A Proven Streamlined Approach to SIL Assessment Requirements

Many companies put FAR too much redundant effort into determining what SIL is needed and then verifying the SIL design will give the SIL targeted. This paper shows how to apply the qualitative definition of IPLs within the setting of a process hazard analysis (PHA) to get most of the gain from LOPA without doing a LOPA (without using numerical values). We show the way we use a PHA team to identify when a SIL is needed and to select the proper target SIL. This portion of the SIL evaluation and the identification and labeling of the IPLs during the PHA-HAZOP does not take any longer than a normal PHA-HAZOP once the right habits are established. Note that this approach eliminates the need for a separate SIL Evaluation Study to identify the IPLs and select the target SIL. Then, this paper describes how to perform the SIL Verification and Safety Requirements Specification remotely, again without the need for a redundant team meeting. This approach has been used at more than a hundred sites and for thousands of SILs.

REQUId ANALYSIS for SIS:
1. Safety Instrumented Function (SIF) Identification
2. Determining the Safety Integrity Level (SIL) for each SIF
3. Designing the SIF to meet the required SIL
4. SIL Verification Calculation (actually, this is iterative, with the end calculation is a deliverable that proves 3 is correct)

Comparison of Risk Analysis Approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Assessment Method</th>
<th>Risk Judgment Criteria</th>
<th>Risk Magnitude</th>
<th>Estimated Marginal Cost</th>
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</thead>
<tbody>
<tr>
<td>Qualitative</td>
<td>Only</td>
<td>HAZOP, FMEA</td>
<td>Expert Weighting, focusing on site data</td>
<td>Categorical</td>
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<tr>
<td>Simplified Quantitative</td>
<td>LOPA, Risk Graph</td>
<td>Multiplication of statistical averages of general failure rate data, with broad assumptions on management systems</td>
<td>Needed on about 5% of the scenarios</td>
<td>Plus or minus 1 order of magnitude</td>
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<tr>
<td>Full Quantitative</td>
<td>FTA, ETA, GHA</td>
<td>Needed for less than 0.01% of the scenarios</td>
<td>Plus or minus 1 order of magnitude</td>
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Allowed: ISA 84.00.01-2004, Part 3, Sec 3.8

"A qualitative method may be used as a first pass to determine the required SIL of all SIFs. Those which are assigned a SIL 3 or 4 by this method should then be considered in greater detail using a quantitative method to gain a more rigorous understanding of their required safety integrity."

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Bill is President of PII. He has a BS and an MS degree in Chemical Engineering.

Bill has over 38 years of chemical industry experience in operations, process engineering, management, safety evaluation, including 13 years of hands-on plant experience.

Bill and Art are principal authors of the LOPA book for CCPS/AICHE (2001) and Bill is primary author of Guidelines for Initiating Events and Independent Protection Layers, CCPS/AICHE (2015). Bill is also a Certified Functional Safety Professional (CFSP).