Aerocoat 7 Replacement Coatings

Corrosion Control

Kennedy Space Center has used Aerocoat 7 (AR-7) to protect stainless-steel flex hoses at Launch Complex (LC-39) and hydraulic lines of the Mobile Launcher Platform (MLP) because it provides excellent corrosion protection in low-temperature applications. The Sovereign Company produced AR-7 exclusively for NASA but discontinued production because the coating released high levels of volatile organic compounds (VOCs) and had a significant environmental impact. The purpose of this project was to select and evaluate potential replacement coatings for AR-7 that would be more environmentally sound.

The physical and mechanical properties of commercially available coatings were investigated through the Internet. The ideal coating would be fluid enough to penetrate the outer mesh of a stainless-steel flex hose and coat the inner hose, and flexible enough to withstand the movement of the hose, as well as the expansion and contraction of its metal caused by changes in temperature. It would also be easy to apply and prepare samples for testing. Ideally, only a single coat would be necessary, applied by brushing, spraying, or dipping.

Forty-one coatings were initially selected. After evaluating the candidates against information obtained from the Internet and coating manufacturers, we narrowed the list to 15 coatings. After the coatings were applied, six were removed from consideration because of their reactivity, short pot life, or long curing time.

Accelerated corrosion tests were performed in the salt fog chamber of the NASA Corrosion Technology Laboratory, according to the guidelines of ASTM B117. After 500 hours of exposure, five coatings performed as well as or better than AR-7 and two others were eliminated from the study. Figure 1 shows coatings that performed worse than AR-7, the same as AR-7 (AR-7 was the control), and better than AR-7. Sample (a) was one of the coatings eliminated from the study.

After 1,000 hours in the chamber, even the best-performing coatings had blisters or creepage along the scribe. Only two of the unscribed coatings had no blisters or corrosion spots. The four best performers were selected for long-term exposure testing, and scribed samples of these coatings are shown in Figure 2. After 1,500 hours of exposure, none of the coatings performed as well as the control.

This study will continue through FY 2008 with further atmospheric exposure and cryogenic testing. Before being included in the list of qualified products in NASA-STD-5008, the replacement for AR-7 must demonstrate that it provides acceptable corrosion protection after exposure for 18 months at the NASA Corrosion Technology Laboratory beachside atmospheric-exposure test site.

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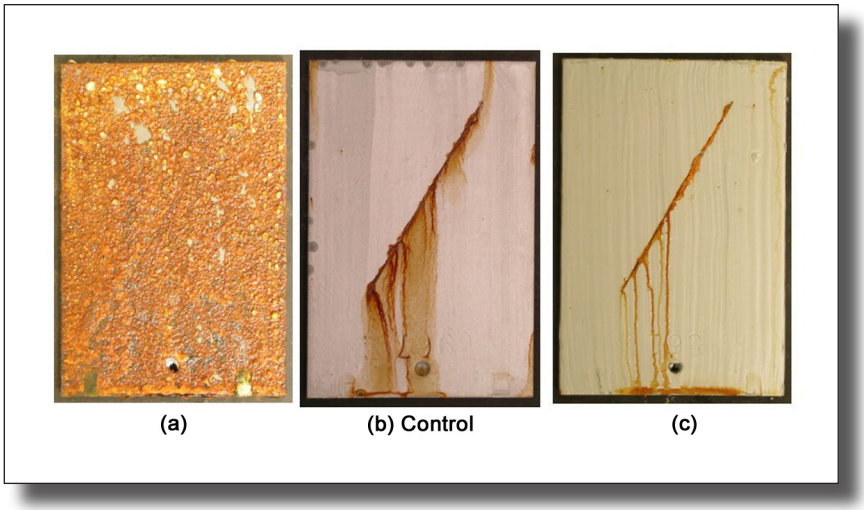

Figure 1. After 500 hours of salt fog exposure, coatings performed (a) worse than AR-7 (the control coating) and (c) better than AR-7.

Figure 2. After 1,000 hours of salt fog exposure, all of the coatings showed degradation.