Florida Department of Transportation Research

Assessment of Structural Steel Coating Applications

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Current Situation

Corrosion is a major concern for the long-term durability and structural integrity of steel components in highway bridges. Of the 583,000 highway bridges in the U.S., about 200,000 are steel, and 30,000 of those are structurally deficient due to corrosion. Many types of coatings have been applied to bridges in the effort to prevent corrosion, but despite decades of progress in coatings, they are still susceptible to breakdown, making it difficult to achieve a durability that matches the intended service life of bridges. Inspection, painting, and replacement of steel components for the thousands of bridges in Florida alone form significant annual expenses for the Florida Department of Transportation (FDOT). Maintenance and inspection records for these bridges are kept in a wide variety of systems and formats throughout the state. Bringing these records into one system would allow better surveillance of coating performance and help to identify better protective coatings for Florida bridges.

Corrosion of steel bridge components can lead to complex and expensive repairs.

Research Objectives

Florida International University researchers designed a database and processes needed to gather, catalog, and assess historical data and to identify and correlate factors that result in premature coating failures.

Project Activities

The researchers conducted a literature review that covered many areas, including coating performance assessment, factors contributing to premature coating failures, types of coatings and related procedures, and environmental factors that lead to coating breakdown. The researchers used this review to develop lists of information needed to identify and understand coating breakdowns and to develop survey and interview questions for FDOT personnel.

The survey focused on three main questions: what data related to steel bridge coatings are available; what are the sources of the data; and if the data are available, how they can be collected. The survey targeted engineers and administrators at the FDOT Materials, Maintenance, Structural Design, and Construction Offices.

The research team gathered sample data to use in the design and development of a steel bridge coating (SBC) database. A user interface facilitates use of the SBC database, such as searching, viewing, editing, adding, or deleting data. An analytics section of the interface allows users to select bridges by several criteria. Using these analytics, users can identify factors that affect premature coating failures by extracting and analyzing information on the historical use of various bridge coating systems. The researchers developed a machine learning (ML) model for steel bridge coating deterioration to predict coating conditions using data from the SBC database. Several ML models were implemented and tested, the best of which was selected to evaluate the impact of environmental factors on the performance of coating deterioration prediction. Recommendations were made for improving the collection and storage of bridge coating, which will improve the prediction of coating performance.

Project Benefits

The tools develop in the project will help choose better protective coatings for Florida bridges, reduce their maintenance requirements, and extend their service lives.

For more information, please see www.fdot.gov/research/.