

RANCANG BANGUN INVERTER SATU FASA LIMA LEVEL BERBASIS PWM UNTUK PERAHU NELAYAN TRADISIONAL

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ABSTRAK

Penelitian ini bertujuan untuk merancang dan menguji kinerja inverter lima tingkat berbasis cascaded H-Bridge menggunakan metode Pulse Width Modulation (PWM) untuk aplikasi penerangan nelayan tradisional. Inverter dirancang menggunakan dua rangkaian H-Bridge dengan sumber DC terpisah dan diuji melalui pengujian laboratorium pada variasi beban 40 W hingga 300 W untuk mengetahui karakteristik efisiensi dan regulasi tegangan. Hasil pengujian menunjukkan bahwa inverter mampu menghasilkan tegangan AC satu fasa dengan lima level tegangan keluaran sesuai prinsip kerja yang direncanakan. Efisiensi inverter tertinggi mencapai 87,9% pada beban ringan, sedangkan pada beban maksimum efisiensi menurun hingga 54,5%. Nilai regulasi tegangan berada pada rentang 3,17% hingga 73,33%, yang menunjukkan bahwa kestabilan tegangan menurun seiring dengan peningkatan beban akibat penggunaan sistem pengendalian terbuka (open-loop). Berdasarkan hasil tersebut dapat disimpulkan bahwa inverter lima tingkat yang dirancang telah berfungsi dengan baik secara prinsip, namun kinerjanya masih belum optimal dibandingkan inverter pasaran, sehingga pengembangan selanjutnya disarankan untuk menerapkan sistem pengendalian tertutup guna meningkatkan efisiensi dan kestabilan tegangan keluaran.

Kata kunci: Inverter Multilevel, Lima Tingkat, PWM, Perahu Nelayan, Penerangan.

**DESIGN AND DEVELOPMENT OF A SINGLE-PHASE FIVE-LEVEL
PWM-BASED INVERTER FOR TRADITIONAL FISHING BOATS**

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ABSTRACT

This study aims to design and test the performance of a cascaded H-Bridge-based five-stage inverter using the Pulse Width Modulation (PWM) method for traditional fisherman lighting applications. The inverter is designed using two H-Bridge circuits with separate DC sources and is tested through laboratory tests at load variations of 40 W to 300 W to determine the efficiency characteristics and voltage regulation. The test results showed that the inverter was able to produce a single-phase AC voltage with five levels of output voltage according to the planned working principle. The highest inverter efficiency reaches 87.9% at light loads, while at maximum loads the efficiency decreases to 54.5%. The voltage regulation value is in the range of 3.17% to 73.33%, which indicates that the voltage stability decreases along with the increase in load due to the use of an open-loop control system. Based on these results, it can be concluded that the designed five-stage inverter has functioned well in principle, but its performance is still not optimal compared to market inverters, so further development is recommended to implement a closed control system to improve the efficiency and stability of the output voltage.

Keywords: Multilevel Inverter, Five-Level, PWM, Fishing Boats, Lighting System.