

Christopher P. Weil
Senior Consultant, Kenexis

Fields of Competence

Process Control Network Cybersecurity Analysis
Process Hazards Analysis (PHA)
Safety Instrumented System (SIS) Engineering
Layer of Protection Analysis (LOPA)
Safety Integrity Level (SIL) Selection
Safety Integrity Level Verification
Safety Requirements Specifications (SRS)
Test Plan Development
Factory Acceptance Testing (FAT)
SIS / FGS Validation and Site Acceptance Testing
Functional Safety Assessment (FSA)
High Integrity Pressure Protection System (HIPPS)
Quantitative Risk Analysis (QRA) / Fault Tree Analysis

Experience Summary

Mr. Weil has thirty-six years of experience in the oil and gas industry and twenty-seven years of experience in the design and implementation of engineered safeguards, such as regulatory control safeguards, safety instrumented systems, and alarm systems in the process industries. Mr. Weil is a Senior Consultant of Kenexis and is responsible for engineered safeguard design basis development and verification/validation projects. In his current position he has solid experience with over 55 SIS implementation and risk analysis projects for a variety of process plants in diverse world-wide locations. Mr. Weil's career has been diverse in the petroleum and chemical industries including overseas work in Saudi Arabia and India. His experience includes the design, installation, programming, commissioning and start-up of distributed control systems, and safety instrumented systems. Mr. Weil participated in the early PLC development of input and output diagnostics for the safety instrumented systems prior to this function being available with the vendor equipment. Mr. Weil has also worked in the development of process control and safety instrumented systems for new processes utilizing micro-channel reactors at the lab level, scale-up level, and commercial applications.

Credentials

Global Industrial Cyber Security Professional (GICSP)
Certified ISA84 SIS Expert
Safety Instrumented System – Front End Engineering Design Part 1 and Part 2
Licensed Master Electrician
ITI Technical College, Industrial Instrumentation 1987

Key Assignments

Mr. Weil has led numerous Process Hazards Analysis (PHA) analyzing over 16,000 deviations including over 12,000 Layer Of Protection Analysis (LOPA) to determine over 12,000 Safety Integrity Levels (SIL). SIS design projects include definition of safety instrumented functions, risk analysis to determine SIL, quantitative reliability analysis to verify achievement of SIL targets, Safety Requirements Specifications (SRS) development, and in many cases, Functional Test Plan development. Clients range from upstream oil & gas, downstream refining, & petrochemicals.

Unit type experience

- Oil and Gas Production Onshore / Offshore
- Onshore Gas Plants
- Gas Well - Pressure Protection
- Oil Pipeline, Terminal and Loading / SBM
- Gas to Liquids (GTL)
- Liquefied Natural Gas (LNG)
- Crude / Crude Vac
- Delayed Coking
- Amine Treating / Sulfur Recovery (SRU)
- Steam-Methane Reforming (SMR)
- Hydrogen Purification
- Hydrotreating / Hydrocracking
- Utility Boilers
- Power Generation/Distribution
- Hazardous Waste Handling Systems
- Large Compressor Systems
- Asphalt Extraction Systems
- Rotary Reactor Systems

Mr. Weil has specified SIS Design and testing for over 11,000 SIF.

Functional Safety Assessments (FSA)

Lead the independent validation process for numerous SIS and Fire & Gas (F&G) projects, Stage 2 and Stage 3, including:

- Offshore Gas Platforms (8)
- Onshore Oil & Condensate Processing Facility
- FPSO, FSO
- Gas to Liquids (GTL) plant
- Gas Treating / Compression
- Gas Turbines, Power Generation
- Onshore Gas Treating Plant
- Phenol / Acetone Production Plant
- Boilers / Fired Equipment

FSA's ensure that key steps in the Safety Lifecycle have been adequately executed and the SIS design achieves the safety requirements prior to startup.

Key Assignments - Continued

Mr. Weil has participated in several accident investigations of fired equipment to identify root causes and contributing factors. These projects involve identifying potential causal factors related to fired equipment Burner Management Systems (BMS)

At a major research and development company in the northeast USA provided engineering support in the electrical power requirements, process control requirements, and safety instrumented systems requirements for commercial applications of new processes being developed using micro-channel technology. These processes included conceptual PHA, lab scale PHA, scale-up PHA, and commercial application PHA, commercial application LOPA, and SIL Selection along with SIL Verification.

At a world class emergency and safety training facility in the Middle East conducted conceptual SIS Design, SIL Selection, Layer of Protection Analysis, SIL Verification, Test Plans, and Startup Assistance for the Industrial Fire Fighting College - Live Fire Training Systems involving over 50 Burner Management Systems.

Developed the Functional Test Plans for the SIS on a Large Gulf of Mexico (GoM) Oil Production Platform. Project included test plans for 10+ instrument types covering over 500 SIF.

Developed Electrical Area Classification requirements for flammable liquid storage, handling, blending, and packaging system

Assisted a major US petroleum refiner in defining the classification of all instrumentation and identifying the safety instrument system loops in its numerous USA refineries. The first phase of assistance identified and classified all instrumentation. Second phase determined if the safety instrumented loops were in compliance with ANSI/ISA-84.00.01-2004 and met the grandfather clause or needed additional analysis. Third phase was analysis of non-grandfathered items, layer of protection analysis, and recommendations to meet the selected SIL targets.

At a major oil production facility and the largest oil field in the USA, performed Process Hazard Analysis (PHA), identified over 3600 Instrumented Protective Functions (IPF), performed over 2400 Layer of Protection Analysis (LOPA), and Safety Integrity Level (SIL) Selection for eleven facilities during a four year period from 2007 to 2010.

Development of Manual Emergency Shutdown System (ESD) for HF Alkylation Unit at 2 US petroleum refineries. Project included assessing the reliability of functionality to ESD, water deluge, and Rapid Acid Transfer.

Developed sophisticated training apparatus for demonstration of optical fire detection technologies, their integration to a PLC control system and has conducted training on Fire & Gas System (FGS) design and testing.

At a major refinery on the West coast of Saudi Arabia provided engineering support for distributed control systems and safety instrumented systems. Enhanced the "hot spares" laboratory in which all critical components were fully functional tested and rotated through the system providing proven good spares for equipment failures. Developed full functional test plans for critical instrument loops. Provide support for major on-line upgrades to the distributed control system for a total refinery system upgrade.

At one of the world's largest refinery's in Northwest India managed the distributed control systems and safety instrumented systems engineering support group. Support included problem solving, upgrading, modifications, and preventative maintenance, for one of the world's largest single integrated control systems comprised of Foxboro I/A, Triconex, Allen Bradley, and Modicon. Developed site-specific procedures to ensure job activities were performed with safe and methodical implementation.

Mr. Weil has participated in numerous factory acceptance tests and on site pre start-up acceptance tests for validation of systems.

Mr. Weil has facilitated and participated in numerous process control network cybersecurity analysis following NIST 800-53 framework and IEC-62443.

Affiliations

International Society of Automation (ISA)
Past Section President (Columbus)
Local Section Officer

Intellectual Property Participant, Articles, and Technical Papers

United States Patent 7,445,650
"Control of Pressurized Microchannel Processes"
United States Patent 8,460,411
"Microchannel compression reactor"
United States Patent 7,807,113
"Microchannel compression reactor assembly"
Velocys Inc.

Christopher Weil
"SRS Safety Requirement Specification Overview"
ISA Expo Control, Mexico City, 2007

Marszal, Edward and Christopher Weil,
"Using BPCS for Protective Functions"
ISA National Show – Technical Conference, Chicago, 2005

Marszal, Edward and Christopher Weil,
"Best Practices in SIS Documentation"
Lakeside/Emerson - 2014 Users Group, Toronto, CA 2014