



INTISARI

Motor PMSM (*permanent magnet synchronous motor*) merupakan salah satu jenis motor listrik yang banyak digunakan untuk menggerakkan kendaraan listrik. Motor jenis ini dipilih karena memiliki *power density*, efisiensi yang baik, dan memiliki volume kecil jika dibandingkan dengan motor jenis lain. Dalam praktiknya, untuk menjalankan motor PMSM berdaya tinggi diperlukan pengendali 3 fase, yang memiliki tugas komutasi pada PMSM secara beruntun oleh sakelar daya dengan *rating* tegangan dan arus yang tinggi. Desain *printed circuit board* (PCB) harus dirancang agar mampu bertahan terhadap arus dan tegangan tinggi. Pada penelitian ini, dilakukan perancangan PCB pengendali 3 fase motor PMSM dengan *rating* 100 V dan arus hingga 35 A dan frekuensi penyakelaran 10 kHz – 20 kHz.

Pengujian pengendali dilakukan dengan melihat karakteristik pensaklaran setiap bagian pengendali dan performa semua sistem pengendali ketika berbeban. Pada pengujian katakteristik pensaklaran MOSFET didapati bahwa *resistor gate* dapat memengaruhi kecepatan pensaklaran, *ringing*, dan *overshoot*, serta *power losses*. Di sisi lain pada pengujian pengendali motor PMSM berbeban dilakukan dengan mengoperasikan motor BLT800 berdaya 800 W dengan algoritma FOC (*Field Oriented Control*). Pengujian dilakukan dengan membandingkan performa pengendali dengan MOSFET yang belum diparalel dan yang sudah diparalel. Dari hasil pengujian didapati bahwa pada pengendali dengan MOSFET diparalel akan memberikan penurunan suhu operasi MOSFET. Akan tetapi, MOSFET yang diparalel akan memberikan efek respon keluaran (tegangan *drain source*) yang lebih lambat. Selanjutnya dilakukan pengujian efisiensi pengendali yang didapatkan efisiensi rata - rata pengendali sebesar 94%.

Kata kunci : Motor PMSM, Pengendali, PCB, *Gate Resistors*, Paralel MOSFET

ABSTRACT

PMSM motor (permanent magnet synchronous motor) is one type of electric motor that is widely used to drive electric vehicles. This type of motor was chosen because it has power density, good efficiency, and has a small volume compared to other types of motors. In practice, to run a high-power PMSM motor, a 3-phase controller is needed, which has the task of commuting the PMSM successively by a power switch with a high voltage and current rating. The printed circuit board (PCB) design must be designed to withstand high currents and voltages. In this research, a 3-phase PMSM motor controller PCB is designed with a rating of 100 V and a current of up to 35 A and a switching frequency of 10 kHz – 20 kHz.

Testing of the controller is carried out by looking at the switching characteristics of each part of the controller and the performance of all control systems when loaded. In testing the characteristics of the MOSFET switching it was found that the gate resistor can affect the switching speed, ringing, and overshoot, as well as power losses. On the other hand, the PMSM motor controller test was carried out by operating a BLT800 motor with a power of 800 W using the FOC (Field Oriented Control) algorithm. Tests are carried out by comparing the performance of controllers with MOSFETs that have not been paralleled and those that have been paralleled. From the test results it was found that the controller with the MOSFET in parallel will provide a decrease in the operating temperature of the MOSFET. However, a parallel MOSFET will give a slower output response (source drain voltage). Furthermore, testing the efficiency of the controller obtained an average controller efficiency of 94%

Keywords : Controllers, PCB, Gate Resistors, Parallel MOSFETs