Functional Safety
A Reality Check in the World of Projects!
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Thank you!
Presenter

- Nagappan Muthiah “Muthu”

- 11 Years in Process Automation
- WGM - Functional Safety Discipline Technical Authority
- Licensed PE – Control Systems Engineering
- ISA 84 Committee - Voting Member
- CFSE Process Safety Advisory Board Member
Wood Group Mustang – Functional Safety

WGM Automation and Control Business Unit

• Safety Lifecycle Services (ISA-84; IEC-61508/61511)
  – Functional Safety Planning, Audits & Audit Compliance
  – PHA & LOPA Participation / Facilitation
  – LOPA, IPL Rationalization / Bowtie Analysis
  – Safety Requirements Specifications Development
  – SIL Verification Calculations, Fault Tree Analysis
  – Functional safety standards and procedures
  – Validation, Proof Testing Procedures

• Safety Instrumented System Design and Integration
  – Emergency Shutdown, Process Shutdown, Plant Protection
  – Fire & Gas Systems
  – Burner/Boiler Management
  – Testing and Commissioning
  – Operations Support
ISA84 - Functional Safety Standards

- ISA 84 / IEC-61511: Safety Instrumented Systems for the Process Industry Sector
- Performance based Specification
- Allows Operating Companies a measure of freedom to determine their own methodology in meeting the targets set by the standard.

Freedom also comes with its own Challenges!
Challenges – Paper to Reality

1. Funding - ISA-84 SLC: Show me where it says we have to do all this?
2. S84 Compliance – Functional Safety Planning
3. S84 Compliance – Breaking the Silos
4. Safety Lifecycle is Continuous – Projects are Not!
5. Don’t let “Best” be the enemy of “Good”

Challenges discovered based on Lessons Learned
From executing Functional Safety Projects
Challenge - 01) Show me where it says so?

Show me where it says, We need to do all this

S84 Compliance

- Functional Safety Plan
- PHA, LOPA
- IPL – Independence
- IPL - Auditable
- SIFs - SIL Rating
- Define Operator Response
- Proof Testing
- Failure rates

ISA-84

OSHA

United States Operations
Challenge - 01) Show me where it says so?

Follow Safety Lifecycle Approach

- ISA-84
- RAGAGEP
- OSHA

United States Operations
1910.119(d)(3)(ii) The employer shall document that equipment complies with recognized and generally accepted good engineering practices.

1910.119(j)(4)(ii) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.

OSHA General Duty Clause:
SEC. 5. Duties
(a) Each employer --
(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

OSHA has sent letter to ISA conveyed that it considers ISA-84 as R.A.G.A.G.E.P

RAGAGEP: Recognized and Generally Accepted Good Engineering Practice
Challenge - 02) Functional Safety Planning

Activities spanning the Entire Lifecycle

- **Plan** (Clause 6)
- **Verify** (Clause 7)
- **FSA & Audits** (Clause 5)

**Clause 5: FSA & Audits**

**Clause 6: Plan**

**Clause 7: Verify**

**Clause 5: FSA & Audits**
Challenge - 02) Functional Safety Planning

Convert Philosophical Requirements
To project specific Requirements

Conceptual Phase
Customize corporate PHA and LOPA rules for project.

Verify rule set by performing mini-PHA/LOPA to confirm effectiveness. Develop deficiency action list.

Update rule set.
Verify that mini-PHA/LOPA actions are closed.

Assessment/Audit
Challenge - 03) Breaking the Silos

S84 Compliance

- Plant Manager / Corporate Sponsor
- PSM Consultants
- PHA Team
- LOPA Validation Team
- Projects Team
- Ops & Field Techs
- Config Commission

Silo Approach

Shared Accountability and Ownership

- Plant Manager / Corporate Sponsor
- PSM Consultants
- PHA Team
- LOPA Validation Team
- Projects Team
- Ops & Field Techs
- Config Commission
Challenge - 03) Breaking the Silos

Management, PSM Consultants, PHA Team

Establish Goals of PHA facilitation:
1) PSM Consultants to facilitate inputs from PHA Teams
2) All members of PHA team should contribute – Process, Operations, Safety Team

Successful Results:
- PHA had better coverage
- Consequence categories better aligned with reality
- Invalid consequences eliminated
PHA Teams and Projects Team

1) PHA / LOPA Documentation not just for passing OSHA Audits.
2) Documentation should be captured keeping Safety Lifecycle usability in mind.
3) Reports to provide useful information to Projects Team

Successful Results:
- Project teams understood requirements faster
- HAZOP scenarios validity was not challenged
- Project scope was defined more effectively
LOPA Validation Team, Projects, Configuration Team and Operations.

Always involve Process and Operations during SRS Definition.
- SIFs are not just about tripping
- It's important to keep the plant running!
- Consider Operability Factors
  - Reducing Spurious trips
  - Startup bypass requirements
  - Reset and Restart requirements

**Successful Results:**
- Better SIF Design with reduced Spurious trip rate
Challenge - 04) Safety Lifecycle vs. Projects

Safety Lifecycle is Continuous – Projects are Not!

The way it should be.

The way it usually is.  
Miracle Required

Scott Adams (Dilbert)

Results: Projects go Over-Budget with most of the money spent on Paperwork!
Challenge - 04) Safety Lifecycle vs. Projects

Safety Lifecycle Approach

- PHA
- LOPA
- MOC 5 Years
- Update SIL Calcs
- IPLs
- SRS/ SIL Calcs
- Test
- Maintain
- Install

Lifecycle Approach

Project Approach

Start
- Estimate
- Approve
- Project Kickoff

Stop
- Purchase
- Design
- FAT/SAT => IFD

T/A
- Unit Shutdown
- Field Commissioning
- Start-up
Projects have finite budgets and finite schedule

Aiming for 100% Perfect Design on Paper and Stalling progress in Field = 0% Safety = Unsuccessful Project

Target Majority of SIF completion of Safety Design on Paper and Majority Safety Design in Field = Majority of SIF’s in place, process safety improved = Successful Project

Address remaining Minority of SIFs in next project cycle

Successful Results: Projects on Schedule within Budgets!
Business Results Achieved

- Successful in converting S84 philosophical requirements to work scope
- All Stakeholders Happy – Project Managers, PSM Compliance Team, Operators, Operations Manager
- Facilities are continuing to operate safely, meeting corporate risk targets, and effectively utilizing their resources
Summary

1. S84 is considered RAGAGEP by OSHA

2. Functional Safety Planning => Project Specific Actions

3. Breaking the Silos => Start with the End in mind

4. Safety Lifecycle is Continuous – Projects are Not!

5. Don’t let “Best” be the enemy of “Good” => Don’t Stall Projects
Where To Get More Information

- Presenter Contact: Nagappan.muthiah@woodgroup.com
Thank You for Attending!

Enjoy the rest of the conference.