

Passivated Steel as a Feedstock to the Coil Coating Process

There are a wide range of passivating agents used in the steel industry to reduce the risk of corrosion during storage and transport. The purpose of this document is to provide background information on the possible impact of the major types of passivates on the coilcoating process and product.

What is chemical passivation?

Passivation is the process of reducing the reactivity of a material. In the case of steel, the purpose of passivation is to reduce the likelihood of corrosion activity during storage and transportation, and is normally achieved through the application of a coating to the steel.

The most common types of coatings used to provide passivation to steel are organic oils, organic chemical passivating films or inorganic chemical passivates. Oils simply provide a temporary barrier coat to protect against moisture or other environmental attack. Organic passivating films provide semi-permanent corrosion protection. The inorganic chemical passivates, which can be chrome-based or non-chrome containing, form a layer of inert oxides that are chemically bonded to the steel surface.

Oils are commonly used on all types of steel supplied to coilcoating lines, while chemical passivates are primarily used on metallic coated products (hot dipped galvanized, electrogalvanized, galvaneal and Galvalume), and are not normally used on cold rolled steel.

Impact on cleaning and pretreatment processes in a coilcoating line

There are a few chemical passivates that are designed to be compatible with coatings and treatments applied on coilcoating lines – these passivates may not need to be removed before coating. Before attempting to coat over a chemical passivate, it is essential to be certain exactly what passivate has been used, that it is designed to be compatible with the specific pretreatments and coatings that are to be applied, and that the passivate has been applied according to the conditions recommended for that product. If these factors cannot be confirmed, attempting to coat this material presents a significant risk.

If the passivate is not specifically designed to be compatible with coilcoating processes and products, it must be removed from the surface in order to properly apply pretreatment to steel in preparation for painting. Oil-based passivates and many chemical passivates fall into this category. The oil or oxide layer must be removed to allow pretreatment oxidation or reduction reactions to occur at the substrate surface, uniformly bonding the pretreatment to the steel.

Removal of oil passivates can normally be accomplished by passing the steel through an industry standard cleaning process. Control of the oil type and quantity on the incoming steel, as well as the temperature, concentration and processing conditions of the cleaning system are key variables in successful oil removal. It is important to note that excessive quantities of oil, or oil that has polymerized on the steel due to age and heat, may not be readily removed through a standard cleaning process, and may introduce risk.

Removal of chemical passivates is very dependent on the design of the passivate (i.e. is it designed to be temporary or permanent), the application level, and the operating conditions of the cleaning process.

Chrome-based inorganic passivates are not completely removed even under aggressive conditions of brushing, temperature and concentration – the residue of chrome-based passivates can significantly impact the uniform deposition of pretreatments. Because of this, it is not recommended that chrome passivated Hot Dipped Galvanized steel be used as feedstock for coilcoating processes. A noted exception is chrome passivated Galvalume, which has a long history of being successfully pretreated and painted through the coilcoating process, using chromate-type pretreatments.

There are also a variety of non-chrome inorganic passivates that are designed to be removed before pretreatment and painting in a coilcoating process. These are more readily removed than chrome-based products in the cleaning process. It is essential that this type of passivate be applied within the coating weight parameters specified, or removal in the cleaning process may not be effective, which may reduce coating adhesion and flexibility.

Summary

Given the wide variety of passivates used to protect steel, and the unique characteristics and requirements of each type, considerable care must be taken in assessing the feasibility and risks of using passivated steel as feedstock for a coilcoating process.

- For passivates designed for compatibility, it is essential to be certain exactly what passivate has been used, that it is designed to be compatible with the specific pretreatments and coatings that are to be applied, and that the passivate has been applied according to the conditions recommended for that product.
- For passivates that are not designed for compatibility, removal is essential.
 - Chrome-based passivates cannot be reliably and effectively removed, so their use on Hot Dipped Galvanized steel for coilcoating is not recommended. Chrome passivated Galvalume, however, can be reliably pretreated with chromate-based pretreatments, and coated using the coilcoating process.
 - Varying results have been experienced in removal of non-chrome inorganic passivates from steel before coilcoating. Once again it is essential to be certain that the passivate has been applied according to the conditions recommended for that product. If these factors cannot be confirmed, attempting to coat this material presents a significant risk.
- If a temporary passivate is needed for protection, careful selection and application of passivates designed for the specific application is essential in order to allow the coilcoating process to effectively and uniformly clean, pretreat and coat the steel provided.