

Functional Safety

Layer of Protection Analysis and SIL Determination Workshop Programme

BACKGROUND AND CHALLENGES:

A Major Hazard Facility operator had previously engaged Equinox Automation to develop an IEC 61511-aligned functional safety management system and supporting processes. This included a defined methodology for Layer of Protection Analysis (LOPA), risk assessment, Independent Layer of Protection (IPL) assignment and Safety Integrity Level (SIL) determination.

The next step was to apply those processes to a large set of existing Safety Instrumented Functions (SIFs) at an operating facility. The work formed part of a programme to confirm the required risk reduction for each existing SIF. Then, a gap analysis of the current design achieved the required SIL/SIF design criteria for IEC 61511 risk reduction compliance.

The programme required multidisciplinary input from the client's engineering, operations and maintenance across multiple days of workshop time. The workshops therefore needed to be well prepared and efficient to reduce impact on the client team's normal work day-to-day priorities.

SOLUTION:

Equinox functional safety engineers planned, prepared and facilitated the multi-discipline LOPA and SIL determination workshop programme. Before each session, the team reviewed the available plant information, prepared the study worksheets and pre-populated them with an initial assessment of process safety consequences, initiating causes, SIF and IPL details and reference data.

This allowed the LOPA workshop team to focus on testing scenarios, challenging assumptions, identifying additional credible initiating events and protection layers, and agreeing the final SIL targets. The workshops moved at a strong pace without compromising the technical discussion.

The LOPA programme was completed through a series of full-day workshops and one shorter online session to close out the remaining assessments. Equinox provided an experienced functional safety facilitator and a dedicated scribe to guide the discussions, provide live updates to LOPA worksheets, and record agreed technical assumptions as the work progressed.

The main workshops were hosted in Equinox Automation's New Plymouth offices and one final workshop online. Our modern workshop room and large-format display allowed the full team to review drawings, worksheets and results clearly. Catering and plenty of coffee kept everyone engaged and avoided losing workshop time.



IEC 61511 Functional Safety Lifecycle



Risk Assessment, LOPA, SIL Determination



Multi-discipline Workshop LOPA Facilitation



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Where a discussion moved away from the scenario or a risk was not fully explored, the facilitator guided the team back through the hazard, initiating causes, consequences and credited protection layers. The aim was to complete a large volume of assessments efficiently while ensuring each conclusion was understood and supported.

RESULTS:

The programme determined target SIL, Required Risk Reduction Factors (RRF) and Probability of Failure on Demand (PFD) targets for the assessed functions. It also identified functions that did not require a SIL assignment but still needed to be managed as low-integrity protection layers through suitable documentation, testing, maintenance, and lifecycle controls.

A detailed report captured the analysis for each SIF, including consequences, initiating events, credible independent protection layers, conditional modifiers, assumptions and calculated results. The completed LOPA study also underwent an independent Functional Safety Assessment review following our internal assurance process, confirming that the methodology, assumptions and calculations were applied consistently with IEC 61511.

The client provided positive feedback on the preparation, collaborative facilitation and pace of the workshops. The results fed directly into Safety Requirements Specification development, SIL verification and gap assessment of the existing Safety Instrumented System.

The programme gave the client a clear and consistent basis for managing the assessed protection functions. The client also provided positive feedback on the preparation, collaborative facilitation and pace of the workshops.

The programme determined:

- SIF design criteria targets for the assessed functions : SIL, RRF and PFD
- Functions that did not require a SIL assignment but still needed to be managed as low-integrity protection layers through suitable documentation, maintenance and lifecycle management.

A detailed report captured the analysis for each SIF, including:

- Consequences, initiating events and credible independent protection layers
- Conditional modifiers, assumptions and SIL assessment results

The completed LOPA study also underwent an independent Functional Safety Assessment review following our internal assurance process, confirming that the methodology, assumptions and calculations were applied consistently with IEC 61511.

OUTCOME:

The client received a clear and traceable risk reduction basis for a large set of existing SIFs, delivered through an efficient workshop programme that made effective use of its multidisciplinary team. The work provided a foundation for the next stages of IEC 61511 functional safety lifecycle activities for an operating production facility.