THESIS INFORMATION

Title: **ADVANCED IDENTIFICATION AND CONTROL PERMANENT MAGNET SYNCHRONOUS MOTOR**

PhD. Student: **Pham Quoc Khanh**

Major: **Electrical engineering**

Major code: **62.52.02.02**

Training institution: **Ho Chi Minh City University of Technology, Viet Nam National University Ho Chi Minh City**

Scientific Supervisors: **Prof. Ho Pham Huy Anh**

Along with developing materials engineering technology and increasing requirements for electric drive systems, high-performance electric machines are also interested in research and development. Among current electrical machines, permanent magnet synchronous motors (PMSM) receive significant attention from equipment manufacturers because they possess the advantages of high-power density, high efficiency, compact size, and lower maintenance costs compared to other electric motors. Furthermore, with the trend of using modern, high-performance intelligent devices in today's life, PMSM electric drive systems appear in industrial production lines and increase in daily consumer products.

In addition to the significant advantages, the PMSM also has some disadvantages, such as the motor speed being limited, and it is necessary to have the rotor position sensor in the vector control methods. There have been many approaches proposed in recent times to solve these issues. The motor speed control methods in the constant power area are proposed to expand the operating speed range for the PMSM motor. Sensorless Control of the PMSM is proposed to eliminate the Rotor angle sensor component. However, with the increasing requirements of the quality of control and the production cost factors, more research is needed to improve the quality of operation further and reduce the cost of PMSM drive. The thesis has researched and proposed several solutions to improve control quality of PMSM speed control, including:

Apply the optimal PMSM parameters identification algorithms. Determining the motor parameters is essential in determining the parameters of the PMSM motor controller. Methods of estimating

the proposed PMSM parameters have high accuracy. The parameters recorded from these identification methods are applied in the proposed PMSM speed control.

Apply a new control method to extend the speed range above the rated speed. The simulation results show that the proposed method of extending the working speed range of the PMSM motor can reduce the conflict between two different speed zones, reducing the speed fluctuations when operating in a steady state.

Apply Fuzzy controller in sensorless PMSM speed control methods. The simulation results show that the proposed sensorless PMSM speed control method can minimize PMSM speed fluctuations, reduced ripple and improved reference speed tracking lead to improved PMSM motor performance.

Scientific Supervisors PhD. Student

Prof. Ho Pham Huy Anh Pham Quoc Khanh