Keeping up with Hydrogen – A vision on testing

Our world has reached a turning point; We are moving away from our traditional energy sources and have made the environment a top priority. A major shift in technology and performance is underway, and the industry is following with the technology to become hydrogen ready. Where we see that the technology advances at an incredible rate, we, from our position, also notice that legislation, standards and even production technology are still at their starting point. No authority has stepped forward to dictate the way forwards on performance and testing of hydrogen valves and therefore leaves manufacturers to refer back to their old ways, and in particular; The standards for Fugitive Emissions (FE) testing.

This is not a strange thing. When we compare the reasoning behind FE testing for, for instance, chemical service and hydrogen service for a valve, we see a lot of similarities; Safety is often the first to reach the table, but the effect of hydrogen on the environment is often forgotten. As a matter of fact, it is argued by the scientific community that hydrogen could be up to 200 times more potent as a short-lived, indirect, greenhouse gas. This raises the question if the outline of traditional FE testing is even useable for hydrogen service valves. As a minimum it should be argued that 100% of hydrogen service valves should be tested for FE using a method close to the final operating conditions, and secondly, the test solution should be defined in such a way that its impact on the environment is limited. Both should be safeguarded by legislation.

Interestingly enough we see that valve manufacturers refer back to standards that prescribe use of Helium and Methane with the intent to use it on hydrogen valves. This is a logical direction on the grounds of technological maturity, but it is questionable if this would should be the way forwards. In fact, we argue that hydrogen as a tracer has at least the same potential as a solution, fewer disadvantages, a fraction of the costs and is much closer to the actual operating conditions. Especially the aspect of costs is incredibly important to give the industry a fair chance of keeping production costs reasonable without compromising on quality. In that perspective, Helium is immediately disqualified because of high cost, limited availability and the origin of the only large source; Oil and Gas production.

To be clear on the technical solution; Hydrogen in a diluted form would be used as the test gas, where the hydrogen concentration will act as the tracer and a hydrogen sensor is used to measure leakages without the need for a vacuum. Such gasses are commonly available in the market as welding gasses used for stainless steel welding. Perhaps the best example is forming gas, which consists of 95% Nitrogen and 5% hydrogen. This combination is stable, not flammable and costs are only a fraction compared to Helium. Technical properties of forming gas are actually safe guarded by ISO 10156, which proves the maturity and stability of the gas on the market.

In potential, using the right equipment and procedure, the forming gas solution has at least the same potential to detect leakages at a level of molecular flow. Hydrogen sensing has matured as a technology for this single purpose in a number of industries, where testing of aviation fuel tanks is a great example of a critical application, whereas leak testing of food packaging show the high speed and accuracy capability in production environments.

In conclusion we see that the number of valves tested for fugitive emissions will grow exponentially in the near future. To achieve the fundamental purpose of minimizing global warming, it is vital that the industry can guarantee that such valves are leak tight to the environment. This can only be achieved if production requirements and corresponding technology is developed and matured before launching the final product. The potential scale alone will require a clear vision on methods of testing, allowable leakages and realistic forms of automation.

It is our opinion that Fugitive Emissions testing using low concentration hydrogen is 'the' only production testing solution to accommodate large scale production of valves for hydrogen service. Technical alternatives, such as Helium, will not be available at the required scale to keep up with the industries production needs. Implementation of Hydrogen FE testing would help the industry to effectively automate testing of products for hydrogen and other critical applications while maintaining a reliable quality system with a great cost balance and near to no disadvantages.