

### ***Todd M. Longendelpher*** ***Senior Engineer, Kenexis***

#### **Fields of Competence**

Safety Instrumented System Engineering  
Fire and Gas System Design  
Layer of Protection Analysis (LOPA)  
Safety Integrity Level (SIL) Selection  
Safety Integrity Level (SIL) Verification  
Safety Requirements Specifications (SRS)  
Quantitative Risk Analysis  
Process Hazards Analysis / Hazard  
Identification (PHA, HAZID)  
Chemical Engineering  
Fault Tree Analysis  
Quantitative Consequence Modeling

#### **Experience Summary**

**Mr. Longendelpher** has eight years of experience in the design, implementation, validation, and verification of safety instrumented systems and fire and gas systems. At Kenexis, he has managed Safety Instrumented System design basis development for over 35 oil & gas facilities, refineries, and pipeline networks. Mr. Longendelpher also has experience in facilitating several Layer of Protection Analyses (LOPA) and Hazard and Operability Analyses (HAZOP). He currently oversees a team of engineers and consultants in performing safety lifecycle activities for oil & gas production facilities throughout the US and the Gulf of Mexico. In addition, he is responsible for maintaining a database for safety equipment which compiles failure rate data from available vendor data, data in operating service, and industry-accepted reliability data sources.

#### **Credentials:**

B.S., Chemical Engineering, The Ohio State University (2006)

ISA 84 SIS Expert

Completed NCEES Fundamentals of Engineering Exam

#### **Affiliations:**

International Society of Automation (ISA) - Columbus Division

#### **Key Projects:**

Performed and managed design basis development activities, including facilitation of Layer of Protection Analysis, for several units of a US national refinery. The activities included a semi-quantitative analysis of process hazards and instrumented safeguards, including quantitative risk analysis where required to determine risk targets and residual risk. Verification was conducted for all safety and equipment protective functions within the identified units following LOPA. Recommendations were developed to modify SIS design and maintenance to achieve desired SIL targets. Scope of study included the following process units:

- Desulfurization
- Fluid Catalytic Cracking (FCC) Gas Compression
- Fired Heaters
- Flare Systems
- Oil and Gas Separation Systems
- Waste Heat Recovery Units

Performed design basis development and Layer of Protection Analysis (LOPA) activities for a multi-million dollar pipeline network spanning Asia, including risk assessment of hazards associated with the pipeline, over ten pump stations, and onshore facilities. Risk analysis of process hazards and instrumented safeguards was performed in accordance with customer risk criteria to determine adequacy of the process design in achieving its risk reduction targets, and recommendations were issued to address residual risk. Additional validation activities and functional test plans for safety devices were performed.

Performed and managed safety lifecycle activities for offshore oil & gas production facilities in the Gulf of Mexico. The project scope covered all major units of the facilities including:

- Oil and Gas Separation Systems
- Gas Compression
- Produced Water Injection
- Crude Oil Shipping Pumps / Metering
- Gas Conditioning
- Glycol Utility Systems
- Oil Fractionating Systems
- Production and Injection Wells
  - Miscible / Water Injection
  - Gas Lift
  - HP / LP Production
- Production Manifolds and Flowlines
- Flare Systems
- Power Generation

The project activities included the development and definition of safety instrumented functions, quantitative risk assessment to verify customer risk reduction targets were achieved, and the development of safety requirements specifications and functional test plans to ensure maintenance and proper performance of safety

instrumented systems during process demands.

Performed fire and gas system (FGS) design basis development and verification / validation at various worldwide locations. Studies included the definition and grading of hazard zones, and selection and mapping of fire and gas detectors to determine proper detector coverage. Safety requirements specifications were also developed for the FGS. These studies were performed for the following processes:

- Offshore and onshore oil and gas production
- Gas treatment and separation
- Refining
- Coke production and fired heaters

Performed consequence dispersion modeling for relief scenarios for several facilities of a US national refinery. The objectives of the studies were to identify potential hazards resulting in a release of combustible and toxic gases, and the effects of the release on the refinery, personnel, and the environment. Recommendations were issued to address unmitigated safety and environmental risks.

Performed a quantitative fault tree analysis for liquid overflow of receivers at a refinery compressor unit in the midwestern US. The fault tree determined the benefit of the existing process safety system in conjunction with the control system and operator alarms to mitigate hazards associated with liquid overflow. The results of the study were used to determine if risk objectives were satisfied and potential areas of improvement.

Conducted a comprehensive functional safety assessment for a manufacturing plant in the midwestern US. The assessment was performed to ensure that the plant site program was developed in compliance with the safety requirements specified in the ISA 84.01 and IEC 61508 / 61511 standards. Recommendations were developed to improve compliance of the site program with the standards.

Managed design basis development and safety instrumented system validation and verification for natural gas processing facilities in the southwestern US. The project activities included developing a list of the process safety instrumented functions, verification of the functions to ensure that each function achieved the specified risk reduction target, and the development of safety requirements specifications and functional test plans in accordance with ISA 84.01 and IEC 61508 / 61511.

Managed the development of a database for safety equipment compiling and aggregating device failure data from vendor performance, field performance, and industry-accepted reliability data sources including Offshore Reliability Data (OREDA) and Non-Electronic Parts Reliability Data (NPRD).