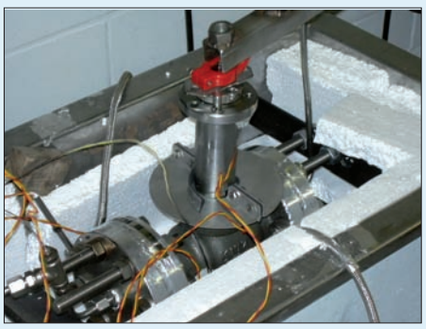
The do's and don'ts of valve testing

To many people (myself included) a leak test might mean watching for bubbles of gas in a jar of water. However, such a simplistic view does not do justice to the complexity of the testing protocol. In fact, there are a lot of issues which need to be addressed if testing is to be done safely and give accurate, meaningful results. Seeking to learn more about the practicalities of emissions testing, Valve World paid a visit to Dutch company DCI, located almost halfway between Rotterdam and Antwerp.

By David Sear

Although it will never win prizes for architectural merit, the newly-built bunker at the edge of the factory is seen as a prized possession by all at DCI. As Commercial Manager Mr Joost-Jan Dingemans explains, it is there to fulfil an important safety function. "If you are running leakage tests, it may be important to check the integrity of the valve at the actual rated working pressure. Obviously, if something were to go wrong when you are working at elevated pressures, then that could compromise the health and safety of people close by. That's why a purpose-built structure such as this one is a pre-requisite for any serious testing house."

Colleague Mr Colin Zegers (Manager Valve Testing Department) added that cameras have been fitted inside the bunker to enable visual monitoring of the tests from a safe position outside. "I know that some companies persist in running leak tests at low pressures. As valves are obviously less prone to leak at these pressures the tests hardly mirror day to day practices. That's why DCI has also invested in the bunker and a new compressor, so we can run tests at 1000 bar and over and all in perfect safety."



Valve being prepared for testing at DCI. Note the multiple thermocouples, used to obtain accurate temperature measurements at various parts of the valve.

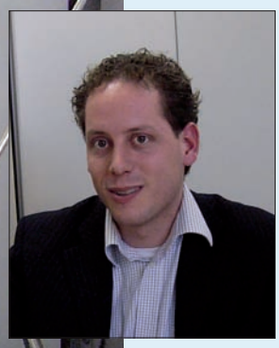
Safety during testing is a key concern not just for Mr Dingemans and Mr Zegers, but also for many of their clients. Mr Dingemans: "Many people in the valve business are using us because they know we can comply with stringent safety precautions. Other reasons we hear why end users and manufacturers are turning to an independent test house include the fact that they lack their own sophisticated in-house equipment, or they may require an independent, unbiased report."

In addition to the bunker and compressor, further recent investments at DCI include an automated test bench, a valve stroking facility (with torque measurement system) and digitalisation of the bubble test. DCI has also developed a unique clamping system, which allows valves to be quickly and easily brought into place without the need for fitting flanges. Mr Zegers: "This system, which is designed to accommodate the pressures required for leakage testing, means we can test valves that way much faster. Even so, it can still take time to run tests, as valves may need to be thermally and mechanically cycled. For example, when recently working on some Kitz valves, (see overleaf), the tests took around five days to complete."

Best practices

Although there are a number of industrial and corporate test protocols available to choose from, the accuracy of the test results can easily be corrupted if inappropriate procedures are followed. Mr Zegers: "In many cases, the valve emissions testing protocols are ambiguous, and therefore the results are not always as reliable as they should be. Consider the bubble test, which would seem so simple as to be foolproof. However, I've seen one company check for bubbles using a hose that was ten meters long and had a diameter of about 10 centimetres. Obviously, in such as case you won't see a bubble for days, so the valve may wrongly appear to be leak-free! We therefore closely review all protocols sent to us and give feedback to the

Mr Colin Zegers (Manager Valve Testing Department): "As many test protocols are ambiguous, you need to properly think about what you are doing otherwise the results may be meaningless."



DCI's Commercial Manager Mr Joost-Jan Dingemans: "By seeking to identify root causes of leakages, we are helping valve manufacturers to implement design improvements."

people who write or use these specifications so that they can be tightened up."
Similarly, it is important to be careful how the valves are cooled for low temperature testing. Mr Dingemans: "Some people still use a alcohol/dry ice mixture, which can lead to cracks in the valve body. Our preference is liquid nitrogen, but again, you mustn't simply immerse the valve in a cooling bath, otherwise crack formation may result due to excessive temperature differences. So we will normally take our time, and perhaps allow two to three hours to properly cool down a 3", 600# valve. A slow rate of cooling is also important to ensure that the entire valve, and not just those parts in contact with the nitrogen, reaches the required temperature."
From time to time, however, DCI may deliberately cool valves at a faster rate. "Some companies do request this, as they say it replicates actual field conditions. Some may go even further, and stipulate that the cooling process should be started inside or outside of the valve. Still, however the cooling is achieved, DCI will check the temperature at several points – including the seats - using thermocouples."

Typical set-up for testing a small valve.

Decreasing failure rates

Concluding Valve World's visit with a piece of positive news, Mr Dingemans notes that the failure rate of valves tested at DCI is decreasing. "In the past, we were seeing failures rates of around one in every three valves submitted to us. Now that figure is falling as valve manufacturers improve their designs. We have made it part of our job to record the results of valves that we have tested, helping to identify root causes of leakages and other failures. This information can be fed back to the manufacturers, enabling them to implement design improvements."

The rate at which a valve is cooled can be varied according to the needs of the client.

In some cases the cause of failure can be surprisingly simple to locate according to Mr Zegers, who recalls testing a valve a minus 50°C which leaked extensively. "When we opened it up we saw it had been fitted with a simple O-ring! Normally, these are only suited to temperatures down to minus 20 or 30°C. We therefore advised the manufacturer to consider an alternative, such as a graphite ring. He did this, and the valve subsequently passed the test easily." ■

About DCI

Located in Kapelle, Holland, DCI's Valve Testing Department has to date tested valves from throughout the world and for destinations in all key areas such as Russia, Nigeria, the US etc.
The first tests were run in the mid 1990s. As demand grew a separate valve testing department was established in 2001. In the past twelve months DCI has tested and inspected over a thousand valves.
DCI can provide a complete test service, including synoptic tables, calibration certificates, drawings, etc.
In addition DCI has two other international activities:
The Leak Test Department can test for leaks (both under and over pressure) in various systems in the energy production and the (petro-)chemical industry, even during production. Specific capabilities have been developed for example for LNG plants.
The Tube Inspection Department is specialised in the inspection of tubes (up to 4") that can only be inspected properly from the inside for corrosion, pitting, erosion, etc. DCI's Tube Inspection Department has the broadest range of inspection techniques available.