Dressing with diamond rollers: working conditions

When the grinding wheel loses its cutting capacity due to rounding of the cutting edges of the individual grains of abrasive, or when the interstices between grain and grain were filled with chips, it is necessary to dress the grinding wheel, ie remove a small layer in its surface exposing new abrasive grains.
This dressing process can be done in several ways:
> * *With single-point diamond*
> * *Diamond rods*
> * *With tools in diamond powder*
> * *With special plaques to dressing grinding wheels in synthetic corundum and CBN*
> * *With diamond rollers*
> * *With special dressing driven turbine or type WST (Winterthur Schleiftechnik)*

In this paper we give some information about the dressing with diamond rollers.
With reference to Figure N°1 and N°2 we will use the following terminology:

q_d = Speed ratio of the diamond roller compared to the speed of the grinding wheel
a_d = Feed of the diamond tool (penetration)
v_R = Peripheral speed of the diamond roller
v_C = Peripheral speed of grinding wheel
v_d = Travel speed of the tool dresser (rolling dresser)
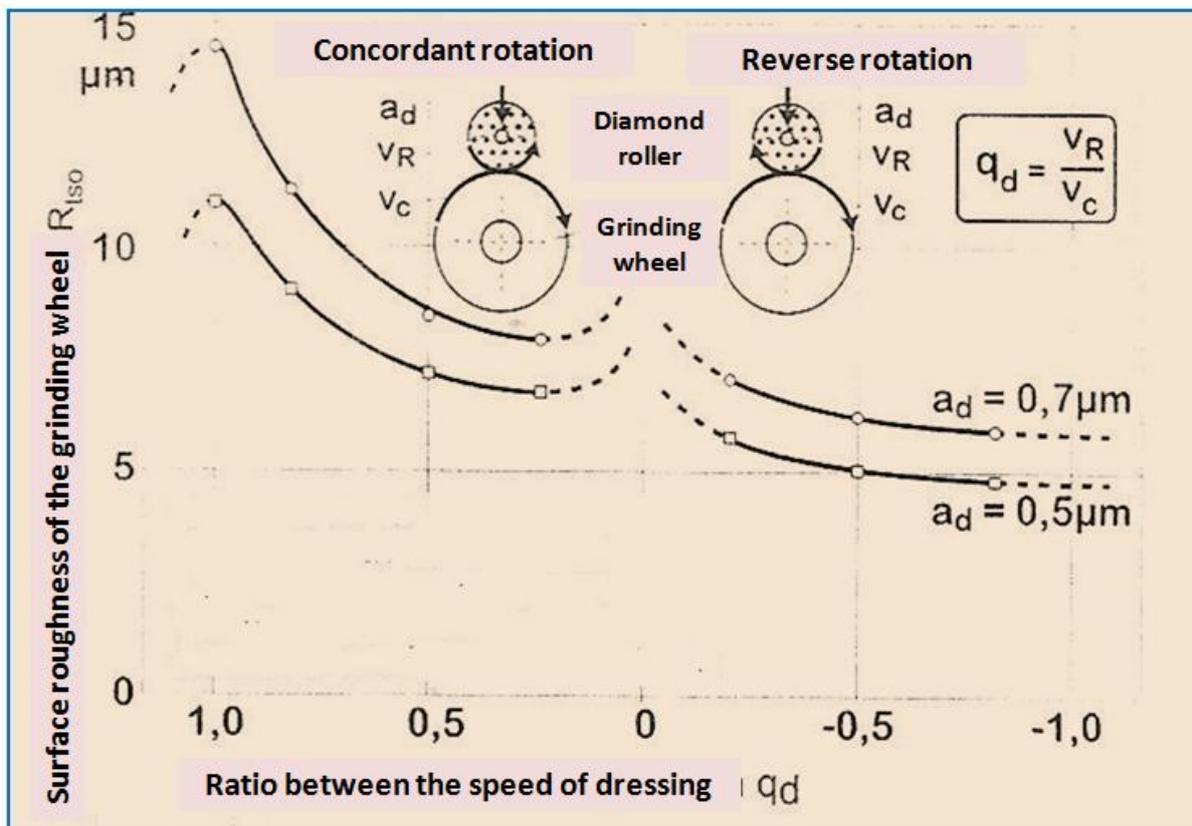
Figure N°1 – *Influence of the ratio between the speed of the roller and the grinding wheel and the feed on the surface roughness of the grinding wheel.*

One of the main parameters that influence the use of the grinding wheel is its surface roughness.

In fact, if the grinding wheel is used for roughing, where it is not important to the surface roughness of the worked surface, it is preferable that the grinding wheel has a high roughness, which facilitates the cutting action.

If instead it is necessary to perform a finishing operation in which it is predominantly the quality of the surface produced the grinding wheel will have to have a low roughness.

The choice of the values of q_d (speed ratio of the diamond roller compared to the speed penetration), are crucial to the effects of roughness of the grinding wheel.

In the figure N°1 it may be seen clearly that the roller can rotate in a concordant way or so discordant with the grinding wheel.

In the first case evidently the two peripheral speeds are subtracted and then the actual speed of the work roller will be less than its peripheral speed, while in the second case the peripheral speeds are added and then the working speed will be higher.

It may be noted also that when the ratio between the two speeds approaching to 1, that is, when the peripheral speeds tend to become equal, their difference tends to zero and in this case you cancel the action of sliding of the roller on the grinding wheel. The roller functions as in the process of crushing and the roughness will be the highest.

This limit condition is not recommended, since it undermines the diamond roller quickly.

the right part of the diagram shows the opposite condition. The roller and the grinding wheel in the contact point move in opposite directions and thus the speed are added. The value of q_d is negative because the two velocities have opposite direction.

When the ratio between the speed increases (in absolute value) the cutting speed increases, thus the surface roughness of the grinding wheel decreases.

In this case it is recommended the discordant rotation with a ratio q_d between -0,5 and -0,8. In any case, the dressing is best be done wet, with an abundant cooling fluid.
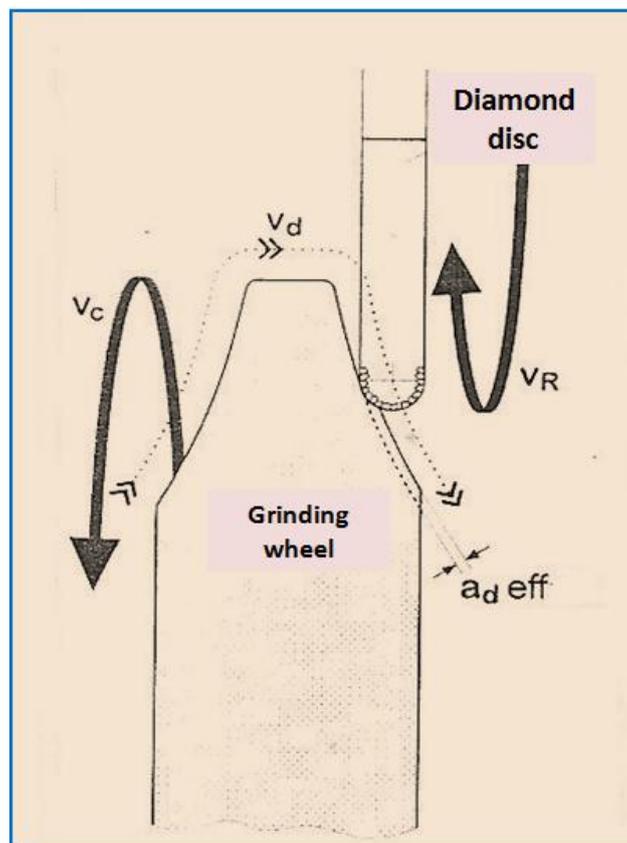
Figure N°2- *Dressing of a grinding wheel for grinding of gears with form method with a diamond disc*

Figure N°2 shows the dressing with a diamond disc of a grinding wheel for grinding the gears with form method. The standard conditions recommended in this type of dressing are:

> - *Direction of rotation concordant with q_d = 0.8 for high removal rate;*
> - *Rotation direction discordant with q_d = -0.5 to -0.8 for good surface finish*
> - *Actual feed for pass a_d = 0.005 to 0.01 mm*
> - *Travel speed v_d = from 0.005 to 0.02 mm per revolution grinding wheel.*

Figure N°3 – *Dressing operation with a diamond roller*