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# TORQUE AND SPEED ESTIMATION WITH PARAMETER IDENTIFICATION OF LINE-START INDUCTION MOTOR OPERATED VALUE

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Abstract. *This paper presents a torque and rotational speed estimation method for Line-start Induction Motor Operated Valves. Routine inspections are carried out to those valves, because Motor Operated Valves are used in the serious plant such as power plant and securing reliability is an extremely important matter. Movement environments in these plants are high temperature and humidity, so it is difficult to put sensors near motors. In such a case, we must find troubles of system without torque or speed sensors. The proposal method can estimate the torque and speed of induction motor not only in the static state but also in the transient state condition by using voltages and currents near the switchboard. Furthermore, we propose the parameter identification of mutual inductance by comparing the inner and outer products between voltages and currents. Proposed estimation methods are verified by results of experiment.*
**Keywords:** Line-start motor, Induction motor, Motor operated valve, Vector control, Parameter identification

1. **Introduction.** The line-start induction motor operated valve shown in Figure 1. Theses valves are being use widely in the industrial world.

The failure diagnosis of these systems is specially taken seriously because such a system is used in the place where reliability should be necessary. In case of our research, it is a premise that a power supply is supplied to the valve directly. And, there are not any rotational speed sensors and torque sensors. In such a case, we cannot get motor torque and speed from sensors. So, it is difficult to conduct diagnosis about failures and aged deterioration about this system. If we can estimate a torque and a speed from voltage and current of the induction motor, we can diagnose the degradations of the motor operated valve. There are many conventional technologies that a torque and a speed are estimated by using only the voltage and the current. However, the conventional methods are effective in following situations: the voltage and the current can be controlled on the control side in the variability and electric parameters can be grasped precisely. In our research, we cannot control the voltage and current in the variability and parameters are inaccurate. Performance isn't assured in our research condition by applying conventional techniques.

In our proposal method, we can estimate the torque and rotational speed of induction motor only from voltages and currents at the switchboard. We can derive torque and speed of induction motor by using time-series data of voltage and electric current. Especially about torque estimation, we use only parameters which are observed easily. This proposal method is concise estimated method of torque and speed by using inner or outer