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exSILentia®
VERSION 4

Conduct Efficient LOPA using LOPAx™

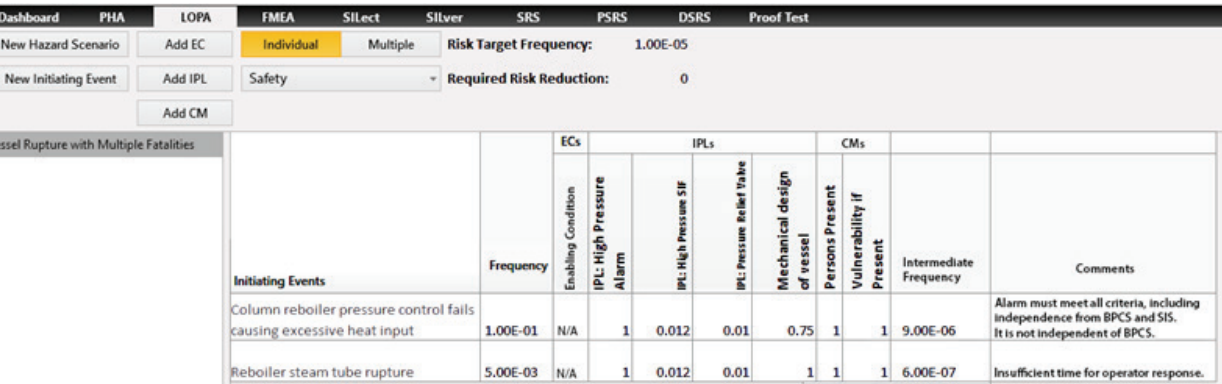
The main objective of a Layer of Protection Analysis (LOPA) is to analyze the likelihood of hazards that have been identified during a process hazards analysis. This step in the process and functional safety lifecycle is critical when there is a need to calculate incident frequencies for subsequent comparison to corporate risk criteria. The LOPA methodology is widely accepted within the process industry as an easily understood quantitative approach to likelihood analysis and is therefore a broadly used practice.

LOPAx™ is a **Layer of Protection Analysis (LOPA)** tool that can be used by process, process safety, and control engineers in support of plant management and operations personnel. LOPAx guides users through the LOPA process. A hazard scenario consisting of a single or multiple Initiating events can easily be evaluated. Multiple **Enabling Conditions (EC)**, **Independent Protection Layers (IPL)**, and **Conditional Modifiers (CM)** can be specified. The effectiveness of each can be specified on a per initiating event basis, allowing the user to thoroughly document the sequence of events that cause an initiating event to become an incident.

LOPAx uses a worksheet approach with the ability to address multiple initiating events for the same hazard scenario. A default LOPA database with initiating events frequencies and potential layers of protection probabilities of failure is provided, complete with the respective data references and criteria that need to be satisfied for the value to be valid. Additionally, users can create their own collection of initiating events and layers of protection.

LOPAx can be used as a standalone tool or in conjunction with other modules within the **exSILentia® v4 suite** to seamlessly share information to support compliance with the overall process safety management requirements.

When using LOPAx in combination with the **Process Hazard Analysis (PHA)** tool PHAx™, the LOPA worksheets are prepopulated with a specific hazard scenario‘s initiating events and safeguards that were identified during the PHA. Similarly incident frequencies determined during the LOPA or assumed levels of Risk Reduction for a **Safety Instrumented Function (SIF)** are automatically identified for the Safety Integrity Level target selection that is performed using the SILect™ module. This seamless exchange of LOPA data to subsequent tasks in the safety lifecycle drastically improves efficiency, ensures completeness of data transition, and provides traceability and auditability.



LOPAx™ Key Features & Benefits

• Calculate risk reduction needed to meet corporate risk frequency target • Use documented reference data from default LOPA database or User defined data • Analyze single or multiple cause-consequence pair scenarios for a single hazard scenario	***Organized, Rigorous, Standards Compliance***
• Ability to pre populate initiating events and associated safeguards from PHAx™ • Standard LOPA database for initiating events and independent protection layers • Data entered can be managed and used in one location, while available for multiple lifecycle tools	***Less Data Entry***
• Advanced automatic report generation capabilities including LOPA worksheet and data references facilitates process safety management (e.g. corporate, OSHA, Seveso) compliance on a global basis	***Standards Compliant Documentation***
• Integration with all exSILentia® 4 suite of tools	***One Safety Lifecycle Tool***

Effectiveness per Initiating Event

A hazard scenario consisting of multiple initiating events may have Enabling Conditions, Independent Protection Layers, and/or Conditional Modifiers identified during the PHA that are not effective to protect against all initiating events. LOPAx allows you to specify the protection capability on a per initiating event basis.

Initiating Events	Frequency		Operator Action	Relief Valve
Control loop failure	0.1	B	0.1	0.02
		E	0.1	NaN
		S	0.1	0.02

	Operator Intervention	Backup Generator
Control loop failure	0.2	NA
Loss of primary power	NA	0.001
Header rupture	0.2	NA
Loss of network connection	NA	NA

Effectiveness per Risk Receptor

LOPAx also allows you to specify the protection capability on a per risk receptor basis for those scenarios where multiple risk receptors, i.e. personnel, environment, etc. are considered.

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