

KAJIAN KESAN DIAMETER DAN  
KEPADATAN TABURAN LEKUK TERHADAP  
PENGURANGAN DAYA GESERAN DAN  
KEHAUSAN PEMUKAAN KELULI AISI 1060

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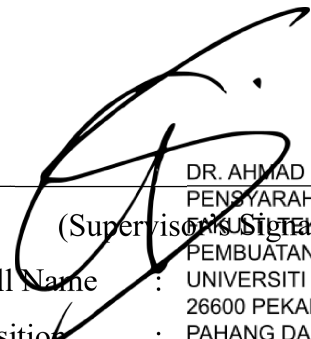
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KAJIAN KESAN DIAMETER DAN KEPADATAN TABURAN LUKUK  
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## ABSTRAK

Kajian ini dijalankan bagi mengenalpasti fenomena kehausan yang disebabkan oleh geseran serta mengenalpasti faktor geseran yang dipengaruhi oleh kehadiran tekstur lekukan. Tekstur lekukan ini terdiri daripada pelbagai diameter, tetapi mempunyai kedalaman yang sama. Bahan yang digunakan dalam penyelidikan ini adalah besi keluli lembut AISI 1060. Di dalam kajian ini, lekukan dihasilkan menggunakan mesin kisar 3 paksi dan mata alat kisar *ball-end nose*. Lekukan yang dihasilkan mempunyai diameter yang berbeza dari 1.0 hingga 4.0 mm. Dalam ujikaji fasa pertama, kesan kepadatan tekstur lekukan terhadap geseran telah dikenalpasti. Sampel-sampel yang disediakan mempunyai diameter yang sama tetapi kepadatan tekstur yang berbeza. Manakala pada ujikaji fasa kedua pula, kesan perbezaan diameter tekstur yang berbeza terhadap geseran dikenalpasti. Permukaan yang mempunyai lekukan berdiameter 1.0 hingga 4.0 mm tersebut kemudiannya dianalisis dengan menggunakan laser mikroskop. Sampel kemudian dianalisis menggunakan Universal Testing Machine UTM dilengkapi dengan kepiawaian ASTM-1894. Sampel diuji menggunakan minyak hidraulik ISO-168 dengan proses ujikaji sentuhan permukaan ke permukaan. Kesan yang menakjubkan terhadap geseran dengan permukaan yang berlekuk ini telah diperolehi dalam kedua-dua kajian. Berdasarkan pemerhatian, lekukan yang berdiameter besar mempunyai keupayaan yang tinggi dalam mengurangkan geseran berbanding dengan lekukan yang berdiameter kecil. Tambahan pula, bagi sampel-sampel berdiameter lekukan yang sama, sampel yang mempunyai kepadatan lekukan yang tinggi menghasilkan geseran yang lebih rendah berbanding kepadatan lekukan yang rendah. Pada ujikaji yang seterusnya, kadar kehausan permukaan keluli lembut AISI1060 yang berlekuk setelah dikenakan beban malar sebanyak 10N diukur. Keputusan ujikaji menunjukkan bahawa permukaan mempunyai lekukan berjarak kecil mempunyai kadar kehausan yang rendah berbanding dengan permukaan mempunyai lekukan berjarak besar. Keputusan ujikaji juga menunjukkan bahawa permukaan yang mempunyai lekukan berdiameter besar mempunyai kadar kehausan yang lebih rendah berbanding permukaan yang mempunyai lekukan berdiameter kecil. Ini boleh disimpulkan bahawa, sifat geseran dan kadar kehausan adalah lebih baik bagi sampel yang mempunyai sentuhan permukaan yang rendah. Hasil dapatan kajian ini dapat membantu dalam langkah untuk mengatasi jangkahayat bagi komponen mekanikal dalam bidang pembuatan.

## ABSTRACT

This study was carried out to identify the phenomenon of wear caused by friction as well as to identify friction factors that are affected by the presence of dimple texture. The texture of these depressions consists of various diameters, but has the same depth. The material used in this research is mild steel AISI 1060. In this study, the dimple is produced using a 3-axis milling lathe with ball-nose end mill. The dimples produced have diameters varying from 1.0 to 4.0 mm. In the first phase of the study, the effect of the density of the dimple texture on friction was identified. The prepared samples have the same dimple diameter but different dimple density. While in the second phase of the study, the effect of different dimple diameter differences on friction was identified. The surface that has a dimples with diameters variation between 1.0 to 4.0 mm are then analyzed using a laser microscope. The sample was then tested using Universal Testing Machine UTM equipped with ASTM-1894 standards, using ISO-168 hydraulic oil with a surface-to-surface contact test process. A surprising effect on friction with this textured surface was obtained in both phases. Based on observations, large-diameter dimples have a high ability to reduce friction compared to small-diameter dimples. Furthermore, for samples with the same dimples' diameter, samples with high dimples' density produce lower friction than those with low indentation density. In the next test, the wear rate of the indented AISI1060 mild steel surface after being subjected to a constant load of 10N was measured. The results of the experiment show that the surface with a small-diameter dimples has a low wear rate compared to the surface with a large-diameter dimples. The test results also show that surfaces with large-diameter dimples have a lower wear rate than surfaces with small-diameter dimples. It can be concluded that, friction properties and wear rate are better for samples with low surface contact. The results obtained from the study can help in steps to overcome the life expectancy of mechanical components in the field of manufacturing.

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