Setting the Standard for Automation™

Conforming to IEC 61511: O&M Requirements

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- VP Global Business Development for exida with 37 years industrial experience in safety and controls
- Employment History
  - Metso Automation
  - ICS Technology plc, ICS plc
  - Gould Advance
  - Marconi Avionics
- Certifications
  - CFSP, Certified Functional Safety Professional
- Industry Associations
  - ISA Member
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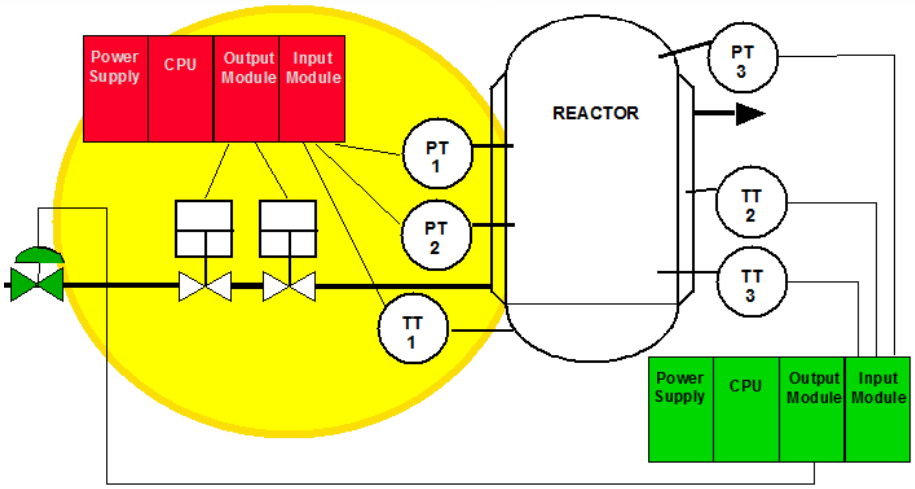
- Publications
  - Author of Managing Risky Projects

Introduction

- In 2003 the IEC 61511 standard was issued for the process industries
- IEC 61511 was unique in that it was non-prescriptive and performance-based around a Safety Lifecycle (SLC)
- IEC 61511 has been widely adopted by companies operating in the process, chemical, petrochemical and refining industries
- The emphasis being placed on reducing risk and mitigating the potential for hazards that could lead to loss of life, destruction of property and plant assets
- Importance placed on operation and maintenance of the Safety Instrumented System (SIS)

IEC 61511-1 Clause 16: SIS Operations & Maintenance

- SIS definition
  - "Instrumented System to implement one or more Safety Instrumented Functions (SIFs), which is composed of any combination of sensor(s), logic solver(s) and final element(s)".



Safety Instrumented System Block Diagram

Operation & Maintenance Plan

- IEC 61511-1 Clause 16 requires a properly and well defined Operation and Maintenance (O&M) plan
- O&M plan is a working document designed to ensure the SIS is maintained to meet its designed safety integrity
- O&M procedures need to be developed (IEC 61511-1 Clause 16.2.2):
  - Routine actions required to maintain the “as designed” SIS
  - Actions/constraints to prevent unsafe state during maintenance
  - Information to be maintained on system failures and demand rate
  - Information to be maintained from audits and tests
  - Procedures to be followed when faults/failures occur with SIS
  - Test equipment used during maintenance is calibrated

O&M Personnel Competency

- O&M personnel need to have requisite skills (IEC 61511-1 Clause 16.2.4)
  - Understand how SIS functions
  - Understand the hazard the SIS is protecting against
  - Operation of all bypasses and when/how to be applied
  - Operation of any manual shutdown switches and/or start up
  - What action is required upon any SIS diagnostic alarm
- O&M personnel need to be trained as required
- O&M personnel have to follow proof test procedure (IEC 61511-1 Clause 16.2.8)
- O&M personnel will require regular training, competency audits and assessments

What Happens In Practice?

- End Users have to ensure adequate procedures, as well as an adequate documentation and tracking system
- End Users have to record spurious trips, process demands, failure data, audit results, test results, etc.
- Requires O&M personnel to be diligent in recording
- Recent Tesoro event highlighted issues with culture and the need for more vigilance
- Need to undertake regular proof testing and visual inspections (IEC 61511-1 Clause 16.3.1, 16.3.2)
- Personnel need to be regularly trained and assessed

How Data Is Recorded

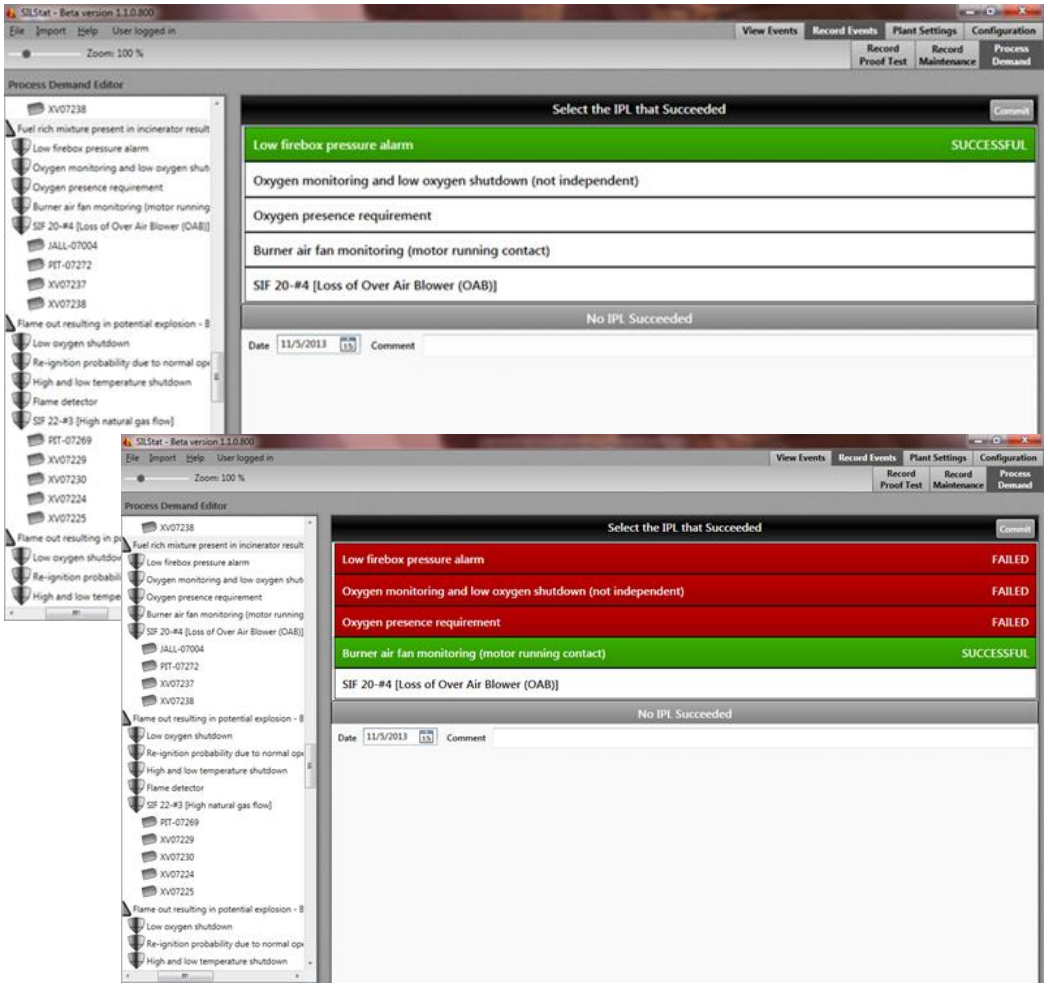
- End User must maintain records that certify proof tests and inspections were completed (IEC 61511-1 Clause 16.3.3)
- Records shall include:
  - Description of the tests and inspections performed
  - Dates of the test(s) and inspections
  - Name of the person(s) who performed tests/inspections
  - Serial no./unique identifier of system tested (e.g. loop, SIF, etc.)
  - Results of tests/inspections (e.g. “as found”, “as left” conditions)
- Standard does not define how these results are recorded
- Most records are paper and/or excel based

Technology Can Help

- A software based tool on a handheld or tablet device would save time and money
- Tools should record functional safety statistics/performance metrics, including life events:
  - Demands both real and spurious for SIS
  - Inspection and proof test results
  - Maintenance activities (e.g. calibration)
  - Failure reporting
- Discrepancies between expected vs actual behavior of the SIS can be analyzed and any modifications implemented

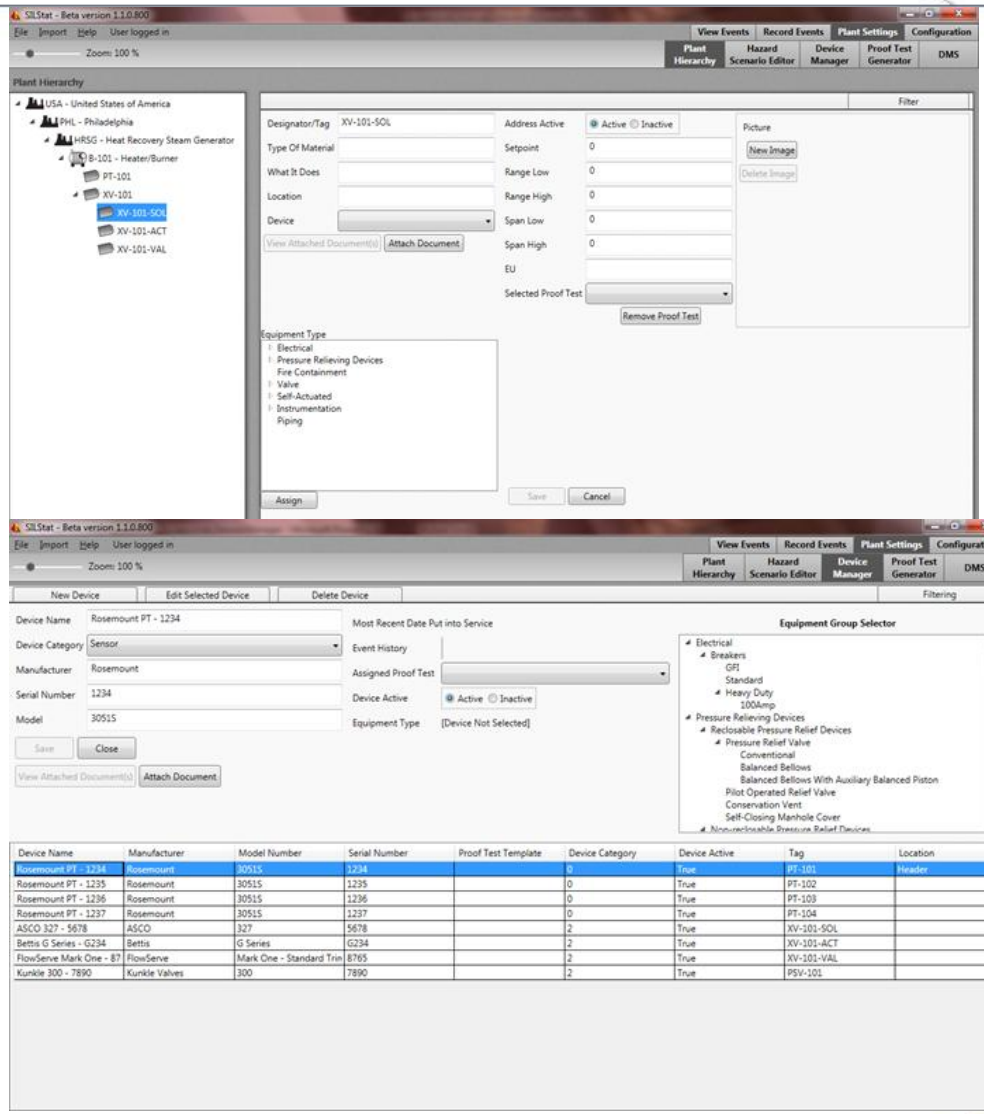
Example For Recording Successful/Unsuccessful Demands

- Can identify the protection layer that was successful
- Information can be used to determine the demand frequency of hazardous event



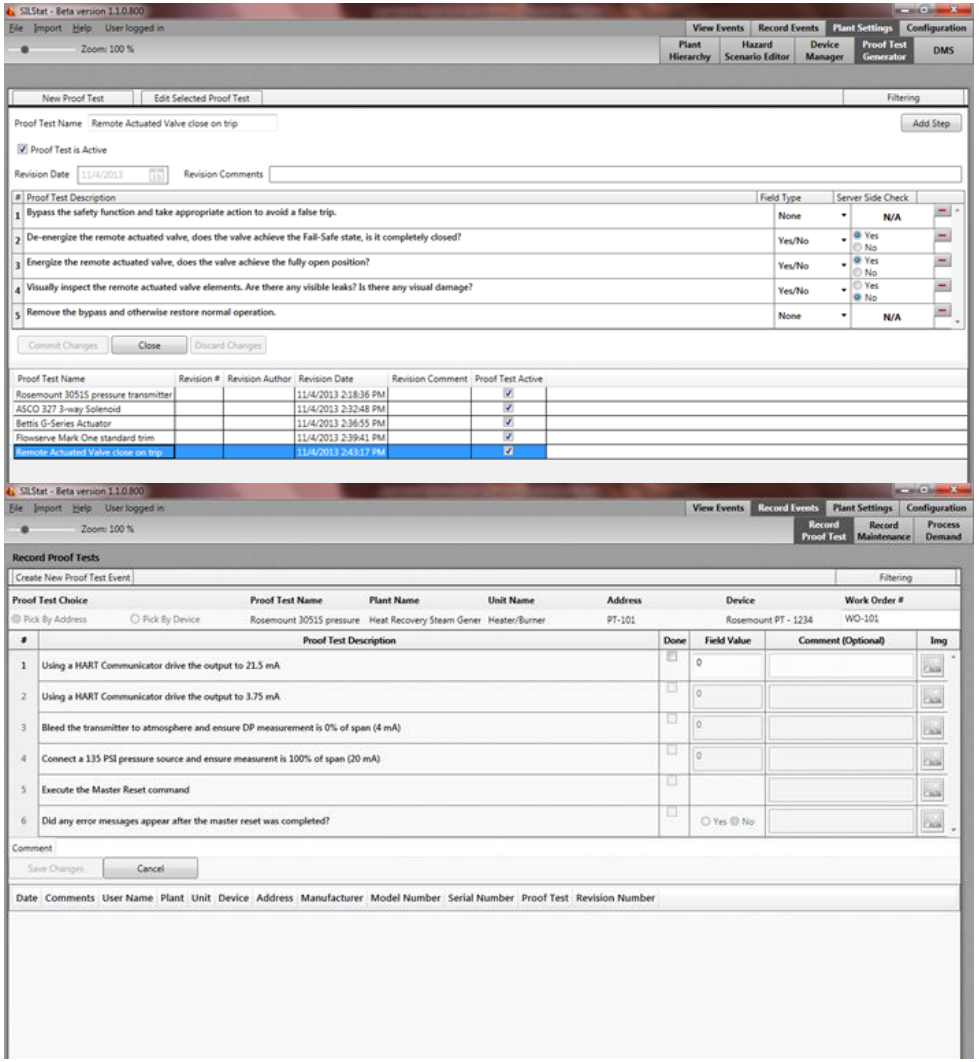
Example For Recording Plant Hierarchy & Managing Devices

- Enables physical devices to be stored and identified by tags/descriptions
- Enables O&M personnel to carry out effective maintenance and/or replacement



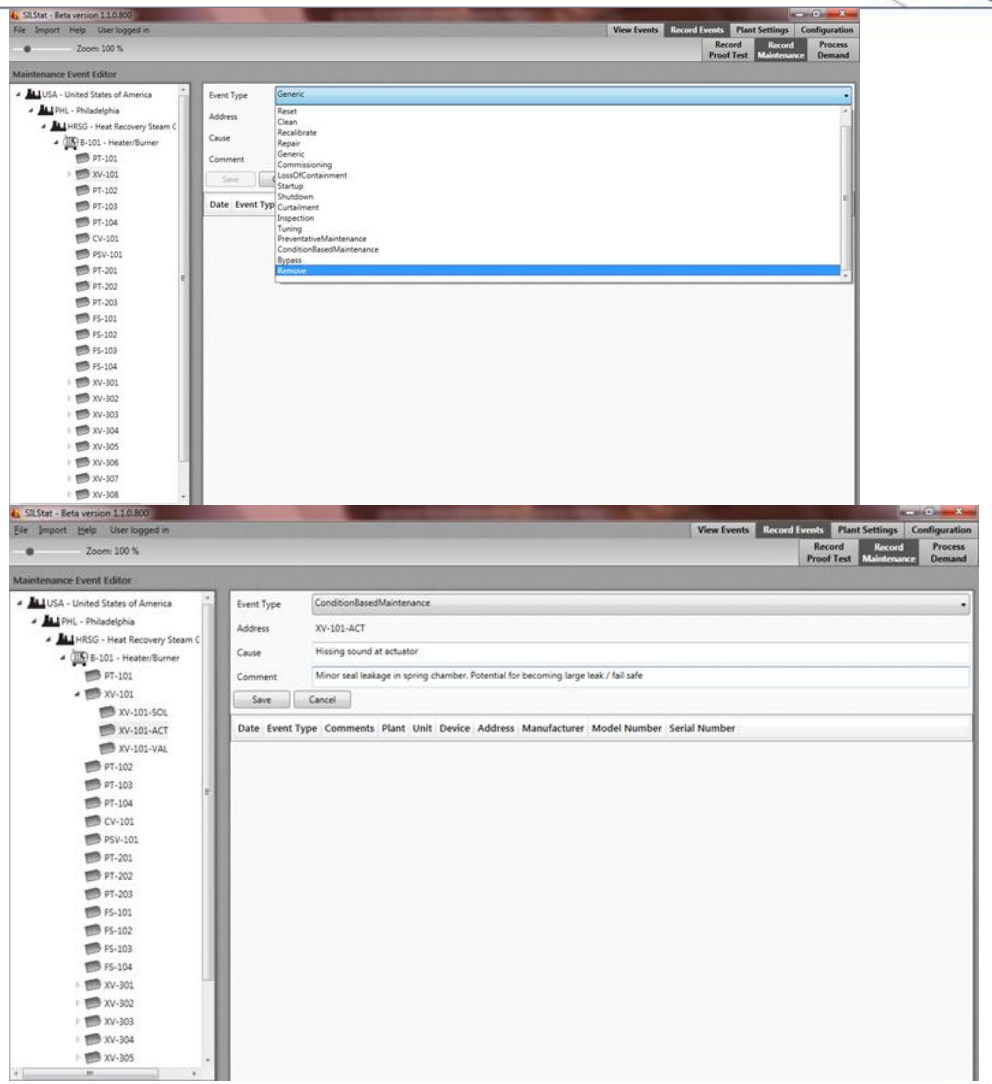
Example For Proof Test Generator & Recording Results

- Proof testing is essential for ensuring SIS integrity
- O&M personnel may have to carry out proof tests at different intervals for different parts of the SIS
- Having an automatic proof test generator saves time



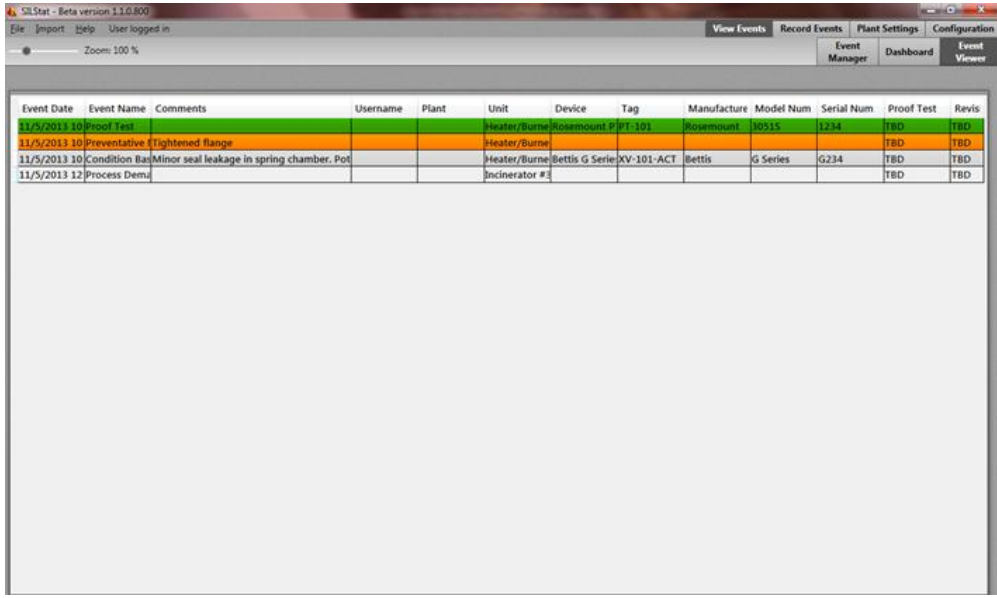
Example For Recording Maintenance Activities

- Simplifies maintenance
- Provides ability to quickly locate device
- Enables recording of “as found”, “as left” condition



Example Event Display

- View events that have taken place
- Time based
- View outcomes & assess



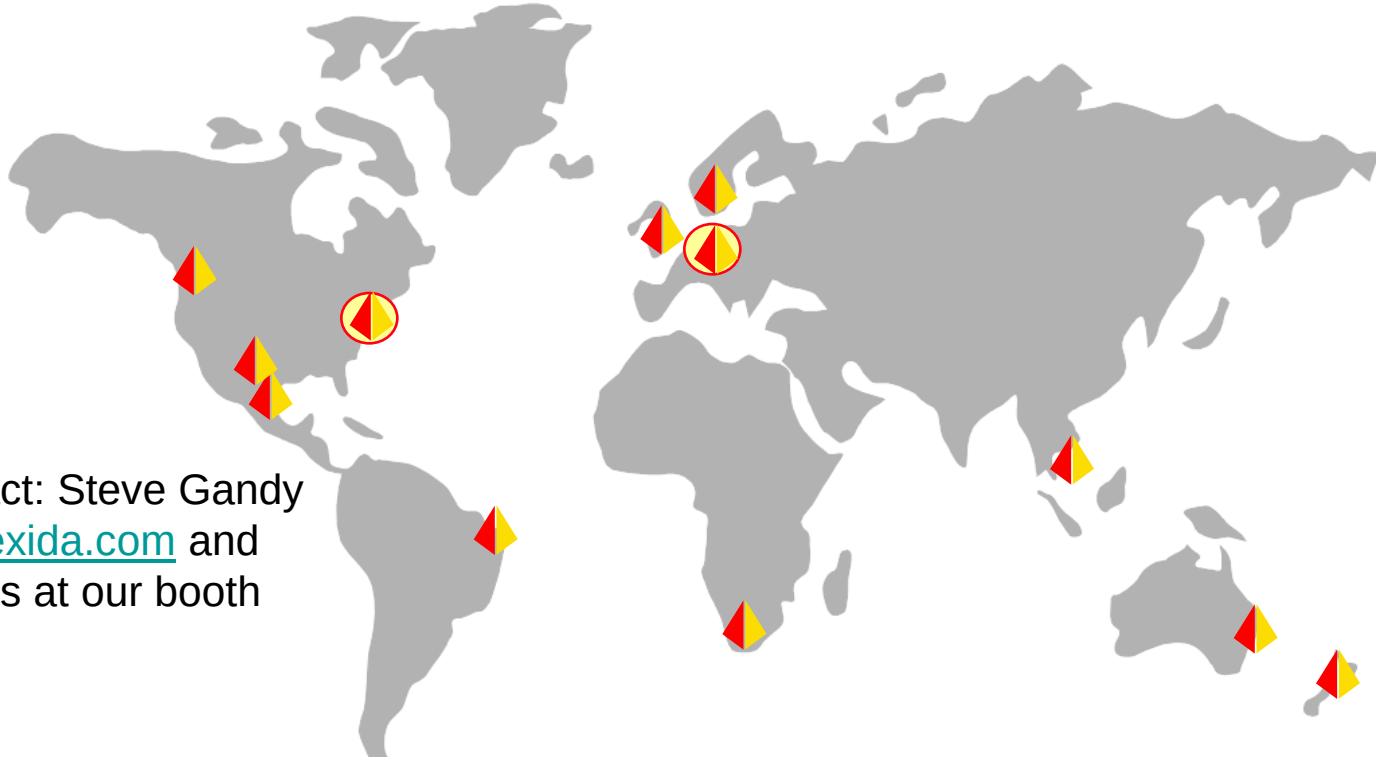
Benefits of an Automated Recording System

- Key benefits:
  - Enables detailed analysis of failures (e.g. specific address, device, device type)
  - Frequent benefit of reducing false trips
  - Ability to compare actual vs expected performance
  - Ability to ensure risk reduction is adequate
  - Ability to identify if risk reduction is inadequate
  - Ability to identify if risk reduction is more than adequate
  - Provides data for future SLC tasks (e.g. Risk Assessment, LOPA, SIL target selection, SIL Verification)
  - Ability to re-evaluate frequency of proof tests
  - Can help communication between plant departments (e.g. operations, maintenance, process safety, reliability and engineering)

Summary

- There is a need to manage risk – not ignore it
- Adopt an appropriate safety-first culture: trained and competent O&M personnel
- Have proper operating and maintenance procedures
- Develop a “safety checklist” to ensure consistency
- Undertake regular employee competency assessments
- Ensure proof testing is conducted in line with SRS
- Record all maintenance activities accurately and faithfully
- Use software tools to assist in recording/auditing
- Use software tools to help analyze failures, false trips and actual SIS performance

We help our clients improve the safety, security and availability of their automation systems



Please contact: Steve Gandy at sgandy@exida.com and please visit us at our booth #19