INVESTIGATION OF THE SURFACE ROUGHNESS OF VARIOUS GRINDING WHEEL MADE OF BRONZE

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Abstract- Coarse-grained bronze-bonded diamond grinding wheels dressed using lasers and silicon carbide dressing wheels were used to grind YG8-cemented carbide work pieces. The wear patterns and grinding ratios of the laser-dressed grinding wheels were investigated after different grinding stages. After grinding, the laser-dressed grinding wheel displayed superior surface topography compared to the silicon carbide wheel, and the surface quality of the workpiece also improved.

Keywords- Grinding wheel, Silicon carbide, bronze.

1. INTRODUCTION

Nowadays a wide range of grinding and dressing techniques are used for machining the variety of engineering materials. These processes include internal, cylindrical, center less and surface grinding. Also, single point dressing and internal arc dressing are the types of dressing process. These methods are widely used in order to increase productivity and quality with better surface finish. Grinding is an abrasive machining process of material removal used to shape and finish the different components made up of metals and non-metals. Since 2000 years, abrasives are used for shaping the material. In early times, resharpening of weapons, knives and tools were done by abrasive stones. Grinding as a manufacturing process was developed in 1959. Now, it is used for high technology applications such as aero engines and missile guidance system. Dressing operation is performed to restore the shape of a grinding wheel. It is a finishing process of wheel to minimize the grinding forces and increase the grinding efficiency. Different types of electroplated, vitrified and metal bonded dressers are used for dressing operation. Also, optimization of some dressing parameters such as dressing orientation, depth of cut, number of passes and speed give the better results of grinding.

to form a solid, circular shape. Various profiles and cross sections are available depending on the intended usage for the wheel. They may also be made from a solid steel or aluminium disc with particles bonded to the surface. Today most grinding wheels are artificial composites made with artificial aggregates, but the history of grinding wheels began with natural composite stones, such as those used for millstones.

3. MATERIALS USED IN THE GRINDING WHEEL

A variety of materials are used in production grinding and primary things available in today's market are wheels of different grade, various structure, varied abrasives, a range of grain sizes, and mixed link.

- Aluminum oxide (A)
- Silicon carbide (S)
- Ceramic (C)

[1] . GRINDING WHEEL

A grinding wheel is a wheel composed of an abrasive compound and used for various grinding (abrasive cutting) and abrasive machining operations. Such wheels are used in grinding machines. The wheels are generally made from a composite material consisting of coarse-particle aggregate pressed and bonded together by a cementing matrix (called the bond in grinding wheel terminology)

- Diamond (D, MD, SD) Cubic boron nitride (CBN)
- Grinding wheels with diamond or CBN grains are called super abrasives.

4. CHARACTERISTICS OF GRINDING WHEEL

1. Abrasive grain

The abrasive aggregate is selected according to the hardness of the material being cut.

2. Grain size

From 10 (coarsest) to 600 (finest), determines the average physical size of the abrasive grains in the wheel. A larger grain will cut freely, allowing fast cutting but poor surface finish. Ultra-fine grain sizes are for precision finish work. **3. Wheel grade**

From A (soft) to Z (hard), determines how tightly the bond holds the abrasive. A to H for softer structure, I to P for moderately hard structure and Q to Z for hard structure. Grade affects almost all considerations of grinding, such as wheel speed, coolant flow, maximum and minimum feed rates, and grinding depth.

4. Grain spacing

Spacing or structure, from 1 (densest) to 17 (least dense). Density is the ratio of bond and abrasive to air space. A less-dense wheel will cut freely, and has a large effect on surface finish. It is also able to take a deeper or wider cut with less coolant, as the chip clearance on the wheel is greater.

5. ADVANTAGES AND APPLICATIONS OF GRINDING WHEEL

Advantages

- Simple in operation
- No advanced skill required
- Good dimensional accuracy can be achieved. • Less investment
- Approximate surface finish can be achieved Applications
- Grinding of different cutters and tools
- Surface finishing
- Internal and external cylindrical surface grinding
- Parting and slitting
- Descaling and deburring

6. SURFACE ROUGHNESS

Surface roughness often shortened to roughness, is a component of surface texture. It is quantified by the deviations in the direction of the normal vector of a real surface from its ideal form. If these deviations are large, the surface is rough; if they are small, the surface is smooth.

7. PROPOSED MATERIAL – BRONZE

Sl. No	Properties	Values
1	Density	8.8 g/cc

2	Hardness, Rockwell B	85
3	Tensile Strength, Ultimate	550 MPa
4	Tensile Strength, Yield	450 MPa
5	Modulus of Elasticity	110 GPa
6	Poisson's Ratio	0.341
7	Shear Modulus	41 GPa

Bronze is an alloy consisting primarily of copper, commonly with about 12% tin and often with the addition of other metals (such as aluminium, manganese, nickel or zinc) and sometimes non-metals. These additions produce a range of alloys that may be harder than copper alone, or have other useful properties, such as stiffness, ductility, or machinability.

8. CONCLUSION

- In this investigation, the effect of process conditions on the surface quality was compared in grinding bronze.
- Based on the statistical analysis of the grinding wheel with increasing depth of cut, the surface roughness deteriorates, whereas with increasing feed rate, the surface roughness becomes better.
- Change of the grinding wheel diameter, and thereby reducing peripheral speed, results in better surface roughness as well as application of coolant.
- To achieve high surface quality of grinding wheel is strongly advised to use cooling during the grinding process.

9. REFERENCES

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