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VAIL-PHA

PROCESS HAZARD ANALYSIS SOFTWARE

- SAFETY INTEGRITY LEVEL (SIL)
- HAZARD AND OPERABILITY STUDY (HAZOP)
- ROOT CAUSE ANALYSIS (RCA)
- WHAT-IF ANALYSIS
- FAILURE EFFECTS MODE ANALYSIS (FEMA)

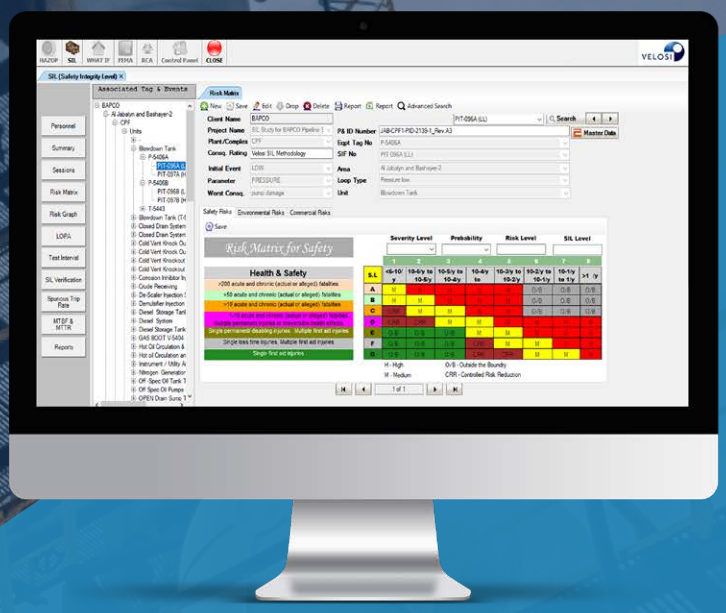
VELOSI

ENGINEERING FOR
A SAFER WORLD

ABOUT VELOSI

Velosi has successfully developed and implemented multiple software solutions for a diverse range of clients in various industries around the world. Through our team of experienced and highly qualified software engineers, we provide innovative software services to many organizations, thus empowering them to acquire the best value from their technology investment.

We work in close liaison with technical teams at energy companies to leverage the technology and infrastructure, support operations, and to provide a market-tested & accepted one-stop customized software solution for all the asset types of our clients in the energy sector.



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Introduction

VAIL- PHA is Velosi's leading proprietary Process Hazard Analysis software which encloses different modules, such as SIL, HAZOP, RCA, What-If and FEMA, and Safety Integrity Level (SIL). It is specially built to execute all stages of SIL classification, SIL verification and preparation of Safety Requirement Specifications (SRS).

VAIL-PHA supports testing interval and Spurious Trip Rate (STR) calculations of Safety Instrumented Functions (SIF), and it is developed in compliance with ANSI/ISA TR84.00.02, IEC – 615011 and IEC 61508.

What is Process Hazards Analysis?

Process Hazard Analysis (PHA) is defined as the analysis of potential causes and consequences of fires, explosions, releases of toxic or flammable chemicals and major spills of hazardous chemicals. It focuses on instrumentation, equipment, utilities, human interference, and external elements that can possibly impact the process.

Why Process Hazard Analysis is Important?

A process hazard analysis is a key element of every Process Safety Management (PSM) program. The main objective of such analysis is to identify hazards within the subject process by systematically reviewing the process and subsequently eliminating or controlling conditions that could lead to hazardous events.

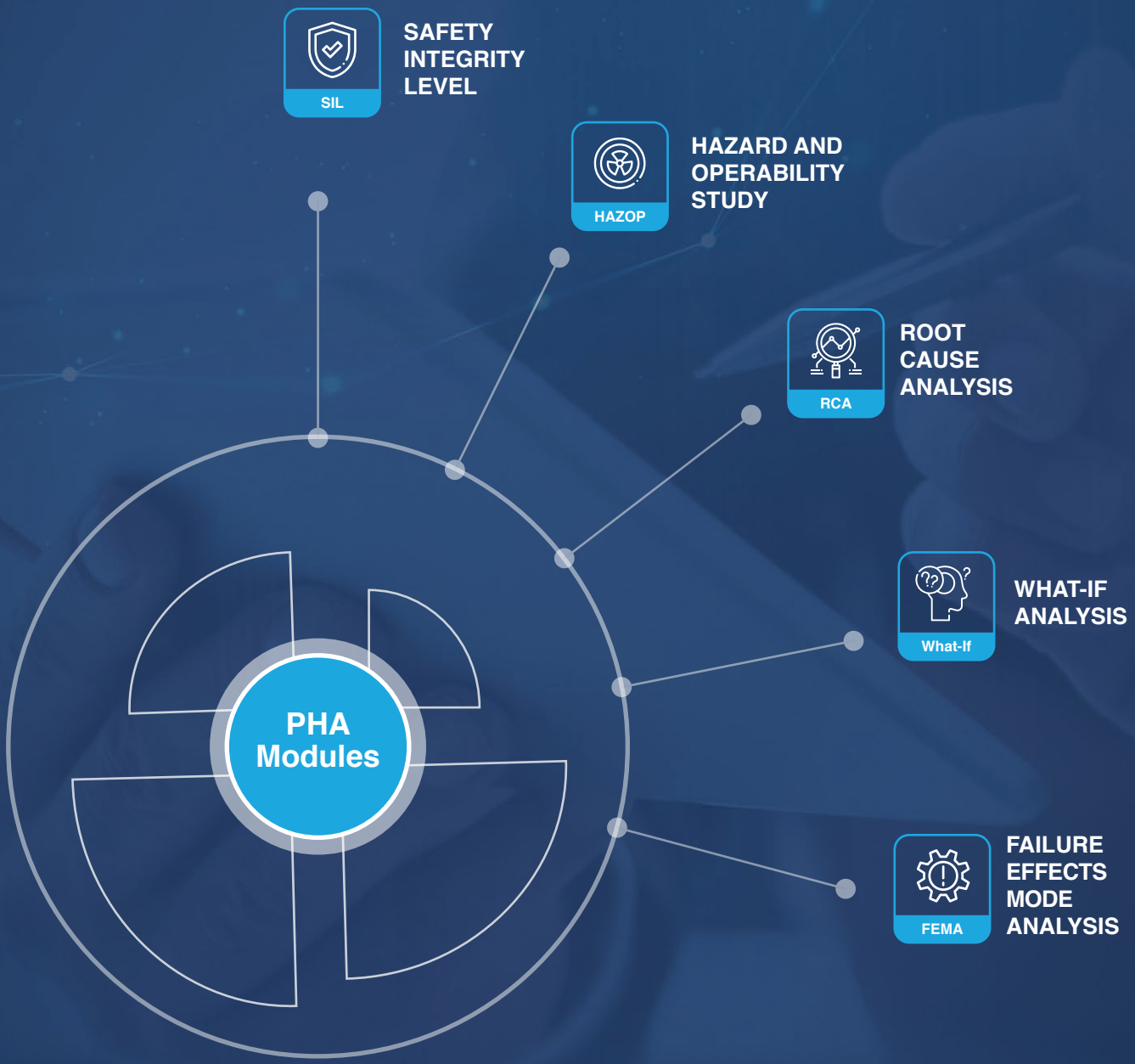
What Makes VAIL – PHA Unique?

VAIL – PHA is considered to be one of the most comprehensive process hazard analysis software systems available in the market for effective process safety management in all stages of design and operation.

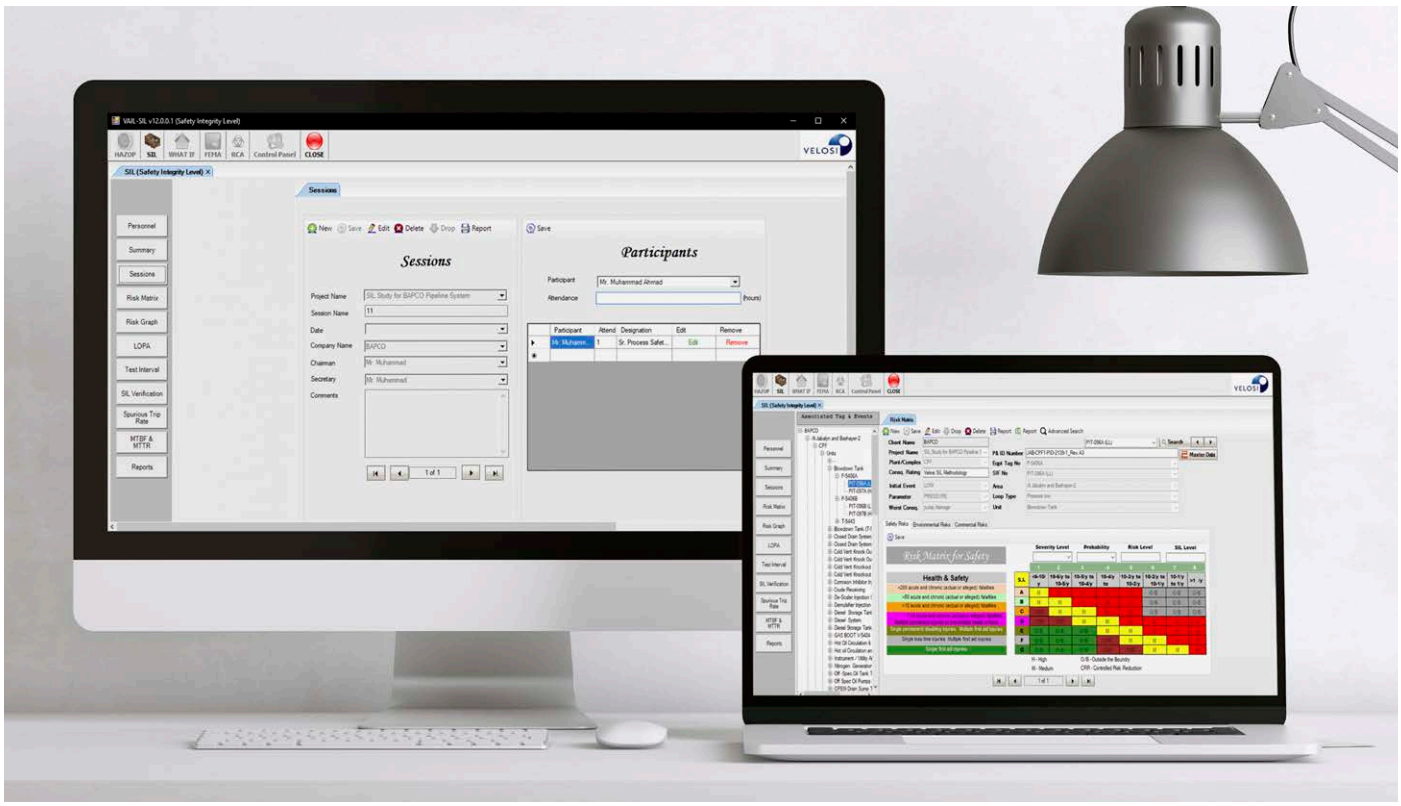
It can examine the progress of a potential incident from the initial release to far-field dispersion analysis comprising modelling of pool spreading and evaporation, and flammable and toxic effects. VAIL – PHA can also optimize the safety and risk management of your process system in accordance with industry best practices without compromising safety, environment and cost.

VAIL – PHA Modules

VAIL – PHA encompasses five modules, including SIL, HAZOP, RCA, What-If and FEMA. It is specially built to execute all stages of SIL classification, SIL verification and preparation of Safety Requirement Specifications (SRS). SIL and HAZOP are the two major modules, and details are as below:



Safety Integrity Level (SIL)



The SIL module is used to facilitate the Safety Integrity Level (SIL) methodology for safety critical systems. It is a unique tool that ensures safety integrity requirements of safety functions are maintained. These requirements are allocated placements within the Electrical/Electronic/Programmable-Electronic safety-related Systems.

VAIL – SIL Features:

- Conducts SIL assessment using either the Layers of Protection Analysis (LOPA) or Risk Graphs methodology (or both) along with Risk Matrix
- VAIL-PHA SIL software meets the requirements of IEC 61508.
- Perceives dynamic changes and shows risk as well as SIL levels in the Risk Matrix.
- Targets PFD calculations.
- Calculates Mean Time between Failure (MTBF) and Mean Time to Repair (MTTR) along with general reliability data.
- Records management of the SIL study session team.
- Provides dynamic reporting.
- Calculates the test interval.

Safety Integrity Level (SIL) Classification

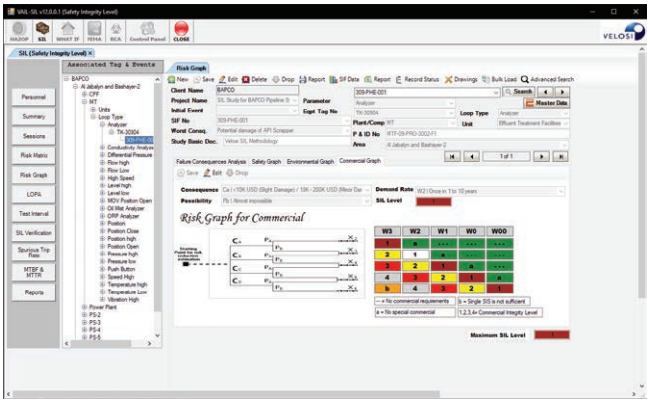
Risk Matrices are used in process safety to rate and rank risks of hazardous events in helping with decision making on risk reduction for processes. In short, they are considered to be a key element of performing Process Hazard Analysis (PHA). Risk matrices appear to be simple and useful tools for risk management.

Risk Matrix

Risk Matrices are used in process safety to rate and rank risks of hazardous events in helping with decision making on risk reduction for processes. In short, they are considered to be a key element of performing Process Hazard Analysis (PHA). Risk matrices appear to be simple and useful tools for risk management.

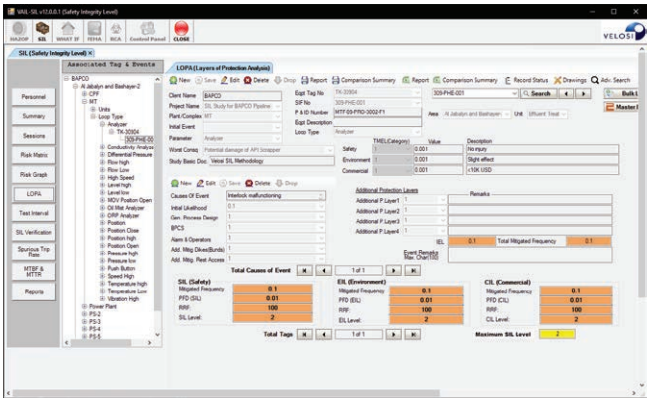
Risk Graph

Risk Graph is one of the most popular methods which enables the SIL of a Safety Instrumented Functions (SIF) to be determined from the knowledge on the risk factors associated with the process. In short, it is broadly applied while determining SIL requirements for local safety functions including process shutdown systems.



Layer of Protection Analysis (LOPA)

LOPA is a quantitative method that considers the initiating event frequency as well as the probability of failures of the different layers of protection.

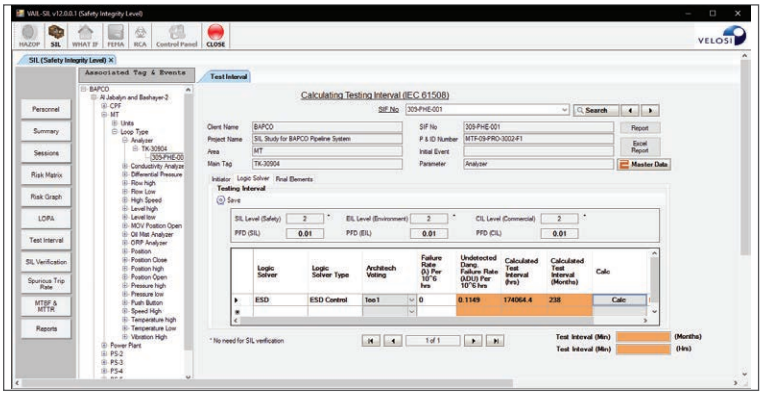


Advantages of LOPA method:

- Can be used both as a relatively coarse filtering tool and for more precise analysis.
- Can be performed as a team exercise; at least for semi-quantitative assessments.
- Facilitates the identification of all relevant risk mitigation measures & taking credit for them in the assessment.

SIF Test Interval

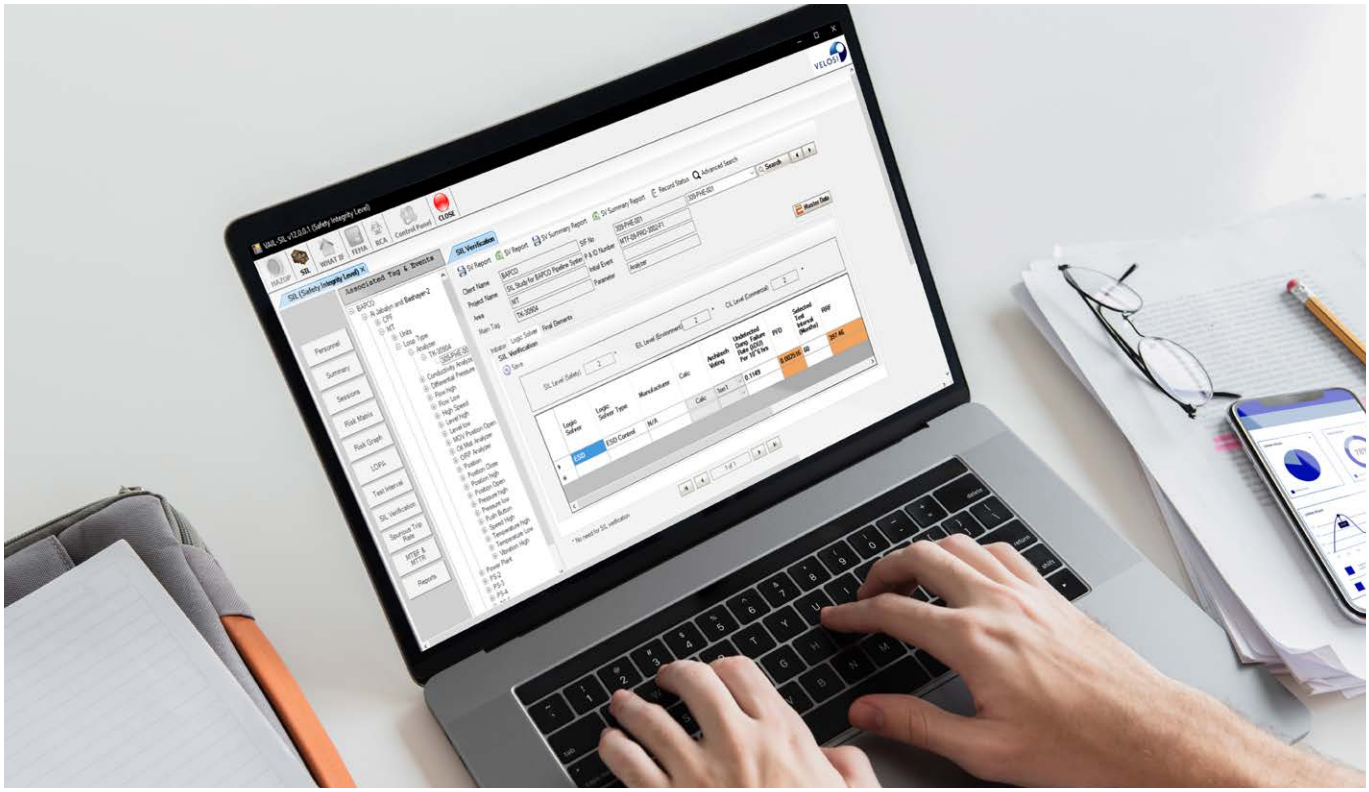
Considered to be a major parameter in the SIL verification phase, SIF Test Interval signifies the interval at which periodic proof tests are conducted. It indicates how strong this requirement is, as during the SIL verification, the proof test interval may be adjusted to accomplish the target SIL.



Safety Integrity Level (SIL) Verification

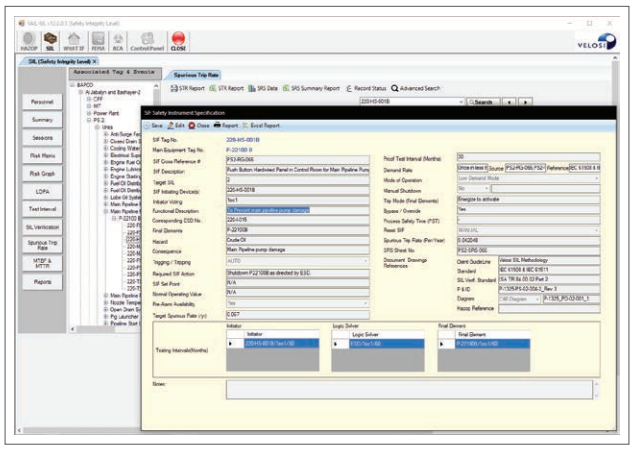
SIL verification is the process of calculating the average probability of failure on demand (or the probability of failure per hour) and architectural constraints for a safety function design to see if it meets the required SIL. It demonstrates the capability of a Safety Instrumented Function (SIF) in accordance with IEC 61508 and IEC 61511 against the following requirements:

- Quantifying the effect of random hardware failures (Probability of Failure on Demand (PFD) or the Average Frequency of Dangerous Failures (PFH))
- Systematic capability
- Hardware safety integrity architectural constraints Safe Failure Fraction (SFF), Hardware Fault Tolerance (HFT), Element Type A or B)
- Common Cause Failure (CCF)



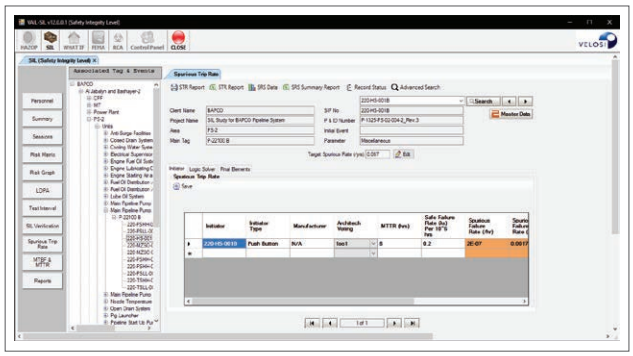
Safety Requirement Specification (SRS)

The SIF SRS phase in VAIL - PHA SIL module provides a template for collecting the Safety Requirements such as overall response time, trip reset, target SIL etc. for a Safety Instrumented Function (SIF). It is primarily focused on the collection of information and is used to optimize the detailed design requirements communication and to enhance the process requirements collection.

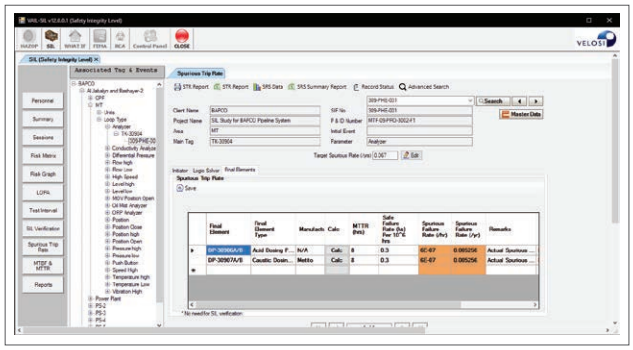


Spurious Trip Rate (STR)

Spurious Trip Rate is the frequency (measured in per unit time) at which a component in the system will fail and cause a spurious trip. The inverse of the Spurious Trip Rate is called the Mean Time to Failure Spurious (MTTFS), which is the average time between spurious trips for that component or system.

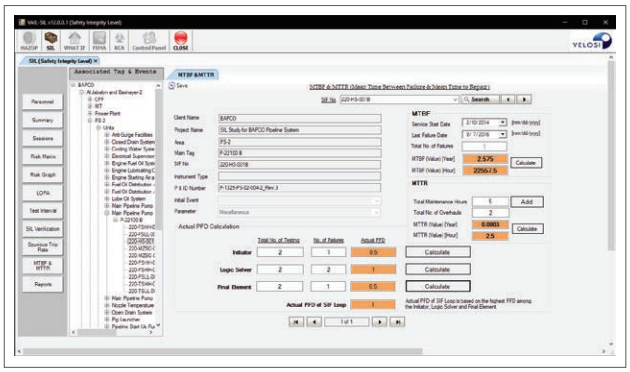


STR is calculated separately for the sensor, final element (including final element interface), and logic solver (including power supply) portions of the SIF. The overall STR for the SIF being evaluated is obtained by summing the individual components. The result is the STR for the Safety Instrumented Function.



Probability of Failure on Demand (PFD)

PFD is a measure of the effectiveness of a safety function, expressing the likelihood that the safety function does not work when it is expected to. The PFD for a loop is calculated on the basis of the failure rates of all the components in the loop.



Mean Time to Repair (MTTR) & Mean Time between Failure (MTBF)

Asset performance metrics like MTTR and MTBF are vital for any organization with equipment-reliant operations. Only by tracking these crucial KPIs, an organization can maximize uptime and keep disruptions to a minimum.

Mean Time to Repair (MTTR)

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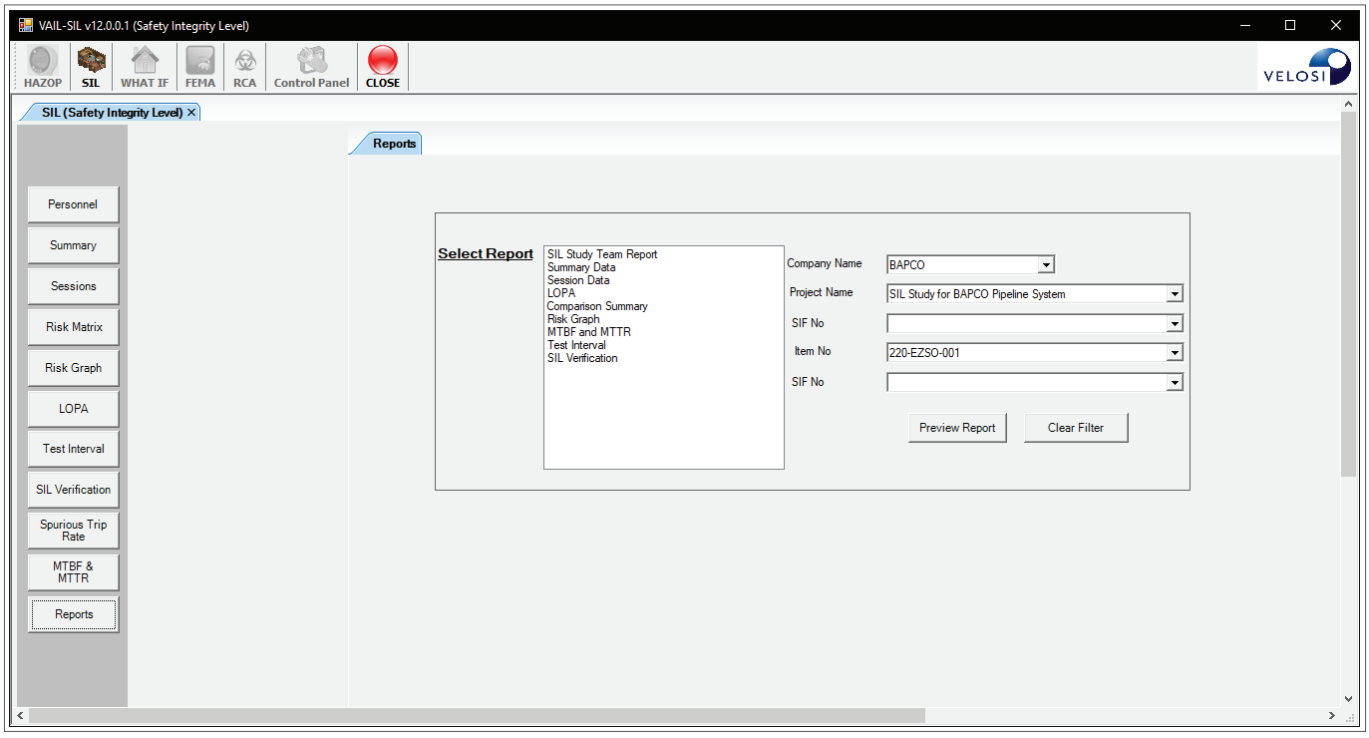
Mean Time between Failure (MTBF)

Mean Time between Failures (MTBF) is the predicted elapsed time between inherent failures of a mechanical or electronic system, during normal system operation. MTBF measures the predicted time that passes between the previous failures of a mechanical/electrical system to the next failure during normal operation.

VAIL – SIL Reports

VAIL–SIL offers you ample options to generate various types of reports in the Microsoft Excel format. The Reports tool provides the following outputs in detail:

- Risk Matrix Report
- Risk Graph Report
- LOPA Report
- Comparison Summary Report
- Test Interval Report
- SIL Verification Report
- SIL Verification Summary Report
- STR Report
- SRS Report



Hazard and Operability Study (HAZOP)

Hazard and Operability Study (HAZOP) tool is used to identify potential hazards to a process system. It is exclusively developed by using API 750, API 14J and API 1150 as reference documents.

Hazard identification is a key phase in the safety management of a facility. Only identified hazards can be analyzed, assessed, managed, and mitigated if warranted. VAIL - PHA HAZOP can provide vital inputs to management of change, written procedures, and incident investigation.

VAIL – PHA's Hazard and Operability Study (HAZOP) features involve:

- Project Team and Session Recording
- Reporting for Project and Facility
- Nodes Data and Scenarios Recording
- Dynamic Action Sheet and Worksheet Generation
- Analysis Summary
- Allocation of Actions & Tasks, and Priority Ranking
- Dynamic Link of Diagrams with Worksheets

Root Cause Analysis (RCA)

Hazard and Operability Study (HAZOP) tool is used to identify potential hazards to a process system. It is exclusively developed by using API 750, API 14J and API 1150 as reference documents.

Hazard identification is a key phase in the safety management of a facility. Only identified hazards can be analyzed, assessed, managed, and mitigated if warranted. VAIL - PHA HAZOP can provide vital inputs to management of change, written procedures, and incident investigation.

What-If Analysis

What-If Analysis is a decision-making process that helps organizations make the right decision and think about what effect it will have beforehand. It is specifically useful if data is limited or if an organization requires more information before they can make a decision.

Failure Effects Mode Analysis (FEMA)

Failure Effects Mode Analysis is a method of analyzing as many components, assemblies, and subsystems as possible for identifying potential failure modes in a system and their causes and effects. For each and every component, the failure modes and their resulting effects on the rest of the system are recorded in a particular FEMA worksheet.

Advantages of VAIL–PHA

Hazard and Operability Study (HAZOP) tool is used to identify potential hazards to a process system. It is exclusively developed by using API 750, API 14J and API 1150 as reference documents:

User-Friendly Interface	Accurate Documentation	Process Studies
Cost-Effectiveness	Default Deviations	Diagrams & Worksheets
Actions Manager	Action Response	Actions Only Reports
Flexibility	Time-Saving	No Duplication
Consistent Approach	Risk Matrix	Less Study Time
Risk Ranking	Effective Process Safety Management	Workers Protection
Efficient	Productive	Optimized PHA templates
Centralized & Efficient Analyses	Regulatory Compliance	

Specially designed for the following industries:

 Oil and Gas Industries	 Power Sectors	 Petrochemical Industries	 Steel Industries	 Infrastructure and Building Construction	 Other Industries

Why Choose Us?

- We provide client-specific solutions.
- Our team of experts can help you to modify or add any custom features that help in business growth.
- We ensure that all of our modules are designed for specific requirements for your business operation.
- We have strong elements of technical knowledge and believe in upholding reliability.
- We are committed to providing continuity of development to ensure the consistency of our software performance and adding extra features.

Our Strengths

 **ONE-STOP SOLUTION**	 **100+ SOFTWARE SOLUTION EXPERTS**	 **BUILDING LONG TERM CLIENT RELATIONS**
 **WORLDWIDE SERVICE**	 **PARTNERING WITH THE WORLD'S TOP COMPANIES**	 **GLOBAL REACH, LOCAL SERVICE**

Some of our clients

Since 2010, we are providing multiple software solutions for business operations & development in various industries which helps clients to reach their full potential to maximize the use of their assets and meet customer satisfaction. We are working with some of the world's largest companies, including Petronas, Galito's, BSR Petrovietnam, PPL, H2AIM, Tanap, ADNOC, SNGPL, Dragon Oil, BUNDUQ, Lukoil, KJO, IDEMITSU, Equion and many others.

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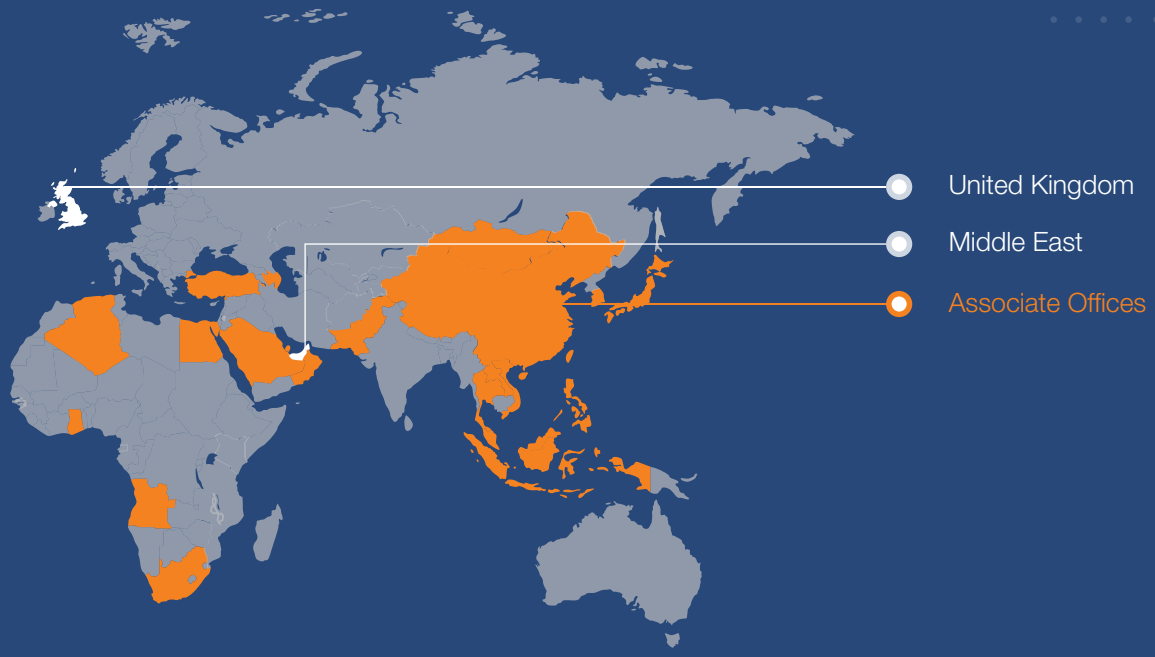

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