



CANADIAN MACHINERY AND

metalWORKING

MACHINE TOOLS : FABRICATING : TOOLING : WELDING CANADA

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*THE FUTURE OF
AEROSPACE*





HEDG your bets on the future

A new grinding process, known as High Efficiency Deep Grinding, or HEDG, promises to provide true abrasive machining and give conventional cutting tools some tough competition in the near future.

HEDG is just one more advancement in a series of recent dramatic changes in grinder design. Likewise, in process development, we have seen grinding wheels move from conventional abrasive technology to superabrasives.

In the battle for cost savings, many manufacturers have found creep-feed grinding — where relatively deep cuts are taken at feed rates of 0.04 to 1.2 in./min — to be a boon to productivity. But, it has its limitations. The process peaks at about 8,500 sft/min.

However, recent research has found that when creep-feed grinding is done at 20,000 sft/min and above, an interesting phenomenon occurs — workpiece materials mysteriously change and tremendous metal removal rates (MRR) are realized. The results are MRR of 5 to 200 in.³/min, per in. width of wheel, compared with 0.01 to 1 in.³/min, per in. width of wheel with conventional creep-feed grinding. This is the process known as HEDG.

HEDG has been researched domestically at upwards of 40,000 sft/min and is now reported to have broken 100,000 sft/min in Europe. Due to extreme sft/min, the following machine and process characteristics are of utmost importance for successful HEDG grinding imple-

mentation: machine rigidity; higher horsepower (150 h.p.); higher speed spindles; superabrasive wheels; high coolant velocity with 400 psi or greater; rotary dressing systems; and in-process balancing systems.

In production, HEDG grinding superabrasive grinding wheels are essential. Ferrous materials require cubic boron nitride (CBN) wheels that are available in a variety of bonds.

Plated CBN bonds use single or very thin layers of abrasive, limiting the truing and dressing options. Plated wheels also require high concentricity between wheel bores and

and excellent form stability. These higher concentration wheels are well suited for high-volume ferrous material grinding where rotary diamond truing is available. Coupled with rotary disk dressers, vitrified CBN wheels can grind to specification accurately, allowing statistical process control to be implemented effectively. Such high concentrations have also required machine tool builders to implement “scrubber lines” that direct coolant perpendicular to the wheel surface at pressures of 300 to 1,000 psi, to provide a more porous wheel for effective chip evacuation. Vitrified CBN wheels,

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profiles. Using plated CBN wheels, traverse HEDG has become commonplace for manufacturing both diesel engine camshafts and dynamically balanced transmission shafts. Plated CBN accounts for about 60% of the HEDG grinding wheels consumed and currently represents the fastest growing superabrasive market.

Vitrified CBN bonds are structured with clay or feldspar, which fuse at high temperatures to form a glass-like structure. With concentrations from 125 to 200 commonly in use today, these wheels are extremely strong, providing superior finishes

used in plunge HEDG, are successful in eliminating turning for punch and out-of-round component manufacturers. Vitrified CBN is most commonly used due to its high strength and excellent rigidity.

Advanced abrasive machining techniques, like HEDG, will challenge conventional cutting tools in the future.

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