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Think BIG

Big part manufacturing opportunities abound in energy and resource sectors

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added requirement of material handling devices such as bar feeders, gantry loaders or robots," says Wilker.

Chaphalkar adds, "these machine don't offer just a combination of machining processes, but they also offer the capability of nine axis motion [some up to 12 axis motion], and when you get to this level of machining it is more complex."

This complexity means you need a highly skilled machinist who can grasp the technology.

"What adds the complexity is the number of turrets, not the spindles or the B axis," explains Fischer. "It is the turrets that will get you into trouble with collisions. A lot of machines have two spindles and operators want to have the turrets moving all at the same time. That's fine if you can handle it, but programming two turrets takes longer because you have to program in collision avoidance. A one-turret, multi-function, multi-tasking machine is the easiest."

Machines should be equipped with controls designed for multi-tasking and machining simulation software, advise machine tool builders contacted for this story. "The more complex the machine, the more difficult it is to check interference between the component and the machine, or the component and the spindle, so the machine needs to be set up with good software, good machining solution, very good CAD/CAM systems, and post processing," adds Colombo. SMT

Multi-Tasking In Grinding

If your shop performs grinding, chances are you've looked at hard turning as an alternative to purchasing a stand-alone grinder. And it's a viable option for some shops, but it also opens up new challenges, says John Manley, president of Machine Tool Systems Inc., Toronto, a machine tool distributor that specializes in multi-axis CNC grinding machinery and accessories. The company is the Eastern Canada distributor for United Grinding's line of grinders.

"The number one challenge is tool life. A manufacturer is often encouraged to go hard turning and it works great for some simple attributes, but if at the fifth part the insert gets a chip in it mid-component, you either have a scrap part or a part that you have to take out and correct on a grinder. If that's a $1000 part, what you've saved in grinding you've now lost as scrap. That's because in hard turning, you can't go back and take a second pass; you need to bury that insert to finish size. In grinding, you can do any number of passes on a part. The super abrasives allow you to do that."

It is this flexibility that has helped advance multi-tasking grinding machines, but they're not for every manufacturer. Indeed, Manley says to consider these machines, which can include milling, turning and polishing functions (e.g. Studer S242 in image at right), a manufacturer must have a significant amount of grinding with a small percentage of cycle time (5 to 10 per cent) devoted to milling and/or turning.

"If it gets up to 20 per cent, you're using a capital-intensive machine to do a simple operation, but for those applications with a small percentage of cycle time for milling or turning there is value add because the component is processed in a single clamping. Traditionally, parts leave a lathe with sufficient stock to clean up clamping runout in the next operation (i.e. grinding). With multi-tasking, hard turning can be performed to near net shape as grinding is used only to kiss the part to critical sizing and surface finish. The injection mould industry is a perfect candidate for this multi-tasking machine."

What makes multi-tasking grinders possible today is development of super abrasives and closed loop processes, says Manley.

Since super abrasives are fixed and hold form tolerances much longer, it allows for more sophisticated machining of complex parts. "Today, we have machines with multi-stations, equipped with a turning station on a turret and another station for grinding, internal, external or even out-of-round/thread grinding, and a third station with live tooling for milling."

A closed loop system is essentially smart technology that can read in-process and post-process machining functions and compensate for any parameter deviations. The machine is equipped with sensors that measure "accoustical emissions" from an insert (in a turning and grinding machine) used in the previous part. If something deviates from that reading, the software senses it and allows the manufacturer to bring in a fresh insert, or send the part to reject, do a tool change and start with a new part.

With post process machining parameters, in a grinding and polishing machine for example, "you don't want to bring that wheel to an inconsistent amount of stock removal because it will destroy the wheel and burn the surface. What the machine does [the Studer CT960] is bring in a probe after we've ground the contoured bore and the probe digitizes the form we just ground, feeds back the stock allowance to the polishing program which then compensates for inconsistent stock throughout the profile. The carbide die industry, including artillery shell casing dies, consumer goods canning dies, fastener dies and wire draw dies are all proven sectors for this technology. There's nothing like it in the world and it's a game changer for industry," says Manley.

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