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A Guide to Proof Testing
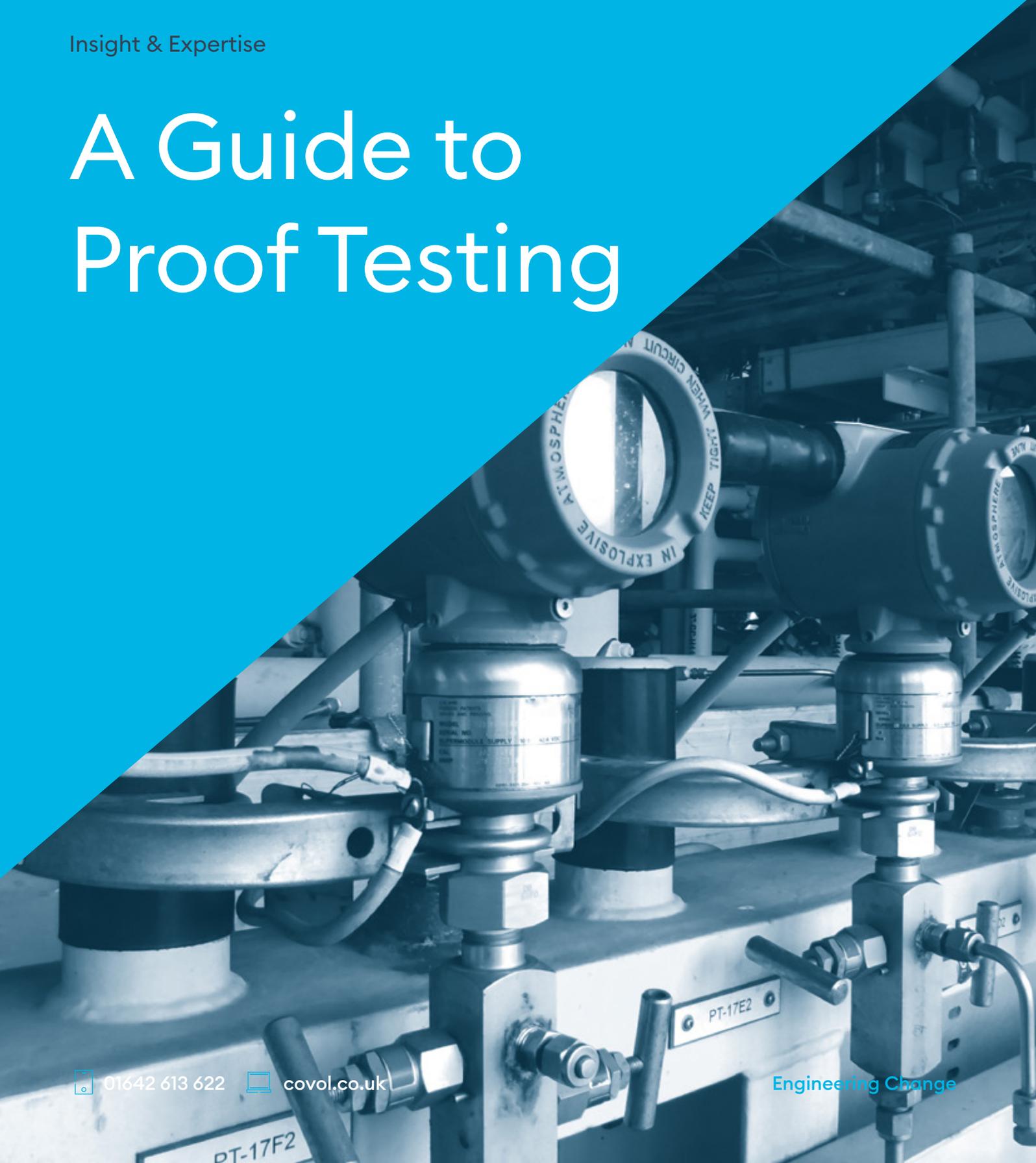
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What is Proof Testing?

Proof testing forms part of the routine actions that are required to maintain the integrity (as designed) of the functional Safety Instrumented Systems (SIS). Their purpose is to reveal dangerous faults that would otherwise remain unrevealed and adversely affect the integrity of the SIS.

Proof tests are executed using written test procedures, the content and accuracy of which govern the effectiveness of the test. The content of procedures addresses many issues;

-→ Defining the scope of the testing
-→ The test equipment to be used
-→ The procedural controls to be adopted

Test procedures must also remain accurate throughout the lifecycle of SIS particularly where change to the original safety function is encountered. The procedures communicate the required actions to the tester and should do so in a manner that takes account of human factors and seeks to minimise the risk of error and violation.

How does it apply to me?

Inspections by the Competent Authority for Functional Safety include operational and maintenance activities associated with the instrumented process safety systems. The leading benchmark standard for these activities is given in BS EN 61511 Functional safety - Safety instrumented systems for the process industry sector.

Fully defined proof test procedures will help improve planned maintenance strategies, fault-reporting capability, avoid unnecessary equipment failures and show compliance with safety management policy.

What should I be doing?

The overall functional safety lifecycle includes the operation and maintenance of Safety Instrumented Systems.

As a minimum, we recommend the following items be considered;

Proof Test Procedure

This should cover full end-to-end loop testing including settings, parameters and trip points. Testing regimes also need to consider equipment outside dedicated safety functions that include instruments that are part of the plant's layers of protection but not in the SIF, such as the control loops, operator alarms and operator responses.

The in-service proof testing regime should also include inspection of hardware to ensure that it is in good condition and meets ATEX requirement where necessary. This requires suitable systems for Hazardous Area inspections, equipment condition inspection, and predictive & preventative maintenance procedures.

Testing

Once the SIF is in service, the organisation needs a clear and documented regime to ensure it achieves the required integrity level over its operating life. Test frequencies are set as part of the PFD calculation and are recorded in the Safety Requirement Specification. The management of the testing must ensure tests are called and completed in time. Test methods must be clear and comprehensive such that a competent technician is able to complete them without any difficulty. The engineering design also needs to have considered testing as part of the PFD calculation and should include the ability to test with the stated plant conditions (e.g. online tests using overrides).

What should I be doing? cont...

Test Frequency

The SIF test frequency can be adjusted in the calculation to ensure that the target risk reduction is met but designers need to ensure that the proof test is achievable in both frequency and method by taking into account periods between plant shutdowns for offline testing.

The test methods should also consider the requirements of the equipment safety data sheet and for diagnostic testing, the need to cycle the power instruments if required.

Faults

All tests need to record faults and successful results. Faults should be repaired and all failures should be logged and recorded even if the repair was simple such as a small calibration error. Fault record systems need to contain all historical information and ideally the system should be able to look for systemic faults and repeat errors by equipment type, duty or service. Any failed tests should be rectified and fully proof tested again.

Missed Tests

It may not be possible to do a test when scheduled. If this is the case, the company must be able to demonstrate that deferred testing is controlled with approved authorisations and valid reasons to defer.

What should I be doing? cont...

Management

To support these processes, there needs to be a clear set of management procedures covering;

- → Management of change
- → Management audit of testing
- → Competency management
- → Engineering line management.

Can I do this myself?

Yes. Once proof testing in in place, it follows similar Codal inspection requirements (such as vessels, pressure systems etc) and will fit into your Safety Management system alongside other similar testing and inspection tasks.

However writing new test methods presents different challenges and unless you have had experience in writing previous methods, it may be advisory to use 3rd party support.

Where Covol can help

We aid businesses in complying with this requirement using techniques that meet a client's requirements. This includes rewriting or validating existing test methods in line with industry best practice and HSE guidelines or alternatively, the writing of new procedures. We work closely with the site team to ensure these documents meet expectations.

The approach we take is dependent upon the complexity and extents of your system in order to achieve a complete and compliant set of proof test methods.

If our help in supporting you with Proof Testing methods is something that you would like to know a bit more about then please contact us.

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Ready to engineer change and progress in your business?

Get in touch to speak to our experts

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