Dew Point Considerations with Protective Coatings

The key to coating effectiveness is adhesion of the film to the surface. Proper surface preparation enhances this adhesion. When coating a surface prepared by blasting, the real issue is not time: the key criterion is that the steel temperature is always at least 3°C (5°F) outside the calculated dew point. This safety margin is sufficient for all types of coatings. Consideration of factors such as time, temperature, and humidity is the responsibility of the inspector.

Moisture causes the following factors:

- High atmospheric humidity enhances **condensation** of moisture on the surface.
- Condensation can result in **flash rust**, which causes the coating to fail.
- Surface condensation, if painted over, may result in **blistering and delamination**.

It has been estimated that 60 to 80 percent of all premature coating failures are either completely or partially caused by inadequate or improper surface preparation. One common surface preparation defect includes flash rust, which occurs if the surface is subjected to environmental factors before the first coat is applied, and prevents the coating from adhering properly to the substrate surface after blasting. The presence of high humidity often causes the formation of rust bloom on the metal surface, which in turn results in blistering and delamination.

The common term “hold” or “holding” (also referred to as maintaining the metallic luster) refers to the prevention of flash rust formation between the blasting and coating cycles. Proper environmental controls with dehumidifiers can help in holding the blast between the blast and coat cycles.

The life of a coating cannot be guaranteed on large, cool metal surfaces, such as ship interiors or petroleum and chemical storage tanks, unless the surface is clean and dry when the coating is applied. Blasting and coating operations on metal surfaces encounter several problems when relative humidity (RH) is high or surface temperatures are low.

For example high humidity in the environment condenses on the colder surface in the form of droplets, causing the metal surfaces to rust immediately after being blasted. Consequently, the coating does not adhere properly, and the
coating process may need to be repeated. In addition, condensation can cause blistering, blooming, and peeling problems in these paint jobs.

Because the rate of condensation and corrosion in a specific environment increases significantly when the RH is 45 percent or above, controlling the humidity below 45 percent is important to prevent corrosion.

Several environmental controls are recommended for ensuring a quality coating:

- Maintain the temperature of the steel surface to be coated at a minimum of 3°C outside the range of the air dew point.
- Maintain a 10°C dew point differential between the air inside and the air outside of a tank to be coated.
- Maintain the RH of the surrounding air below 40 percent.

To learn how MCOR products can protect against corrosion, visit mcor.net.