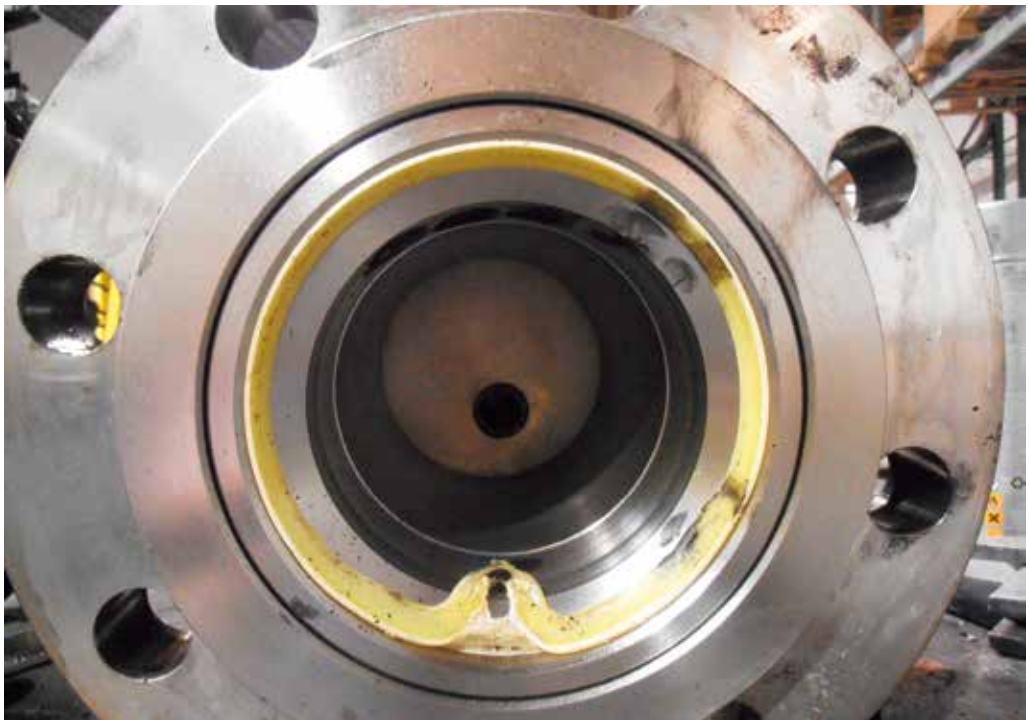
Misinterpretation of design validation testing

Valve test expert Colin Zegers has concerns about how his design validation testing (DVT) services are often interpreted in practice. DVT only covers a certain section of the MESC procedure. Unfortunately, many end users do not recognize this.



Seal malfunction to elevated PT conditions. The material used, PCFTE (polychlorofluorethylene), was susceptible to higher temperatures. Often suppliers indicate higher temperature resistance than is possible in practice, according to Zegers.

Colin Zegers is the founder and owner of the company ITIS (Industrial Testing and Inspection Services) located in Goes, the Netherlands. Their success has led to considerable growth of their operations and as a result they have opened a new and modern testing facility where they provide a wide range of services such as type approval, production and fire safe testing, as well as NDT and Fugitive Emission testing. At this location, they also carry out the renowned Shell MESC SPE 77/300 – Procedure and Technical Specification for Design Validation Testing of Industrial Valves (formerly known as TAT - Type Acceptance Testing) now known as DVT. This extensive testing procedure is designed to assess the capability of valve manufacturers to design and prove full functional performance of newly designed industrial valves. When valves have passed this qualification, it will be rewarded with certificate of acceptance which have validity of 5 years, and can be extended. There are several (inter)national standards applicable for valve testing however most are not complete enough to make an educated conclusion about the performance of the valve when operating in practical conditions. The DVT test is designed specifically to prove a valve for its designed purpose i.e. the minimum and maximum design P/T rating as specified by the OEM.

The organisation who designed this procedure has expressed their confidence in the expertise of Colin's team and the proficiency of their equipment to execute these Design Validation Tests in a written statement. It reads: "During the execution of the Design Validation Tests, ITIS's testing facility had the required equipment available to perform the seat testing, fugitive emissions testing and operational torque measurement recordings and appointed staff was sufficiently knowledgeable to execute the testing in accordance with the MESC procedure SPE 77/300 Appendix C – Performance Validation."

Major issue

This DVT test executed by ITIS dictates the requirements and operational methods to evaluate the performance of industrial valves when they are exposed to their design limits. The performance requirements establish limits of acceptability for a valve, in relation to its type, designed purpose, size and pressure rating. The MESC SPE 77/300 Appendix C specifies DVT testing parameters and is a testing method to confirm the

seat sealing, fugitive emission and operational torque capabilities of a valve when subjected to its rated design conditions, during and after it must undergo a series of mechanical and thermal cycles. Appendix C is the only valve test procedure which requires testing at RT (room temperature), upper design temperature, lower design temperature, finally again at RT and a strip-down after testing for examination of the parts. To ensure strict compliance with the MESC procedure a representative is required to be on site and to observe the testing process.

However, there is a major issue that is sometimes 'conveniently' overlooked. In order for a valve to receive its final certification and is cleared to be installed, it not only has to pass the test performed at ITIS. In fact, testing at ITIS only covers Appendix C of the MESC SPE 77/300 procedure! For a valve to be in accordance with the full scope of the MESC procedure, one must consider every step prescribed. This includes for example design review assessment and evaluation, a technical audit of the manufacturing location ensuring every step of the manufacturing process is in full compliance with international (ISO) standards and required certification bodies.

Serious concerns

Keeping this in mind we now arrive at the subject of this article. We turn to Colin Zegers to explain the misunderstanding most end users have when they receive word from ITIS their valve has passed the 'DVT' test. He is quick to stress: "We have no partnership with end users or suppliers: we have to prove our independence every day. Weekly, if not daily, notified bodies are present at our tests, and through live-streaming end users can follow the test progress by means of live video images and data logging. During DVT's executed at ITIS, we have seen several casting defects, gasket failures, broken parts, leakages etc. About 60/70% of tested valves do not pass the test in spite of the fact that the valve data sheets 'prove' all parts are in accordance with the PT (pressure/temperature) requirements. That being said, in recent times it seems that the DVT is being misunderstood by some end users. They fail to see we only provide services on one specific section of MESC SPE 77/300, this being Appendix C, which is only dealing with the DVT testing sequence. Appendix C is a testing protocol to validate the design but does not address the OEM's valve design development review and auditing the valve manufacturing location, other essential requirements of the design verification validation part of 77/300. When we pass a valve test and draw up a conformity test report, we often get the reaction from end users and suppliers alike: "Excellent, our valves have passed the DVT test", which is not the case. We always try to be as clear as possible as to what service we are offering but as you can understand, for us this raises serious concerns."

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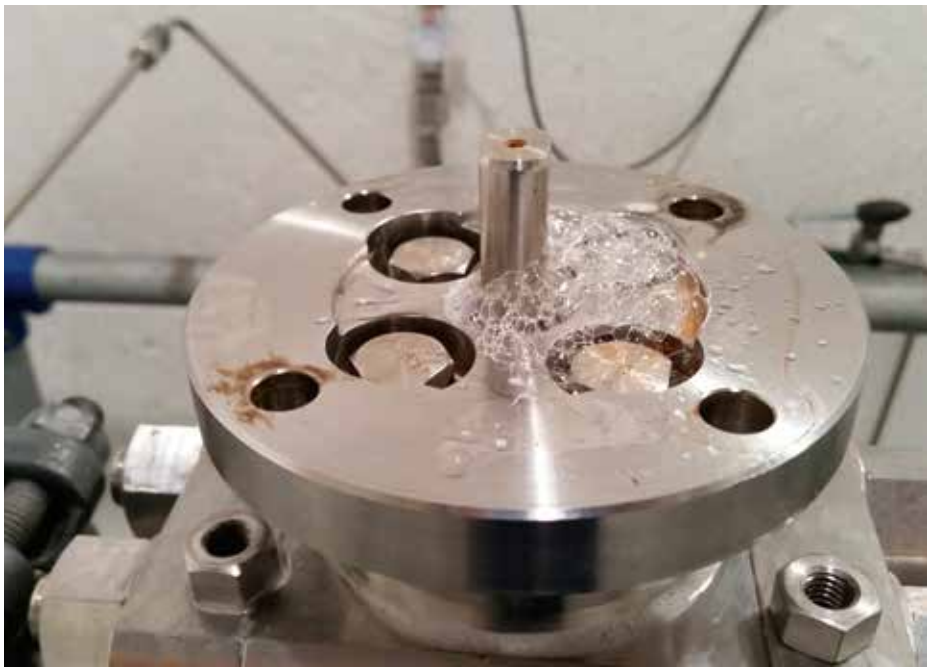
Clear understanding

Zegers stresses that for IT IS it is nearly impossible to cover the entire valve's design development and manufacturing history. To which he would like to add that this is not something his company has to do. "We are there to prove the valve does or does not perform according to Appendix C. But I confess in some cases we know nothing about the foundry, about the design, the engineering, gaskets, stem or sealings origin and have no confirmation the other valves of the batch are outfitted with the same parts or have undergone the same production steps. What happens if the manufacturer makes changes to design, manufacturing location, approved suppliers like foundry, critical sealing materials or replace parts here and there? How much details should we demand of our clients? Do we adhere to and follow full compliance of MESC SPE 77/300 requirements? Should we visit the critical suppliers, foundry and production facility?"

Conclusion? Colin observes that some end users ask for the SPE 77/300 Appendix C test and then label the valve to be completely in compliance with the MESC SPE 77/300 requirements. "As ITIS provides only the Appendix C part, this poses the question: how valid is our test report or certificate? Besides, ITIS is not authorised to claim when a validation has expired and is no longer valid or has expired. I like to compare this to having your moped driver's license, and therefore think you are qualified to drive the heaviest truck you can find. This is why, in my opinion, end users need to have a clear understanding of what the MESC SPE 77/300 entails and subsequently issue detailed requests. They also have to ascertain for themselves that the OEM manufacturing locations and valve designs they buy are safe, reliable and applicable for their plant when asking for a DVT."



Visual leakage observed during a DVT (fugitive emission) after several operational cycles caused by a damaged stem seal.