On the Use of LOPA and Risk Graphs for SIL determination

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Abstract

Safety Integrity Level (SIL), as defined in ANSI/ISA S84.00.01 (IEC 61511-mod), is a widely used safety performance measure for safety instrumented functions. The standard ISA S84.00.01 suggests several methods for SIL determination, ranging from fully quantitative methods to fully qualitative methods. The large number of safety functions to evaluate during plant design and the need to integrate multidisciplinary design and operation knowledge to achieve effective risk reduction, has made necessary the use of multi-disciplinary-team workshop approaches.

Two widely used methods in the O&G industry for SIL determination are Layer of Protection Analysis (LOPA) and Risk Graphs. Each of these methods has their own advantages and disadvantages. LOPA allows the required risk reduction to be incorporated into the SIL values with higher precision. This enables a more detailed consideration of the available protection layers and leaves an objective traceable record of the decision-making process.

In contrast, the simplicity of Risk Graphs makes them convenient for screening a large number of safety functions. This can make Risk Graphs useful as a first screening pass prior to using LOPA. However, Risk Graphs are still widely used as a stand-alone method.

This paper seeks to explore the differences between LOPA and Risk Graphs and to investigate whether the Risk Graphs method can provide the same level of SIL determination rigor as LOPA. The paper aims to determine if the simplicity of Risk Graphs can make that method more efficient for cases when the number of safety functions to evaluate is considerable.

Keywords

Safety Instrumented Systems (SIS), Safety Integrity Level (SIL), Layers of Protection Analysis (LOPA), Risk Graph