FIELDVUE® Instruments

Improving Safety Instrumented System Reliability

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Process Management


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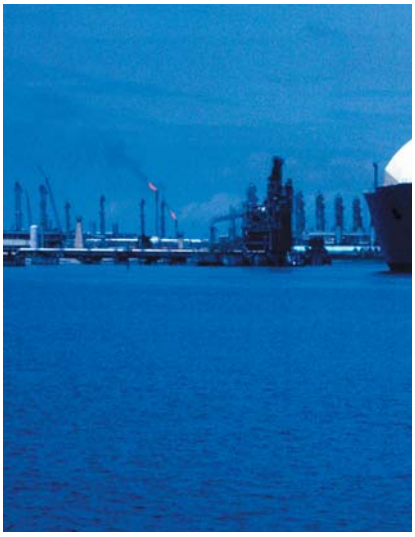
Actuators & Controls

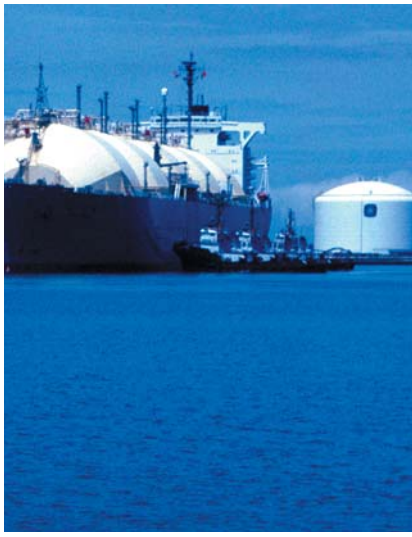
Safety Instrumented Systems: Meant to Protect.

Safety instrumented systems are intended to protect against the risks posed by hazardous processes.

Processes that involve toxic or highly flammable fluids typically rely upon safety instrumented systems (SIS) to protect against upsets or failures that might threaten worker safety, cause environmental concerns, or damage operating equipment.

A safety instrumented system typically consists of sensors to monitor the process, logic devices that compare process conditions to predetermined process limits, and final control elements that shut down or vent the process should conditions reach a trip point.





Will the Shutdown Valve Work?

All SIS components must work on demand to ensure that the system operates as planned.

The operating integrity of the SIS most often depends upon its final control elements. These valves typically remain in one position until called upon to respond. In fact, they may never be instructed to stroke from a standby position, which means they eventually may become stuck, unable to operate.

If a shutdown valve fails, the safety instrumented system may not be able to take the process to a safe state.

Determining Shutdown Valve Readiness.

Traditional ways of checking valve readiness can create problems.

The periodic stroke testing of the final control element gives an indication that the valve will perform when needed. Traditional test methods, however, pose several problems:

- The process must be shut down, or the shutdown valve bypassed, to allow a full-stroke test of the final control element. Either approach proves time-consuming and costly.
- Partial-stroke testing requires a manual device or other method to limit the movement of the shutdown valve. If the device is not removed following a test, the valve's range of movement may be restricted, making the SIS ineffective should a demand arise.
- Emergency valves must be taken "off-line" during a stroke test, which makes them unavailable should an event occur.
- Worker safety becomes a concern since most tests require direct involvement with the SIS on the plant floor.
- The testing procedure is labor intensive and therefore, costly.

Automated Partial-Stroke Testing: The FIELDVUE® Digital Solution.

Safety shutdown valves equipped with the industry-leading FIELDVUE Digital Valve Controller bring significant new advantages to performance testing.

FIELDVUE Instruments, with their micro-processor based capabilities, provide automated[1] performance monitoring and testing, keeping operators informed about, yet safely away from SIS emergency valves.

For instance, as part of the emergency valve package, the FIELDVUE Instrument enables partial-stroke testing while the valve is online, without having to shut down the process.

Importantly, test personnel can remain within the safety of a control room or maintenance facility to initiate the test sequence. They can communicate with the FIELDVUE Instrument using a hand-held communicator or a personal computer, without having to go onto the plant floor. They can also initiate the test from a remote pushbutton connected to the FIELDVUE Instrument.

Note 1: The partial-stroke test procedure or sequence can be completed automatically, thereby avoiding errors and possible nuisance trips. However, for safety reasons a qualified operator is required to initiate the test.

Diagnostic Data: A Key to Improved SIS Performance.

FIELDVUE Instruments help take the guesswork out of valve maintenance.

Determining when an emergency valve needs to be maintained is often a guessing game.

The traditional approach to SIS valve maintenance relies upon the partial-stroke test to indicate whether or not the valve will operate upon demand. Little to no additional insight is gained about the overall mechanical condition of the valve.

Proof of a valve's ability to close completely requires either shutting down the process to allow a full-stroke test, or waiting until the next scheduled plant shutdown to fully test and evaluate the valve's operating condition.

The FIELDVUE Instrument automatically checks the condition of the final control element during each partial-stroke test. It looks at pneumatic supply and actuator pressure values, and at valve position to verify whether or not valve components are in proper working condition.

Should a valve be found to be stuck, the FIELDVUE Instrument through its AMS ValveLink software generates an Event Messenger alert. Critical alerts can be sent to key people via email, pager or phone.

The data gathered by the FIELDVUE Instrument allows diagnostic interpretation and analysis. For instance, a FIELDVUE-generated valve signature test provides insight to valve packing friction, air path leakage, valve sticking, actuator spring rate and bench set. Comparing current data to previous test values may identify a potential valve failure long before the valve quits working. Armed with this knowledge, maintenance personnel can schedule repair activities rather than having to react to an unexpected valve failure.

Also, the FIELDVUE Instrument receives scheduled partial-stroke test commands from the logic solver and applies a time and date stamp to each test. This information is saved automatically on a workstation, making regulator compliance efforts much easier.

Greater Safety at Less Cost.

FIELDVUE Instruments bring money-saving advantages to SIS design, implementation and operation.

Consider the potential time and cost-savings offered by partial-stroke testing:

Lower Cost of Ownership - Unlike full-stroke tests, partial-stroke testing does not require a bypass around the emergency valve, which avoids the cost of additional piping and full-size bypass valves. Automated testing also eliminates the expensive, pneumatic panels typically required by manual test procedures.

Reduced Labor Requirements - Valve testing from the convenience and safety of the control room eliminates the time-consuming and labor-intensive manual testing of emergency valves.

For instance, manual testing often involves the installation and subsequent removal of mechanical valve interlocks. Repeated trips onto the plant floor are no longer required to conduct the SIS performance test.

Increased System Availability - The simple and secure method of partial-stroke testing allows more frequent verification of a valve's ability to move. These tests can be conducted at a time best suited to operators' schedules. The need to stop the process completely for full stroke testing is minimized, increasing system availability.

FIELDVUE Instruments Can Dramatically Impact Plant Costs and Safety.

From installation savings to employee safety, FIELDVUE Instruments play an important role.

The benefits brought to a safety instrumented system by FIELDVUE Instruments are easy to see.

On the system design and installation side, whether implementing a new SIS or updating an existing layout, significant savings can result immediately since FIELDVUE Instruments help reduce hardware, piping and labor costs.

From a production standpoint, being able to partial-stroke test emergency valves online with the FIELDVUE Instrument helps keep the process running without costly disruption.

FIELDVUE-provided maintenance diagnostics help avoid unnecessary and costly valve repair, while the FIELDVUE Instrument's data historian capabilities help satisfy and simplify record-keeping requirements.

Personnel safety is the greatest benefit brought to SIS testing by FIELDVUE Instruments. Keeping operators and technicians off the plant floor and out of harm's way offers the best payback of all.

Proof of Performance

Saudi Aramco facilities utilize FIELDVUE Instruments to enhance SIS performance.

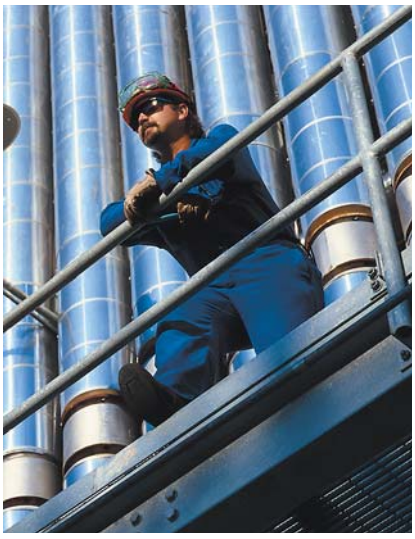
Production and processing operations at Saudi Aramco gas plants and refineries utilize FIELDVUE Instruments on critical, emergency isolation valves.

On-line since early 2000, the FIELDVUE units have exceeded system operators' expectations by enabling the systematic, partial-stroke testing of emergency shutdown valves without impacting production rates.

Partial-stroke testing helps operations personnel determine that ESD valves within safety systems are capable of operating should a demand occur. Patrick Flanders, instrument engineer at Saudi Aramco, credits FIELDVUE Instruments with bringing a new level of security to safety instrumented systems.

"Before the FIELDVUE-ESD concept evolved, it was difficult to functionally test these valves and very difficult to document any meaningful test results," Flanders explains. "Now, thanks to the Fisher FIELDVUE design, it's not only possible to check valves, but we can also do so more safely, at less cost, and with greater efficiency."

Commenting that FIELDVUE technology is easy to apply in safety applications, Flanders states, "This is one product truly based on a customer's requirements and direction for limited valve-travel testing. What was once a very manual process is now semi-automatic. With the FIELDVUE unit in the ESD loop, valve travel is controlled to predetermined limits, and test data are collected during both on-line partial-stroke tests and during full-stroke tests. The device doesn't automatically initiate testing, but it does automate the testing process, greatly simplifying the testing procedures and reducing the time required of our operators."



TÜV Certification.

Successful product testing by a third-party authority leads to a thorough review of components for safety instrumented systems.

The DVC6000 ESD series has been certified by TÜV Product Services (Germany) to be in accordance with IEC61508 for use in Safety Instrumented System up to SIL 3. By evaluating devices per IEC and ISA standards, the TÜV certification process determines whether a product is fit for use in a specified safety application.

TÜV certification is issued along with a report explaining how the product was tested and what application criteria must be met for the product to retain its certification. With the report, system analysts and designers can better understand how a product contributes to meeting the required risk reduction (SIL) level.

The TÜV approval report on FIELDVUE Instruments is readily available. To obtain a copy, contact your nearest Emerson Process Management sales location.

SIL – Explaining the Acronym.

Current standards and guidelines applicable to the design of safety-instrumented systems are performance oriented. The standards do not mandate technology, level of redundancy or test intervals. Rather, they identify "safety integrity levels."

IEC 61511 has been developed as a process sector implementation of the international standard IEC61508: "Functional safety of electrical / electronic / programmable electronic safety-related systems."

IEC 61511 defines four safety integrity levels for safety-instrumented system design.

The devices that make up a specific SIS design, from the input units through the logic solver to the final control element determine a SIL.

It reflects device integrity, the architecture of the system, device testing and diagnostics coverage, and the common mode failures inherent to the SIS.

Within IEC 61511, SIL 1 represents the highest probability of system failure on demand as shown in the following table. Note that IEC 61511 suggests that applications requiring a SIL 4 function are rare in the processing industries.

Safety Integrity Level	Probability of Failure on Demand per Year	Risk Reduction Factor
SIL 4	>=10-5 to <10-4	100,000 to 10,000
SIL 3	>=10-4 to <10-3	10,000 to 1000
SIL 2	>=10-3 to <10-2	1000 to 100
SIL 1	>=10-2 to <10-1	100 to 10

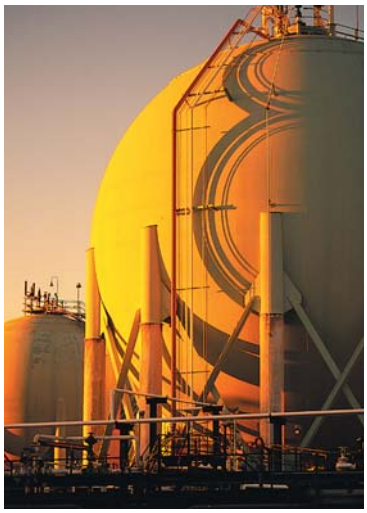
Sensor to Final Control Element: The Emerson Approach to Safety

Only Emerson Process Management takes a smart SIS approach by continuously diagnosing the sensors, logic solvers and final control elements as an entity to verify the ability to operate on demand. Key to this approach is the DeltaV SIS system, rated for SIL 1-3 applications. It's joined by integrated, easy-to-use configuration software and embedded digital communications for safety applications of any size.

The Emerson approach provides:

- Risk reduction
- Reduced project capital requirements
- Reduced maintenance costs
- Easier regulatory compliance

When it comes to safety applications such as emergency shutdown, burner management, and fire and gas systems, Emerson's trained professional safety personnel and global project services organizations have the knowledge to perform process hazard analyses and risk assessment. They also provide safety instrumented system design, implementation and commissioning. Within the framework of PlantWeb SIS Solutions, Emerson provides the most integrated, reliable, easiest to use safety instrumented system for the lowest lifecycle cost.

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