STUDI KOMPARATIF KEAUSAN SLIDING PADA MATERIAL BAJA DALAM BEBERAPA VARIASI KECEPATAN DENGAN METODE ELEMEN HINGGA

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ABSTRAK

Penelitian ini membandingkan karakteristik keausan geser pada material AISI 440C, AISI 431, AISI 630, M50, dan Stellite 6 menggunakan simulasi Metode Elemen Hingga pada perangkat lunak. Pengujian mengadopsi model kontak *ball-on-disc* dengan beban konstan 10 N pada variasi kecepatan 200 rpm, 400 rpm, dan 600 rpm. Volume keausan diprediksi menggunakan hukum Archard, sedangkan perilaku deformasi dinamis dimodelkan dengan persamaan *Modified Johnson-Cook*. Hasil simulasi menunjukkan bahwa peningkatan kecepatan tidak berbanding lurus dengan keparahan keausan. Pada 400 rpm, fenomena pengerasan regangan menurunkan volume keausan pada baja M50 dan AISI 440C. Namun, pada 600 rpm, akumulasi regangan dan panas memicu pengelupasan dan mekanisme pembajakan permukaan yang parah. Secara keseluruhan, baja M50 menunjukkan ketahanan aus yang paling superior di semua variasi kecepatan. Disimpulkan bahwa ketahanan aus suatu material sangat dipengaruhi oleh kemampuannya menahan laju deformasi plastis saat kontak terjadi, bukan sekadar kekerasan awalnya.

Kata Kunci: Keausan Geser, Metode Elemen Hingga, Bantalan, *Modified Johnson-Cook*, Baja M50.

COMPARATIVE STUDY OF SLIDING WEAR ON STEEL MATERIALS UNDER VARIOUS SPEED VARIATIONS USING FINITE ELEMENT METHOD

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ABSTRACT

This study compares the sliding wear characteristics of AISI 440C, AISI 431, AISI 630, M50, and Stellite 6 using Finite Element Analysis (FEA) simulation in software. The test adopted a ball-on-disc contact model with a constant 10 N load at speeds of 200 rpm, 400 rpm, and 600 rpm. Wear volume was predicted using Archard's Wear Law, while dynamic deformation behavior was modeled with the Modified Johnson-Cook equation. The simulation results indicate that an increase in speed does not correlate linearly with wear severity. At 400 rpm, the strain rate hardening phenomenon reduced the wear volume in M50 and AISI 440C. However, at 600 rpm, the accumulation of strain and heat triggered flaking and severe ploughing mechanisms. Overall, M50 steel demonstrated the most superior wear resistance across all speed variations. It is concluded that a material's wear resistance is strongly influenced by its ability to withstand the rate of plastic deformation during contact, rather than solely its initial hardness.

Keywords: *Sliding Wear, Finite Element Method, Bearing, Modified Johnson-Cook, M50 Steel.*