Profile-Grinding vs. Dressing

Even the most modern HSC processes can not subsidise profile- grinding completely.

In grinding here are two different processes used:
- plunge grinding using a grinding wheels that is dressed with the required form
- Contour grinding using a normal straight or a half rounded wheel.

Both processes have advantages but also disadvantages.

Plunge grinding is limited by the width of the wheel as well as by the geometry of the profile, because some forms are not possible to be transferred to the wheel. The next point is that dressing a new wheel is very time consuming. Modern software solutions for optimising the dressing path can reduce this time considerable, but it is still a not to be neglected factor. The implementation of these solutions is not easy to realise because of the enormous memory consumption.

Another point is that the surface quality is not as good as the one that can be reached using contour grinding, what is a matter of fact. And last but not least the need for storing a lot of different wheels and flanges will increase the costs for the user. The biggest advantage of plunge grinding is definitely the cycle time that is tremendous shorter than the one for contour grinding.

The biggest problem for contour grinding is the processing time. Latest technologies for table driving systems can reduce this to an acceptable value. An other fact is the point that profiles have to be programmed totally in G-code, because no standard forms, that can be modified by changing parameters only, can not be used. This can be solved by software solutions witch are capable to convert CAD files into G-code and so this can be seen as a minor disadvantage. The last item that limits the use of contour grinding is the fact that the accuracy of the profile depends very much on the condition of the grinding wheel edge is has to be checked during the process.
Realising all these facts, OKAMOTO developed a new type of PROFILEGRINDER, the UPG 31 LI.

Remarkable is the very small floor space area of just 1 m².

The table driving system is using linear motors which allow table speed up to 100M/min. In addition with the new flexible hydrostatic system for the slide ways, temperature stabilisation for the motors and the lubricants as well as very precise reversing position for all axis allows to grind with, until now not to be considered, precision (0.3 µm) at a up to 10 times reduced grinding time.

The machine comes with complete new operation software and a high resolution CCD camera (magnification 100 – 1000 x) that images the generated profile and compensates the grinding error automatically during the process. The Grinding head can be swivelled by ±5° and allows a high precision grinding of vertical shoulder parts. This grinding was very difficult to realise in the past. The reversing position of the table in x-axis is also controlled by the software and enables grinding of single or both side closed slots.

The latest FANUC 31i CNC control, for faster communication between machine components and control unit, allows increasing the position accuracy once more.
The UPG 31 Li can be seen as a counterpart for optical profile grinding machines, but here you have the possibility of using coolant. This option increases the surface quality, the thermal damage created into the component and the cycle time can be reduced. In addition the machine can be utilised with several dressing systems for the use of conventional bonded grinding wheels.

The well know tendency of chipping when grinding cemented carbide can be nearly completely eliminated if using small infeed amount without extending the cycle time because of the high speed table oscillation. With machining punches and sliding elements in the withdraw direction of the press the lifespan of these tools increases demonstrable.

The position of the slide ways for table and the columns at the same vertical position minimises the risk of tilting during grinding and improve the stability of the machine as well as a stronger machine body.

As a conclusion this state of the art machine is one of a series of HIGH PRESION GRINDERS developed by OKAMOTO and one step into the direction of realising the “ZERO IDEAL” and “ULTRA PLANARISATION” (THL)