



THE CHALLENGES OF A WET SURFACE

Dr. Martin Molberg, DENSO GmbH, Germany, discusses a new field-applied anti-corrosion system for pipelines with moist surfaces.

One of the biggest challenges for field coating systems are pipelines that show a condensate film on the metal substrate. Such moist surfaces can be found on gas pipelines or coolant lines that are under load or with high humidity in the

environment. As a result, DENSO GmbH Germany has produced VivaxCoat®; a reliable and permanent corrosion protection system for wet surfaces. The system is applied directly to these surfaces without any need for special tools.



Many operators try to cope with the situation of moist surfaces by regulating the pressure of the pipeline or air drying of the surface in a acclimatised tent, but without significant success. Until now, there have been no corrosion prevention systems for moist surfaces available that could be applied under nearly all conditions onsite. When standard anti-corrosion coatings – such as PE/butyl tapes, heat shrinkable sleeves or liquid coatings – were used on moist surfaces, the results were often very questionable. Over the last few years, only a number of liquid epoxy systems were able to be applied on damp or even wet surfaces. However, they all needed mandatory grit blasting as a form of surface preparation, according to

SA 2 1/2. This is because not every grit blasting process can be applied on pipelines that are under load.

A new approach

A new approach starts by accepting the circumstances. In many cases, it is simply not possible to remove the moisture from the surface. Therefore, it seems almost impossible to reduce the costs of potential shutdowns or pressure reductions.

DENSO GmbH's new corrosion prevention system is designed for the corrosion protection of wet and damp surfaces, as well as for fittings on steel pipelines. It also only needs minor pre-surface treatment, can be executed under almost all conditions onsite, and can be applied to pipes under load in order to avoid shutdowns and maintain the pressure of the lines. The combination of a water repellent petrolatum system and a concerted self-amalgamating 3-ply PE/butyl tape provides long lasting corrosion prevention and mechanical protection.

The system also offers a good resistance to salt-containing atmospheres and soils. Neither of the system's components contain solvents, and needs no time for curing or drying. Thus, it enables a fast working progress, a self-amalgamating PE/butyl tape – e.g. DENSOLEN®-AS50 – will be utilised.

The coating system, DENSO® VivaxCoat, is comprised of three components: first, a special primer; second, a corrosion prevention tape; and third, a mechanical protection based on a concerted self-amalgamating PE/butyl tape.

The first component to apply is a corrosion protection petrolatum primer. The primer helps to avoid high costs for line disconnections or long waiting times for rehabilitation measurements. By applying the primer-mastic, the moisture or moist substrate will be displaced from the surface. At the same time, the surface will be sealed against corrosive media of all kinds. The primer is applied manually to the surface and can be used for permanent operating temperatures of up to 80°C (176°F).

The second element of the system is a newly developed petrolatum tape, which consists of a robust and nonwoven polypropylene as well as a corrosion prevention petrolatum-based coating. It shows a high dripping point and good adhesive resistances at high temperatures. Therefore, the tape is especially qualified for high mechanical and thermal loads. Both the petrolatum primer-mastic and the petrolatum tape provide thorough corrosion prevention.

An additional high impact resistance is achieved with the third element, a 1.1 mm thick,



Figure 1. Application of DENSO-AO primer.



Figure 2. Application of DENSO-MT petrolatum tape.

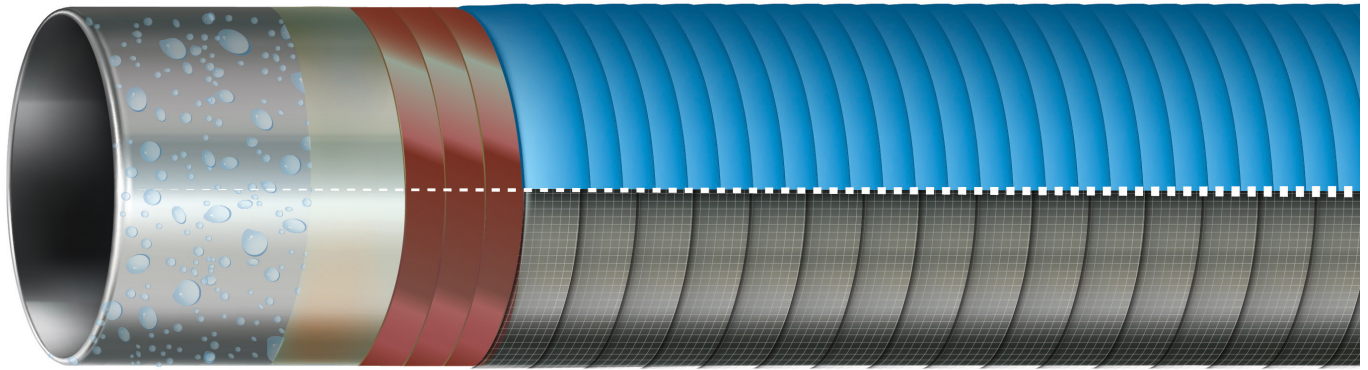


Figure 3. VivaxCoat is comprised of DENSO-AQ primer, DENSO-MT tape and mechanical protection with 3-ply DENSOLEN-AS 50 tape.

self-amalgamating PE/butyl tape. The amalgamation of the butyl rubber layers not only creates a mechanical protection, but also creates a hose-like coating or a second barrier of corrosion prevention. This is because there will be no chance for oxygen or vapour to get into the system.

From a physical point of view, butyl rubber is more fluid than a solid substance. Where the tape layers of the PE/butyl tape do overlap, the molecules migrate from one butyl rubber layer to the other, forming a hose-like coating right after a short period of time.

As the petrolatum tape (the second element) is especially modified, there will be a self-amalgamating connection between the inner butyl layer of the PE/butyl tape and the outer layer of the petrolatum tape. This feature will provide a cohesive break during a peeling test. For the first time, this high quality criterion could be achieved.

The VivaxCoat system is applied without any special tools. Extensive and error-prone lamination, typically needed for many glass fibre reinforced plastic systems (GRP systems), is not required.

The combination of these three elements provides not only a proven corrosion and mechanical protection for lines with a condensate film on the substrate, but also an easy application and long lasting protection for irregular shaped geometries, such as tees, flanges and valves. It is essential that field coating materials can be easily applied under a wide variety of ambient conditions. This ease of application reduces the risk of human mistakes. Thorough quality corrosion prevention is the result, which provides an economical and safe operation of the pipeline.

Case study

On 6 - 10 July 2015, the corrosion protection coating of a gas pipeline located near Espenhain (eastern Germany), belonging to the German operator ONTRAS Gastransport GmbH, had to be rehabilitated (Figure 1 and 2).

The pipeline was constructed in 1994. It has a nominal diameter of 900 mm (36 in.) and transports approximately 400 000 - 600 000 m³/hr of gas. The pressure of the gas is roughly 55 bar. Special circumstances were given; the surface of the pipeline was wet due to the cold gas flow through the pipe in combination with relatively high ambient temperatures. Hence, a corrosion prevention system had to be chosen for wet surfaces. And what's more, the pipeline had to stay in operation.

The construction company VORWERK from Halle (Germany) chose the VivaxCoat system with the self-amalgamating PE/butyl tape, DENSOLEN-AS50, as the outer mechanical protection layer. After the fast and easy installation, both ONTRAS and VORWERK were satisfied with the application and technical performance of the system.

Conclusion

The evaluation of an appropriate rehabilitation system for corrosion prevention on pipelines with moist surfaces depends on many specific circumstances. They system must be chosen in co-ordination with the material and onsite requirements, and has to be suitable and tailored specifically to the relevant and unique project conditions, especially taking into account an easy and economical way of applying the system.

The newly developed VivaxCoat system is designed to combine ease of application, thorough mechanical resistance and innovative corrosion prevention for small and large scale rehabilitation projects. It is developed specifically for application on wet surfaces and, therefore, on pipelines that remain in service. Due to its flexibility, the system can also be used for fittings that are coated with a condensate film. With VivaxCoat, the costs of rehabilitation are reduced to a minimum, as shutdowns or pressure reductions of pipelines are no longer required. 