



Professional Profile

Edward M. Marszal, PE, ISA84 Expert
President and CEO, Kenexis

Fields of Competence

Layer of Protection Analysis
Hazards and Operability Studies
Safety Instrumented System Engineering
Safety Integrity Level Verification
Fault Tree Analysis
Fire and Gas System Engineering
Reliability Engineering
Process Hazards Analysis / Hazard Identification
Quantitative Risk Analysis
Security PHA Review
Chemical Engineering
Process Safety Management

Experience Summary

Mr. Marszal has thirty years of experience in risk analysis and the design and implementation of engineered safeguards, such as safety instrumented systems, fire and gas detection systems, alarm systems, and relief systems, in the process industries. Mr. Marszal is President and CEO of Kenexis and responsible for risk analysis, instrumented safeguard design basis development and verification/validation projects, thought leadership and training development, and development of technical safety software applications. In his current position he has experience in SIS implementation and risk analysis projects for a variety of process plants in diverse world-wide locations. Marszal began his career with UOP, a licensor of process units to the petroleum refining and petrochemical industries, where he performed field verification of control and safety instrumented systems at customer sites, where he developed the LOPA process which started as simplified fault tree analysis. Mr. Marszal is committed to providing education on chemical process loss prevention. He teaches many of the Kenexis and ISA courses on SIS and F&G topics. In addition to training, Mr. Marszal is a prolific author, including numerous technical papers and the award-winning ISA books *Safety Integrity Level Selection* and *Security PHA Review*. Mr. Marszal is very involved in the International Society for Automation (ISA) society and is a Fellow of that organization, along with being a past ISA Safety Division Director. Mr. Marszal participates on ISA/IEC standards committees, including standards panel (SP) 84 for safety instrumented systems (including FGS Work Group 7 for ISA TR84.00.07). Mr. Marszal is also a member of the technical advisory board of the Purdue Process Safety and Assurance Center (P2SAC) of Purdue University.

Patents

US Patent No. 10,600,057, March 24, 2020, Edward Marszal, Sean Cunningham, Kevin Mitchell, Evaluating a Placement of Optical Fire Detector(s) Based on a Plume Model

Education - Formal

B.S., Chemical Engineering, The Ohio State University, 1992

Ongoing Training Received

UOP "Road School" – Refining Technology – 1992
UOP Instrument Engineer Apprenticeship – 1992-1994
UOP Instrument Field Service Apprenticeship Project 1 – 1993
UOP Instrument Field Service Apprenticeship Project 2 - 1994
ISA EC50 – Safety Instrumented Systems – Design, Analysis, and Justifications

Licensures

Registered Professional Engineer (Control Systems), State of Ohio

Certifications

ISA 84 SIS Fundamentals Specialist (SFS)
ISA 84 SIL Selection Specialist (SSS)
ISA 84 SIL Verification Specialist (SVS)
ISA 84 Expert
Certified Functional Safety Expert, TUV Sud

Affiliations

American Institute of Chemical Engineers (AIChE) - Senior Member

Instrumentation, Systems and Automation Society (ISA) - Fellow, and Past Director – Safety Division, Committees – SP84, SP18, and SP91

Purdue Process Safety and Assurance Center (P2SAC), Member and Board Participant

International Electrotechnical Commission, SC65A, Voting Member

Key Projects

Performed and managed safety instrumented system (SIS) design basis development and verification / validation projects at various customer sites worldwide on various process units including. SIS design basis projects include identification and definition of safety instrumented functions, risk analysis to determine safety integrity level, quantitative reliability analysis to verifying achievement of SIL targets, Safety Requirements Specifications development, and in some cases, functional test plan development and PSAT assistance.

- Hydrocrackers
- Steam Reformers
- Hydrogen Purification Units (Liquid/Liquid, PSA, Membrane)
- Diesel Hydrotreating
- Gasoline Hydrotreating
- HF Alkylation
- Naphtha Reformers
- Cokers
- Fluidized Catalytic Cracking (FCC)
- Batch Custom Peroxide Production
- Utility Boilers
- Onshore/Offshore oil and gas production
- Gas Liquefaction
- Sulfur Removal and Recovery
- PTA/PIA Production
- Polypropylene Production
- Phenol / Acetone Production
- Butandiol Production
- Utility Boilers
- Compressor Systems (Centrifugal, Reciprocating, Screw, and Liquid Ring)
- Bio-catalyzed waste water treatment systems

Performed and managed performance-based fire and gas system (FGS) design basis development and verification/validation projects at various worldwide locations. FGS design basis development projects include some or all of the following tasks: definition of zones, risk based zone categorization and grading, fire and gas mapping for detector coverage determination, detector technology selection, preparation of FGS safety requirements specifications. FGS design basis development performed for the following facility types.

- Offshore oil and gas production
- Onshore oil and gas production
- Refinery Hydrotreating Units
- Refinery Tank Farms
- Refinery Product Truck Loading

Presented numerous training classes discussing the principles and techniques employed in instrumented safeguards and risk analysis.

- Safety Instrumented Systems Engineering
- Layer of Protection Analysis
- Process Hazards Analysis
- Security PHA Review
- Burner Management Systems
- Performance Based Fire and Gas System Engineering
- ISA EC50/52/54 Safety Instrumented System Design Courses for ISA

Professional Profile

Participated in performing all aspects of implementing the requirements of the ISA 84.01 specification and IEC 1508/1511 specifications for a major U.S. process licensor with global licensee operations and manufacturing facilities. The project included determining scope of liability, SIL selection methodology and procedure development, creation of tolerable risk policy, equipment SIL verification procedure creation and detailed SIS design procedures.

Managed the detailed design, construction, installation, and start-up of several multi-million dollar control system projects, including advanced process control. Projects included control system detailed design, control software development, operator interface software development, advanced process control software development, controller assembly and fabrication, packing and shipping, installation, pre-startup checkout, and loop-by-loop "hot cut over" commissioning.

Performed detailed fire and gas requirements assessments for numerous refinery and oil and gas production customers. Studies included zone definition and grading, along with fire and gas system mapping in order to verify quantitative performance targets. The studies resulted in FGS performance requirements specifications that were subsequently used for detailed design and construction of the completed systems.

Performed detailed fault tree analyses of process systems for the purpose of determining the overall availability of highly critical systems. The results of these studies were utilized to determine the overall suitability of process designs in terms of safety and throughput and also to provide recommendations for improvement of the process designs in order to minimize the rate of losses from safety incidents and business interruption.

- Batch Reactor – High Energy Chemistry – Northeast US
- Emergency Flare Pilot Gas System – Shanghai, China
- Refinery Fuel Gas System – Northeast US
- Hydrocracker Runaway Reaction – Gulf Coast US

Managed and participated in the analysis and design of a High Integrity Pressure Protection Systems (HIPPS) for various clients in various locations. HIPPS project scope includes assessing the appropriateness of a HIPPS system by reviewing the flare loading scenarios that are the design basis of the flare. Subsequently, requirements were placed on the HIPPS by a combination of ISA 84 risk analysis techniques and prescriptive requirements in the ASME Boiler and Pressure Vessel Code. The projects also included a conceptual design evaluation and quantitative SIL verification, ensuring that the design was appropriate for the situation and all requirements were met. In several cases, reports generated for this project were presented to the authority having jurisdiction for approval of this alternative pressure protection scheme.

- Gasoline Desulfurization Unit – Canada
- Gas Production Wellhead System – Trinidad and Tobago
- Gasoline Desulfurization Unit – US Gulf Coast
- Batch Reaction – US MidAtlantic Coast
- FCC Regenerator – Northeast US
- Entire Refinery Flare System – Midwest US

Managed and participated in the quantitative risk analysis of several facilities of a major global refiner. The objective of the study was to profile the risks of various facilities throughout the organization according to criteria that we assisted in developing. The results of this study were used by board level executive to prioritize risk reduction expenditures and assign responsibility for EHS performance.

Authorship and Lecturing

Mr. Marszal is a prolific author and educator on the topics of engineered safeguards and risk analysis, publishing a number of articles, technical papers, and books on the subject, along with developing and presenting training courses and seminars.

Books

- “Safety Integrity Level Selection with Layer of Protection Analysis”, Edward M. Marszal, and Eric Scharpf, International Society for Automation (ISA), Research Triangle Park, NC, 2002.
- “Security PHA Review”, Edward M. Marszal, and James McGlone, International Society for Automation (ISA), Research Triangle Park, NC, 2019
- Kenexis Safety Instrumented System Engineering Handbook, Kevin J. Mitchell, Todd M. Longendelpher, Matthew C. Kuhn, Edward M. Marszal, Kenexis Consulting Corporation, Columbus, OH, 2010.
- Kenexis Fire and Gas Engineering Handbook, Kevin Mitchell, Beth Smith, Austin Bryan, Edward Marszal, Kenexis Consulting Corporation, Columbus, OH, 2015.
- Instrument Engineer’s Handbook, Section 3.2.1, “Hazardous Area Classifications”, Third Edition, CRC Press, New York, 2002.
- Instrument Engineer’s Handbook, Section 4.1, “Alarms and Annunciators”, Fourth Edition – Volume II, CRC Press, New York, 2002.

Training Courses

- EC52 – Safety Instrumented Systems – Advanced SIL Determination, ISA (2-Day)
- EC51VID – Understanding Changes in IEC 61511, ISA (1-Day)
- EC – Security PHA Review, ISA (1 Day)
- EC56P – Performance Based Fire and Gas System Engineering, ISA (3-Day)
- Safety Instrumented Systems Engineering – Parts 1 and 2, Kenexis (4-Day)
- Safety Instrumented Systems – Overview and Awareness, Kenexis (1/2 Day)
- Layer of Protection Analysis Facilitation, Kenexis (2-Day)
- Layer of Protection Analysis Participant Training, Kenexis, (2-Hour)
- SIL Verification, Kenexis (2-Day)
- SIS Detailed Design and Safety Requirements Specifications, Kenexis (2-Day)
- Process Technology and Hazards of Oil Refining, Kenexis (5-Day)
- Burner Management Systems, Kenexis
- Performance Based Fire and Gas System Engineering, Kenexis (3-Day)
- Safety Instrumented System Bypass Management, Kenexis (1-Day)
- Safety Requirements Specifications, Kenexis (2-Day)

Articles and Technical Papers

- Marszal, Edward, “Process Control Safety Standards as Institutional Memory”, Process Plant Safety Symposium, 2001.
- Marszal, Edward and van Beurden, Iwan, “Risk-Based Instrumented Safeguard Design”, AIChE Spring National Meeting, 2002.
- Marszal, Edward, “Human Reliability Analysis for SIL Selection”, ISA National Show - Technical Conference, Chicago, 2002.
- Marszal, Edward, “Hydrocracker SIL Selection Case Study”, ISA Safety Division Symposium, 2002.
- Marszal, Edward, “Protection Layer Commonality in LOPA”, ISA National Show - Technical Conference, Houston, 2003.
- Marszal, Edward, and Mitchell, Kevin J., “Defining Safety Instrumented Functions”, ISA Safety Division Symposium, Houston, 2003.
- Marszal, Edward M., “Considerations for Using SIS for Consequence Mitigation”, ISA Fall Meeting Technical Conference, 2004.
- Marszal, Edward, et al. “Oxidation Reaction Safeguarding”, Loss Prevention Symposium, New Orleans, 2004.
- Marszal, Edward, and Mitchell, Kevin J., “Justifying use of High Integrity Pressure Protection Systems”, ASME PVP Division Conference, 2004.
- Marszal, Edward, and Weil, Christopher P., “Using BPCS for Protective Functions”, ISA National Show – Technical Conference, Chicago, 2005.
- Marszal, Edward, “Fired Heater Safeguarding Survey”, AIChE Spring National Meeting, 2006.
- Marszal, Edward, “Case Study: FCC Regenerator Overpressure Protection”, ISA Fall National Show, 2006
- Mitchell, Kevin J. and Marszal, Edward, “Reconsidering the Need for Overpressure Protection via Instrumentation and Controls in the Petroleum Refining Industry”, ISA Safety Division Symposium, 2006
- Marszal, Edward, “A New Paradigm for Safety Metrics for Major Loss Prevention”, TIPS Users Conference, 2007.
- Marszal, Edward, and Longendelpher, Todd, “Comparative Risk Assessment for Coke Drum Relief Vent and Disposal”, ISA Safety Division Symposium, 2008.
- Mitchell, Kevin J. and Marszal, Edward, “Development of Methods for Risk-Based Fire and Gas Detection and Suppression System Assessment”, Texas A&M Instrumentation Symposium for the Process Industries, 2008.
- Herena, Peter, and Marszal, Edward, “Emergency Isolation Valve (EIV) Safeguarding Survey, AIChE Spring Conference, 2009.

Articles and Technical Papers (Cont'd)

- Marszal, Kuhn, Garand, Khalil, "Non-SIS IPL Testing Guidelines", ISA Safety Division Symposium, 2010.
- Marszal, Edward, "I've got a LOPA Report, Now What?", ISA NPRA Reliability Conference, 2010.
- Marszal, Edward, and Godsoe, Todd, "Best Practices in SIS Documentation", ISC Safety Control Systems Conference, Calgary, 2010.
- Marszal, Edward, , "Fire Detector Coverage Mapping for Improving Existing Systems", ISC Safety Control Systems Conference, Calgary, 2010.
- Longendelpher, Todd, and Marszal, Edward, , "Selecting Set Points for Alarms and Shutdowns", ISA Automation Week Conference, 2011.
- Marszal, Edward M., et al, "Comparison of Safety Integrity Level Selection Methods and Utilization of Risk Based Approaches", Process Safety Progress, (Vol. 19, No. 4) Winter 1999.
- Marszal, Edward, "Tolerable Risk Guidelines", ISA Transactions 40 (2001) 391-399.
- Marszal, Edward, "Transmitters in Safety Critical Service, IMEKO Conference, 2001.
- Marszal, Edward, "Artificial Intelligence Advancements Applied in Off-The-Shelf Controllers", Loss Prevention Symposium, 2001.
- Marszal, Edward, and Clark, Kevin, "The Data Dilemma: Maintenance and Test Tracking in a Post ISA 84 Era", NPRA Reliability Conference, 2011.
- Marszal, Edward, "Managing Competency – Application to SIS Lifecycle Activities", ICS Safety Control Systems Conferences, Perth, Australia, 2011.
- Marszal, Edward, "Shared Field Instruments in SIS: Incidents Caused by Poor Design and Recommendations for Improvement", Texas A&M Instrumentation Symposium for the Process Industries, 2012.
- Marszal, Edward, "Dispelling Myths About SIL Selection", ISA Safety Division Newsletter, 2006.
- Marszal, Edward, "Fine Points – What is a Risk Reduction Factor", ISA Safety Division Newsletter, 2006.
- Marszal, Edward, "LOPA and Unintended Consequences", ISA Safety Division Newsletter, 2007.
- Marszal, Edward, "Leverage Existing Systems for SIS Data Collections Needs", Offshore Magazine, December 2011.
- Marszal, Edward, "The State of Safety Instrumented Systems in Offshore Production", Offshore Magazine, June 2011.
- Marszal, Edward, and Longendelpher, Todd, "Selecting Set-Points for Alarms and Shutdowns", ISA Automation Week, 2011.
- Marszal, Edward, "Storage Tank Overfill Prevention Requirements using Focused QRA", Indian Oil Company Limited, Tank Safety Conclave, 2012.
- Marszal, Edward, "Shared Field Instruments in SIS – Incidents Caused by Poor Design and Recommendations for Improvement", TAMU Instrumentation Symposium, 2012.
- Marszal, Edward, and Smith, Beth, "Case Study: Implementing Performance Based Gas Detector Placement per ISA TR 84.00.07 on a Sulfur Recovery Unit", ADIPEC 2013.
- Marszal, Edward, "SIS Testing Strengths and Limitations of Full Loop Tests and Partial Tests", TAMU Instrumentation Symposium 2014.
- Marszal, Edward, "Fire and Gas Detection Optimization with ISA 84.00.07", AIChE CCPS China Chemical Safety Conference, Ningbo, China, 2015.
- Marszal, Edward, "Inherent Safety Against Cyber-Attack for Process Facilities", International Atomic Energy Authority (IAEA) Nuclear Facilities Cyber Security Conference, Vienna, June 2015.
- Marszal, Edward, "CFD for Tank Farm Gas Detector Placement", TAMU Instrumentation Symposium, 2015.
- Marszal, Edward and Smith, Beth, "Instrument Process Connection Plugging", TAMU Instrumentation Symposium, 2016.
- Marszal, Edward, "Leveraging PHA for to Develop Requirements for CyberSecurity", AIChE Spring Meeting, 2016
- Marszal, Edward, "A Brief History of Layer of Protection Analysis", China Chemical Safety Association Conference, Tianjin, 2016
- Marszal, Edward, "Gas Detector Coverage Using Gaussian Dispersion Models", Global Congress on Process Safety, 2017
- Marszal, Edward, "Unified Hazard Assessment – Bringing Together HAZOP, LOPA, Hazard Registers, and Bowtie in a Unified Structure", Mary Kay O'Conner Process Safety Center Conference, 2019
- Marszal, Edward and Austin Bryan, "Facilitating Barrier Integrity Management During PHA Revalidation", Global Congress on Process Safety, 2020
- Marszal, Edward, and Andrew Oulton, "Common Gas Detector Design Guidelines that Results in Poor Designs", TAMU Instrumentation and Automation Symposium, 2020
- Marszal, Edward and Austin Bryan, "Incorporating Mitigative Safeguards with LOPA", Mark Kay O'Conner Process Safety Center Symposium, 2020
- Marszal, Edward and Austin Bryan, "Risk Assessment and Safeguarding of Lithium -Ion Battery Containing Facilities", Global Congress of Process Safety, 2021
- Marszal, Edward and Margaret Hughes, "Mobile Computing for Procedure Execution Facilitation to Reduce Risk", Global Congress of Process Safety, 2021
- Marszal, Edward, "You Have SIS Bypassed Right Now and Don't Know It", Global Congress of Process Safety, 2021
- Marszal, Edward, "LOPA is Obsolete! Move to Quantitative Bowtie Analysis", Global Congress on Process Safety, 2022