Life Is On Schneider Electric

How to easily comply with the requirements of IEC61511 edition 2 clause 16

by Sven Grone & Steve J. Elliott

Executive summary

The latest edition of IEC61511 Edition 2 Clause 16 puts a new emphasis on operating companies to prove and demonstrate that the safety instrumented systems they designed to reduce the risk to an acceptable level are operating as designed and intended. This activity is often a manual exercise whichis time consuming and prone to error. This paper looks at how software applications can provide an automated solution delivering efficiency and productivity gains.

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Introduction

Many of today's high hazard facilities rely on Safety Instrumented Systems (SIS) executing Safety Instrumented Functions (SIF) to reduce inherent risk to an acceptable limit. These systems are often designed in accordance with modern safety standards such as IEC61511 Edition 2.

The new requirements of IEC 61511 Edition 2, Clause 16 covering the operations and maintenance phase of the safety lifecycle mandates monitoring and validating the "operating" SIF performance versus their "as designed" SIF criteria.

SIF Manager from Schneider Electric has been specifically developed to help owners/ operators meet these requirements. SIF Manager monitors actual operating live field data (with time stamp) from the plant historian and / or SIS Logic solver and then validates key SIF parameters against their design parameters. It then uses integrated analytics engine to display the performance of the SIF compared to design performance, produces detailed reports, safety KPI dashboards and Email alerts.

Figure 1
SIF Manager overview.

SIF Manager is a plant wide solution for safety monitoring and reporting that is independent of any specific SIS manufacturers equipment

SIF Manager has been designed to quickly and easily:

- Identify safety events such as SIF activation, Overrides and Inhibits
- Benchmark safety performance against design expectations
- Provide key stakeholders such as auditors, regulators, technical authorities with accurate information when required

It also provides a consolidate environment for users to evaluate the monitored data within the context of SIF design parameters, allowing users to gain (near) real-time visibility as to SIF performance, providing an audit trail of how the SIF and SIF Components (field devices) have been managed within the functional safety context, as well as providing SIF demand tracking and demand event analysis tool to evaluate demand performance.

In this paper we will explore how SIF Manager automates many of the tasks required to comply with Clause 16 of IEC 61511 Edition 2 and some of the benefits, including:

- How to identify potential safety issues
- Reduce maintenance activities
- Improve safety designs

Requirements of IEC61511 Edition 2 Clause 16

The objectives of the requirements of IEC61511 Edition 2 Clause 16 are to ensure that:

- the required SIL of each SIF is maintained during operation and maintenance
- the SIS is operated and maintained in a way that sustains the required safety integrity

In order to achieve the above objectives – key SIF performance parameters that affect the SIL of the SIF need to be monitored and validated against the original design assumptions for that SIF. These include:

- SIF Demand Rate vs. design assumptions in SRS
- SIF function testing period vs. design testing period stated in SRS
- SIF Component (SIS device) proof testing vs. proof test interval stated in SRS
- SIF Component (SIS device) time in bypass vs. allowable time in bypass as specified in the SRS
- SIF Time in Bypass vs. allowable time in bypass as specified in the SRS

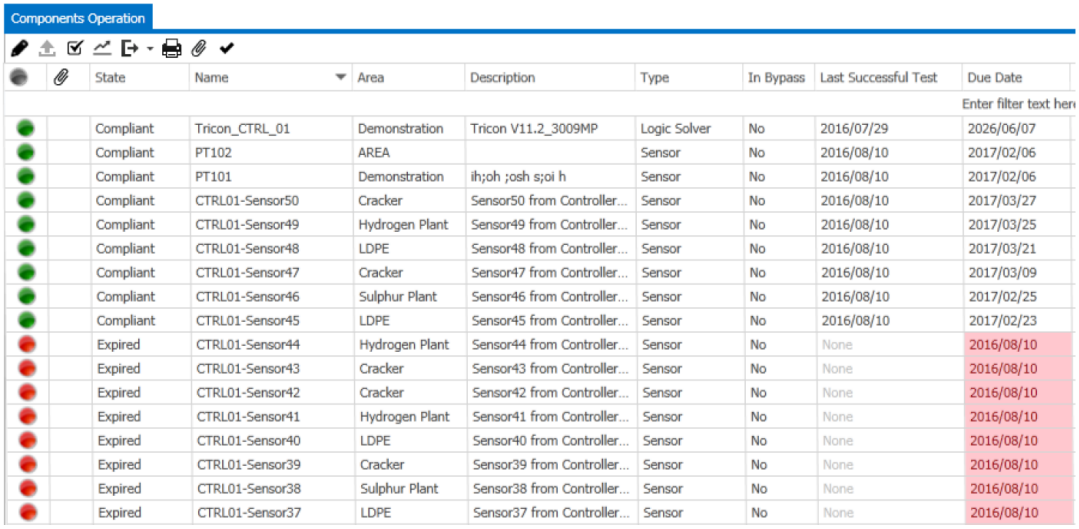
Without tracking and managing the above, the objectives of the requirements of Clause 16 may not be achieved.

SIF Manager provides the required monitoring, analysis and audit trail for all of the above parameters, as well as other SIF operational performance information that either directly provides or supports the specific requirements of the remainder of Clause 16 subsections.

SIF Manager Functionality Specific to IEC 61511 Ed2 Compliance Requirements

Specific SIF Parameters Monitored and/or Validated by SIF Manager include the following. Where applicable we have listed the Subsections of Clause 16 that relate directly to the information provided by SIF Manager – either as a direct input into meeting the requirements – or as a tool to assist providing documented history/evidence of operational conformance to those requirements.

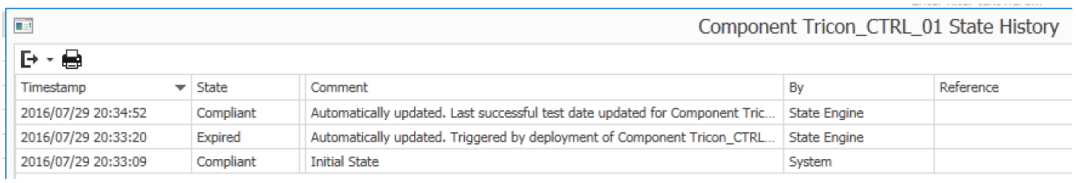
SIS Component (sensor, logic solver and final element) proof test tracking and compliance. Specifically applicable to Clauses 16.1; 16.2.1; 16.2.2a; 16.2.2f; 16.2.9.



State	Name	Area	Description	Type	In Bypass	Last Successful Test	Due Date
							Enter filter text here
Compliant	Tricon_CTRL_01	Demonstration	Tricon V11.2_3009MP	Logic Solver	No	2016/07/29	2026/06/07
Compliant	PT102	AREA		Sensor	No	2016/08/10	2017/02/06
Compliant	PT101	Demonstration	ih;oh ;osh s;oi h	Sensor	No	2016/08/10	2017/02/06
Compliant	CTRL01-Sensor50	Cracker	Sensor50 from Controller...	Sensor	No	2016/08/10	2017/03/27
Compliant	CTRL01-Sensor49	Hydrogen Plant	Sensor49 from Controller...	Sensor	No	2016/08/10	2017/03/25
Compliant	CTRL01-Sensor48	LDPE	Sensor48 from Controller...	Sensor	No	2016/08/10	2017/03/21
Compliant	CTRL01-Sensor47	Cracker	Sensor47 from Controller...	Sensor	No	2016/08/10	2017/03/09
Compliant	CTRL01-Sensor46	Sulphur Plant	Sensor46 from Controller...	Sensor	No	2016/08/10	2017/02/25
Compliant	CTRL01-Sensor45	LDPE	Sensor45 from Controller...	Sensor	No	2016/08/10	2017/02/23
Expired	CTRL01-Sensor44	Hydrogen Plant	Sensor44 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor43	Cracker	Sensor43 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor42	Cracker	Sensor42 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor41	Hydrogen Plant	Sensor41 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor40	LDPE	Sensor40 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor39	Cracker	Sensor39 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor38	Sulphur Plant	Sensor38 from Controller...	Sensor	No	None	2016/08/10
Expired	CTRL01-Sensor37	LDPE	Sensor37 from Controller...	Sensor	No	None	2016/08/10

Figure 2
Example of SIS Component Compliance

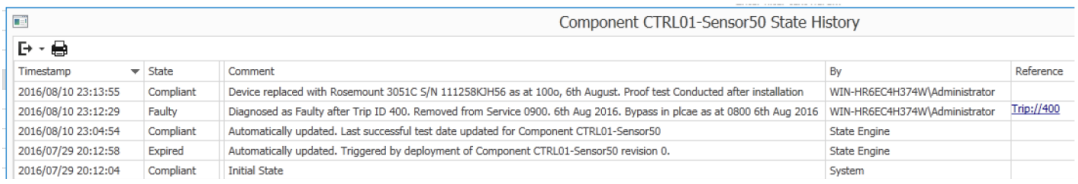
IS Component (sensor, logic solver and final element) proof test history and audit Trail. Specifically applicable to Clauses 16.1; 16.2.1; 16.3; 16.3.1.3



Timestamp	State	Comment	By	Reference
2016/07/29 20:34:52	Compliant	Automatically updated. Last successful test date updated for Component Tric...	State Engine	
2016/07/29 20:33:20	Expired	Automatically updated. Triggered by deployment of Component Tricon_CTRL...	State Engine	
2016/07/29 20:33:09	Compliant	Initial State	System	

Figure 3
Example of SIF proof test history

SIS Component (sensor, logic solver and final element) faulty status history and audit Trail. Specifically applicable to Clauses 16.1; 16.2.1; 16.3; 16.3.1.3



Timestamp	State	Comment	By	Reference
2016/08/10 23:13:55	Compliant	Device replaced with Rosemount 3051C S/N 111258KJH56 as at 100o, 6th August. Proof test Conducted after installation	WIN-HR6EC4H374W\Administrator	
2016/08/10 23:12:29	Faulty	Diagnosed as Faulty after Trip ID 400. Removed from Service 0900. 6th Aug 2016. Bypass in plcae as at 0800 6th Aug 2016	WIN-HR6EC4H374W\Administrator	Trip://400
2016/08/10 23:04:54	Compliant	Automatically updated. Last successful test date updated for Component CTRL01-Sensor50	State Engine	
2016/07/29 20:12:58	Expired	Automatically updated. Triggered by deployment of Component CTRL01-Sensor50 revision 0.	State Engine	
2016/07/29 20:12:04	Compliant	Initial State	System	

Figure 4
Example SIF status and history

SIS Component (sensor) time in bypass tracking and audit trail including bypass exceedance tracking and audit trail. Specifically applicable to Clauses 16.2.3; 16.2.7; 16.2.9

Component CTRL01-Sensor02 Bypass Events

ID	Name	Area	In Bypass	Start Time	Expected End Time	End Time	Exceeding	Has Exceeded
						Enter filter text here...		
115	CTRL01-Sensor02	Sulphur Plant	No	2016/08/09 16:10:52	2016/08/09 16:12:52	2016/08/09 16:16:20	No	**Yes**
89	CTRL01-Sensor02	Sulphur Plant	No	2016/08/09 14:28:07	2016/08/09 14:30:07	2016/08/09 14:33:35	No	**Yes**
71	CTRL01-Sensor02	Sulphur Plant	No	2016/08/09 10:42:21	2016/08/09 10:44:21	2016/08/09 10:47:50	No	**Yes**
64	CTRL01-Sensor02	Sulphur Plant	No	2016/08/08 15:35:09	2016/08/08 15:37:09	2016/08/08 15:40:37	No	**Yes**
61	CTRL01-Sensor02	Sulphur Plant	No	2016/08/08 12:15:52	2016/08/08 12:17:52	2016/08/08 12:21:20	No	**Yes**
56	CTRL01-Sensor02	Sulphur Plant	No	2016/08/03 15:21:04	2016/08/03 15:23:04	2016/08/03 16:46:29	No	**Yes**
52	CTRL01-Sensor02	Sulphur Plant	No	2016/07/29 20:31:24	2016/07/29 20:33:24	2016/07/29 20:36:52	No	**Yes**
31	CTRL01-Sensor02	Sulphur Plant	No	2016/07/29 18:55:07	2016/07/29 18:57:07	2016/07/29 19:00:36	No	**Yes**
14	CTRL01-Sensor02	Sulphur Plant	No	2016/07/29 17:18:55	2016/07/29 17:20:55	2016/07/29 17:24:23	No	**Yes**
12	CTRL01-Sensor02	Sulphur Plant	No	2016/07/29 15:42:38	2016/07/29 15:44:38	2016/07/29 15:48:06	No	**Yes**
2	CTRL01-Sensor02	None	No	2016/07/29 12:47:07	None	2016/07/29 12:52:37	No	No

Figure 5
Example sensor time in bypass

SIS Component (sensor) active bypass by Plant Area (time frame selectable). Specifically applicable to Clauses 16.2.3; 16.2.7; 16.2.9

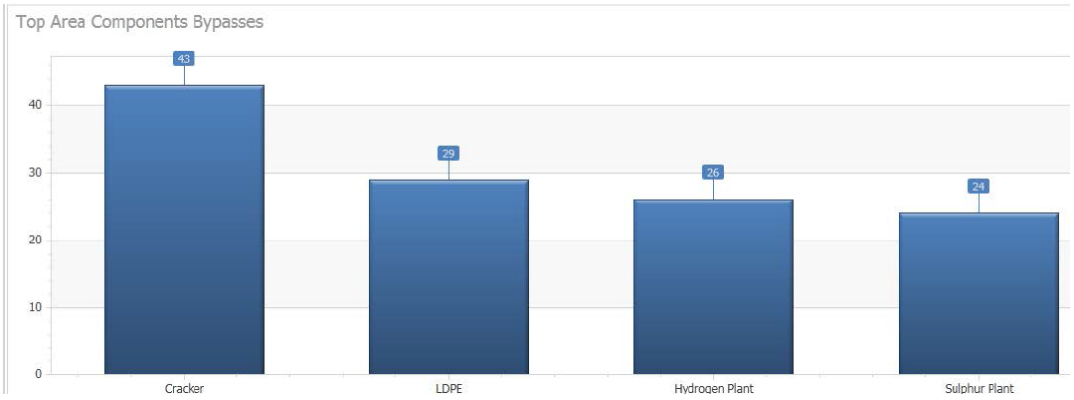


Figure 6
Example of active sensor bypasses

SIS Component (sensor, logic solver and final element) faulty status history and audit Trail. Specifically applicable to Clauses 16.1; 16.2.1; 16.3; 16.3.1.3

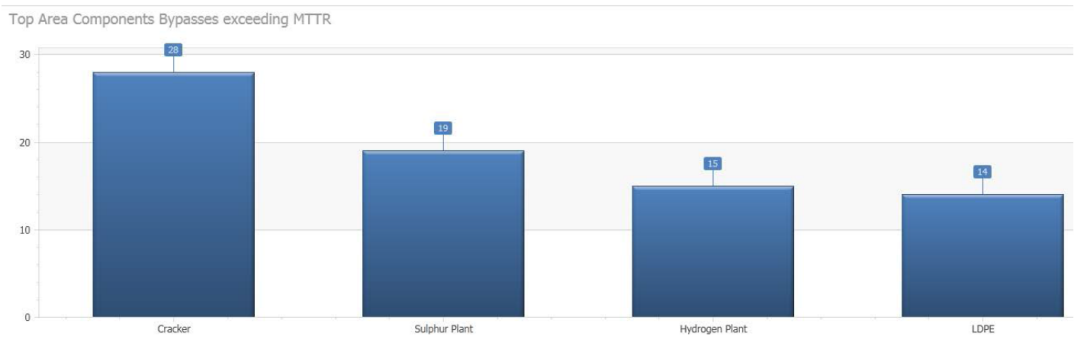


Figure 7
Example of bypass exceeding allowable time

SIF Demand Rate tracking and audit trail.
Specifically applicable to Clauses 16.2.9

Figure 8

Example of current demand rate for SIF (last 12 months)

SIFs Operation

State	Name	SIL	Area	Description	Demand Rate
					None
Compliant	CTRL01-SIF01	3	Sulphur Plant	SIF01 found in controller 01	37.923/yr
Compliant	CTRL01-SIF04	3	Sulphur Plant	SIF04 found in controller 01	24.049/yr
Compliant	CTRL01-SIF05	2	Sulphur Plant	SIF05 found in controller 01	22.199/yr
Compliant	CTRL01-SIF06	2	Sulphur Plant	SIF06 found in controller 01	21.274/yr
Compliant	CTRL01-SIF22	2	Sulphur Plant	SIF22 found in controller 01	8.325/yr
Compliant	CTRL01-SIF46	3	Sulphur Plant	SIF46 found in controller 01	3.700/yr

SIF Demand Event tracking and audit trail.
Specifically applicable to Clauses 16.2.9

Figure 9

Example of actual demand rate versus design over selectable time period

SIF Dashboard

Top SIF Demands

SIF Name	SIL	Area	Count
CTRL01-SIF01	3	Sulphur Plant	40
CTRL01-SIF04	3	Sulphur Plant	26
CTRL01-SIF05	2	Sulphur Plant	24
CTRL01-SIF06	2	Sulphur Plant	23
CTRL01-SIF07	2	Cracker	21
CTRL01-SIF08	3	Cracker	18
CTRL01-SIF21	2	Hydrogen Plant	9
CTRL01-SIF22	2	Sulphur Plant	9
CTRL01-SIF24	2	Hydrogen Plant	8

SIF Demand Event tracking and audit trail.
Specifically applicable to Clauses 16.2.9

Figure 10

Example of demand event tracking for all SIFs

Trips

Behavior	ID	Timestamp	SIF Name	SIF SIL	SIF Area
Behaved as expect...	400	2016/08/10 18:41:44.947	CTRL01-SIF08	3	Cracker
Behaved as expect...	399	2016/08/10 18:41:44.947	CTRL01-SIF07	2	Cracker
Behaved as expect...	398	2016/08/10 18:41:44.947	CTRL01-SIF06	2	Sulphur Plant
Ignored	397	2016/08/10 18:41:44.947	CTRL01-SIF05	2	Sulphur Plant
Ignored	396	2016/08/10 18:41:44.947	CTRL01-SIF04	3	Sulphur Plant
Ignored	395	2016/08/10 01:00:07.928	CTRL01-SIF42	1	Hydrogen Plant
Behaved unexpect...	394	2016/08/10 00:57:00.099	CTRL01-SIF25	3	Cracker
Fixed	393	2016/08/10 00:53:55.987	CTRL01-SIF03	1	Hydrogen Plant
Not Investigated	392	2016/08/09 16:51:21.679	CTRL01-SIF41	1	LDPE

SIF Demand Event Category (Genuine, Spurious, Manually Initiated test) tracking and audit trail. Specifically applicable to Clauses 16.2.9

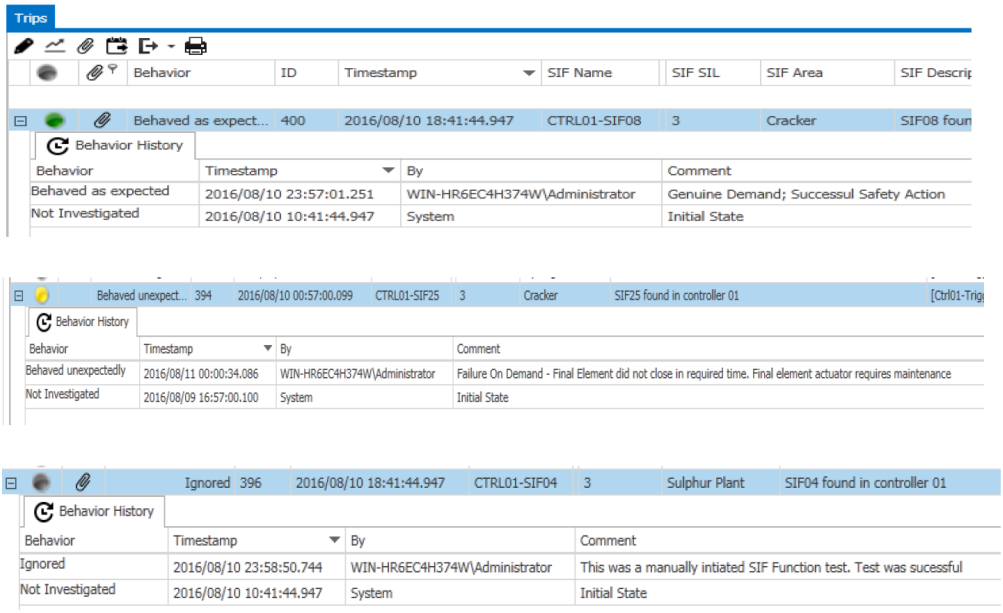


Figure 11

Example of demand event categories

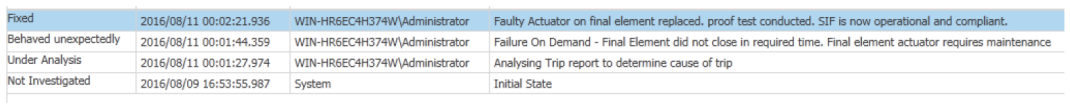


Figure 12

Example demand event resolution audit trail for an individual SIF

SIF Demand Event Historical Trend Capture.
Specifically applicable to Clauses 16.2.9

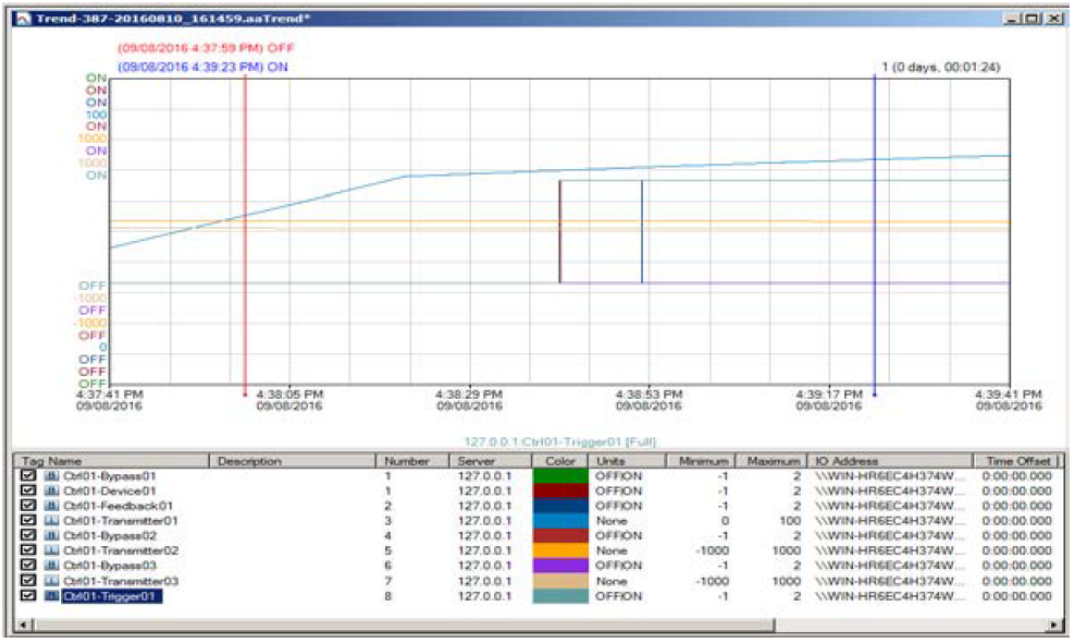


Figure 13
Example of live and/or historical trends

SIF Demand Event detailed report. Specifically applicable to Clauses 16.2.9

The automatically generated report includes the following data:

- SIF response time
- Individual final element(s) response time(s)
- SIF Component Bypass status of all at time of demand
- SIF Component proof test compliance status at time of demand
- Engineering values of all SIF Components at time of demand
- Sequence of events for demand

SIF Manager Trip Report

Name:	CTRL01-SIF01	**Response Time:**	11105 ms
Area:	Sulphur Plant	**Response Time Limit:**	3000 ms
Description:	SIF01 found in controller 01	**Trip Time:**	2016-08-09 16:38:41.155
Demand Rate:	3.801e+01	**Start Time:**	2016-08-09 16:37:41.155
Trip Trigger:	[Ctrl01-Trigger01] = 1	**End Time:**	2016-08-09 16:39:41.155
Trigger Description:	Trigger Tag for SIF01 (Controller01)		

SIF States at Trip

Time	Type	Name	Description	Bypassed	State
16:38:41.155	SIF	CTRL01-SIF01	SIF01 found in controller 01	No	Compliant
16:38:41.155	CO	Voting			Faulty
16:38:41.155	SE	CTRL01-Sensor01	Sensor01 from Controller01	No	Faulty
16:38:41.155	SE	CTRL01-Sensor02	Sensor02 from Controller01	No	Expired
16:38:41.155	SE	CTRL01-Sensor03	Sensor03 from Controller01	No	Expired
16:38:41.155	LS	Tricon_CTRL_01	Tricon V11.2_3009MP		Compliant
16:38:41.155	FE	CTRL01-FinalElement01	FinalElement01 from Controller01		Compliant

Final Element Feedback Response Times

Time	Type	Component	Tag	Response	Limit
16:38:52.060	FE	CTRL01-FinalElement01	Ctrl01-Feedback01	10905 ms	1000 ms

Tag Values at Trip

Time	Type	Component	Tag	Description	Value
16:38:41.155	SIF		Ctrl01-Bypass01		OFF
16:38:41.155	SIF		Ctrl01-Trigger01	Trigger Tag for SIF01 (Controller01)	1.00
16:38:41.155	SE	CTRL01-Sensor01	Ctrl01-Bypass01		OFF
16:38:41.155	SE	CTRL01-Sensor01	Ctrl01-Transmitter01		70.00 None
16:38:41.155	SE	CTRL01-Sensor02	Ctrl01-Bypass02		OFF
16:38:41.155	SE	CTRL01-Sensor02	Ctrl01-Transmitter02		74.19 None
16:38:41.155	SE	CTRL01-Sensor03	Ctrl01-Bypass03		OFF
16:38:41.155	SE	CTRL01-Sensor03	Ctrl01-Transmitter03		24.00 None
16:38:41.155	FE	CTRL01-FinalElement01	Ctrl01-Device01		OFF
16:38:41.155	FE	CTRL01-FinalElement01	Ctrl01-Feedback01		OFF

Sequence of Events

Time	Type	Component	Tag	Description	Value
16:38:41.155	SIF		Ctrl01-Trigger01	Trigger Tag for SIF01 (Controller01)	1
16:38:41.355	FE	CTRL01-FinalElement01	Ctrl01-Device01		ON
16:38:52.260	FE	CTRL01-FinalElement01	Ctrl01-Feedback01		ON

Figure 14

Example of detailed trip report

SIF Time in Bypass tracking and audit trail including time in Bypass exceedance tracking and audit trail. Specifically applicable to Clauses 16.1; 16.2.9

SIF CTRL01-SIF02 Bypass Events

ID	Name	Area	SIL	In Bypass	Start Time	Expected End Time	End Time	Exceeding	Has Exceeded
					Enter filter text here...				
23	CTRL01-SIF02	Hydrogen Plant	1	No	2016/08/09 15:07:28	2016/08/09 23:07:28	2016/08/09 15:19:30	No	No
16	CTRL01-SIF02	Hydrogen Plant	1	No	2016/08/09 13:05:45	2016/08/09 21:05:45	2016/08/09 13:17:05	No	No
14	CTRL01-SIF02	Hydrogen Plant	1	No	2016/08/08 15:54:57	2016/08/08 23:54:57	2016/08/08 16:06:58	No	No
10	CTRL01-SIF02	Hydrogen Plant	1	No	2016/07/29 19:42:11	2016/07/30 03:42:11	2016/07/29 19:54:14	No	No
3	CTRL01-SIF02	Hydrogen Plant	1	No	2016/07/29 17:39:43	2016/07/30 01:39:43	2016/07/29 17:51:44	No	No

Figure 15

Example of bypass history for a single individual SIF

SIFs Bypass Events

ID	Name	Area	SIL	In Bypass	Start Time	Expected End Time	End Time	Exceeding	Has Exceeded
									Enter filter text here
26	CTRL01-SIF04	Sulphur Plant	3	No	2016/08/09 16:45:07	2016/08/10 00:45:07	2016/08/09 16:59:47	No	No
27	CTRL01-SIF05	Sulphur Plant	2	No	2016/08/09 16:43:42	2016/08/10 00:43:42	2016/08/09 16:51:21	No	No
25	CTRL01-SIF04	Sulphur Plant	3	No	2016/08/09 16:17:25	2016/08/10 00:17:25	2016/08/09 16:31:37	No	No
24	CTRL01-SIF03	Hydrogen Plant	1	No	2016/08/09 15:11:50	2016/08/09 23:11:50	2016/08/09 15:17:19	No	No
23	CTRL01-SIF02	Hydrogen Plant	1	No	2016/08/09 15:07:28	2016/08/09 23:07:28	2016/08/09 15:19:30	No	No
22	CTRL01-SIF08	Cracker	3	No	2016/08/09 14:34:40	2016/08/09 22:34:40	2016/08/09 14:48:53	No	No
21	CTRL01-SIF07	Cracker	2	No	2016/08/09 14:19:22	2016/08/09 22:19:22	2016/08/09 14:27:01	No	No
20	CTRL01-SIF06	Sulphur Plant	2	No	2016/08/09 14:04:04	2016/08/09 22:04:04	2016/08/09 14:07:21	No	No
19	CTRL01-SIF05	Sulphur Plant	2	No	2016/08/09 13:53:09	2016/08/09 21:53:09	2016/08/09 14:00:48	No	No
18	CTRL01-SIF04	Sulphur Plant	3	No	2016/08/09 13:40:03	2016/08/09 21:40:03	2016/08/09 13:54:15	No	No
17	CTRL01-SIF03	Hydrogen Plant	1	No	2016/08/09 13:07:15	2016/08/09 21:07:15	2016/08/09 13:12:42	No	No
16	CTRL01-SIF02	Hydrogen Plant	1	No	2016/08/09 13:05:45	2016/08/09 21:05:45	2016/08/09 13:17:05	No	No
15	CTRL01-SIF03	Hydrogen Plant	1	No	2016/08/08 15:57:08	2016/08/08 23:57:08	2016/08/08 16:02:36	No	No
14	CTRL01-SIF02	Hydrogen Plant	1	No	2016/08/08 15:54:57	2016/08/08 23:54:57	2016/08/08 16:06:58	No	No
13	CTRL01-SIF06	Sulphur Plant	2	No	2016/08/03 15:26:08	2016/08/03 23:26:08	2016/08/03 15:29:25	No	No

Figure 16

Example of Bypass history for all SIF's

SIF Compliance tracking and audit trail.
Specifically applicable to Clauses 16.1

SIFs Operation

State	Name	SIL	Area	Description	Last Trip
Compliant	CTRL01-SIF01	3	Sulphur Plant	SIF01 found in con...	2016/08/09 08:38:41.155
Not functional	CTRL01-SIF02	1	Hydrogen Plant	SIF02 found in con...	2016/08/09 08:31:12.258
Compliant	CTRL01-SIF03	1	Hydrogen Plant	SIF03 found in con...	2016/08/09 08:53:55.987
Compliant	CTRL01-SIF04	3	Sulphur Plant	SIF04 found in con...	2016/08/10 02:41:44.947
Degraded	CTRL01-SIF05	2	Sulphur Plant	SIF05 found in con...	2016/08/10 02:41:44.947
Compliant	CTRL01-SIF06	2	Sulphur Plant	SIF06 found in con...	2016/08/10 02:41:44.947
Compliant	CTRL01-SIF07	2	Cracker	SIF07 found in con...	2016/08/10 02:41:44.947
Compliant	CTRL01-SIF08	3	Cracker	SIF08 found in con...	2016/08/10 02:41:44.947
Out of Compliance	CTRL01-SIF21	2	Hydrogen Plant	SIF21 found in con...	2016/08/09 07:44:31.503

Figure 17

Example of compliance status for all SIF(s)

SIF CTRL01-SIF03 State History

Timestamp	State	Comment	By
2016/08/10 00:16:20	Compliant	Automatically updated. Triggered by state update of Compound Voting in SIF...	State Engine
2016/08/10 00:04:18	Degraded	Automatically updated. Triggered by state update of Compound Voting in SIF...	State Engine
2016/08/09 23:32:36	Compliant	Automatically updated. Triggered by state update of Compound Voting in SIF...	State Engine
2016/08/09 23:24:58	Degraded	Automatically updated. Triggered by state update of Compound Voting in SIF...	State Engine
2016/08/09 23:17:19	Compliant	Automatically updated. Triggered by state update of Compound Voting in SIF...	State Engine

Figure 18

Example of compliance history for an Individual SIF

Visibility of Critical Performance Events that may impact Safety Integrity

In addition to the specific monitoring and analysis functionality, SIF Manager will also push email alerts to responsible SIS personnel to ensure they are aware of potential safety issues. Although email alerting is not specifically required by IEC 61511 Ed2, this functionality does assist in complying with Clause 16.2.8 where the standard requires that "Maintenance personnel shall be trained as required to sustain full functional performance of the SIS (hardware and software) to meet the target SIL of each SIF". It does this by drawing attention of the maintainers to leading safety indicators that may have otherwise remained covert.

SIF Manager has the ability to push email alerts to a preconfigure list of recipients based on the following events. The email alerting function is selectable on a SIF by SIF and Component by Component basis. Email alert events include the following:

- SIF Demand Event
- SIF Demand Rate has exceeded the alerting limit (user selectable)
- SIF Demand Rate has exceeded its design limit
- SIF has been Bypassed
- SIF has exceeded its allowable time in Bypass
- SIF Component (sensor) in Bypass
- SIF Component (Sensor) has exceeded allowable time in Bypass
- The aggregate monetary value of plant at risk as a result of Non-Functioning or Out of Compliance SIF's has exceeded a (user selectable) limit

Finally SIF Manager provides information about the overall Health of the SIS by providing aggregated statistics on status of Components that make up the SIS, as well as SIF Performance and Demand Events. Specifically applicable to Clauses 16.1; 16.2.9

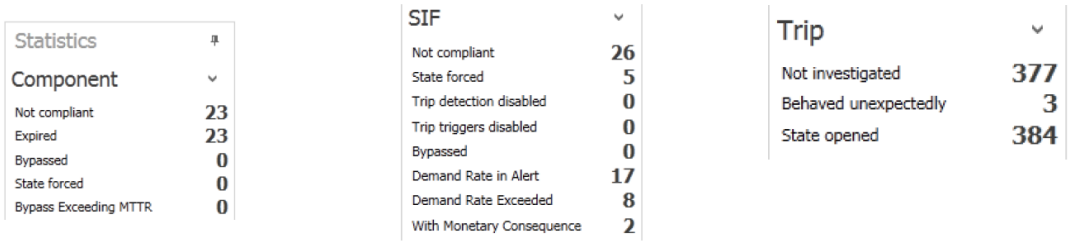


Figure 19
Example of summary performance

Who does SIF Manager help?

SIF Manager is designed to help all members of the organization with their everyday activities, making their jobs easier, making them more efficient and effective:

	Corporate Executives	Corporate Process Safety Manager	Plant Manager	Operations Manager	Area Manager	Shift Supervisor	Plant Engineer	Console Operator	Process Operator	Maintenance Supervisor	Maintenance Technician
Check SIF health status/compliance	X	X	X	X	X	X	X	X	X	X	
Check SIF bypass status/compliance		X	X	X	X	X	X	X	X	X	
Check SIS device bypass status/compliance		X	X	X	X	X	X	X	X	X	X
Check SIS device proof test status/compliance		X	X	X	X	X	X	X			X
Check SIF demand rate status/compliance		X	X	X	X	X				X	X
Generate individual SIF trip report							X				
Analyse/verify individual SIF performance at trip							X		X		
Review allocation of "Proof Test Credit" for successful SIF operation at trip			X	X	X	X	X			X	
Conduct total trip event investigation (multiple SIF trips and sequence of trips)							X		X		
Allocate SIF demand category (success/failure/manual/spurious etc.)							X		X		
Compile periodic SIF Trip event reports							X		X		
Compile SIS performance and history for functional safety audit							X		X		
Periodic review & validate functional safety design assumptions							X				
Review statistics of open trip investigations			X	X	X	X	X		X		
Review statistics of non-compliant SIS devices			X	X	X	X	X	X			
Review statistics of non-compliant SIF's			X	X	X	X	X	X			
Prepare failure on demand reports							X	X			
Review commercial value of plant at risk	X		X	X	X	X	X	X			
Review impact of SIF bypass status/compliance			X	X	X	X	X	X			
Review impact of SIF demand rate status/compliance			X	X	X	X	X	X			
Review impact of SIF trip event causes (spurious, genuine, failed, successful)			X	X	X	X	X	X			

Table 1

Example of how SIF Manager functionality helps make peoples jobs easier and more efficient

Conclusion

No matter what advanced technological solutions or operational procedures are in place, when operating in high hazard manufacturing industries such as oil and gas, petrochemical, chemical and refining operational risks are dynamic and constantly changing. While risk can never completely be eliminated, it can be better managed through a variety of tools, technologies and techniques.

Using a combination of visualization techniques, analytics and the standards, we can understand what the systems we have in place are telling us and demonstrate that they are working as designed and intended. It is important to remember that data and information needs to be presented in a simple and meaningful way so that all departments and organizations can understand the information and have a meaningful discussion around the issues, and possibilities for resolution.

Be active and be focused. We live in the age of big data and the Internet of Things, yet these tools and devices don't make a sufficient impact on process safety performance if they are not used effectively to assess, visualize and manage risk.

Risk management is not a one-person job, but fostering cross-departmental interaction in tracking data and improving risk management strategies strengthens the organization's commitment to and success in mitigating process safety risks. And while it can be easy to rest on one's laurels after implementing these strategies managing your process safety is a journey that does not end with implementing a "safe" design, it's essential to regularly analyze and benchmark performance to determine what improvements can be made. Taking these steps can help ensure that the appropriate process safety indicators are used and maintained to manage hazard risks for the entire lifetime of your operation.

About the author

Sven Grone is the Safety Services Practice Leader for Asia Pacific & Middle East regions for Schneider-Electric. He is a TÜV certified functional safety engineer with over 25 years of experience in instrumentation & controls, safety instrumented systems and distributed control systems

Acknowledgements

Special thanks to **Steve Elliott** for coauthoring the content of this white paper. Steve is a Senior Marketing Director for Triconex safety solutions. He is a TÜV certified functional safety engineer with over 20 years of experience in distributed control systems, SCADA systems, PLC and safety systems. He holds a Process Safety patent, has published multiple articles in global journals focused on functional and process safety and has authored several white papers.

Contact us

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Schneider Electric
35 rue Joseph Monier 92500 Rueil-Malmaison, France Tel: +33 (0)1 41 29 70 00
schneider-electric.com/processautomation

PN 998-20018028_GMA-US Rel. 05/17