

Extending Asset Lifecycle with Inspections and Maintenance

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ABSTRACT

Regular coating inspections and surveys, collectively referred to as Coating Condition Surveys (CCS), provide invaluable information about the condition of existing coatings that can be used to inform effective maintenance strategies. Without routine surveys, maintenance strategies can be ineffective and can become obsolete. Regularly scheduled surveys and planned maintenance are essential to asset integrity. However, both are often neglected as the value in each task is not fully understood. The findings, recommendations, and priorities offered by a CCS not only help owners better understand their assets, but also help engineers, designers, specifiers, coatings applicators, and inspectors better maintain assets. This understanding can help owners make decisions on budgeting for maintenance, help designers plan for repairs and inspections, and provide coatings contractors a clear understanding of the repairs needed and how the repairs should be completed. This paper focuses on the inspection and repair strategies for existing coatings on steel substrates, however the plans and strategies can be applied to all assets.

Key words: Coatings Condition Survey, CCS, coatings, maintenance, corrosion, repairs.

INTRODUCTION

Consistent coating inspections and planned maintenance are essential to asset integrity. Non-existent, delayed, and cursory inspections can allow premature coating breakdown, corrosion, and costly failures. On the other hand, improper maintenance can be ineffective, costly, and wasteful. The challenge involved in executing informative inspections and effective maintenance practices is identifying and understanding the numerous conditions that can contribute to a reduction in the lifecycle of an asset. This paper will discuss some of the aspects involved in identifying coating conditions that are likely to result in failures and developing cost effective coating repair strategies that will extend the life of the asset. We will also

navigate the process involved in balancing repair priorities to ensure the essential repairs are completed in a timely manner, yet customized to the needs of the asset owner. This paper focuses on the inspection and repair strategies for existing coatings on steel substrates, however the plans and strategies can be applied to all assets.

Coatings Condition Surveys

The first step in asset management is performing a Coatings Condition Survey (CCS). A CCS on each asset should be performed at least annually to determine the state of the coating and identify areas for repair. The CCS must be performed by a coatings professional with experience in identifying defects and specifying repairs.

Data Collection

A proper CCS involves a field inspection and assessments including, but not limited to, the following:

- The overall condition of the coating
- The dry film thickness (DFT) (i.e., ASTM⁽¹⁾ D7091¹)
- The distribution and degree of rusting (i.e., ASTM D610²)
- The degree of blistering (i.e., ASTM D714³)
- The degree of chalking (i.e., ASTM D4214⁴)
- The heavy metal testing (i.e., EPA⁽²⁾ Method 3050B⁵ or EPA Method 6010C⁶)
- The coating adhesion (i.e., ASTM D3359⁷, or ASTM D6677⁸, or ASTM D4541⁹)

Some assessments can be made with a non-destructive inspection, such as the coating thickness measurements, degree of rusting, blistering, and chalking. Other tests, such as heavy metal testing and coating adhesion are destructive in nature, and require the inspector to damage the coating to perform the testing. All of the tests provide insight into the current condition of the coating and the coating repair options.

Non-destructive testing can be used to understand the as-inspected condition of the coating system. Thickness measurements are important because coating systems have an optimum thickness range. If overcoating exceeds this thickness, coating delamination is more probable. Chalking is evidence of coating degradation, which means the coating thickness and requisite barrier protection could be compromised. Each coating system is different, and the coating manufacturer should be consulted to determine the optimum thickness range. The corrosion degree and pattern can inform the type of repair that may have to be performed. The presence of limited spot rusting on the surface of the asset will require an entirely different repair procedure than the presence of a general and widely distributed corrosion pattern throughout the surface of the asset. If blistering is present, not only does the extent of blistering need to be determined for repair recommendations, but the root cause of the blistering may need to be addressed to ensure appropriate coating repairs will be performed. These tests are essential in understanding the remaining coating life and preparing a coating maintenance plan for that asset.

Destructive testing, including heavy metal testing (to determine the lead/chromium/cadmium content of the current coating) and adhesion testing, provides insight into the composition and strength of the coating. Adhesion testing can be performed several ways including the “tape test” (ASTM D3359⁷), the “knife test” (ASTM D6677⁸), and the “pull-off test” (ASTM D4541⁹). A CCS is not complete without a final report distributed to the pertinent parties detailing the assets surveyed, assessments conducted, observed findings, and recommended prioritized repairs.

⁽¹⁾ ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

⁽²⁾ United States Environmental Protection Agency, 1200 Pennsylvania Ave., Washington, DC 20460.

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