

IEC 61511 Functional Safety Lifecycle Management System and Pilot Implementation Project**BACKGROUND AND CHALLENGES:**

An operator responsible for safety-critical gas infrastructure engaged Equinox Automation after identifying that, while individual functional safety activities were being performed across its assets, there was no single functional safety management system defining when, why, and how functional safety decisions were made and maintained across the asset lifecycle. The work related specifically to Safety Instrumented Systems (SIS) within the scope of IEC 61511 – Functional Safety for the process industry sector.

The challenge lay in governance and standardised lifecycle management across projects and operations, rather than IEC 61511 alignment itself. Functional safety activities were undertaken without a single functional safety management system, and safety documentation lacked lifecycle management.

Equinox Automation was engaged to define and establish the functional safety management system and supporting processes aligned with IEC 61511, and to validate their application through a controlled pilot on existing Safety Instrumented Functions (SIFs).

SOLUTION:

Equinox Automation drew on operational experience to define a functional safety management system and supporting processes covering the full safety lifecycle, from analysis through implementation and operation.

The work clarified when Layer of Protection Analysis (LOPA) risk assessment and SIL determination are required, how risk criteria inform SIL targets, and what level of evidence is expected at each stage of the lifecycle.

Common procedures were established for LOPA risk assessment, SIL verification, and Safety Requirement Specifications (SRS) development, providing a consistent basis for use across projects and existing assets.

A pilot program spanning a representative set of existing SIFs was used to test the framework against operating assets. The work followed a defined sequence and acceptance basis, maintaining clear traceability from hazard identification through to verified SIF performance.

**Function Safety
Lifecycle
Management****IEC 61511
Aligned
Decision
Framework****LOPA, SIL
Determination,
SRS and SIL
Verification**

Figure 1: Safety Instrumented System (SIS) IO Card

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RESULTS:

A complete IEC 61511-aligned functional safety lifecycle management system was established and approved for internal use. Functional safety decisions became repeatable, auditable, and transferable across assets and projects.

The pilot confirmed where existing SIFs provided adequate risk reduction and where improvement was required. Future projects are now supported by defined functional safety processes, improving consistency of approach and clarity of risk reduction, and reducing rework and long-term safety risk.

All functional safety activities were undertaken by certified and competent Functional Safety Engineers with experience in Safety Instrumented Systems across operating process facilities.

The client has since applied the functional safety management system and supporting processes to existing assets, with Equinox providing lifecycle implementation support for functional safety risk reduction related to process hazards.



Figure 2: Example process facility where IEC 61511 functional safety is typically implemented.