

Optimization of grinding operation

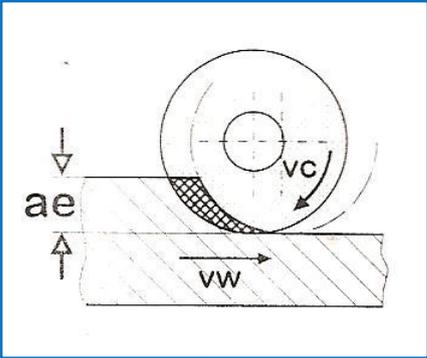
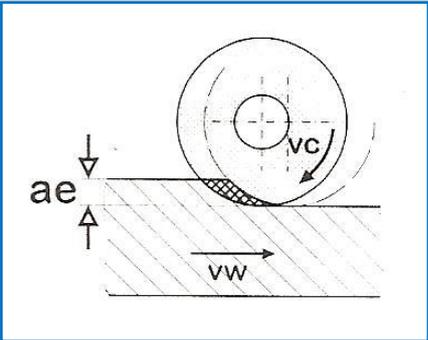
With grinding operation we can achieve various objectives such as surface very well finished, or high accuracy, or tend to a better cutting capacity in order to remove a large amount of material in less time.

But you can also find the conditions for the lowest cutting force and lower heating on a piece that can be deformed.

The parameters that affect the “intensity” of cutting action, ie the load acting on each abrasive grain, and the kind of abrasive, structure, hardness and bonding to the wheel, are the real work conditions and in particular to:

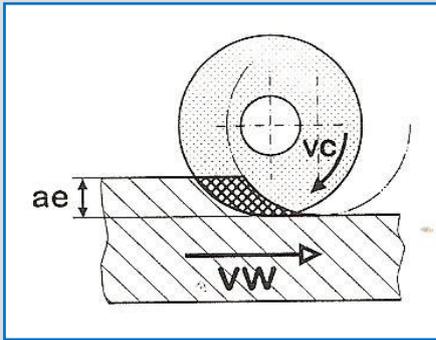
- Depth of cut a_e
- Relative feed between grinding wheel and workpiece v_w
- Cutting speed v_c
- Grinding wheel diameter d_s
- Quality of cutting oil

Each of these parameters more or less strongly influence the behavior of the wheel.

Depth of cut a_e	
<p>❖ <u>if increases</u></p>  <p>A diagram of a grinding wheel in contact with a workpiece. The wheel is rotating clockwise, indicated by a curved arrow labeled v_c. The workpiece is moving to the right, indicated by a horizontal arrow labeled v_w. The depth of cut is labeled a_e with a vertical double-headed arrow. A green arrow points upwards from this diagram towards the diagram below it.</p>	<p>❖ <u>As if the wheel was softer</u></p> <ul style="list-style-type: none">➤ More material removed➤ Bigger chips➤ More load over each abrasive grain➤ Greater friability of the grain
<p>❖ <u>If decreases</u></p>  <p>A diagram of a grinding wheel in contact with a workpiece, similar to the one above but with a smaller depth of cut a_e. The wheel rotates with cutting speed v_c and the workpiece moves with relative feed v_w.</p>	<p>❖ <u>As if the wheel was harder</u></p> <ul style="list-style-type: none">➤ Less material removed➤ Smaller chips➤ Less load over each abrasive grain➤ Lower friability of the grain

Relative feed between grinding wheel and workpiece v_w

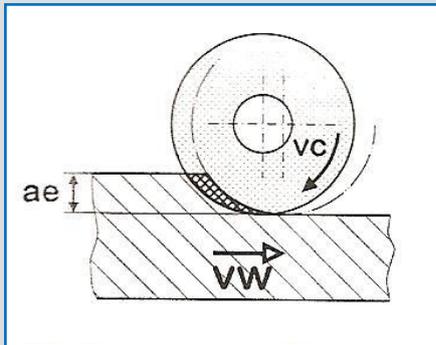
❖ **If increases**



❖ **As if the wheel was softer**

- More material removed
- Bigger chips
- More load over each abrasive grain
- Greater friability of the grain

❖ **If decreases**

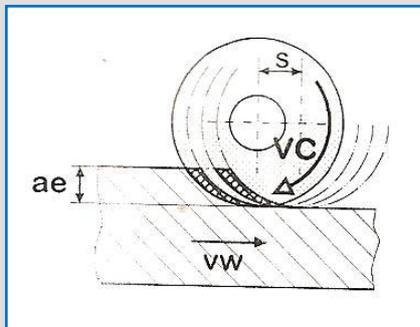


❖ **As if the wheel was harder**

- Less material removed
- Smaller chips
- Less load over each abrasive grain
- Lower friability of the grain

Cutting speed v_c

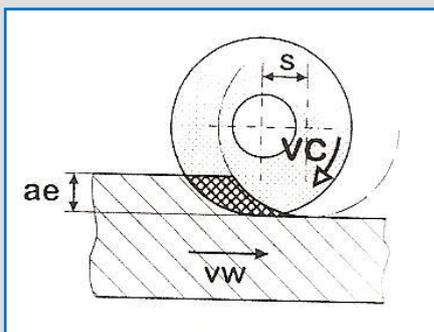
❖ **If increases**



❖ **As if the wheel was harder**

- More cutting edges work in the time unit
- Smaller chips
- Less load over each abrasive grain

❖ **If decreases**

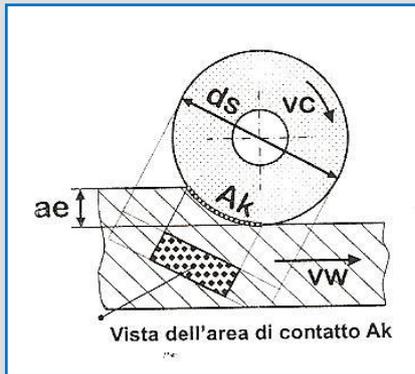


❖ **As if the wheel was softer**

- Less cutting edges work in the time unit
- Bigger chips
- Greater load over each abrasive grain

Grinding wheel diameter d_s (with same cutting speed)

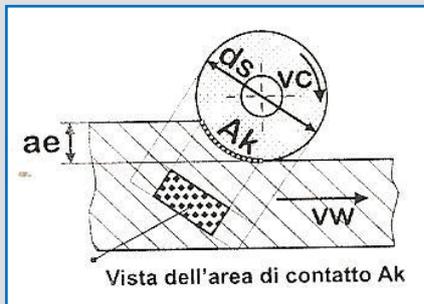
❖ If increases



❖ As if the wheel was harder

- Increases the contact area between grinding wheel and work-piece
- The cutting forces not vary significantly
- Less load over each abrasive grain
- Lower friability of the grain

❖ If decreases



❖ As if the wheel was softer

- Decreases the contact area between grinding wheel and work-piece
- The cutting forces not vary significantly
- Greater load over each abrasive grain
- Greater friability of the grain

Lubrivity of cutting oil

❖ If increases

- Decreases the friction
- Less load over each abrasive grain
- Lower friability of the grain



❖ If decreases

- Increases the friction
- Greater load over each abrasive grain
- Greater friability of the grain



*The cutting oil must have in any case a strong washing and cooling power.
Normally we suggest a low viscosity fluid*