Functional Analysis of Modified Low Carbon Steel Shaft with Gear Ratio Variations in an Electric Conversion Tractor

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ABSTRACT

This study aims to analyze the functional performance of a transmission shaft in a tractor converted from a diesel engine into an electric tractor using a Brushless Direct Current (BLDC) motor. The shaft functions to transmit torque from the electric motor to the transmission system, thus requiring adequate strength and stability. This research employed an experimental method by comparing two types of shafts, namely a standard (manufacturer) shaft and a modified shaft made of low carbon steel that has undergone a hardening heat treatment process. Testing was conducted on an electric conversion tractor using six variations of transmission gear ratios (1–3 low and 1–3 high). The observed parameters included shaft stability, diameter changes, Angular Backlash, and indications of structural failure. The results showed that both types of shafts can still be used in the electric tractor transmission system; however, the standard shaft demonstrated better stability and smaller deformation compared to the hardened low carbon steel shaft. Therefore, the standard shaft has better functional performance in withstanding loads during testing compared to the modified shaft.

Keywords: *Shaft, Hardening, Transmission, Electric Tractor.*