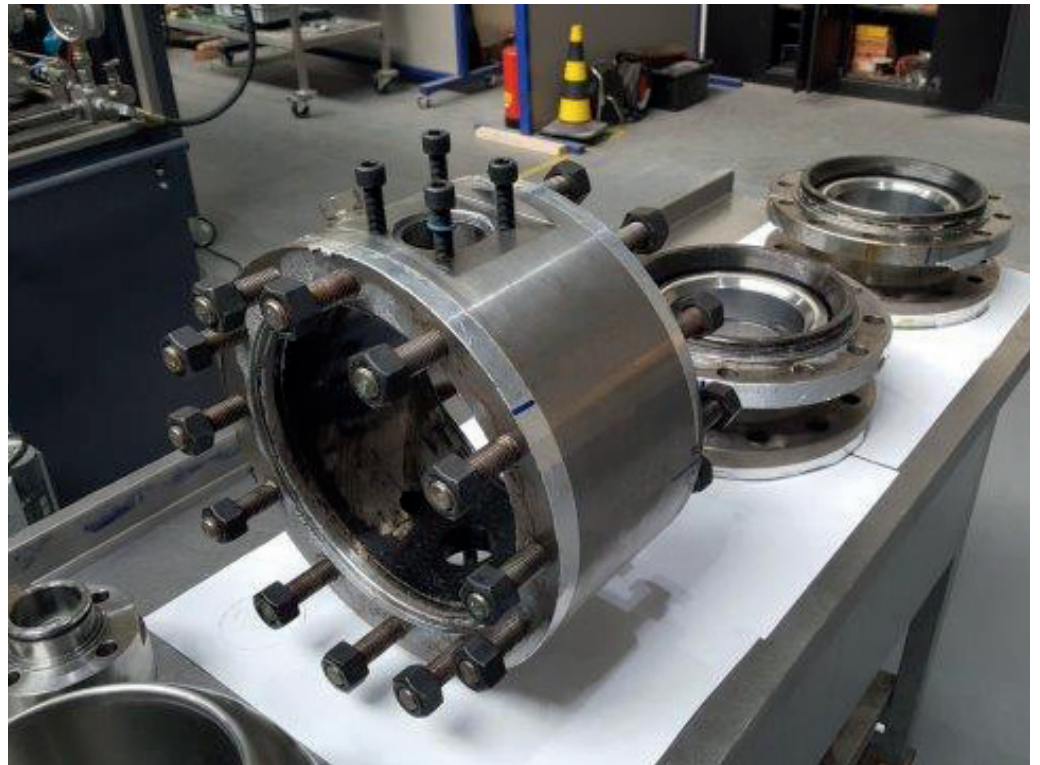


TAT part of the solution

"Roughly 65% of all valves are not passing a Type Approval test (TAT) that we conduct because these valves don't meet the expected requirements (leak rates for fugitive emission, seat leakage and operability, etc.). It can also lead to serious malfunctions. Type Approval Tests (TAT) or Design Validation Testing (DVT) could be part of the solution."

By Lucien Joppen



Colin Zegers, director/founder of ITIS, has an extensive background in testing valves. In the beginning of this century he was involved in TAT's for shut-off valves according to Shell's standard SPE 77/300. "At the time, this standard was only applicable for Shell. Other end users did not type test as rigorously and were satisfied with 'fit for purpose' tests which means that shut-off valves were tested at room temperature. This is a still common practice. This method, of course, is not representative of the conditions these valves encounter when in operation - with elevated temperatures and/or pressures. I know from our experience that in some cases valves are not fit for the task. For example, we encountered a check valve where the bolts were so weak that the top flange was lifted at elevated pressure levels. These defects are more common than one would expect. To be fair, some of these defects also arise due to the wrong selection of the valve type or requirements."

New car

Type Approval Testing, also known as Type Acceptance Testing or Design Validation Testing, is still not common practice in the industry, Zegers says. He uses an analogy of the automotive sector. "When you buy a new car, you expect it to work flawlessly. There won't be a customer

who says 'I want this type to be tested'. Of course, with a high-end product that is designed to be used under critical conditions it is a different story. In that respect, a TAT could at least determine whether a particular valve type would be able to withstand design or working conditions. To give an example, a valve should be able to deal with 400 degrees Celsius and 100 bar. In other words, the functionality of the valve should be the same before and after the test. Back to the analogy with automotive - the tires are still inflated after an hour at maximum speed, but are the outer surfaces still functional or bare threaded? It is the same with the TAT's we conduct. We test these valves under varying (design) conditions, such as room temperature, minimum and maximum design temperature and final room temperature. What follows is a strip-down where we assess potential damage(s) and wear and tear."

Part of the solution

Given the problems Colin and his colleagues encounter when performing TAT's, one would expect that it would be useful to employ this method more across the board.

Zegers nods: "It is a useful tool to minimize future problems at the operational level. Of course it is not the be all and end all. In the end, it is only one product we put to the test."



Unfortunately it does not mean that a similar product ordered and delivered, say six months later, will be identical. Therefore, a TAT is only part of a management system

designed to ensure that the customer gets what he wants and needs." Zegers mentions the Shell requirements which go much deeper into the supply

chain. "Shell has devised a qualification system which applies to the design and production/assembly of its suppliers. Shell wants a number of questions answered, such as the production location of the valves and the locations that are responsible for various parts of the valve. What materials have been used and procured from which company/ies? Has the valve design been validated? Which tests have been conducted and by whom? In short, Shell wants to cover all possible bases in the process of design and production. If the company in questions ticks all these boxes, Shell issues a certificate for a certain valve range which is valid for 5 years. However, if there are any changes, a new audit/test is required. This could be a location change of the foundry, the use of another sealing or gasket, or a change in the supply base."

Internal communication

According to Zegers, part of the solution lies in the internal management and communication between various management layers that are involved in the process of



testing, procurement and usage (operational level).

"Some companies have put a system in place which ensures that issues regarding valves are communicated to a higher level. If these issues are serious enough, they will demand answers from its suppliers within 24 hours. If not answered to their satisfaction, the end user will take appropriate measures which could ultimately lead to a removal from the preferred vendor list."

Zegers admits there can be many changes, some of these minute, which escape the attention of both the end user and (independent) testing agencies. He mentions the use of various polymer or mineral blends that are used for sealing purposes. "Graphite is a fire-safe material, but there are several blends around with slightly different properties. It is customary that suppliers provide detailed information about the composition of these blends. More often than not, this information is unknown, therefore we only mention 'material unknown' when performing a TAT."

Unrealistic demands

Zegers has also experienced issues which arose in TAT's that demonstrated that some requirements are not realistic. He mentions the operability of a swing check valve.

"This valve is equipped with an 800 pound disc. According to the 77/300 requirements, a low pressure seat test at 2 bar, using nitrogen, should be conducted. The disc, however, is too heavy to be operated at such low pressures and therefore is not in use for low pressure systems. After we conducted the test, the seat leakage was more than 15% than the allowed threshold, but at 5 bar there was zero leakage rate. In other words, fit for purpose but not accepted according to 77/300."

As a testing agency, ITIS will not make recommendations, Zegers says. "Whether it is acceptable, is up to the end user. Sometimes there is a grey area. For example, minute damage or wear and tear, for example on the stem, during strip downs. As the TAT is limited to 200 operational cycles, there are limitations to the TAT, especially as the operational use (the intensity and frequency) is important in determining the life cycle of the valve in question."

Wider industry use

Zegers recognizes that the demand for TAT's is growing. More and more end users are demanding more information regarding the quality and operability for the shut-off valves they procure. They also emphasize



that these TAT's should be conducted by an independent party. Of course ITIS is one of the testing agencies that are able to do the job. We are able to perform TAT's on various parameters such as operability, safety, fugitive emissions, fire safety, and so on."

A sector-specific standard for type approval testing of several valve types would be able to address the aforementioned issues (see the check valve example) and also enable a wider use within the industry. Zegers states it could also reduce the costs for TAT's and make the whole process more transparent for end users and valve manufacturers. "There are discussions within the supply chain about TAT. Some suppliers say these requirements are too strict. On the

other hand, there are shut-off valves that leak at 50% of the test pressure. As I have mentioned in the beginning, more than half of the valves we type test are not delivering what they should. If we can bring this down, partly by using and refining TAT, it would save some serious problems at the operational level."

Zegers is a supporter of making TAT's more available to the industry. That's one of the reasons why he joined the committee of the international working group TC153. Within this working group he intends to build upon the existing norm ISO 15848-1 and produce an amendment which incorporates seat testing and design temperatures. "This goes deeper than just 'Fugitive Emissions rates.'"