PHORGOTTEN PHENOMENA

Predicting Coating Life

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The prediction of coating life depends on many factors, including the coating system used, preparation and application methods, and the severity of the environment. This article describes the knowledge needed to estimate coating life and the conditions that can compromise coating systems.

The prediction of coating life involves a fair degree of complexity and skill. The first thing to be established is how you are going to judge coating failure, and at what point you are going to repair or repaint. For coatings that have been properly selected and applied, failure can usually be based on the amount of chalking down to the primer (Figure 1). At 20% primer exposure, the structure can be cleaned up, spot-primed where necessary, and have its topcoat replaced. This is a very economical maintenance system. This approach, of course, depends on the appearance one is willing to accept. In an industrial plant out of the public eye, exposure of the primer up to the 20% level may be acceptable. A similar approach can be taken if the failure is caused by rusting of the substrate, unless there is severe corrosion occurring, in which case earlier repainting will be required.

The estimation of coating life is simplified when the following criteria are met:

- Good specifications
- Qualified contractors
- Good inspection
- Quality coatings

When these criteria are met, one can expect excellent performance (Figures 2 and 3). When these criteria are not met, the estimation of coating life is more difficult, and requires knowledge about the following items:

FIGURE 1

Tank roof showing chalking failure of an alkyd system in a mild environment.

- Coating adhesion
- Dry film thickness (DFT)
- Chalking rate
- Severity of the environment
- Type of coating
- Coating system

Estimating coating life on only one of these parameters will not give reliable estimates. For example, if the coating was applied at the specified DFT, but was applied over a layer of rust and dirt, the life would undoubtedly be shortened, and be less than what could normally be expected for that DFT.

Measurement of these factors does not generally require great accuracy, with the possible exception of DFT. In my experience, rating adhesion either good or poor as determined by testing with a pocket knife is adequate. Also, the chalking rate can be either slow or fast, and the corrosive environment can be rated as mild, moderate, or severe. This procedure was used in a major oil company's maintenance program and was successful in predicting maintenance requirements of the coating many years into the future.

Obviously, there are always exceptions to every rule. For example, a knockout drum in a refinery unit had been painted with a typical alkyd enamel. These vessels receive product from units when there is an upset, and they are generally too hot for an alkyd. The coating had been on the vessel for some 20 years, however, and it was decided to repaint with the same system. Within 30 days, the unit had an upset, which dumped some very hot product into the vessel and destroyed the alkyd—the first time in 20 years, presumably.

This discussion has been brief, and many items have not been completely expanded upon. But perhaps this will indicate a useful approach to coating life estimation.

FIGURE 2

Alkyd coating system on a tank with 30 years of service in the Denver, Colorado area.

FIGURE 3

Alkyd coating system on a tank shell with 30 years of service in the Salt Lake City, Utah area.

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