ORGANIC finishing

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Non-destructive Testing for Protective Coatings: Implementing a Lifetime Corrosion Prevention Program

During the 20th century cheap and abundant energy made corrosion a manageable problem. This era is coming to an end. Soon, industry will find there is less funding available for corrosion prevention after adjusting for rising energy costs. At this time, management will be forced to decide whether to continue with traditional corrosion control practices or change to something new with a greater potential for energy savings. For many, this will be an extremely difficult decision to make.

Protective coatings non-destructive testing (PC/NDT) is a lifetime maintenance discipline that has been designed to provide a significant improvement in the maintainability of protective coatings. PC/NDT is based on the application of permanent foundation primer coats over-coated with expendable finish coats. Maintenance focuses on the repair or replacement of the finish coats, leaving the primer coats intact.

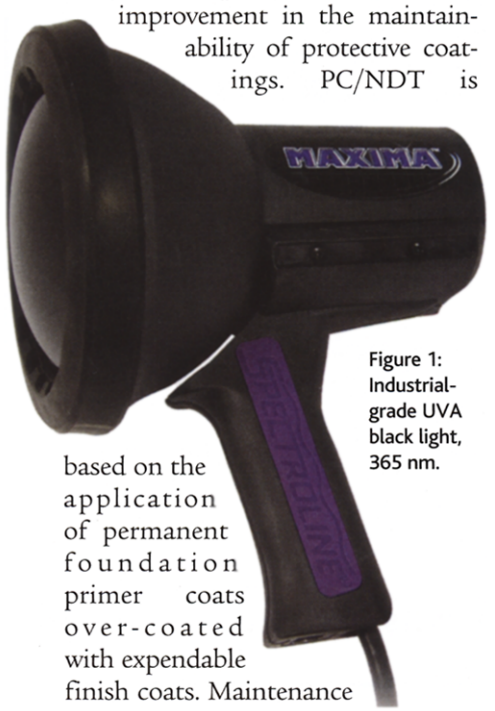

Figure 1: Industrial-grade UVA black light, 365 nm.

Recoating is scheduled by black-light–activated fluorescence (a type of non-destructive testing). The integration of an early warning defect detection indicator (fluorescence) into the original coating formulation produces an enhanced visual signature (EVS) that allows workers to monitor large or complex surfaces in relatively short periods of time and determine the best time for coating repairs (Fig. 1). This allows maintenance to be performed before complete coating failure occurs and irreversible corrosion damage begins.

THE PROBLEM

Oil, the main source of energy in today's world, is a product of buried biomass. Over a period of 200 million years, this raw material has been transformed by heat and pressure into an energy source that has no equal for its versatility, ease of transportation, and cost-to-benefit ratio. For example, the energy produced from one barrel of oil is equal to 12 people working 40 hours a week all year long, or 25,000 man hours of labor.

On July 12, 2008, oil reached a record price of $147 per barrel. This is a 488% increase over the 2004 price of $25 per barrel. Oil, coal, and natural gas are the fossil fuels that produce 85% of the world's energy. Currently, the United States uses more than 20 million barrels of oil per day. This represents upwards of 25% of the world's total production. When fossil fuels are converted into energy they produce carbon dioxide, a greenhouse gas. Each year, 6.1 billion metric tons of greenhouse gases are added to the earth's atmosphere.

Since the discovery of massive oil deposits in the early 1900s, mankind has consumed more than 1 trillion barrels. Today, conservative estimates place global oil reserves at 1.1 trillion barrels that can be obtained by conventional means. In less than 100 years humans have consumed more than half the world's oil reserves. The oil we have left will be harder to get and much more expensive to buy.

According to a 2002 report by the Federal Highway Administration, the annual direct and indirect cost of corrosion to the U.S. economy exceeds $500 billion. This represents 6% of the gross domestic product (GDP) valued at $8.76 trillion. Experts predict that energy costs will double in the next 20 years. This could easily cause corrosion costs to exceed one trillion dollars by 2050.

Maintainability is defined as the measure of time and effort required to return an asset to a predetermined state of performance after a failure event has occurred. Designed maintainability is performed during the concept phase and is used to incorporate durability, inspection, and serviceability into new products. This is done to improve the efficiency and effectiveness of subsequent maintenance operations.

Traditionally, the coating industry has limited its use of engineered maintenance programs due to the complexity and high labor costs involved with the inspection and evaluation of aged coatings. Another problem is the fact that modern coatings are not specifically designed

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