Standardised long-term quality made in Wipperfürth

European standards are often called nonsensical and exaggerated. This can be true in some cases, an example being Regulation No. 2257/94 (the banana regulation) which prescribes a minimum length of 14 cm and a thickness of at least 27 mm for bananas. The technical standards of the European Community are, on the other hand, extremely sensible. EU directives can unleash a veritable surge of innovation. A prime example of this is the EU End of Life Vehicles Directive 2000/53/EC. This directive provided the impetus for the development of a high-performance surface protection which is less harmful to the environment and is today increasingly becoming the standard in hydraulics. The VOSS zinc-nickel coating has ushered in a new era in the area of hydraulic tube couplings.

History

Up until a few years ago, standard surface protection in the area of hydraulics involved yellow chromatising with hexavalent chromium. The EU End of Life Vehicles Directive ended this peace and harmony. This directive stipulates that, in the case of vehicles weighing less than 3.5 tonnes, no materials or components should be introduced from the first of July 2003 which contain lead, mercury, cadmium or hexavalent chromium. Hexavalent chromium is contained as a reactive substance in yellow chromatising. This chromium (VI) is toxic for both people and the environment. Environmental reasons therefore led to the banning of the reliable yellow chromatising process by the European Union. Of the numerous developments triggered by the EU End of Life Vehicles Directive, the zinc-nickel combination has proven to be particularly superior. The development leader for the protection variant is Voss Fluid GmbH in Wipperfürth. The enterprise from the Bergisch region has since converted its entire tube coupling range to the new protection system. Many well-known vehicle manufacturers and mechanical engineering firms value the excellent Voss corrosion protection and use Voss couplings with the zinc-nickel coating.
What makes Voss zinc-nickel so attractive?

In addition to conforming to EU environmental concepts, the VOSS zinc-nickel coating also provides considerably enhanced surface protection when compared to yellow chromatising. Where less strong corrosion protection layers are used, white bloom can form on the couplings during sea transportation to the USA or Japan. The high white bloom resistance of VOSS couplings is a major advantage for exporting enterprises with many overseas customers. The zinc-nickel coating is also much less sensitive to aggressive cleaning agents. This is also an important factor where working machinery needs to be cleaned of excessive dirt.

Red rust is another form of corrosion which can afflict hydraulic couplings. The standard test for this is the salt spray test conforming to DIN 50021 SS. Red rust only occurs after a period of exposure of 720 hours at the earliest in the case of couplings with the VOSS zinc-nickel coating. A peak value when compared to other protection types. Corrosion resistance not only means security for customers, but also improved sales revenue when reselling a machine. Even where zinc-nickel is subject to particularly severe conditions during assembly, it still offers protection against red rust and white bloom.

Voss Fluid GmbH decided for several reasons in favour of a zinc-nickel layer, refusing to be satisfied with zinc alone. The correctness of this decision was also confirmed by an independent and reputable test institute. Five years of practical experience with this coating have since been gathered, experience which has proved extremely positive. Many serial applications in mobile hydraulics with completely different requirement profiles indicate that the coating is capable of withstanding all common forms of stress and strain. It therefore comes as no surprise that manufacturers are increasingly deciding in favour of VOSS couplings, and not just for mobile hydraulics. VDMA has in the meantime issued the 24576 standard sheet for corrosion protection substances free of chromium (VI). This contains descriptions of the structure and the performance of a protective layer. Division occurs in a total of five corrosion protection classes, K1 to K5. The VOSS zinc-nickel coating meets the criteria of the highest class, thus indicating once again how right the decision to combine zinc and nickel was.

The VOSS zinc-nickel coating is the winner in durability tests. The protective effect against white bloom and red rust endures for an extremely long period.

How is white bloom created?

A zinc patina merely forms if galvanised surfaces are moistened with water from precipitation or humidity and, simultaneously, adequate ventilation is available (atmospheric oxygen, carbon dioxide, etc.). However, if humidity or the condensation do not contain the minerals required to form a protective layer (e.g. CO2) due to, for example, inadequate air admission, a poorly-adhering and porous layer forms which is called white bloom. Parts with severe white bloom formation do not make a great impression on a new vehicle and require replacing.
The latest plating facility
When one thinks of a plating facility, one thinks of stinging vapours and yellow swathes of mist. The new plating facility at VOSS Fluid GmbH in Wipperführt which recently commenced operation demonstrates that much has changed in the sphere of action of acids and lyes. Voss invested ten million Euro in the building and equipment, and that during the gravest recession in the post-war period. The actual coating facility is located on the upper floor of the building. Large carriages in which racks hang fully loaded with the most varied couplings are transported from one bath to the other. The coating is applied in 12 different working steps. Computers check the composition of the bath, control the holding time in the baths and regulate the optimum working sequence. Production parameters should be scrupulously adhered to when it comes to corrosion protection. Even minor coating deviations can harbour fatal consequences for corrosion resistance. A “porous” protective layer is created if the required coating thickness is undershot. Attacks from different contact media (e.g. damp, salt water or cleaning chemicals) thus become easier.

Housed on two floors, the surface of the plating facility is as large as a football pitch and has an area of 5000 m². The current coating capacity lies at 6000 tonnes annually and can be considerably increased where necessary. And environmental protection and occupational safety are also extremely important in the new Voss plating facility. No employee need be present in the plating area during operation. The process is to a broad extent completely automatic. Particular attention was paid to noise protection when designing the exhaust air plant. The noise level is less than 72 dB, whereas 90 dB prevail in many factories. Service water is used instead of drinking water to operate the plant. A further highlight is the installed heat recovery plant. Process heat is thus drawn to a major degree from exhaust air, being utilised to heat fresh air. This measure saves about 300 MWh during the main heating periods.

The new, completely computer-controlled Voss plating facility has a coating capacity of 6000 tonnes per annum. It is currently the most modern coating plant in Europe.

Also top in long-term sealing stability
Voss has, in the meantime, converted its entire product range to the new surface protection. But the excellent zinc-nickel surface is only an additional benefit, albeit a very interesting one, particularly when it comes to mobile hydraulics. Every hydraulics designer presumes today that certain important basic characteristics must be evident in a coupling. Fitting of the coupling should be easy and visible to avoid generating unnecessary production costs. It should seal for a lifetime (i.e. it should not drip or stream after only a few years of use), and it should be possible to release or remove the coupling and fit it again as frequently as necessary without impairing sealing stability. And this is not just a dream, as the VOSS ES-4 cutting ring demonstrates. Several highly interesting design characteristics are immediately apparent. For example, the two consecutive in-series cutting edges which support each other synergically. The advance movement of the union nut causes the first cutting edge to cut into the tube, throwing material onto the front of the cutting edge and ensuring sealing and reliability. The cutting depth of the first cutting edge is controlled by the second cutting edge, ensuring that an excessively-deep cut and all the mechanical disadvantages associated with this cannot occur. The second cutting edge also ensures a uniform distribution of force over the entire surface.
Even thought the two synergically-harmonised cutting edges generate an extremely high mechanical sealing effect, Voss has also integrated two FPM soft seals in the ES-4 as a secondary measure. These only come into play if the metallic seal is overcome by hard blows or extreme stress. The two integrated soft seals secure the two theoretical leakage channels on the tube and connecting piece.

Another extremely interesting characteristic of the VOSS ES-4 cutting ring is the integrated block stop which considerably enhances fitting reliability. The risk of excesses during fitting where small tube diameters are involved or inadequate fitting in the case of large dimensions is avoided. In the case of the coupling, the friction increases suddenly when the block stop is reached, leading to a clear increase in force. This signals to the fitter that the connection has been adequately tightened. The mechanical protection provided by the block stop also considerably facilitates the work of fitters who must establish a hydraulic connection in poorly-accessible locations. Sealed hydraulic couplings can also not be taken for granted in the case of new installations. It is assumed that, on average, the leakage rate during initial fitting lies at around 3 %. The real quality, however, is only demonstrated when machines and vehicles are used. Hydraulic couplings are removable couplings. Repeated fitting is therefore a basic prerequisite. And that is not all. The surface protection should also be capable of withstanding multiple mechanical loading without any difficulties. The VOSS ES-4 cutting ring with its nickel-nickel coating realises this without any problem, even if the fitter tackles the coupling a little less gently than usual. The Voss development can also take on the chromium (VI) classic when it comes to self-healing powers.

Image: Thanks to its fitting reliability and the combined sealing system, the VOSS ES-4 coupling ensures that life-long freedom from leaks is achieved.

Summary

Anybody who chooses a Voss hydraulic coupling today particularly values a high level of performance, environmental protection and top quality. A differentiation should be made between mechanical and corrosion protection characteristics with regard to the first attribute mentioned. Protective characteristics are achieved today with the superior-quality zinc-nickel coating from VOSS Fluid GmbH which would have been unthinkable a few years ago. The sophisticated design of the VOSS ES-4 gives the fitter the certainty of having established a good connection. That is a basic prerequisite for freedom from leaks for the entire service life. Voss has integrated a dual sealing system in the ES-4 cutting ring to ensure that even the severest practical conditions do not undermine seal reliability. In the event of the mechanical sealing being overcome, two soft seals made of FPM continue to ensure a dry coupling. Freedom from leaks for the entire service life is therefore no longer a dream with a VOSS ES-4 coupling. A new, environmentally-friendly plating facility was built in Wipperführt for a multi-million Euro sum. Even the smallest process deviations can be detected immediately, as all process steps are computer controlled and monitored. Reduced or even poor coating quality is therefore ruled out. Indeed, the excellent product quality itself is an important decision-influencing factor for many Voss customers. After all, good quality always succeeds on the market.