

Setting the Standard for Automation™



Conforming to IEC 61511: O&M Requirements

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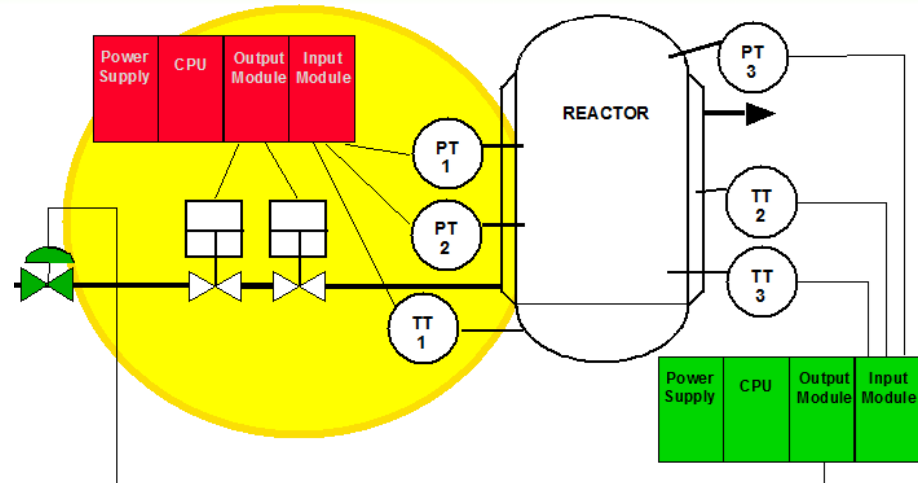
- VP Global Business Development for exida with 37 years industrial experience in safety and controls
- Employment History
 - Metso Automation
 - ICS Technology plc, ICS plc
 - Gould Advance
 - Marconi Avionics
- Certifications
 - CFSP, Certified Functional Safety Professional
- Industry Associations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



- 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

- 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 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?



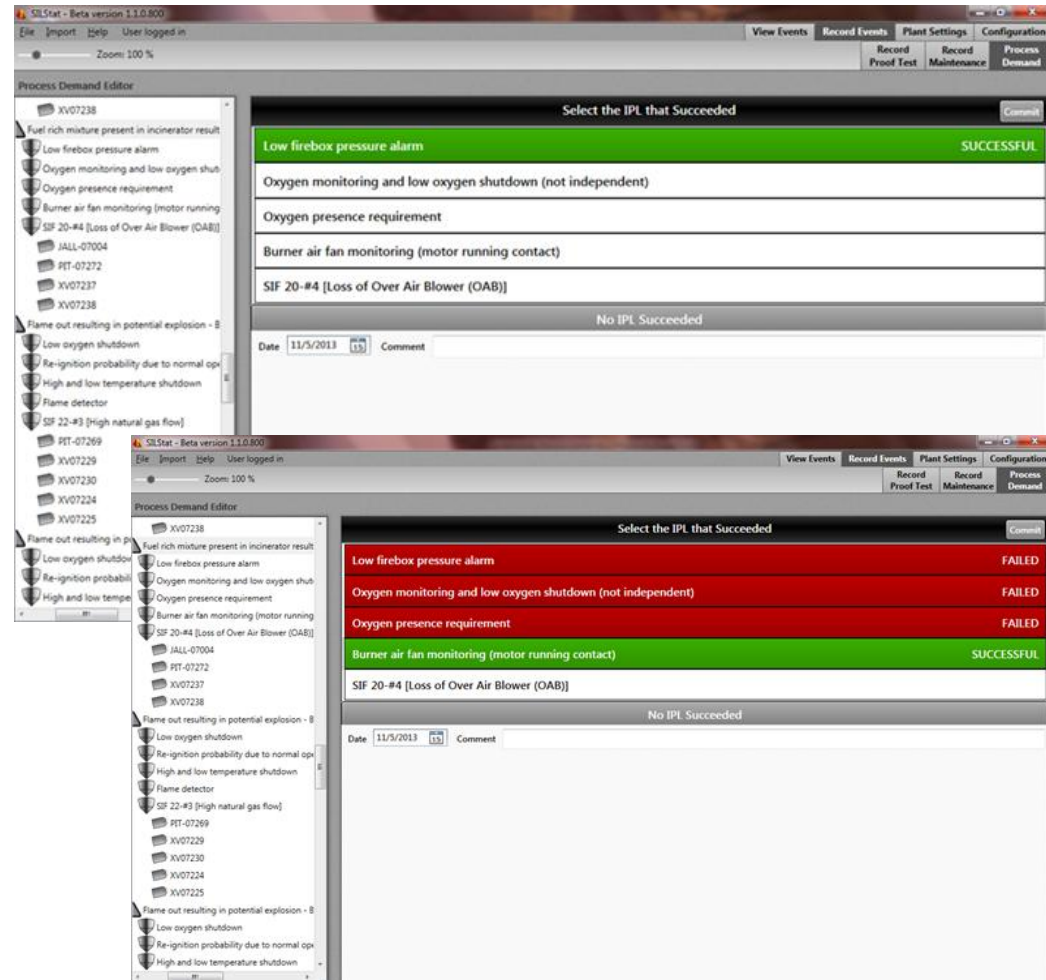
- End Users have to ensure adequate procedures, as well as an adequate documentation and tracking system
- End Users have to record spurious trips, process demands, failure data, audit results, test results, etc.
- Requires O&M personnel to be diligent in recording
- Recent Tesoro event highlighted issues 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

- 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

- 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

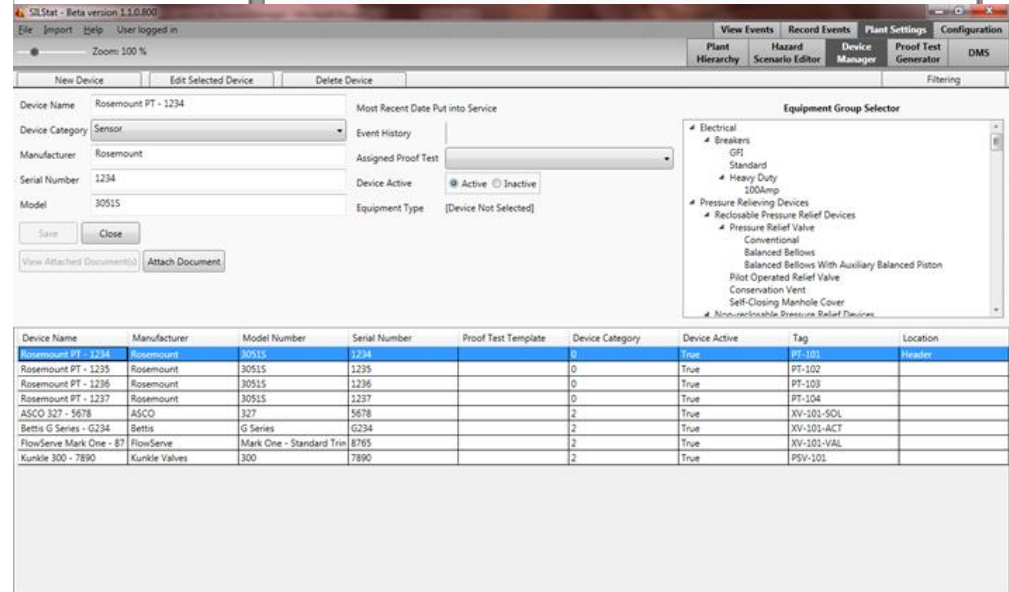
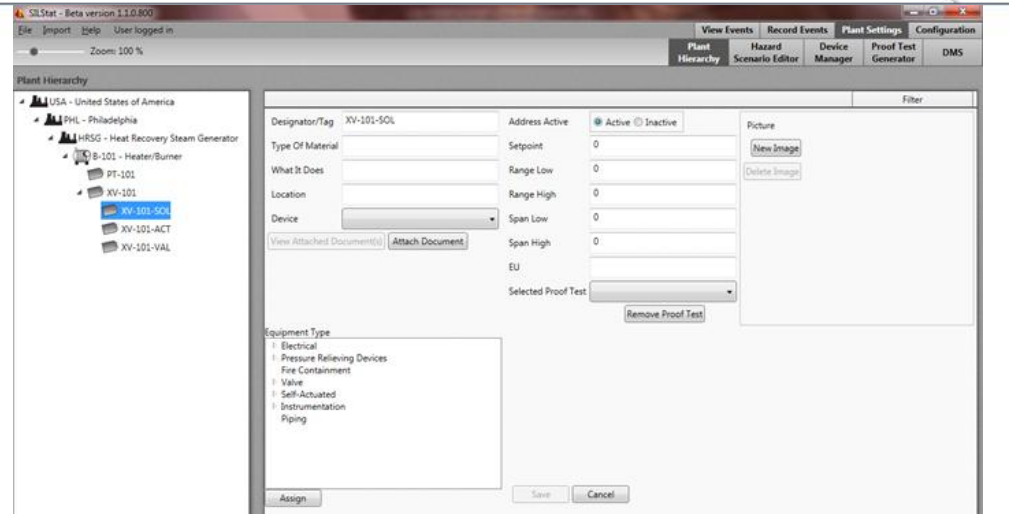
- Can identify the protection layer that was successful
- Information can be used to determine the demand frequency of hazardous event



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

The screenshot displays two windows from the SILStat software (Beta version 1.1.0.800).

Top Window: Edit Selected Proof Test

Buttons: New Proof Test, Edit Selected Proof Test, Filtering, Add Step

Proof Test Name: Remote Actuated Valve close on trip

Proof Test is Active

Revision Date: 11/4/2013 | Revision Comments: [empty]

#	Proof Test Description	Field Type	Server Side Check
1	Bypass the safety function and take appropriate action to avoid a false trip.	None	N/A
2	De-energize the remote actuated valve, does the valve achieve the Fail-Safe state, is it completely closed?	Yes/No	<input checked="" type="radio"/> Yes <input type="radio"/> No
3	Energize the remote actuated valve, does the valve achieve the fully open position?	Yes/No	<input checked="" type="radio"/> Yes <input type="radio"/> No
4	Visually inspect the remote actuated valve elements. Are there any visible leaks? Is there any visual damage?	Yes/No	<input checked="" type="radio"/> Yes <input type="radio"/> No
5	Remove the bypass and otherwise restore normal operation.	None	N/A

Buttons: Commit Changes, Close, Discard Changes

Proof Test Name	Revision #	Revision Author	Revision Date	Revision Comment	Proof Test Active
Rosemount 30515 pressure transmitter			11/4/2013 2:18:36 PM		<input checked="" type="checkbox"/>
ASCO 327 3-way Solenoid			11/4/2013 2:32:48 PM		<input checked="" type="checkbox"/>
Bettis G-Series Actuator			11/4/2013 2:36:55 PM		<input checked="" type="checkbox"/>
Flowserve Mark One standard trim			11/4/2013 2:39:41 PM		<input checked="" type="checkbox"/>
Remote Actuated Valve close on trip			11/4/2013 2:43:17 PM		<input checked="" type="checkbox"/>

Bottom Window: Record Proof Tests

Buttons: Record Proof Test, Record Maintenance, Process Demand

Create New Proof Test Event | Filtering

Pick By Address | Pick By Device

Proof Test Name: Rosemount 30515 pressure | Plant Name: Heat Recovery Steam Gener | Unit Name: Heater/Burner | Address: PT-101 | Device: Rosemount PT - 1234 | Work Order #: WO-101

#	Proof Test Description	Done	Field Value	Comment (Optional)	Img
1	Using a HART Communicator drive the output to 21.5 mA	<input type="checkbox"/>	0		
2	Using a HART Communicator drive the output to 3.75 mA	<input type="checkbox"/>	0		
3	Bleed the transmitter to atmosphere and ensure DP measurement is 0% of span (4 mA)	<input type="checkbox"/>	0		
4	Connect a 135 PSI pressure source and ensure measurement is 100% of span (20 mA)	<input type="checkbox"/>	0		
5	Execute the Master Reset command	<input type="checkbox"/>			
6	Did any error messages appear after the master reset was completed?	<input type="checkbox"/>	<input type="radio"/> Yes <input checked="" type="radio"/> No		

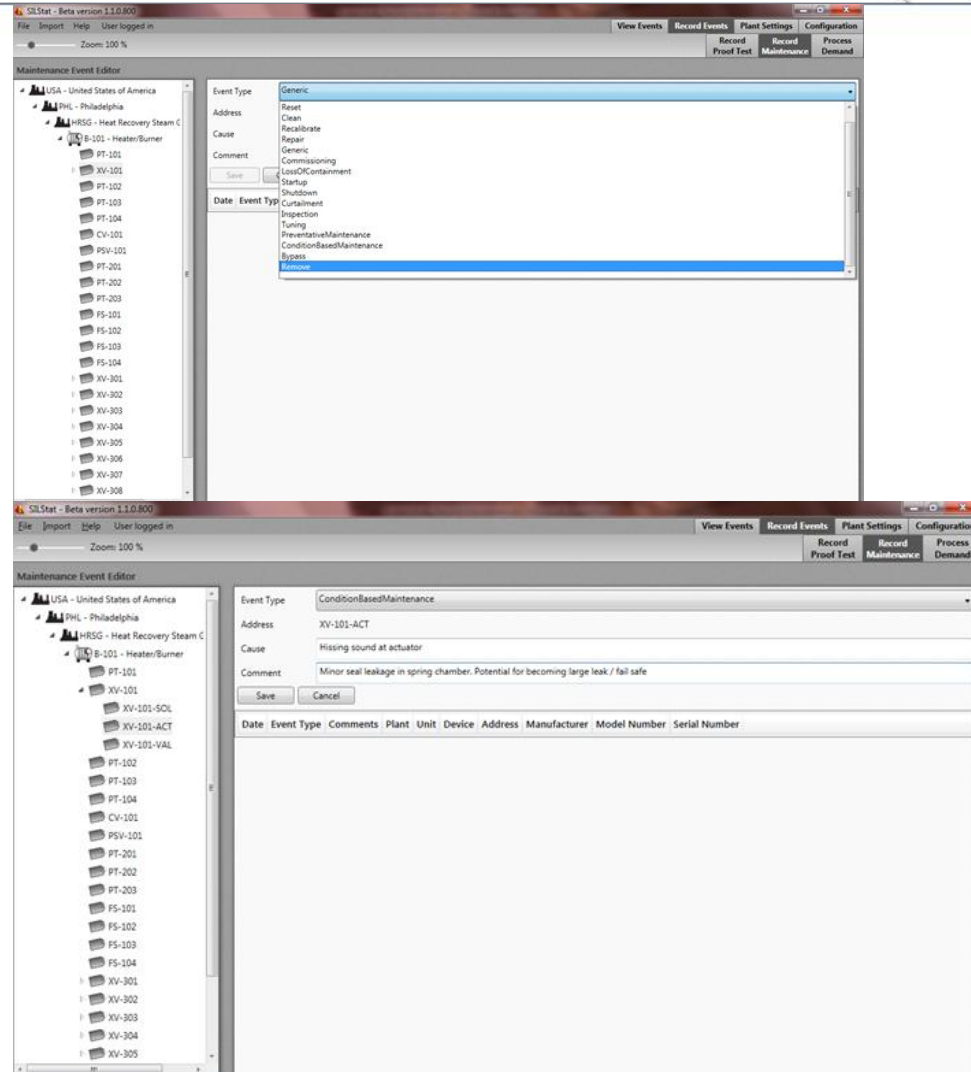
Buttons: Save Changes, Cancel

Date | Comments | User Name | Plant | Unit | Device | Address | Manufacturer | Model Number | Serial Number | Proof Test | Revision Number

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

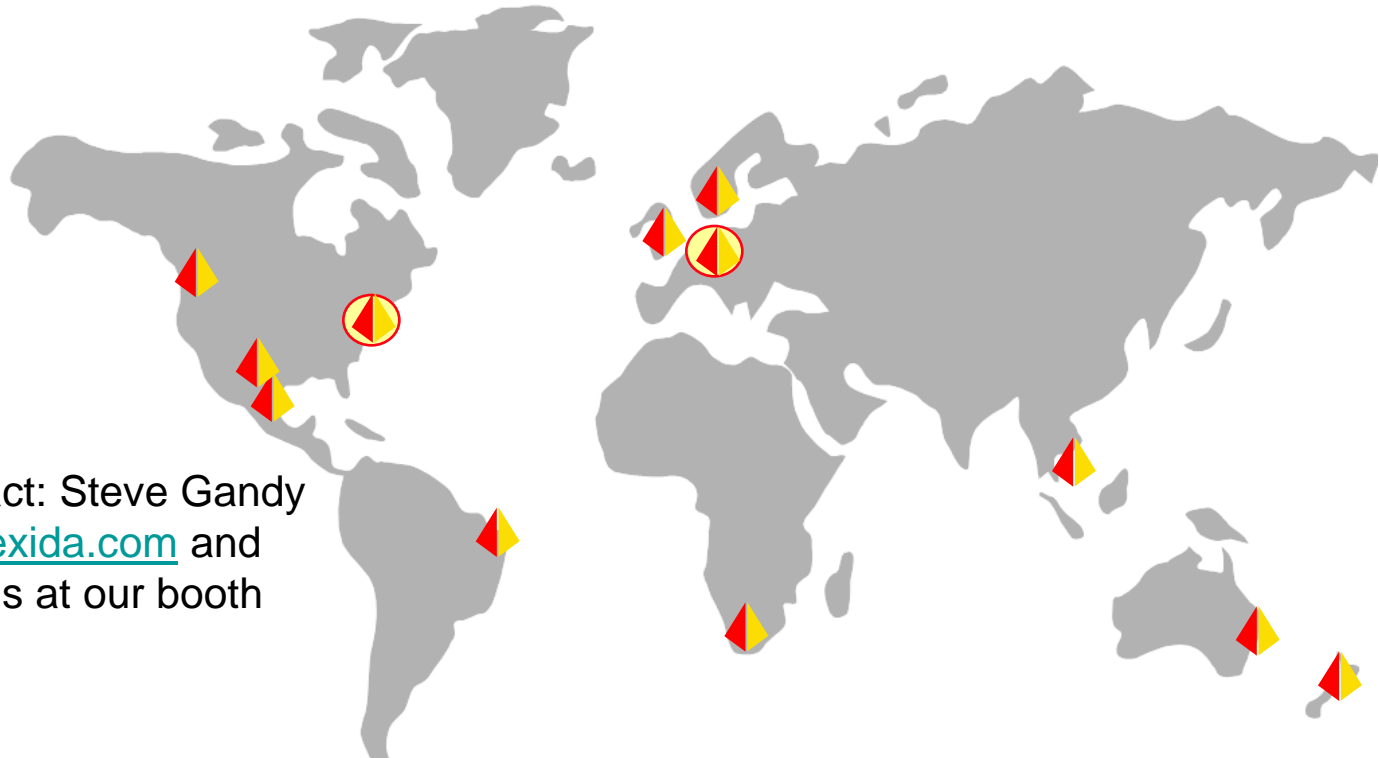
The screenshot shows the SiliStat software interface with a menu bar (File, Import, Help, User logged in) and a toolbar (View Events, Record Events, Plant Settings, Configuration, Event Manager, Dashboard, Event Viewer). A table displays event data with columns for Event Date, Event Name, Comments, Username, Plant, Unit, Device, Tag, Manufacture, Model Num, Serial Num, Proof Test, and Revis. The table contains four rows of data, with the first two rows highlighted in green and orange.

Event Date	Event Name	Comments	Username	Plant	Unit	Device	Tag	Manufacture	Model Num	Serial Num	Proof Test	Revis
11/5/2013 10	Proof Test				Heater/Burne	Rosemount #	PT-101	Rosemount	30515	1234	TBD	TBD
11/5/2013 10	Preventative	Tightened flange			Heater/Burne						TBD	TBD
11/5/2013 10	Condition Bas	Minor seal leakage in spring chamber. Pot			Heater/Burne	Bettis G Serie	XV-101-ACT	Bettis	G Series	G234	TBD	TBD
11/5/2013 12	Process Demj				Incinerator #3						TBD	TBD

- 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)

- 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



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please visit us at our booth
#19