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2000 CNC GENSUS

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Universal grinding or complete machining?

Despite what they claim, job shops and manufacturers are not able to provide universal grinding services.

According to Webster's dictionary, the term "universal" is defined as "including or covering all... without limit or exception." Traditionally, any machine with centres, an OD and an ID spindle, has been considered a universal grinder. Today, though, there are new features available that redefine a grinder as truly universal.

Grinders today have greater flexibility than before, thanks mainly to recent hardware and software advancements. Some features, along with their benefits, follow:

- *Automatic multi-spindle turret wheel heads* offer OD, face and complex bore grinding in an unattended, single clamping, while easily maintaining concentricity between faces, diameters, tapers and bores.

- *Infinitely variable turret indexers*, using Hirth serrations and cam gearing for fine radial adjustment, allow multi-taper shafts and contoured bores to be ground without complex wheel dressing.

- *High-accuracy indexing workheads* allow machines to generate very true out-of-round forms. Form generation of eccentrics, polygons, oblongs, cams and relief are now possible due to recent advances in dynamic direct drives, high-resolution measuring systems, high-speed serial buses, and fiberoptic cables. PC-based cylindrical grinders can now generate complex and extremely accurate free profiles from simple pictogramming and CAD-driven software.

- *High speed machining (HSM)* is the next major step forward. Already used in the mould manufacturing industry for high speed milling, this extremely efficient technology is establishing itself in form grinding. In the past, the maximum rotational speed of a workpiece was one to four r/min. Depending on the shape of the piece, HSM permits grinding speeds of between five and 120 r/min. This r/min increase has resulted in cycle times that are three to ten times faster. High r/min has also allowed the grinding process to run cooler, providing far superior

ing feature, to ease setup.

- *Acoustical sensing* of the air gap between the grinding wheel and the workpiece/dresser is achieved with excellent accuracy today. This feature provides the process with the necessary feedback to reduce the non-productive air time associated with approaching the part. In cast parts with dimensional variations or collected parts with drawback, the savings are dramatic.

- *Complete machining* is the integration of the above capabilities. Only the truly universal grinder will offer this flexibility. The days of

Reduce setup, minimize scrap and free up skilled operators with the advanced universal grinder.

outer edges. Punch manufacturers, in particular, have quickly embraced HSM. High stress internal applications with out-of-round forms benefit dramatically from HSM as cycle times are drastically reduced.

- *Thread generation* is now possible by using parallel-axis thread grinding. The grinding wheel is not inclined to the helix angle, but rather remains in a vertical position so that its rotating axis is parallel with the infeed axis. Such grinding requires compensating profile-distortion software for dressing of the wheel form. Probing of the thread's radial start point from a pre-turned condition is often married to this interest-

milling, turning, thread rolling and indexing heads, followed by grinding of components, is quickly passing as complete machining in one setup gathers acceptance.

Grinding job shops need to reevaluate their investment strategies. As their customer base diversifies and applications broaden in scope, having a true, universal grinder with complete machining capability could prove to be very lucrative.

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