a part with a 20" through-bore

The S33 grinder features the latest generation UniDrive MFM high frequency internal grinding spindle. The spindle turns this universal cylindrical grinder into an effective internal grinding machine with high torque over a wide speed range. The machine can now grind with speeds up to 120,000 RPM, thus allowing the grinding of bores down to 0.625 inches (16 mm). A "flat" torque curve on this type of spindle means fewer spindles over a larger speed range. This reduces setup time and investment costs.

"The most impressive feature of the S33 has been the repeatability," says Tersigni. "It will be a year in May since we took delivery of the machine, and I'm still astounded by this. Not only has it given us the capability to do production jobs competitively, it has caused us to rethink our manufacturing strategy, allowing us to offer high production and reduce our times on standard jobs."

Tersigni adds that the reason they took the option of the high-frequency deep bore spindle was to accommodate the body of their most common rock drill. "The deep bore

spindle is unique to our machine," he says. "The cylinder itself has a 4.500 inch diameter bore which steps up to a 4.875 inch diameter bore. The part is 20 inches long. Prior to the S33, we ground these parts manually on a dedicated internal grinder. To make matters worse, the part is off-center. The cylinder runs on slides, so it's not perfectly round."

Tersigni describes the job as the cylinder for the rock drill. It's more like a jackhammer, he says. The cylinder runs in and out and the piston inside runs back and forth, up and down and at the same time twists. "It's a complicated internal grinding job, and we hold tolerances of 0.000,500" in lots of 50. The S33, however, can run 0.000,100" all day long. We also do pump shafts, which come in lots of 1000, but those are all OD work. We also do pinch rolls, again in lots of 50. The important thing about the S33 is that it gives us the flexibility to adapt. Since you never really know what's coming next, you've got to be very agile to shift with the flow. With manual grinding machines, as good as many of them are, you just don't have the agility or facility to react to the immediacy of some of your customer needs."

S33 overview

The basic wheel-head on the S33 can be indexed at 0° or 30° for straight and angular plunge grinding, respectively. A universal turret wheel-head swivels manually or automatically, permitting external, internal and face grinding in a single setup. Optionally, the machine features a high precision Hirth coupling B-axis with a 1° indexing capability. The turret head repeats to within 0.08 arc seconds, allowing for extremely accurate ID to OD run-out and concentricity.

V and flat guideways are coated with abrasion-proof Granitan S200 and provide high vibration dampening and superior rigidity. The machine base of Studer-developed Granitan S103 delivers outstanding vibration dampening, rigidity and strength, as well as excellent chemical stability and thermal compensation.

Axis	Travel		Speed		Resolutions		Distance between guideways	
	inch	mm	in./min	mm/min	inch	mm	inch	mm
X	11.2	285	200	5,000	0.000,004	0.000,1	11	280
Y	45.3	1,150	400	10,000	0.000,004	0.000,1	7.8	200

- Z axis table tilts up to 8.5° for high precision grinding of tapers.

Grinding Spindle

Power		Peripheral Speed		
HP	kW	inches/sec	m/sec	
10	7.5	1,800	45	Infinitely adjustable up to 120,000 RPM

- High-precision roller bearings for precise, high-resistance, maintenance-free operation

The operator can set wheel dressing intervals following these simple methods: by pressing a button at any time during any grinding cycle; after a programmed number of specific machined parts or grinding operations; at programmed switchover points; at the programmed nominal size; after a specific number of strokes - or a combination of these, permitting the optimum solution for the specific grinding application.

Grinding wheel reference points are referred to as "T" numbers, and together with Studer grinding cycles, "T" numbers permit programming with nominal sizes. The actual value indication on the control LCD refers in each case to the programmed wheel reference point. Values of the grinding wheel shape are entered in a dressing dialog display at the control.

The S33 features state-of-the-art Fanuc 21i digital control and axis drive components. Studer's innovative step-by-step "Pictogramming" makes machine operation, setup, changeover, dressing and programming of even complex parts easy. The operator simply connects grinding cycles to one another and adds necessary numerical values. The control then generates the machine program automatically. You can program directly at the machine or off-line and then downloaded to the machine control. You can also change process parameters on the fly, while the machine runs, without affecting the workpiece program.

Workhead

Roundness adjustment during grinding		Roundness Tolerance		Straightness Deviation	
Inch	µm	Inch	mm	Inch	mm
+/- 0.002	+/- .40	0.000,02	0.000,4	0.000,1	0.002,5

- High-precision roller bearings
- Handles grinding between dead centers as well as live grinding with revolving spindle.



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The S33 control package features proven application-specific Studer grinding cycles for diameters, shoulders (left and right), tapers (negative and positive) and contours.

"The Studer software package has really made things more efficient," says Tersigni. "The operator can pre-program the next job and have it waiting in queue while the machine runs production. This makes changeover very fast and smooth. We use the Studer Profile software on occasion, but really rely on the Studer GRIND option. We could get by with Studer GRIND alone; it's simply a great way to enhance grinding efficiency."

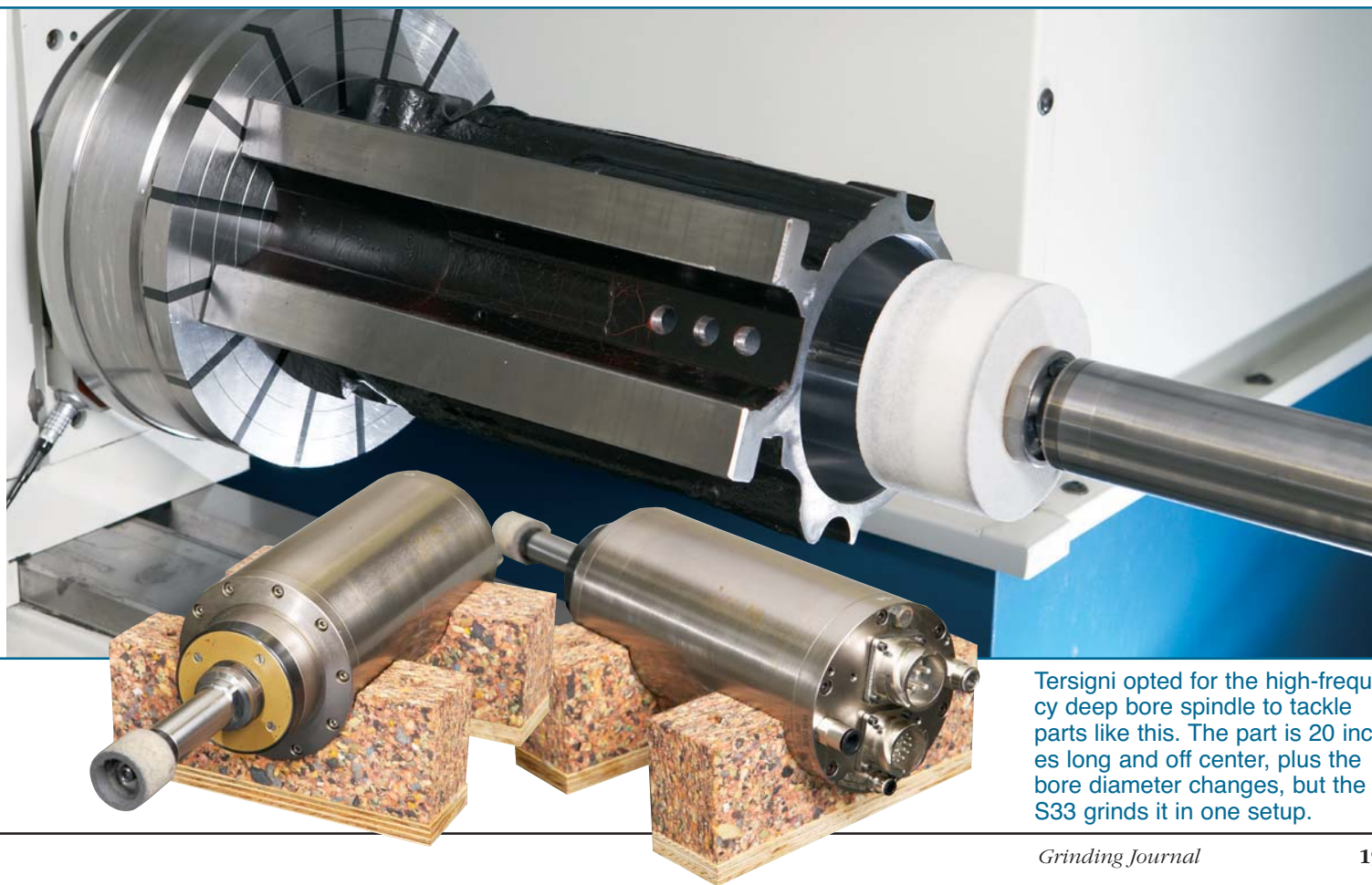
Standby

Tersigni says the S33 is rarely idle. "We have a standby feature where the machine idles at night and then a program starts the machine up one and half hours before the employees come in. So, basically it's been running for an hour and a half prior to anybody operating it. When they get in it's up to temperature and ready to go. The operator loads our programs the night before, further reducing start-up time. Once he hits the cycle start, we're off and running. We try to utilize every moment that we possibly can on the S33."

He notes that he has another CNC grinder, a large CNC surface grinder, and then 22 other grinders, all manuals, ranging from universals to dedicated internal and cylindrical grinding machines. But the Studer has really rounded out their capacity and capability.



Hendriks' Magicians: "We run very much like a family. When we have to pull a rabbit out of our hat, we make it happen."



Tersigni opted for the high-frequency deep bore spindle to tackle parts like this. The part is 20 inches long and off center, plus the bore diameter changes, but the S33 grinds it in one setup.

"We've now been able to reach out to other customers and other fields," says Tersigni. "Our sales have been increasing steadily, as well as our customer base, because we're now able to offer more service — like very quick turnaround. Two weeks isn't good enough anymore. Our customers have come to expect rapid turnaround, and we've become accustomed to that kind of pressure. This is one of the things that separates us from the competition. It's brought us to where we are now, and it's why we stay lean and keep overhead low. If we have to work weekends or evenings to get a job done, we do it. Our workforce is very dedicated; we run very much like a family. When we have to pull a rabbit out of our hat, we make it happen."

Tersigni observes that operations his size and type are all trying to run lean. They understand the criticality of staying no larger than necessary and keeping overhead low. But this comes at a price, and it's not just the pressure. "That's the price you've got to pay today, but an equally important factor is technology investment. The investment is, quite honestly, daunting. But, for example, the S33 has given me a new dimension, a capability I can offer to customers that I couldn't before, and that's a great differentiator. Second, it's really increased the quality of the work that goes out the door, and that reduces my competition in certain areas, which means I can go after a higher level, more elite kind of work. This paves the way to new opportunity for us."

Crazy?

"What really surprises me," Tersigni says, "is that it's been a year since we took delivery on the S33. Had you asked me last year if we'd be looking at acquiring another S33 today, I would have asked if you were crazy! Yet here we are sitting down negotiating a price for another. The first one I got with just about every option. This one will have fewer options because I have a more specific purpose for it. Bottom line, though, investing in technology and running lean is the best way of keeping work from flowing offshore. We've got to remain competitive and invest in the technology that allows us to do the high-precision, close-tolerance work and deliver at the fastest turnaround possible. And that's the edge that the S33 has provided."

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