

**Christopher P. Weil**  
**Senior Consultant, Kenexis**

### Fields of Competence

Process Hazards Analysis (PHA)  
Safety Instrumented System Engineering  
Layer of Protection Analysis (LOPA)  
Safety Integrity Level (SIL) Selection  
Safety Integrity Level Verification  
Safety Requirements Specifications (SRS)  
High Integrity Pressure Protection System (HIPPS)  
Quantitative Risk Analysis  
Fault Tree Analysis  
Functional Test Procedure Development  
Project Management

### Experience Summary

Mr. Weil has over twenty 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 40 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

Certified ISA84 SSS - SIL Selection Specialist

Certified ISA84 SFS – SIS Fundamentals Specialist

Qualified on Safety Instrumented System – Front End Engineering Design Part 1 and Part 2

Louisiana State Department of Education VTIE Certificate

Licensed Master Electrician, 1987 - Current

ITI Technical College, 1987  
Industrial Instrumentation – (Instrumentation and Control Technology)

### Key Assignments

At a major chemical facility in the southern USA provided engineering support for over 120 PLC's used in Safety Instrumented Systems. This support entailed the creation of a "hot spares" laboratory in which all critical components were fully functional tested and rotated through the system providing proven good spares for equipment failures. Software development for modifications and new systems was tested with simulation software or hardware for validation. Developed full functional test plans for critical instrument loops. Developed an external diagnostic system for critical outputs on PLC's to prove circuit continuity on redundant systems prior to this functionality being built into the PLC. A partial list of the major systems that were upgraded and or modified included:

- ◆ 400+ megawatt power plant BMS's
- ◆ Ethylene Oxide plant SIS
- ◆ Chlorine plant SIS
- ◆ Caustic plant SIS
- ◆ Light Hydrocarbon plant SIS
- ◆ Tri-block Copolymers plant SIS

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.

### Key Assignments - Continued

At a major research and development company in the northeast USA provided engineering support in the process control and safety instrumented systems 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.

Assisted a major 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 2004 and met the grandfather clause or needed additional analysis. Third phase was analysis of non-grandfathered items 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), Safety Instrumented Function (SIF) identification, Layer of Protection Analysis (LOPA), and Safety Integrity Level (SIL) Selection for numerous facilities during a four years period from 2007 to 2010. These PHA's included the world's largest gas processing plant at 246 MMcm/day with 11 compressors totaling over 500,000 HP.

Additionally performed numerous Process Hazard Analysis (PHA), Safety Instrumented Function (SIF) identification, Layer of Protection Analysis (LOPA), and Safety Integrity Level (SIL) Selection for numerous onshore/offshore upstream oil and gas production facilities.

### Unit type experience

- Oil and Gas Production Onshore/Offshore
- Delayed Coking
- Sulfur Recovery (SRU)
- Steam-Methane Reforming
- Hydrogen Purification
- Utility Boilers
- Gas Liquefaction
- Utility Boilers (Gas, Oil)
- Ethylene Oxide
- Power Generation
- Flare and Flare Gas Recovery Systems
- Open and Closed Hydrocarbon Drain Systems
- Hazardous Waste Handling Systems
- Hazardous Waste Rotary Kiln Incinerator
- Compressor Systems (Centrifugal, Reciprocating, Screw, and Liquid Ring)

Mr. Weil is now using these skills to facilitate Process Hazards Analysis (PHA) and Layer Of Protection Analysis (LOPA) to determine Safety Integrity Level (SIL) Selection. 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.

### Affiliations

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

### Articles, Technical Papers and Intellectual Property

United States Patent 7,445,650 B2  
"Control of Pressurized Microchannel Processes"

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