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EVALUATION OF PERFORMANCE OF A NOVEL VOLTAGE COMPENSATION STRATEGY FOR AN AC CONTACTOR DURING VOLTAGE SAGS

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Abstract. *This study concentrates on developing a novel voltage compensation strategy based on feedback control approach that allows contactors to ride through power line disturbances such as voltage sags and dropouts. Voltage sags are widely reported as being one of the worst power quality problems in many continuous process industries. Since the momentary voltage sag event, the electrical contacts of contactor abnormally open and lead to an uncontrollable and possibly resulting in expensive process shutdown results. In this paper, an ac contactor model is analyzed when sags event is ensured occurrence as well as a novel voltage compensation strategy is designed for timely offsetting the coil voltage; therefore, the critical equipment in continuous process industries are safely protected and prevents the loss caused by downtime. A dynamic performance evaluation was conducted on an ac contactor governing model for analyzing the system performance when the proposed compensation strategy is introduced. The simulation results clearly depicted that contactors are critical component as it was unable to ride through 20% sag and longer than 48 milliseconds. The effectiveness and feasibility of the proposed coil voltage compensation strategy during voltage sag events occur is validated by using simulation approach. Moreover, the shading rings have the effect of the contactor's transient performance when voltage sags event occur is studied and discussed as well.*
Keywords: Voltage sags, Voltage compensation strategy, Feedback control, Ride through, Contactor, Shading rings, Power quality

1. **Introduction.** Because of the use of equipment that causes disturbances in the system such as adjustable-speed drives (ASDs), larger demand from consumers and significant implications for safety and cost. The various processing units operate continuously supplied with the utilities required for industrial equipment. Continuous equipments may be shutdown caused by power line disturbances such as sags, abrupt interruption of power supply, and motor reacceleration, if none of the important utilities are installed for a safe stop [1].

There is growing concern over the power quality phenomenon in industry has focused the interest on realizing the behavior of equipments during power line disturbances. Voltage sags particularly are extensively reported as being one of the worst power quality problems and are frequent in the plants. Momentary voltage sags caused by fault conditions that may occur inside the plant in its distribution circuits or in the utility system, particularly common in rural areas. In addition, voltage sag also occurs due to motors reacceleration. These types of events are random in nature and their effects on the voltage provided by utilities are also random. Since the tripping of electrical equipment susceptible to these abnormalities in the power line disturbances may lead to process unit