Vertical-Spindle Surface Grinding

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Process Characteristics

Vertical-spindle surface grinding is often thought of as exclusively a roughing operation. While the process is a common first operation on a casting, forging, or weldment, it is also used for fine finishing applications that demand close control of flatness and surface finish. Because the abrasive wheel on those machines are nearly always wider than the work, they are not mounted on cross slides or other devices for the purpose of traversing the wheel across the work. The elimination of those mechanisms contributes to the accuracy of the machine tool.

Grinders of that type usually are equipped with wheel drive motors, which seem to have very high horsepower ratings when compared with other types of grinders. That is because the machines are designed to cut using the entire end surface of the abrasive. The large area of that abrasive face requires a high power wheel drive, even though the cutting forces per unit of area are no higher than in other grinding processes. Fig. 9.1 illustrates a large high powered machine.

Flatness

One unique characteristic of vertical-spindle surface grinding is that the geometry of the work, i.e., its flatness, is generated by the wheel surface and does not rely on a shape that is formed into the wheel by a diamond or other dressing device. That means that, assuming the wheel is properly chosen for the work being done, flatness is not lost as the wheel
wears. If the wheel dulls abnormally, forces can be generated that will alter the machine geometry and flatness will be lost, just as on other types of surface grinders.

**Surface Finish**

Vertical-spindle surface grinding leaves the workpiece with a characteristic cross-hatched pattern on the finished surface. The depth of that pattern is a function of wheel selection, feedrate, sparkout time, and work material. Finishes as good as 1 or 2 microinches RMS can be obtained if proper attention is paid to all of those variables.

Individual abrasive grains leave very long scratches on surfaces produced by vertical spindle surface grinding. That may be viewed as a process flaw or as an advantage depending on the end use or purpose of the ground surface. Fig. 9.2 illustrates the characteristic pattern resulting from vertical-spindle surface grinding.