Analysis of Electric Motor Power Consumption with Gear Ratio Variations in the Conversion of a Tractor to Electric Drive

By

Satria Yudha Laksana

Automotive Engine Study Program, Engineering Department, Jember State Polytechnic

ABSTRACT

This study aims to analyze the power consumption of an electric motor with variations in gear ratios on a tractor converted from a diesel engine to a Brushless Direct Current (BLDC) motor, as an effort to support the development of more environmentally friendly and energy-efficient agricultural technology. The motor used has a capacity of 5000 watts with a working voltage of 72 volts and is powered by a Lithium-Ion battery equipped with a Battery Management System (BMS). The research method employed is quantitative, with testing conducted on a dynamometer (dyno) using gear variations from 1L to 3H. The measured parameters include voltage, current, and input power of the electric motor. Data were collected three times at each gear level and averaged. The test results indicate that the voltage remains relatively stable at around 79 volts across all gear variations, while the current and power increase with higher gear levels. The average power consumption at gear 1L is 179.85 W and rises to 440.12 W at gear 3H. Therefore, it can be concluded that higher gear ratios result in increased current and power consumption of the electric motor, while voltage remains relatively stable. Thus, gear variation significantly affects the power requirements of the electric motor in the converted tractor.

Keywords*: Electric tractor, BLDC motor, power consumption, gear ratio variation, vehicle conversion.*