15 Abrasive belt grinding

During abrasive belt grinding, an endless grinding belt runs on 2 or more rollers (Figure 15.1). The roller, for which the method is named and on which contact between grinding belt and workpiece occurs, is referred to as the contact wheel.

The metal removal rate, the surface quality of the workpiece and the tool life of the grinding belt depend primarily on the contact wheel's design.

Contact wheels (Figure 15.2) consist of an aluminium or plastic core that is coated with rubber, plastics or textile material.

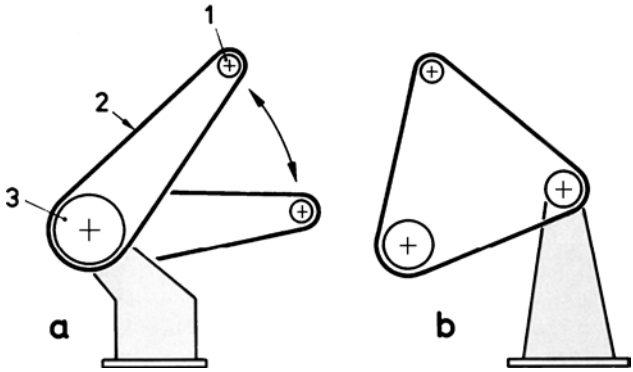

Figure 15.1
Abrasive belt grinding machine-working principle
a) stationary abrasive belt grinder (grinding wheel spindle head)
1 guide roll,
2 grinding belt,
3 contact wheel
b) Universal stator grinding machine with 2 guide rolls and 1 contact wheel

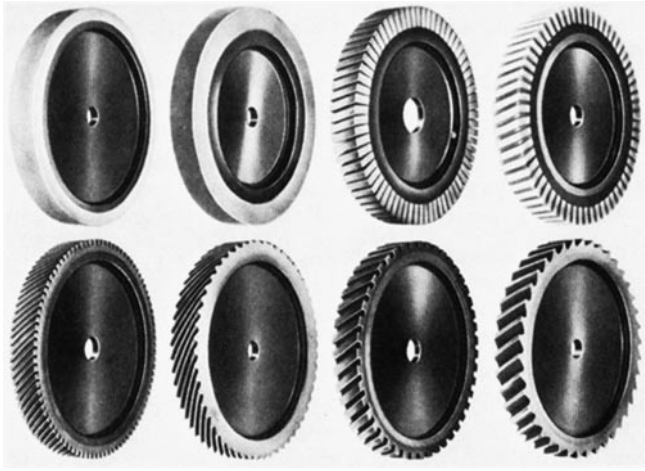

Figure 15.2
Contact wheel design types

The wheel's contact area may be smooth or helical/ double-helical with various angles. The lands are rectangular or saw-like, depending on each range of application. The hardness values of the support pads range from 40 to 95 shores on the shore-A scale.

Hard contact wheels with saw profiles are required to achieve high metal removal rates. Rectangular grooved contact wheels of medium hardness are used for common grinding operations, whereas smooth and soft contact wheels are applied for finishing grinding.

Hardness is the parameter that most affects the grinding result. Metal removal rate increases as a function of increased hardness; however, peak-to-valley height increases, too.

Smaller land widths and greater groove widths, as well as a smaller contact wheel diameter, also result in an increase in the amount of metal removed per unit of time, as well as in a coarser grinding pattern.

The grinding belts have a length of 2 to 5 m. Due to the length, the belt grains can cool down on the return stroke.

The belt grains are uniformly distributed in their bonding material with the tips upward. The gaps between grains are not filled with binder as they are in the case of felt wheels used for polishing.

Since the belt grains are positioned homogeneously and are not surrounded with binder, the grinding capacity is greater than it is for grinding with coated (emery) wheels.

Skin glues, synthetic resins and varnishes are used as binders.

For cooling and lubrication, in contact grinding, spray oils are used (with 5° E or 37° cSt at 20 °C) for manually guided workpieces, flood oils (with 1,6°–4° E) for broad belt equipment and grinding operations that generate a great deal of heat.

Emulsions of water-soluble mineral oils are used for throughfeed grinding, whereas greases are used for grinding of finished formed or cast workpieces, which only need to be polish ground for follow-up electroplating or varnishing.

15.1 Application of the abrasive belt grinding method

Today, abrasive belt grinding, which was originally almost exclusively used for abrasive belt polishing instead of the grinding-wheel spindle head, to which it was considered preferable, embraces almost all grinding techniques. Abrasive belt grinding is often used as a grinding method for finishing, since it is able to generate outstanding surface qualities.

All fundamental grinding techniques, such as flat- and cylindrical grinding, are also implemented as abrasive belt grinding methods.

Since the contact wheels rotate exactly and, unlike the grinding wheel, do not wear out, it is possible with abrasive belt grinding to achieve a constant cutting speed, which is a prerequisite for automated grinding.

Abrasive belt grinding is preferentially applied in grinding of

Ironwork for construction and furniture,
Parts for bicycles and hand tools,

Parts from the flatware industry,
Base plates for irons,
Rotational solids and plane-parallel plates for various industries.

On flat grinding machines (Figure 15.3), for example, metal- and plastic parts are face ground. But centreless circular grinding (Figure 15.4) can also be performed using the abrasive belt grinding method.

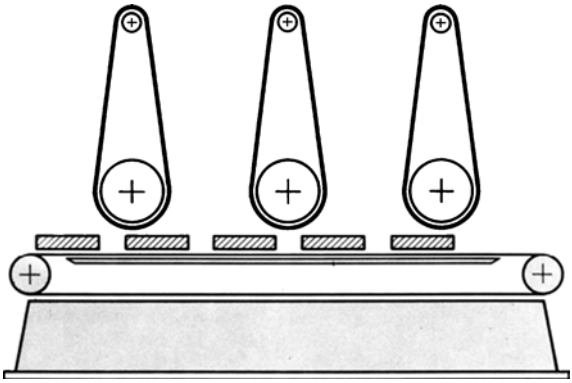

Figure 15.3
Design principle of a partially automated flat grinding machine

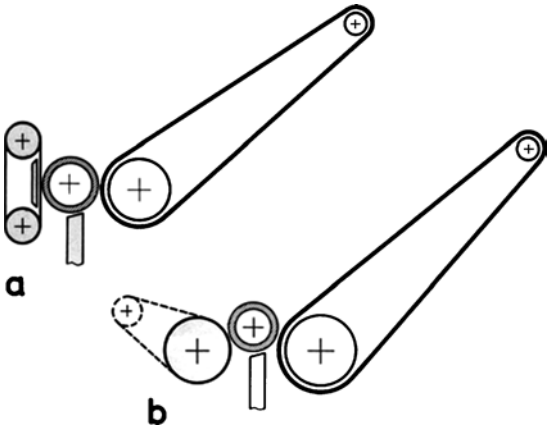

Figure 15.4
Centreless abrasive circular grinders – design principle
a) with regulating belt,
b) with regulating wheel

In abrasive belt grinding, allowances of 0,1 to 0,2 mm are removed. Accuracy to size may be assumed from IT 10 to IT 11, feasible peak-to-valley height is from 2 to 4 µm.