Application of functional safety to electrical power equipment and systems in process industries

Janardhanan Kallambettu P.Eng., Principal Engineer-Control Systems, Bechtel TX, U.S.A
Email: jkallamb@bechtel.com

Venkatesh Viswanathan P.Eng., Senior Electrical Engineer, Bechtel, TX, U.S.A
Email: vviswana@bechtel.com

Abstract

In process industries, the application of functional safety in preventing major incidents is a well-established practice. The functional safety standard IEC 61511[1] is applied to the safety instrumented system (SIS) protection layers to avoid the undesired events or reduce the likelihood of the events or impacts due to failures in the process, process equipment, or its control system including human interactions. However, there are risks of catastrophic incidents due to electrical equipment failures as well. Therefore, one should not underestimate the importance of the management, design, installation, operation, and maintenance of electrical power systems and protection devices. Regulatory authorities, in some countries, require the owners or operators to address the risks that arise from electrical equipment failure.

The risk-based assessment, allocation of safety functions to protection devices, the establishment of integrity requirements, design, installation, operation, and maintenance of electrical protection devices must be managed like the protection layers for the process units. This paper focusses on the application of IEC 61511 to the protection of electrical equipment and systems, available industry guidelines, and the unique challenges in implementing the functional safety standards. The paper guides the electrical engineers with an example risk assessment, identification of protection device and its safety integrity level (SIL), verification of the reliability of the protection device and establishing a maintenance and operation program.