

COURSE OVERVIEW IE0236

Safety Integrity Level/Layer of Protection Analysis (SIL/LOPA)

Course Title

Safety Integrity Level/Layer of Protection Analysis (SIL/LOPA)

Course Reference

IE0236

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Date/Venue

Session(s)	Date	Venue
1	April 05-09, 2026	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai UAE
2	June 21-25, 2026	
3	September 06-10, 2026	Crowne Meeting Room, Crowne Plaza Al Khobar, KSA
4	December 14-18, 2026	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.



This course is designed to provide participants with a detailed and up-to-date overview of Safety Integrity Level/Layer of Protection Analysis (SIL/LOPA). It covers the concepts, importance, methodology and applications of safety integrity level (SIL) and layer of protection analysis (LOPA); the risk assessment and management, hazard identification techniques, consequence analysis, severity assessment, likelihood assessment, frequency analysis and risk matrix and risk ranking methodologies; the significance of safety integrity level (SIL), concept of tolerable risk and risk reduction, SIL classification levels, SIL selection criteria and SIL determination methods; the layer of protection analysis (LOPA) methodology and scenario identification; and collecting relevant data and information, documenting scenarios and initiating events, consequences and safeguards.



During this interactive course, participants will learn the frequency of initiating events; the sources of data and information, analyzing historical data and incident databases; the uncertainty factors and calculating event frequencies; the consequences of potential incidents and consequence estimation methods and models; calculating initial risk for each scenario and risk estimation methods and techniques; the risk reduction measures, selecting appropriate safeguards and protection layers and documenting risk reduction measures and their effectiveness; preparing LOPA reports and documentation; reviewing and verifying the LOPA analysis and independent assessment; and auditing, implementing and maintaining LOPA results.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on safety integrity level/layer of protection analysis (SIL/LOPA)
- Discuss the concepts, importance, methodology and applications of safety integrity level (SIL) and layer of protection analysis (LOPA)
- Carryout risk assessment and management, hazard identification techniques, consequence analysis, severity assessment, likelihood assessment, frequency analysis and risk matrix and risk ranking methodologies
- Discuss the significance of safety integrity level (SIL), concept of tolerable risk and risk reduction, SIL classification levels, SIL selection criteria and SIL determination methods
- Recognize layer of protection analysis (LOPA) methodology and apply scenario identification
- Collect relevant data and information, document scenarios and identify initiating events, consequences and safeguards
- Estimate frequency of initiating events, identify the sources of data and information, analyze historical data and incident databases, apply uncertainty factors and calculate event frequencies
- Evaluate the consequences of potential incidents and apply consequence estimation methods and models
- Calculate initial risk for each scenario and apply risk estimation methods and techniques
- Identify and evaluate risk reduction measures, select appropriate safeguards and protection layers and document risk reduction measures and their effectiveness
- Prepare LOPA reports and documentation, review and verify the LOPA analysis, apply independent assessment and audit, implement and maintain the LOPA results

Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.

Who Should Attend

This course provides a complete and up-to-date overview of safety integrity level/layer of protection analysis (SIL/LOPA) for senior process control engineers, process control engineers, senior control systems engineers, senior control systems engineers, control systems engineers, reliability and integrity engineers, process engineers, safety engineers, professionals and regulators.



Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

-  British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

-  The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units (CEUs)** in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.





Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Mr. Sydney Thoresson, PE, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience within the **Power & Water Utilities** and Other **Energy Sectors**. His specialization highly evolves in **Electrical Safety, Power System Equipment, Electrical Drawing, Electrical Forecasting, Transmission Networks, Substation, Distribution Networks, Substation Automation Systems & Application, Electrical System, HV/LV Electrical Authorisation, Variable Frequency Drives (VFD), HV/LV Equipment, Circuit Breaker, Motor Controllers, Hazardous Area Classification, Intrinsic Safety, Electrical Power Systems Quality & Troubleshooting, Protection & Relay, Electric & Control System Commissioning, Liquid & Gas Flowmetering, Fault Analysis in Electrical Networks & Distribution Cables, Custody Measurement, Ultrasonic Flowmetering, Loss Control, Gas Measurement, Process Control Instrumentation, Compressor Control & Protection, Control Systems, Programmable Logic Controllers (PLC), SCADA, Distributed Control Systems (DCS) especially in Honeywell DCS, H&B DCS, Modicon, Siemens, Telemecanique, Wonderware and Adrioit**. Moreover, he has vast experience in the field of **Safety Instrumented Systems (SIS), Safety Integrity Level (SIL), Emergency Shutdown (ESD), Flowmetering & Custody Measurement, Multiphase Flowmetering, Measurement and Control, Mass Measuring System Batching (Philips), Arc Furnace Automation-Ferro Alloys, Walking Beam Furnace, Blast Furnace, Billet Casting Station, Cement Kiln Automation, Factory Automation and Quality Assurance Accreditation (ISO 9000 and Standard BS 5750)**.

During Mr. Thoresson's career life, he has gained his thorough and practical experience through various challenging positions such as a **Project Manager, Contracts Manager, Managing Director, Technical Director, Divisional Manager, Plant Automation Engineer, Senior Consulting Engineer, Senior Systems Engineer, Consulting Engineer, Service Engineer and Section Leader** from several international companies such as **Philips, FEDMIS, AEG, DAVY International, BOSCH Instrumentation and Control, Billiton, Endress/Hauser, Petronet, Iscor, Spornet, Eskom and Afrox**.

Mr. Thoresson is a **Registered Professional Engineering Technologist** and has a **National Higher Diploma (NHD) & a National Diploma in Radio Engineering** from the **Witwatersrand Technikon**. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)**, an active member of the **International Society of Automation (ISA)** and the **Society for Automation, Instrumentation, Measurement and Control (SAIMC)**.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.





Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introductions
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to SIL/LOPA Safety Integrity Level (SIL) & Layer of Protection Analysis (LOPA) Concepts • Importance of SIL/LOPA in Risk Management & Process Safety • The SIL/LOPA Methodology & Its Application • Relevant Standards & Guidelines (IEC 61508, IEC 61511, Etc.)
0930 – 0945	Break
0945 – 1030	Risk Assessment Fundamentals Principles of Risk Assessment & Management • Hazard Identification Techniques (HAZID, HAZOP, Etc.)
1030 – 1215	Risk Assessment Fundamentals (cont'd) Consequence Analysis & Severity Assessment • Likelihood Assessment & Frequency Analysis
1215 – 1230	Break
1230 – 1420	Risk Assessment Fundamentals (cont'd) Risk Matrix & Risk Ranking Methodologies
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

Day 2

0730 – 0930	Introduction to Safety Integrity Level (SIL) Safety Integrity Level (SIL) & Its Significance • The Concept of Tolerable Risk & Risk Reduction • SIL Classification Levels & Their Corresponding Risk Reduction Targets • SIL Selection Criteria & SIL Determination Methods • Introduction to Safety Instrumented Systems (SIS) & Their Role in Achieving SIL
0930 – 0945	Break
0945 – 1100	Layer of Protection Analysis (LOPA) Methodology Introduction to Layer of Protection Analysis (LOPA) Methodology • The Layers of Protection & Their Effectiveness
1100 – 1215	Layer of Protection Analysis (LOPA) Methodology (cont'd) LOPA Terminology & Definitions • LOPA Workflow & Step-By-Step Approach
1215 – 1230	Break
1230 – 1420	Layer of Protection Analysis (LOPA) Methodology (cont'd) Roles & Responsibilities in LOPA Analysis
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two



Day 3

0730 – 0930	LOPA Step 1: Scenario Identification <i>Identifying Scenarios for LOPA Analysis • Criteria for Scenario Selection Collecting Relevant Data & Information</i>
0930 – 0945	<i>Break</i>
0945 – 1100	LOPA Step 1: Scenario Identification (cont'd) <i>Documenting Scenarios & Their Context • Identifying Initiating Events, Consequences, & Safeguards</i>
1100 – 1215	LOPA Step 2: Frequency Analysis <i>Estimating the Frequency of Initiating Events • Sources of Data & Information for Frequency Estimation • Analyzing Historical Data & Incident Databases</i>
1215 – 1230	<i>Break</i>
1230 – 1420	LOPA Step 2: Frequency Analysis (cont'd) <i>Considerations for Human Error Probabilities • Applying Uncertainty Factors & Calculating Event Frequencies</i>
1420 – 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day Three</i>

Day 4

0730 – 0930	LOPA Step 3: Consequence Analysis <i>Evaluating the Consequences of Potential Incidents • Consequence Estimation Methods & Models • Evaluating Potential Damage to People, Environment, & Assets</i>
0930 – 0945	<i>Break</i>
0945 – 1100	LOPA Step 3: Consequence Analysis (cont'd) <i>Assessing Severity Levels & Their Impact on Risk • Documenting Consequence Analysis Results</i>
1100 – 1215	LOPA Step 4: Risk Estimation & Comparison <i>Calculating the Initial Risk for Each Scenario • Risk Estimation Methods & Techniques • Determining the Target Risk Levels Based on Tolerability Criteria</i>
1215 – 1230	<i>Break</i>
1230 – 1420	LOPA Step 4: Risk Estimation & Comparison (cont'd) <i>Comparing the Initial Risk to the Target Risk • Identifying Scenarios Requiring Further Risk Reduction</i>
1420 - 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day Four</i>

Day 5

0730 – 0830	LOPA Step 5: Risk Reduction Measures <i>Identifying & Evaluating Risk Reduction Measures • Layers of Protection & Their Effectiveness • Determining the Required Risk Reduction for Each Scenario</i>
0830 – 0845	<i>Break</i>
0845 – 1000	LOPA Step 5: Risk Reduction Measures (cont'd) <i>Selecting Appropriate Safeguards & Protection Layers • Documenting Risk Reduction Measures & Their Effectiveness</i>



1015 - 1145	LOPA Step 6: Documentation & Verification <i>Documenting the LOPA Analysis & Results • Preparing LOPA Reports & Documentation • Reviewing & Verifying the LOPA Analysis</i>
1145 - 1200	<i>Break</i>
1200 - 1345	LOPA Step 6: Documentation & Verification (cont'd) <i>Independent Assessment & Audit of the LOPA • Implementing & Maintaining the LOPA Results</i>
1345 - 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 - 1415	POST-TEST
1415 - 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art “PHA/HAZOP”, “Mindview Software”, “Visio Software” and “Safety Automation Builder Software (Rockwell Automation)” simulators.

The screenshot displays the PHA/HAZOP Simulator software interface. It features several overlapping windows and panels:

- Master List Sections:** A table listing sections with columns for No., Highlight, Method, Type, Name, and Description. Sections include Tank/Vessel, Line/Pipe, Heat Exchanger, and Chlorine Vaporizer.
- HAZOP Worksheet:** A central window showing a risk matrix with columns for Severity (S1-S4) and Likelihood (L1-L3). The matrix cells are color-coded (e.g., red for high risk, yellow for medium, green for low).
- Master List: Action Items:** A table listing action items with columns for No., Refs, and Action. Actions include 'Verify that all of...', 'Verify that the...', and 'Verify that back...'
- Master List: Drawings:** A table listing drawings with columns for Type, Number, Title, and See. Drawings include Chlorine Unloading, Bleach Plant, and Chlorine Vaporizer.
- Master List: Team Members:** A table showing team member participation with columns for Name and participation status (checked/unchecked).
- HAZOP Worksheet: Causes/Consequences:** A table listing causes and consequences with columns for No., Link, and Cause. Causes include 'Loss of containment' and 'Corrosion/erosion'.

PHA/HAZOP Simulator

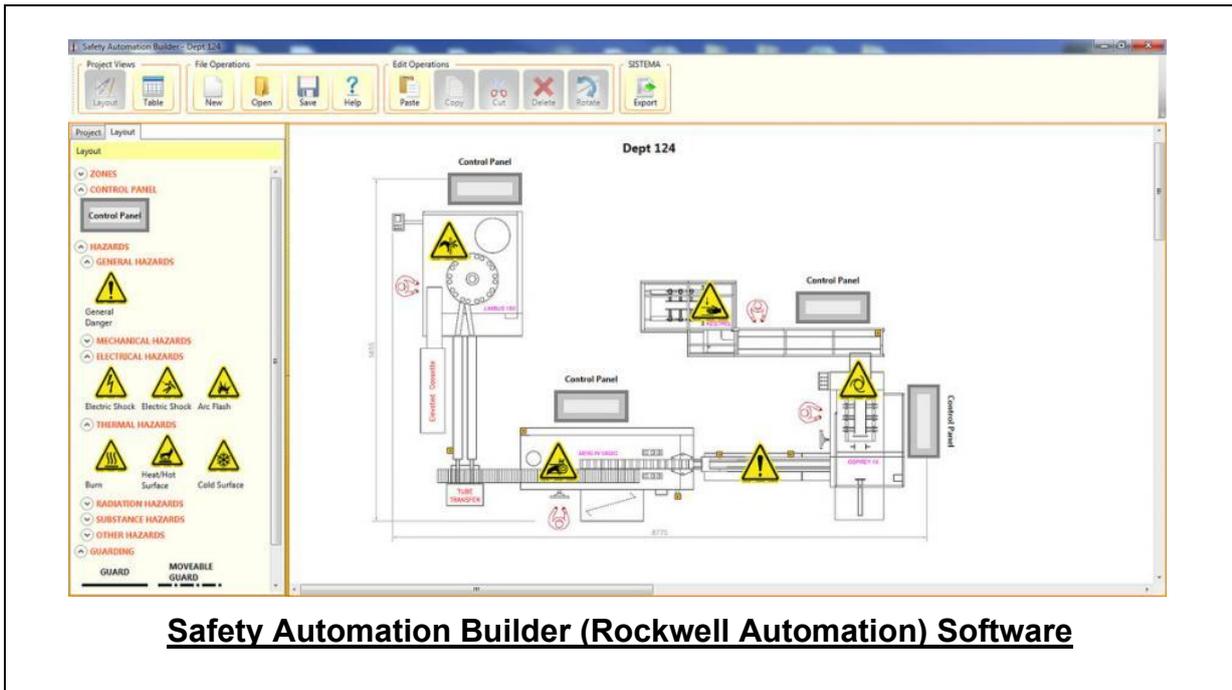


The screenshot displays the Mindview software interface. At the top, a mind map titled "Problem Solving" is shown with a central node "Problem Solving" and several branches: "Assessment", "Planning", "Measurement", and "Monitoring". Each branch contains sub-nodes with icons and text. Below the mind map, a Microsoft Word document is open, showing a structured document with sections corresponding to the mind map's nodes. The Word document includes sections for "PROBLEM SOLVING", "Assessment", "Planning", "Measurement", and "Monitoring", each with a list of sub-points. The software interface includes a menu bar (File, Home, Insert, Review, Share, View, Design) and a ribbon with various tool icons. The text "Mind map" is written to the right of the mind map, and "Word" is written below the Word document.

Mindview Software

The screenshot shows the Visio Professional software interface. The main window displays an Ishikawa diagram titled "Ishikawa diagram - Factors reducing competitiveness". The diagram is a fishbone-style flowchart with a central horizontal arrow pointing to the right, labeled "Reduced Competitiveness". The arrow is red. Above the arrow, the main categories are "External Environment", "Management Project Approach", and "Management". Below the arrow, the main categories are "Corporate Structure", "Staff", and "Process Approach to Management". Each category has several sub-causes listed as arrows pointing to the main category. For example, under "Management Project Approach", causes include "Disregard for Research and Development", "Absence of Change Management Rules", and "Lack of Motivation Programs". The software interface includes a menu bar (FILE, HOME, INSERT, DESIGN, DATA, PROCESS, REVIEW, VIEW) and a ribbon with various tool icons. The text "Ishikawa diagram" is written at the bottom of the diagram area.

Visio Software



Safety Automation Builder (Rockwell Automation) Software

Course Coordinator

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