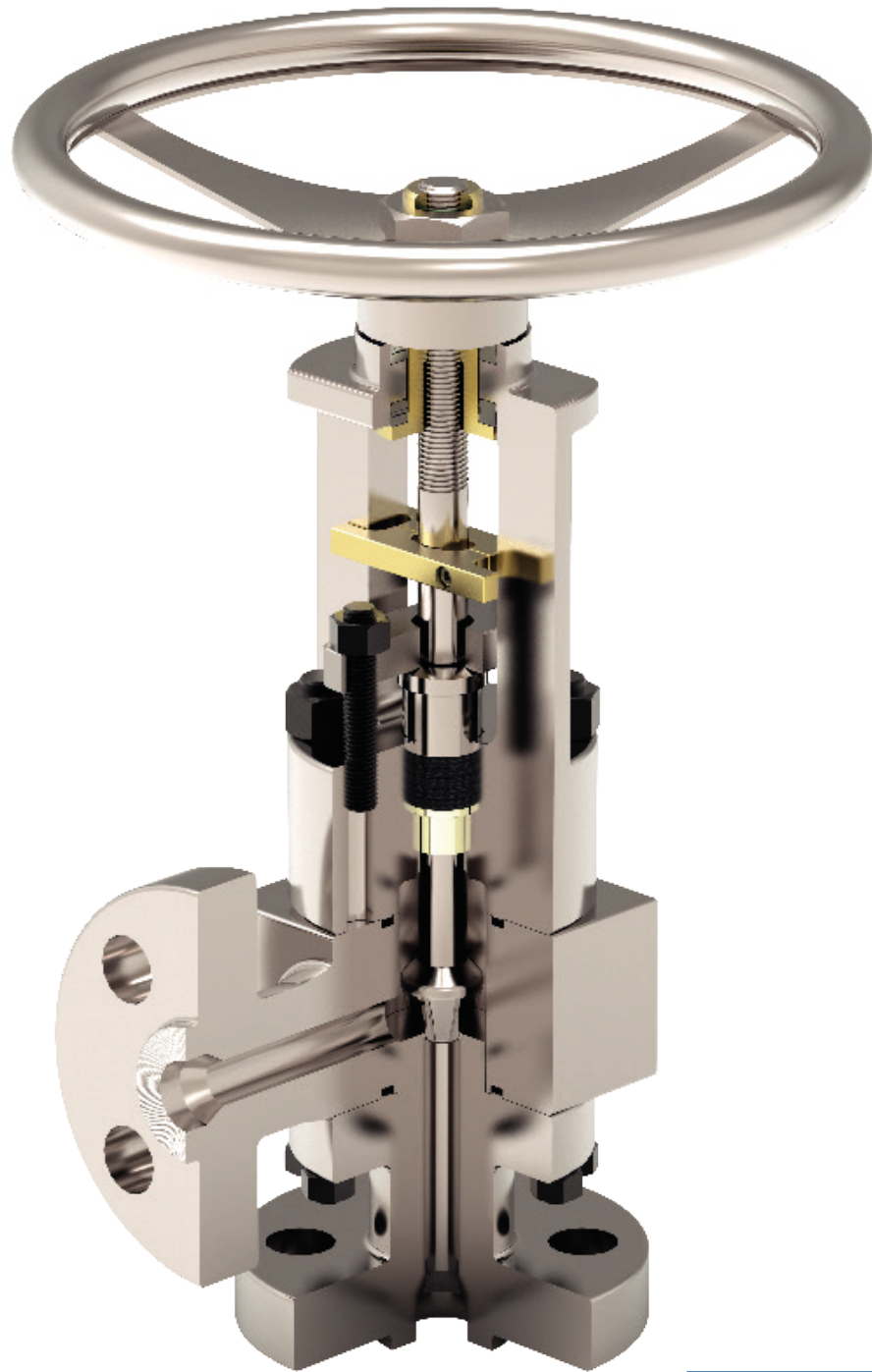


WE INNOVATE TO REDUCE DOWNTIME CAUSED BY CORROSION



| Upstream | Midstream | Downstream | Chemical valve applications



FAST TRACK DELIVERY

SPECIAL MATERIALS

SPECIAL DESIGN

WE INNOVATE TO REDUCE DOWNTIME CAUSED BY CORROSION WHITEPAPER

Ivo Los (Account Manager and Fertilizer Valve Specialist) and Fred Jansen (Sales Director) at Red Point Alloys BV explains the importance of valve innovation in the fertilizer industry to reduce downtime caused by corrosion.

Facing increasingly strict requirements and building new installations that need to comply with a growing number of specifications, the fertilizer industry can benefit from the innovation of valves. New technologies can help reduce erosion, corrosion and crystallisation in installations, and reduce emissions and risks at fertilizer plants. Safety and the environment are top priorities for fertilizer manufacturers. Emission requirements in densely populated areas become stricter every year and accidents and leaks have to be prevented at all times. Although innovation in this area is not always a priority in this traditional sector, it is crucial that safe and reliable valves are given the attention they need, especially in a sector that is constantly under scrutiny in the climate debate, and where incidents can have disastrous consequences, and plant shutdowns can cost millions.

SAFER AND CLEANER

As the fertilizer industry uses aggressive, explosive, corrosive or otherwise hazardous substances, valves can play an important role in making the industry cleaner and safer. New stricter standards are continuously being introduced in this sector. In addition to the requirement for zero emissions, changing processes in companies (e.g. temperature and conditions) mean that ever-increasing demands are being placed on valves and their specifications. These requirements are not so different from those implied in the petrochemical industry, for example, where Red Point has thirty years of experience. By focusing on innovation, the company wants to make an important contribution to the fertilizer industry as well.



Figure 1. Angle type globe steam jacket

INCREASED WALL THICKNESSES

Red Point uses a unique production process in which the base material is not cast, but rather made from forgings that have already been extensively tested in the laboratory by carrying out tough tensile tests, as well as chemical and mechanical analyses.

Casting is also time-consuming and additional tests on the body are required to proof the quality. A forged approach ensures that valves have increased wall thicknesses and are more rugged.

This is an extremely important factor in the fertilizer industry because, like piping, valves are subject to heavy loads, and material losses always occur. It is not surprising, therefore, that corrosion is measured in micrometres per annum. Increased wall thickness can help to extend service life and bring down the cost of ownership.



Figure 2. Angle type globe stempack flush

CORROSION TEST

With corrosion being one of the major problems, fertilizer plants want to know up front if the specific batch of material complies with the desired specifications.

To make sure it does, Red Point performs a Streicher test (developed by American metallurgist Michael A. Streicher), also known as the ASTM A262 practice B test.

This is a corrosion detection method for intergranular attack based on weight loss determinations. The procedure includes subjecting a specimen to a 24 – 120 hr boil in ferric sulfate (50% sulfuric acid). This test is faster than the commonly used Strauss test (to evaluate the heat-treatment of as-received material), because of increased acid concentration.



Figure 3. Angle type globe valve DN25 1500 lbs

Streicher testing is carried out on samples from finished material in the as-delivered condition. For example, to meet requirements of major clients, the used material is exposed for 120 hr – calculated from the moment of boiling – to a ferric sulfate-50% sulfuric acid solution, after which the loss of weight of the material is determined. The loss of weight shall not exceed 1.6 g/m² (10 µm/48 hr). After this test, the material is microscopically inspected for specific and selective attack indications. The penetration and weight loss of the material cannot exceed 100 µm in any direction.

STEAM JACKET

Valves for fertilizer plants need to be resistant to the corrosive, erosive and crystallising effect of the urea used. That is why the choice of base material is so important. The materials used by Red Point include refined duplexes and specially treated 316L urea grade material for effective resistance. The 316L urea grade material is a modified stainless steel with extra low silicon content and substantially higher molybdenum content. The low carbon content, combined with a well-balanced chemistry, makes the alloy fully austenitic, free of intermetallic phase precipitations.

The alloy is designed for improved corrosion resistance properties in urea carbonate environments. One of the dangers is that cavities can form in valves and pipes, in which liquids can accumulate and crystallise.

To prevent the accumulation and crystallisation of the medium, packing, flushing and heating/ steam jackets can be added to the valve design. The steam heats the liquid in order to prevent it from crystallising. For the same reason, fertilizer valves are designed without springs or the springs are covered.

ANGLE TYPE GLOBE VALVE

Innovation can prevent and solve the problems that erosion, corrosion and crystallisation can cause. Instead of a normal globe valve, Red Point developed an angle type globe valve, which has a low pressure drop for less crystallisation. The angle type globe valves also do not have any dead spaces, which prevents the crystals from building up and reduces corrosion in the valve. It has an integral stellite seat and plug. The one piece plug and stem prevents product and corrosion buildup between plug and stem. The fully stellite plug face reduces wear. The valve has a Kolsterized stem. This low temperature surface carbon diffusion treatment enhances the mechanical properties of the alloys without affecting the good corrosion resistance of the base material, making the steel surface four to five times harder (900 – 1200 HV)

than the untreated material. Kolsterizing leads to an increase in wear resistance, fatigue life, erosion and cavitation resistance.

Other features are a non-rotating rising stem to reduce wear on the plug and seat, lower friction between stem and packing and an integral yoke, which is compliant with Stamicarbon's specifications for urea plants.

ZERO EMISSIONS

Valves can play an important role in reducing the environmental impact of the fertilizer industry. Since the Paris climate agreement, there has been strong demand from governments for a reduction in emissions.

In China, the government takes an even stricter stance than its US counterpart. Fertilizer plants can have a significant environmental impact and that is why requirements are so strict. In particular, governments require zero emissions if work is carried out with hazardous substances. That is when valves that produce no emissions are needed. Red Point uses class A low-emission stem packing and gaskets to comply with the strictest emission standards.

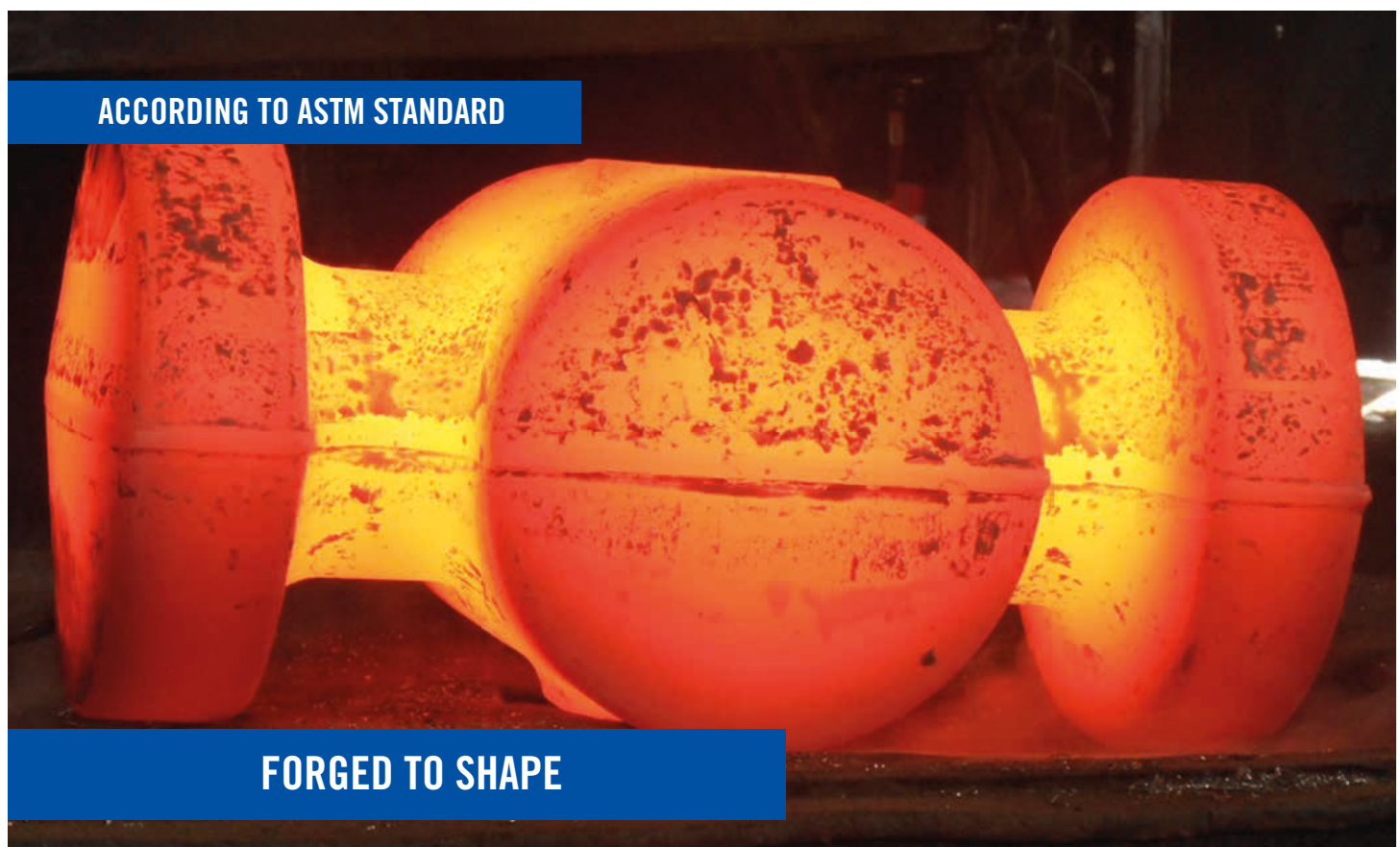


Figure 4. Forged valve

NO SHUTDOWNS

If a valve is not doing its job or is malfunctioning, it can cause problems for fertilizer plants, even shutdowns, which can cost millions. In order to prevent this, two innovative operating procedures are important. Firstly, there is on site problem solving. By visiting a fertilizer plant and actually having a look at the problem, you can analyse and evaluate the malfunction and come up with a better solution. This solution can be applied for other customers and plants as well. Secondly, there is fast track supply. This is not only a matter of a strategic location, near to ports or airports, but mainly due to a relatively short production time of customised valves within two to ten weeks. That also stimulates innovation because the fast turnaround time means that improvements can be incorporated in new products quicker.

DECADES OF IMPROVEMENT

Innovation also means customisation. Red Point currently has 30 000 different designs of ball, gate, (angle) globe and check valves in which all the features and improvements from past decades have been incorporated. New valves are produced based on these designs,

meeting precise specifications, and thus incorporate all past improvements. In addition, so-called FEM calculations are carried out in order to verify that the valve supplies the pressure required in conjunction with the medium. Test reports and all material documents are given to the customer.

IMPORTANCE UNDERESTIMATED

The importance of good valves is often underestimated. Valves are often seen as the final part to be added to an overall project. When designing large installations, for instance, the valves are left until the end. However, in the case of offshore installations and refineries, for example, they account for 5% of the total costs and €20 billion are spent on valves every year within the global market. That is why valves must not be seen as 'the appendix', but as an important part of the whole construction of a fertilizer plant. Innovation of valves means innovation to the whole plant.

MATERIAL QUALITY ASSURANCE

All base materials used by Red Point are from the Western Hemisphere or of European origin and come with a DIN EN 10204/3.1 certificate.

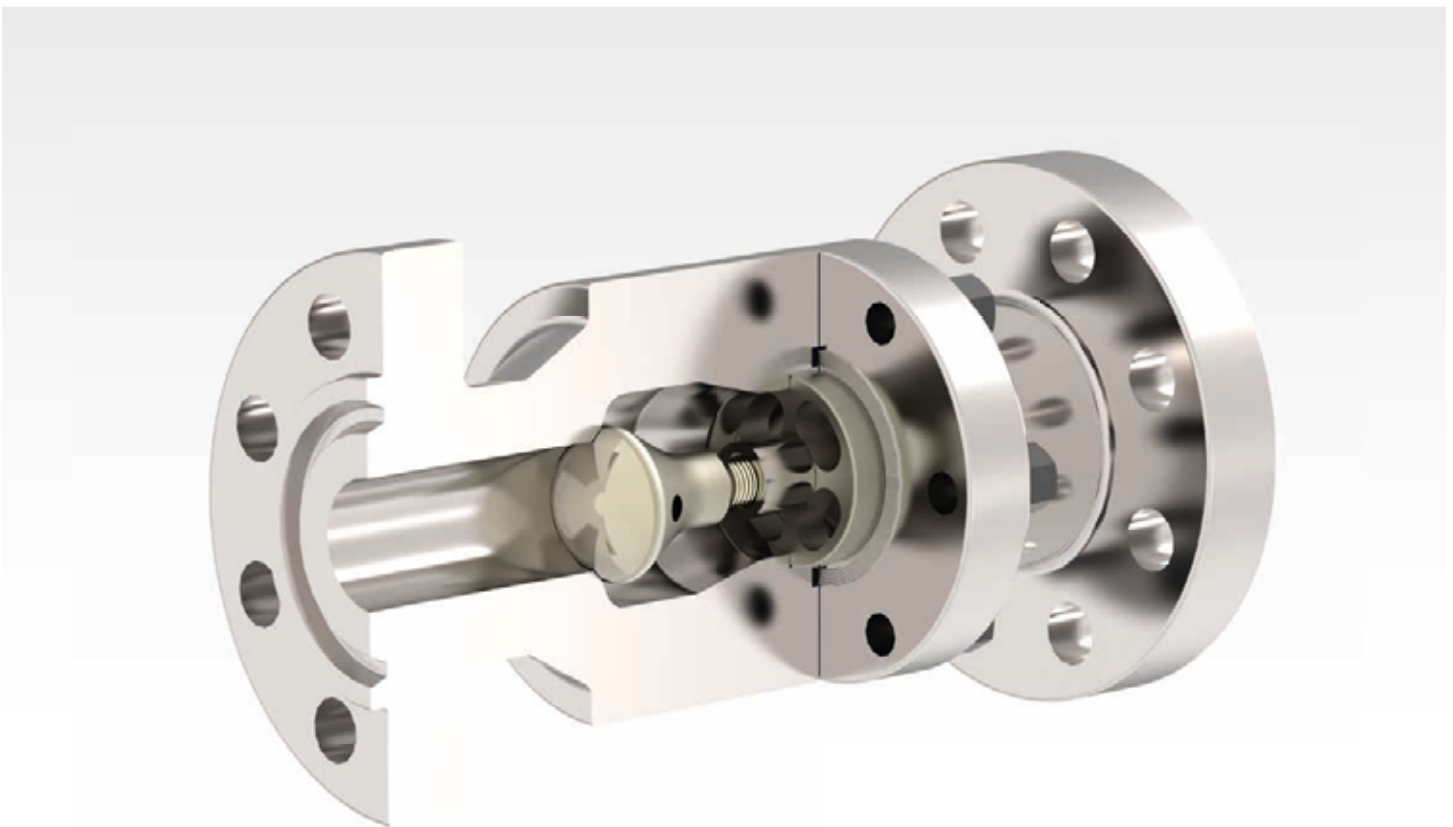


Figure 5. Inline piston check valve.

Additional requirements according to NORSOK, NACE, DIN EN 10204/3.2 or AD Merkblätter are met as standard in the case of Red Point Alloys.

Specific tests can be carried out on the base materials depending on the design pressure, temperature and application, such as: low or high temperature impact testing (strength properties); macro etch testing (for flow lines and internal imperfections); the Streicher test (corrosion detection method for intergranular attack) and ultrasonic or radiography testing (to detect internal flaws). A wide range of non-destructive tests including MPI, PMI, hardness testing and DPI can also be performed in-house.

VALVE FEATURES

Specific features have been added to valves based on the company's knowledge of the fertilizer process. For example, needle bearings are used in order to reduce the operating force exerted by the operator.

“Making valves takes co-ordination and teamwork at every step of the way: from order intake to engineering, from procurement to machining, from assembly to testing, as we have just witnessed. From standard valves in unique materials to bespoke valves for one-off applications, a fast track service is in the Red Point DNA.”

CHALLENGES

Increased wall thicknesses, corrosion testing, steam jackets, surfacing, low-emission stem packing and gaskets are proof that innovation is key in valves for the fertilizer industry.

This innovation is leading to fewer emissions, incidents and risks, as well as less corrosion, erosion and crystallisation.

In other words, innovation is leading to a cleaner and safer industry, in which valves are no longer seen as just an appendix.



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