

Chapter 10.3

Using Plant Surveys to Maintain Coating Protection of Structures

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Introduction

Plant maintenance personnel often ask:

- How can I best develop a program for maintaining coating protection for different plant structures?
- How can I determine whether localized repair of damaged substrate and coating or substrate repair and total coating replacement is the better choice?
- What coatings systems should be used in each case?
- When is the best time to take the necessary actions?

This chapter will attempt to show how information obtained by field surveys can be used to answer these and other maintenance questions. Information is provided from actual field experiences.¹

Minimum Walk-Through Survey

A minimum walk-through survey consists of a visual assessment of the overall conditions of substrates and coatings on plant structures. It is a relatively fast and inexpensive method to prepare general information on the overall conditions and establish times when maintenance actions can be anticipated. A simple numerical rating system (e.g., priority ratings of 1 through 5) can establish work priorities should limited funds not permit all of the desired work to be done. This method may also provide data for establishing a logical approach to subdividing the facilities into smaller units for a systematic collection of data in more detail.

Mid-Level Survey

In a mid-level survey, facilities are subdivided into smaller units in order to obtain more information about individual components. Alternatively, these components can be subdivisions related to function (e.g., architectural, electrical, mechanical, etc.). This survey level provides more detailed data. The types and extents of substrate and coating deterioration are made in accordance with industry standards:

- Definitions for defects are found in Reference 2 and

depicted pictorially in References 3 and 4. The latter two references can be used very effectively to identify types of defects.

- The extent (percent) of defects in localized areas can be determined using SSPC-VIS 2 (Reference 5). A series of pictures visually depicts different levels of deterioration for more precise estimation.
- The general distribution of defects in large areas can be determined using Reference 6, which presents a series of pictures with known distributions levels of deterioration.

It should be noted that natural deterioration occurs more rapidly at edges and other irregular areas where cleaning and coating is more difficult or in localized areas where the environmental forces are more severe. Exterior water traps (where rain water collects) present an especially severe environment.

Detailed Survey

In a detailed survey, the individual components are further subdivided, and actual physical tests are conducted, notably dry film thickness and adhesion. These values are critical in establishing whether the existing coating has adequate properties for localized repair rather than total replacement.

Defects should be identified and quantified using ASTM rating standards (e.g., size and density of blisters). If appearance is important, the extent of chalking, color fading, discoloration, loss of gloss, etc. should be measured using standard ASTM procedures. If the identity of the existing coating is not known, it may be necessary to submit a sample for analysis to find a compatible repair material.¹ If pitting corrosion is present, measuring the pit depths may be very important.

A detailed survey is required to provide the necessary data to define work requirements for a specification. The additional expense for a detailed survey is well justified by minimizing risks associated with maintenance painting.

Analysis of Survey Data

The survey data must be collected systematically using a standard printed form in a complete and quantitative manner to obtain sufficient data for reliable decisions. There are seldom too much data available.

While it would be nice to establish deterioration levels at which maintenance work should be undertaken (e.g., 10% substrate or coating deterioration), there are many other factors that affect decision making. Those related to the coating survey are discussed here.

Type and Extent of Substrate Damage and Coating Defects

The nature of any corrosion (e.g., uniform, pitting, filiform, etc.) is very important in determining best corrective actions. Thus, pitting corrosion may be critical to a storage tank, if penetration of a steel wall or floor is threatened. Concrete deterioration is described in SSPC's book *The Fundamentals of Cleaning and Coating Concrete*.

Reference 2 describes causes and corrective actions for coating defects. The extents of damage to substrates and coating is critical in determining whether spot repair of substrate and coating or more extensive substrate repair and a total replacement of coating is more appropriate. To determine the total extent of coating deterioration, it may be necessary to scrape with a dull putty knife to expose all of the damaged areas. Visually sound coating may have poor adhesion to its substrate.

Distribution of Substrate and Coating Damage

The distribution of substrate and coating damage can determine whether only localized damage repair will be necessary.

Loss of Coating Function

Some coatings have functions other than substrate protection. These include non-slip, reflective, or electrical conductive properties. If these properties have been significantly reduced, it may be necessary to restore them by total repainting.

Rate of Increase of Defects

An important part of a deterioration control program is the periodic survey of the component structures. Navy shore facilities receive annual condition inspections. By establishing the current rate of

deterioration, the likelihood of further significant deterioration with deferred maintenance can be deduced.

Identity of Surface Coating

The identity of the surface coating is important in determining the compatibility of the existing coating with the system selected for localized repair. All localized-repair coatings must not only cover the damaged areas but also overlap onto the sound existing coating. If compatibility cannot be established, a test patch of the proposed system must be applied to the existing coating.

Adhesion

Topcoating a coating with limited substrate adhesion may actually accelerate total coating deterioration.

Film Thickness

It is important to determine if chalking erosion or some other mechanism has significantly reduced the film thicknesses of the existing coatings. This may, in turn, significantly reduce the barrier protection of the substrate.

Appearance

Appearance may be an important factor in selecting the types of corrective actions. Localized repair may produce an unsightly patchy appearance. A thin, total finish coat may be applied to remove this. However, the finish coat may increase the rigidity of the total system and associated stresses to reduce overall adhesion.

Other Factors Affecting Decisions

Unfortunately, there are sometimes factors unrelated to survey data that affect the choice of maintenance actions. Some of these factors are described here.

Limited Funding

Maintenance funds may not be available in sufficient quantity to cover all of the desired work. To avoid this problem, surveys should be taken periodically, so that future funding requirements can be determined and requested to meet anticipated maintenance requirements in future years.

At times, it may be necessary to prioritize the

desired work to address the areas with the greatest deterioration. However, prioritization may also be based on those areas that have the greatest effect on operations.

Risk of Deferred Maintenance

If only localized repair is conducted, there is a risk that the protection provided will be short term, and a total coating replacement will be necessary. This will result in a considerable loss of money.

Effects of Maintenance Actions on Plant Operations

Maintenance work of any kind is likely to affect continuing operations. It may be necessary to conduct the maintenance work at night, on weekends, or at a time of total operational shut down. Obviously, interference with plant operations and the work of other trades must be minimized.

Contamination of Products

If substrate and/or coating deterioration is causing contamination of products, immediate corrective action is usually necessary. This is particularly true for food products or sophisticated electronic instrumentation.

Summary

Preparing plans for maintenance work on coated structures is not an easy matter. Necessary actions must be determined by a plant survey, but other factors come into play. The best approach to such problems is to establish a total maintenance program for all plant facilities. Periodic condition surveys will permit detailed planning for present work and more general planning for future work. The latter should include requests to management for funding for anticipated future work and permit maintenance decisions to be based on survey data.

References

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About the Author

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Dr. Richard W. Drisko has been the senior technical advisor to SSPC: The Society for Protective Coatings since January 1995. Prior to this, he was employed for over 40 years at the Naval Civil Engineering Laboratory, Port Hueneme, California, where he conducted research, evaluation, and testing, and served as the Navy's center of expertise on coatings for shore structures. He is a professional corrosion engineer in the state of California, an SSPC certified protective coatings specialist (PCS), and a NACE International certificated corrosion specialist. Dr. Drisko received his BS, MS, and PhD degrees from Stanford.