Determination of Safety Instrumented Level using Fuzzy Risk Graph Method - Case Study: Heater of Oil & Gas Industry

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Abstract

Although the risk graph method, described by the IEC 61508 standard is widely used for the determination of Safety Integrity Levels for the Safety Instrumented Functions (SIF) which performed by Safety Instrumented Systems (SIS). This technique has limits regarding the linguistic interpretation of the parameters of the risk analyzed. In addition, the calibration of the risk graph method as defined at the IEC61511 standard consists to use discrete intervals include also a problem of uncertainty in the calculation of Safety Integrity Levels. The purpose of this work is to improve of conventional risk graph in order to ensure a better implementation of safety instrumented systems (SIS). The proposed model based on fuzzy rules, considers the parameters defining the risk graph as inputs of a fuzzy inference systems and the Safety Integrity Level (SIL) as unique output. In order to validate the proposed model, a case study on an industrial system is carried out. The obtained results show a particular interest of fuzzy graph risk for estimating the appropriate Safety Integrity Level than that given by the risk graph conventional.

Keywords

Risk graph; Safety Instrumented Systems; Safety Integrity Levels; fuzzy rules