Managing Process Risk

Acceptable Risk Level

PCU: Basic Controls

SIL: Safety Instrumented System

SPEC: Safety Instrumented Protection System

Risk Reduction

Inherent Process Risk

RISK

SAFETY INSTRUMENTED SYSTEMS

Safety Instrumented Systems (SIS) are often cited as the “last line of defense” in accident prevention. They are generally utilized when the severity of an accident is considered HIGH and reduction of likelihood is the only viable risk management option.

Due to the complexity in assigning the Safety Integrity Level (SIL) target for the SIS, many organizations end up with improperly designed SIS systems. When conducted by BakerRisk, SIS performance evaluation studies are optimization studies. Once we ensure that all risk management requirements are met, our analysts investigate opportunities for potential savings by minimizing the impact on process operability and eliminating any system over-design. Operating cost savings are achieved through the reduction of nuisance trips and the reduction of testing requirements, while capital cost reductions are achieved through the elimination of excess redundancy provided in the original design.

BakerRisk analysts have been deeply involved in SIS related work, conducting hundreds of SIS related studies in process industries, including onshore and offshore exploration and production, refining, LNG, LPG, gas processing, reactive systems, specialty chemicals, polymers, pipelines, fire and gas systems, and high integrity pressure protection systems (HIPPS).
SAFETY INSTRUMENTED SYSTEMS - SPECIFICATION & EVALUATION

DEVELOPMENT OF CORPORATE ENGINEERING PRACTICES:
- SIL assignment methodology
- Integration of SIL assignment into existing systems
- Approaches to existing SIS
- Methods for managing functional safety

ASSIGNMENT OF SAFETY INTEGRITY LEVEL:
- Qualitative, semi-quantitative or quantitative methods, e.g., risk matrix, risk graph, & LOPA
- Integration with API 14C
- Alignment of risk tolerance with existing corporate statements of risk acceptability
- Facilitation of SIL assignment meetings

SIS CONCEPTUAL DESIGN:
- SIS Overview
- Cause & Effect Matrix
- Testing and Bypassing
- Development and review of test plans

DEVELOPMENT OF SAFETY REQUIREMENTS SPECIFICATION (SRS):
- Safety Functional Specification
- Safety Integrity Requirements
- SRS Database Development

SIL VERIFICATION:
- Quantitative SIS Performance Evaluation using Fault Tree Analysis & Simplified Equations

RECOMMENDATIONS FOR OPTIMIZING SIS DESIGN:
- Reduce spurious tripping
- Minimize testing intervals
- Eliminate over-design

FIRE & GAS SIS:
- Calculate Geographic/Scenario Coverage
- Calculate PFD according to ISA84 TR7

SIS RELATED TRAINING:
- Standards
- SIL Assignments
- SIL Verification
- Fault Tree Analysis
- SRS Development
- SIS Testing

ARCHITECTURE

TESTING FREQUENCY

DEVICE INTEGRITY

DIAGNOSTIC CAPABILITY

MULTIPLE SIS LAYERS

BakerRisk can use internal or external software according to client requirements, and our work empowers clients to select any SIS manufacturer or instrumentation they prefer.

ABOUT BAKERRISK
Baker Engineering and Risk Consultants, Inc. is one of the world’s leading explosion analysis, structural design, and risk engineering companies. BakerRisk provides comprehensive consulting, engineering, laboratory and range testing services to government agencies and private companies who are involved with dangerous, highly hazardous, reactive, or explosive materials.

- Blast Effects & Explosion Testing
- Dynamic Structural Analysis and Design
- Risk Engineering
- Process Safety
- Incident Investigations
- Reactive Chemicals Testing & Management Systems
- Materials Engineering and Failure Analysis

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