

Fire safety tests are required for all components

Into the fire

The importance of developing a fire safe standard to ensure all health and safety requirements are met

Most petrochemical companies require fire safe tested components for their installations. Valves are often tested for fire safety, but other components like flanges, gaskets, fittings and hoses must be as well.

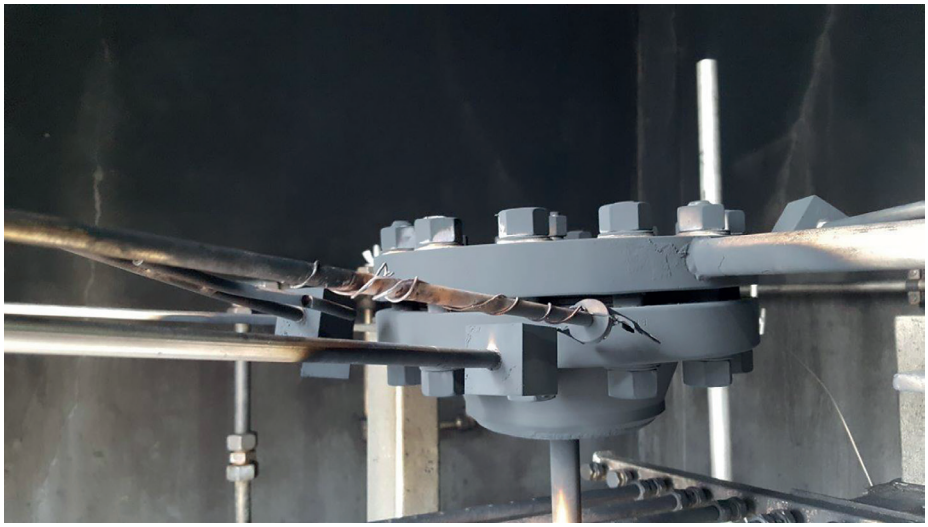
A closed valve has to be filled with water under pressure and must be completely enveloped in flames with an environmental temperature in the region of the valve of 750-1,000°C for a period of 30 minutes.

The objective is to completely envelop the valve in flames to assure that the seat and sealing areas are exposed to the high burn temperature.

The intensity of the heat input is monitored using thermocouples and calorimeter cubes as specified in the standard. During this period the internal and external leakage is recorded. After a (forced) cooling down, the valve is hydrostatically tested to assess the pressure containing capability of the valve shell, seats and seals.

If all results are within the prescribed parameters, the valve will be considered as 'fire safe' and receives a test report with a certificate.

As an independent leak testing company, ITIS often sees misinterpretations regarding valves and fire safe testing.



Pressure testing is also crucial

Reasons for concern:

On behalf of NEN (the standardisation process in the Netherlands) ITIS is involved in working group 14 of TC/153, which is developing the Fire Safe Standard ISO 10497: testing of valves- Fire type-testing requirements.

ITIS is often asked by end users to review fire safe test reports and/or certificates. During the review the company often comes across similar issues.

The (minimum) test temperatures of the burn are clearly specified in the applicable standards; however, in some cases the tested valves has not reached the required temperature during the burn.

Test pressure

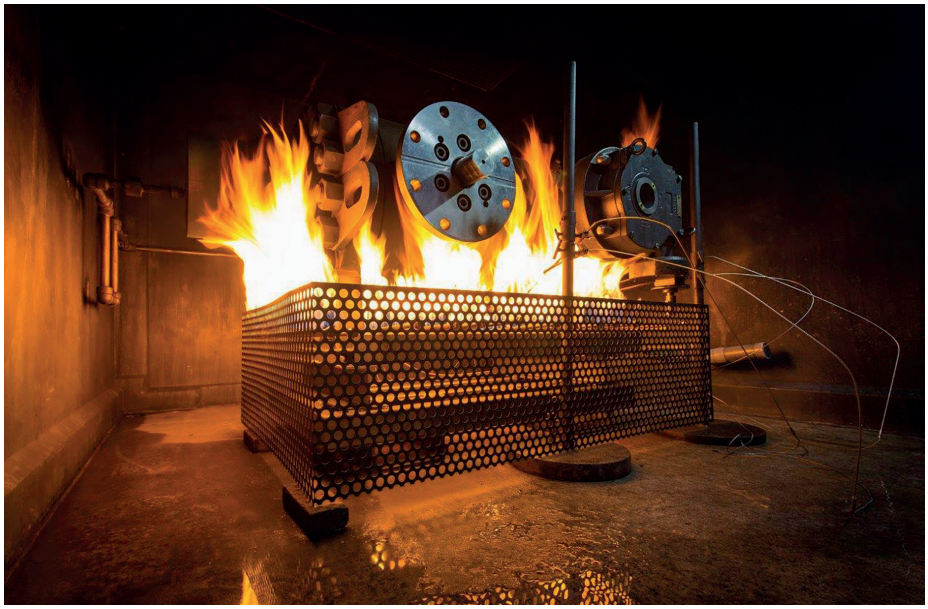
Another issue is the test pressure. The tolerance on all test pressures during the test is ±10%. However, this is also applicable in case of internal and external leakage; the test medium water can also result in steam due to input of heat. This is typical applicable for smaller or lighter valves. In this case firms have to release the (steam) pressure in order to guarantee the requirements for test pressure.

Pressure relief provision

If a valve has a cavity then the cavity pressure must be monitored during the burn. Therefore, a pressure relief provision must be incorporated in the







Components in operation under tough conditions

system, consisting of a pressure relief valve to relieve the test valve center cavity pressure to the atmosphere, to protect against potential rupture of the valve, if it is designed such that liquid can be trapped in the cavity.

ITIS has seen tests where the cavity pressure provision was not applied or the cavity pressure was not monitored, which could lead to serious accidents.

Fire Safe by Design

Fire Safe by Design is generally used for example in gate, globe gate, needle, check and metal to metal ball valves.

What can happen if metal-to-metal seated valves with graphite stem seals and gaskets are used?

These valves exposed to a burn can show leakages during the test caused by the shape and size of parts in combination with the thermal expansion coefficients even when these parts are made of the same material.

In case of a cavity pressure more than maximum allowable during the burn, the cavity of a bi-directional gate valve must be relieved. ITIS has seen a failure on this requirement several times.

Qualification of other valves

Instead of testing each nominal size and nominal pressure rating of a given valve design, all valves of the same basic design as the test valve may be deemed to have been fire-tested, subject to several limitations like qualifications for sizes, class ratings (reduced bore/full bore), mass, etc. as specified in the standard ISO 10497.

Construction materials

For the purposes of product compliance certification or type-testing systems, the materials used in construction of the pressure retaining envelope of the valve must qualify within the classifications as specified in ISO 10497.

Any change in non-metallic materials with respect to the seat-to-closure member seal, seat-to-body seal, stem seal and body joint and seal require a re-qualification.

End users are being advised to get valid fire safe certificates to see if the valves are within the qualification range of a fire safe standard. ▮

For more information:
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