

PERFORMANCE EVALUATION OF DIAMOND CUTTING TOOLS WHEN
ULTRA PRECISION GRINDING SPHERICAL PART

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To my beloved parents, and friends...

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ABSTRACT

Bondless diamond wheel is fabricated in UTM by depositing diamond on carbide substrate. The deposited diamond layer is only on the top of the substrate surface and having grain size up to 10 μm depending the parameters used during diamond coating process. In general, Grain size of abrasive wheel seems to influence the final surface finish of the work piece. Finer grit size is expected to remove less material than coarse grit size. In this work, two type of grinding wheels, ie Resin bonded and bondless wheels are investigated to form spherical convex surface on tungsten carbide material. Both wheels have 1-3 μm grit size. The experimental trials are conducted on ultra-precision lathe machine under different grinding parameters such as wheel speed and feedrate for evaluating surface roughness, form accuracy and surface texture. Feedrate (F) and wheel speed (Vc) are found to have significant the effects on surface finish when ground with both types of wheels. Lower federate and higher wheel speed provide better surface finish and form accuracy.

ABSTRAK

Roda pencanai intan tanpa perekat dihasilkan di UTM dengan mendeposit intan ke atas substrat karbida. Lapisan intan yang terdeposit hanya berada pada permukaan atas substrat dan mempunyai saiz bijian sehingga $10\mu\text{m}$ bergantung kepada parameter yang digunakan semasa proses salutan intan. Secara umumnya saiz bijian roda pencanai mempengaruhi permukaan akhir benda kerja. Saiz grit yang lebih halus dijangka akan membuang serpihan kurang dari roda yang mempunyai grit kasar. Dalam kajian ini, dua jenis roda pencanai, Roda pencanai resin terikat dan roda pencanai tanpa perekat telah diselidiki untuk membentuk permukaan cembung bulat pada benda kerja tungsten karbida. Kedua roda mempunyai size grit 1-3 μm . Kerja ujikaji dilakukan menggunakan mesin larik ketepatan ultra dengan parameter pencanaan yang berbeza seperti kelajuan roda dan kadar uluran untuk menilai kekasaran permukaan, ketepatan bentuk dan tekstur permukaan. Kadar uluran (F) dan kelajuan roda (V_c) didapati mempunyai kesan yang besar pada permukaan akhir apabila mencanai dengan kedua-dua jenis roda pencanai. Kadar uluran yang rendah dan kelajuan roda pencanai yang tinggi memberikan permukaan akhir dan ketepatan bentuk yang lebih baik.