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Designing of Induction Motor Efficiency Monitoring System

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Abstract : Energy is one of the important issues with high priority property in the world. Energy demand is rapidly increasing depending on the growing population and industry. The useable energy sources in the world will be insufficient to meet the need for energy. Therefore, the efficient and economical usage of energy sources is getting more importance. In a survey conducted among electric consuming machines, the electrical machines are consuming about 40% of the total electrical energy consumed by electrical devices and 96% of this consumption belongs to induction motors. Induction motors are the workhorses of industry and have very large application areas in industry and urban systems like water pumping and distribution systems, steel and paper industries and etc. Monitoring and the control of the motors have an important effect on the operating performance of the motor, driver selection and replacement strategy management of electrical machines. The sensorless monitoring system for monitoring and calculating efficiency of induction motors are studied in this study. The equivalent circuit of IEEE is used in the design of this study. The terminal current and voltage of induction motor are used in this motor to measure the efficiency of induction motor. The motor nameplate information and the measured current and voltage are used in this system to calculate accurately the losses of induction motor to calculate its input and output power. The efficiency of the induction motor is monitored online in the proposed method without disconnecting the motor from the driver and without adding any additional connection at the motor terminal box. The proposed monitoring system measure accurately the efficiency by including all losses without using torque meter and speed sensor. The monitoring system uses embedded architecture and does not need to connect to a computer to measure and log measured data. The conclusion regarding the efficiency, the accuracy and technical and economical benefits of the proposed method are presented. The experimental verification has been obtained on a 3 phase 1.1 kW, 2-pole induction motor. The proposed method can be used for optimal control of induction motors, efficiency monitoring and motor replacement strategy.

Keywords : induction motor, efficiency, power losses, monitoring, embedded design
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