

ABSTRAK

ANALISIS VIBRASI MESIN BUBUT BERDASARKAN VARIASI PUTARAN SPINDLE SEBAGAI METODE MONITORING KONDISI OPERASIONAL MESIN

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(2026: xvi + 38 Halaman, 6 Gambar, 9 Tabel)

Mesin bubut konvensional sering kali dioperasikan tanpa adanya sistem pemantauan getaran yang terukur, sehingga potensi kerusakan komponen dinamis sulit dideteksi sejak dini. Penelitian ini bertujuan untuk menganalisis karakteristik vibrasi pada arah vertikal dan horizontal dengan memvariasikan putaran spindle (290, 460, dan 725 rpm) serta kedalaman pemakanan (0,5, 1,0, dan 1,5 mm) menggunakan material baja ST37. Pengukuran dilakukan dengan vibration meter pada titik headstock, dan data dianalisis menggunakan Two-Way ANOVA. Hasil menunjukkan bahwa peningkatan putaran spindle dan kedalaman pemakanan secara signifikan meningkatkan nilai vibrasi ($p < 0,05$). Terdapat interaksi signifikan antara kedua faktor, di mana kombinasi putaran 725 rpm dan kedalaman 1,5 mm memicu lonjakan vibrasi tertinggi (vertikal 2,333 mm/s dan horizontal 2,300 mm/s). Meskipun demikian, berdasarkan standar ISO 10816, seluruh nilai getaran masih berada pada Zona A (0–2,8 mm/s), yang mengindikasikan mesin berada dalam kondisi operasional yang sangat baik. Pemantauan berkala direkomendasikan untuk mencegah keausan dini.

Kata Kunci : Mesin bubut, Analisis vibrasi, Putaran spindle, Kedalaman pemakanan, ISO 10816

ABSTRACT

LATHE MACHINE VIBRATION ANALYSIS BASED ON SPINDLE SPEED VARIATIONS AS A WAY TO MONITOR MACHINE OPERATING CONDITIONS

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Conventional lathe machines are frequently operated without a measurable vibration monitoring system, making early detection of potential dynamic component failures difficult. This study aims to analyze vertical and horizontal vibration characteristics by varying spindle speeds (290, 460, and 725 rpm) and depths of cut (0.5, 1.0, and 1.5 mm) using ST37 steel. Measurements were conducted using a vibration meter at the headstock point, and data were analyzed via Two-Way ANOVA. The results reveal that increasing spindle speed and depth of cut significantly raises vibration levels ($p < 0.05$). A significant interaction between both factors was observed, where the combination of 725 rpm and 1.5 mm depth triggered the highest vibration surge (vertical 2.333 mm/s and horizontal 2.300 mm/s). Nevertheless, based on the ISO 10816 standard, all measured vibration values remain within Zone A (0–2.8 mm/s), indicating that the machine is in excellent operational condition. Routine monitoring is recommended to prevent premature wear.

Keywords : Lathe machine, Vibration analysis, Spindle speed, Depth of cut, ISO 10816