

Abstract

Induction motors are the majority of electric motor consuming approximately between 43% and 46% of global electricity consumption. They are popular due to their robustness, reliability, prices, and efficiency. Constant speed application was common induction motor practice. Meanwhile, variable speed application has been dominated by DC motors, since they are relatively easy to control. However, DC motors have some shortcomings such as expensive and necessity of regular maintenance. Because of these reasons, variable speed control algorithm for induction motor needs to be developed. Certain technique has been developed to control induction motor for variable speed application. Vector control, or field oriented control (FOC), is capable to control flux and torque of an induction motor individually in a similar way to DC machine. Therefore, advantages of both DC motor and induction motor can be achieved. Rotor position needs to be known in order to perform FOC. However, sensorless technique allows to control induction motor without physical sensor. In this thesis, sensorless FOC has been performed well, showing good speed regulation and decent response. The estimator is capable giving precise estimation about rotor position and speed. Motor performance in all speed region will also be discussed briefly. Using field weakening method, motor is successfully controlled generating constant power output.

Keyword: vector control, field oriented control, induction motor, constant power

Intisari

Motor listrik, dengan mayoritas motor induksi tiga fase mengkonsumsi sekitar 43% hingga 46% total konsumsi listrik dunia. Aplikasi motor induksi pada umumnya adalah pada aplikasi kecepatan konstan, sedangkan aplikasi pada kecepatan variable didominasi oleh DC motor karena kemudahan kendalinya yang memiliki kendali arus pengatur fluks dan torsi terpisah. Teknik khusus telah dikembangkan untuk motor induksi pada aplikasi kecepatan variable. Kendali vector atau field oriented control (FOC) mampu mengendalikan fluks dan torsi secara terpisah dengan cara yang mirip dengan kendali motor DC. Dengan hal itu, keuntungan menggunakan motor induksi dan motor DC dapat diperoleh. Untuk melakukan kendali FOC, posisi rotor perlu diketahui. Dengan teknik sensorless posisi rotor bisa diketahui tanpa sensor. Pada tugas akhir ini, teknik sensorless berhasil dilakukan. Estimator dalam teknik sensorless mampu memberikan informasi posisi dan kecepatan rotor untuk kendali FOC. Kinerja motor pada semua daerah kecepatan akan dibahas dengan singkat. Dengan metode field weakening, motor berhasil dikontrol untuk menghasilkan keluaran constant power.

Kata kunci: *kendali vektor, field oriented control, motor induksi, constant power*