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CHEMEON TCP-HF SP

Background

Chemical conversion coating methods based on hexavalent chromium have been used for several decades in the aerospace, military and general industry as effective and cost-efficient technologies to provide anti-corrosion and paint adhesion properties on different metallic surfaces. However, the metal finishing industry has been developing less toxic alternative conversion coatings in order to comply with environmental regulations and EU's Reach and toxic substance restriction legislation.

In recent years there have been new developments in trivalent chromium chemfilm technologies. The most significant development for the replacement of hexavalent chromates is the trivalent chromium pre-treatment (or post-treatment), developed by United States Navy, Naval Air Systems Command (NAVAIR) and licensed by CHEMEON Surface Technology, a Woman Owned Small Business. This is a unique trivalent chromium based conversion coating chemistry, specifically formulated and developed for aluminum, magnesium, zinc alloys, anodized aluminum and platings. CHEMEON is a leader in identifying and developing new processes applications and use of our CHEMEON TCP-HF suite of trivalent chromium chemfilm technologies. This formulation is relatively less trivalent chromium concentration in a working bath and operates at room temperatures. It does not contain any restricted or hazardous substances and it complies with European Union REACH guidelines.

This short communication will describe the performance characteristics of CHEMEON TCP-HF SP chemical conversion coating on aluminum alloys with high corrosion protection, good adhesion qualities for subsequent paint and powder coat, low cost, quick and easy processing, and all while meeting the stringent requirements of military specifications. It is QPL (Qualified Product List) approved for the spray application by the United States Navy-Defense Standardization Program under governing Spec MIL-DTL-81706B. CHEMEON had identified and proven the same level of performance for client specific immersion and brush-on applications. Because of these findings, qualification for the methods of immersion and brush-on applications are currently in progress.

In addition to aluminum alloy surface treatment, CHEMEON TCP-HF SP has been successfully used for zinc and magnesium alloy surface treatment, sealing the anodic coatings, platings (zinc, zinc-nickel, IVD Aluminum, Cadmium, etc.).

Performance Results

Salt spray resistance: High copper alloyed aluminum, 2024-T3, and high zinc alloyed aluminum, 7075-T6, test coupons were processed with CHEMEON TCP-HF SP (5% v/v, pH 3.85, 65-85 deg F, 5 min) and there was no sign of pit formation after 336 hours of salt spray (ASTM B117).

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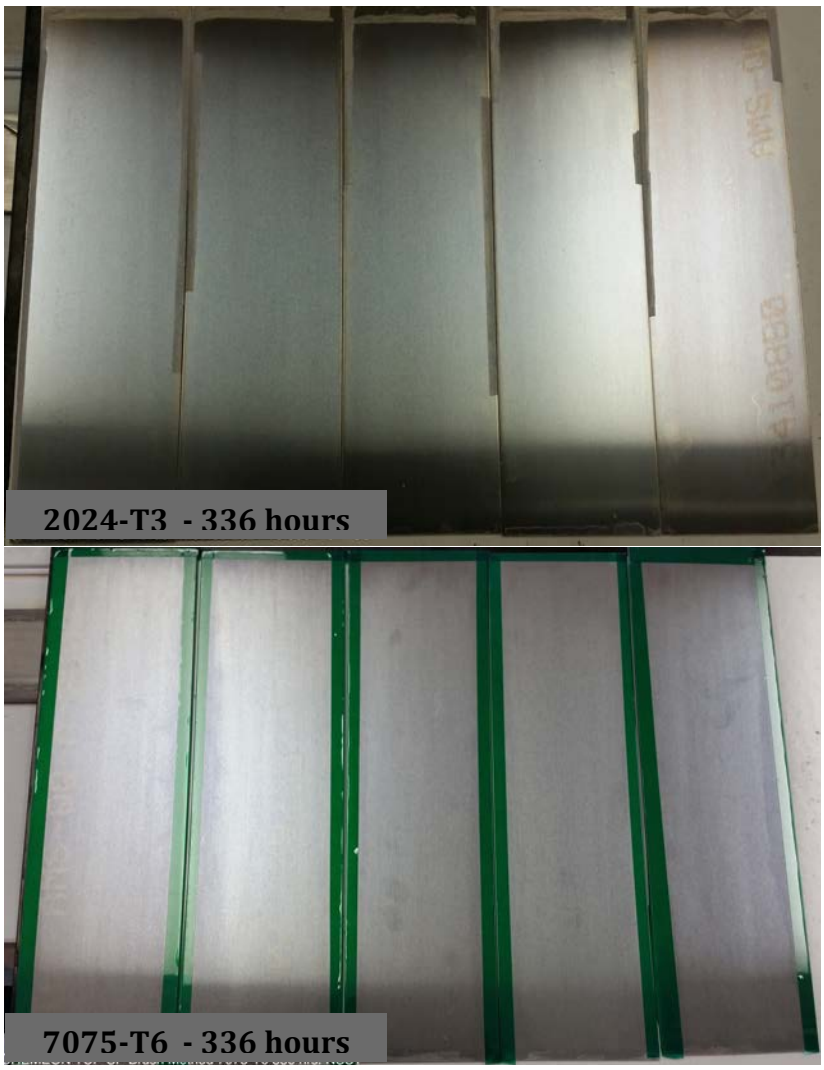
Figure 1. Salt spray corrosion performance of 2024-T3 and 7075-T6 aluminum coated with CHEMEON TCP-HF SP.



Coating weight: Coating weight analysis was done on CHEMEON TCP-HF SP processed 2024-T3 and 7075-T6 aluminum alloys in accordance with MIL-DTL-81706.

Average coating weight of 28.2 ± 1.4mg/ft^2 and 34.4 ± 2.5mg/ft^2 was measured for 2024-T3 and 7075-T6 aluminum alloys, respectively.

Wet Tape Adhesion: Epoxy primer conforming to MIL-PRF-23377 (High solids) was applied on CHEMEON TCP-HF SP processed (3x10 in^2) 2024-T3 and (3x10 in^2) 7075-T6 panels. Wet tape adhesion tests were done in accordance with FED-STD-141, Method 6301.3. No visible flaking

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of separation of the epoxy from the panel beyond the cuts. No visible removal from the chemical film and no damage to the chemical film.

Figure 2. Wet tape adhesion performance of 2024-T3 and 7075-T6 aluminum coated with CHEMEON TCP-HF SP.

2024-T3 7075-T6

Electrical Contact Resistance: CHEMEON TCP-HF SP processed aluminum alloy surface has Low Electrical Resistance (LER) before and after 168 hours salt spray exposure. It meets or exceeds MIL-DTL-5541F and MIL-DTL-81706B LER requirements. As-Processed: 922.7 ± 4.5 microhms/in^2 . After 168 hrs salt spray: 1098.9 ± 7.4 microhms/in^2

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Summary

CHEMEON TCP-HF SP provides the required 336 hours salt spray corrosion performance on high copper alloyed 2024-T3 and on other aluminum alloys. Coating weight depends on the method of application and alloy type and CHEMEON TCP-HF SP coating weight is far above 10mg/ft^2 requirement per MIL-DTL-81706B. Electrical Contact Resistance before and after salt spray is about 922.7 and 1098.9 microhms/in^2, respectively. Wet tape adhesion results showed no sign of removal from the scribed area.
CHEMEON TCP-HF SP is already QPL approved for the method of spray application. Immersion and brush-on qualification is in progress. It has been successfully used on magnesium and zinc alloys, sealing anodized aluminum and platings.