



CHEMMEON™
SURFACE TECHNOLOGY

Replace Hex Chrome Now with an
Environmentally Friendly/Drop-In
Replacement

February 2017

Hexavalent Chrome

Hexavalent Chrome a.k.a. Sodium Dichromate / Cr⁺⁶ is used for corrosion protection as a chromate and is also found in: Inks, polymer pigments, plastics, stainless steel, textile dyes, wood preservatives, leather tanning.

Cr⁺⁶ is prohibited for use in the EU or import into the EU after September 21, 2017. Cr⁺³ and Cr⁺⁰ are acceptable. An average vehicle contains 4-8 grams of Cr⁺⁶. 2002 Data shows that ELV in EU community generate 8 to 9 million tons of Cr⁺⁶ waste. Also Zinc chromate & chromium chromate are carcinogenic substances.

Hexavalent Chrome Characteristics

- ▶ Wet, gelatinous film, drying at the surface. Subsurface moisture (dehydrating ~ 48 hours) provides self-healing and lubricity
- ▶ Hard coating surface (as compared to Cr⁺³)
- ▶ Offers torque and tension to meet fastener finishing requirement (fasteners ~ 45% of Cr⁺⁶)
- ▶ The permissible exposure limit (PEL) for Cr⁺⁶ and all other Cr⁺⁶ compounds is 5 micrograms/M³ (for 8 hour time weighted average) per Occupational Safety and Health Administration (OSHA, 02/2006)

Available options to replace Hexavalent Chrome

- ▶ Trivalent chromates with a topcoat or a sealer to enhance corrosion protection performance (some recent developments offer no-sealer/topcoat)
- ▶ No-Chrome coatings with zinc and/or aluminum flakes by different applications:
 - ✓ Spray
 - ✓ Dip
 - ✓ Spin
 - ✓ Immersion
- ▶ Unique Military Specified Trivalent Chromium Pretreatment, CHEMEON TCP-HF suite of products for overall superior performance without any topcoat or a sealer
- ▶ Other options include ceramic based coating

Alternative Option: Cr⁺³

- ▶ Most conventional Cr⁺³ baths require a topcoat or a sealer to enhance corrosion resistance performance (some offer equal performance without any sealer or a topcoat)
- ▶ Typical color is pale greenish yellow (compared with Cr⁺⁶ gold yellow color)
 - ✓ Colors available (Dye)
- ▶ Deposits are not as hard (Cr⁺⁶) and not self-healing
- ▶ Heated bath (typical 140° F / 60°C)

REPLACE HEX CHROME NOW WITH CHEMEON TCP-HF

- ▶ Shorter bath life (requires drain & recharge)
- ▶ Non-conductive (unless applied over zinc alloy)

Available Option: No Chrome Finish

- ▶ Most coatings are zinc/aluminum based
- ▶ Typical application is spray/spin
 - ✓ Recent development includes immersion
- ▶ Requires more than one coat application to achieve customer's engineering specification
- ▶ Color
 - ✓ Silver
 - ✓ Gray
 - ✓ Black
- ▶ Can not be used for finer thread fasteners
- ▶ Conductive due to its metal content (Zn, Al)
- ▶ Excellent corrosion resistance
 - ✓ Can be enhanced with a (plus) sealer

Available MIL-SPEC Option: CHEMEON TCP-HF

- ▶ Trivalent Chromium Pretreatment (TCP) was originally developed by the United States Navy (NAVAIR) following extensive research
 - ✓ +2.5 years
 - ✓ 15,000 + test panels

CHEMEON TCP-HF is a simple drop-in replacement for hex chrome. Attributes include:

- ▶ Operates at room temperature with long bath life
- ▶ No sealer or a topcoat is required to enhance its performance (as compared to other alternatives)
- ▶ Harder deposit than conventional Cr⁺³
- ▶ Electrically conductive & excellent adhesion
- ▶ Can be subject to heat

What is CHEMEON TCP-HF?

- ▶ Trivalent Chromium (Cr⁺³) "HF" = Hexavalent Free
- ▶ Pre-treatment designed for aluminum (and other metals)
- ▶ CHEMEON has further developed and optimized
 - ✓ Over 10 years and 6,000+ test panels
- ▶ Replaces conventional hexavalent chrome (Cr⁺⁶) treatments
- ▶ Complies with ALL European Union's Directives

REPLACE HEX CHROME NOW WITH CHEMEON TCP-HF

- ▶ CHEMEON TCP-HF has passed all QPL testing for MIL-DTL-81706B for immersion and spray application, Class 1A and Class 3
- ▶ QPL approved May 15, 2006

CHEMEON TCP-HF can be used on various materials:

- ▶ Bare aluminum
- ▶ Anodized aluminum
- ▶ Zinc and zinc alloys
- ▶ IVD
- ▶ Cadmium
- ▶ Silver
- ▶ Brass
- ▶ Steel and Iron alloys
- ▶ Magnesium
- ▶ Zirconium



CHEMEON TCP-HF on bare aluminum

- ▶ Meets or exceeds corrosion resistance of similar conventional Hexavalent chrome coatings
- ▶ Results of 168 to 500 hours can be achieved in salt spray testing (ASTM B117), depending upon the alloy tested
- ▶ Paint bonding properties are often dramatically improved compared to similar coatings
- ▶ CHEMEON TCP-HF is used to replace high and mid-temperature anodize seals

Extreme Temperature Exposure

- ▶ CHEMEON TCP-HF can be dried at temperatures exceeding 200°F (93°C), for most applications
- ▶ CHEMEON TCP-HF can be baked for hydrogen relief in excess of 500°F (260°C) for 12+ hours without loss of performance
 - ✓ Hexavalent chromates cannot be baked above 140°F (60°C) without loss of performance
- ▶ CHEMEON TCP-HF is an ideal undercoat for cured coatings and overcoat for plated materials that require subsequent hydrogen relief

Contact Resistance (Conductivity)

- ▶ Also known as (LER) Low Electrical Resistance
- ▶ Typically used in electric and electronic equipment where surface resistivity is required and critical
- ▶ Meets or exceeds electrical resistance per MIL-DTL-81706

REPLACE HEX CHROME NOW WITH CHEMEON TCP-HF

Adhesion

- ▶ CHEMEON TCP-HF is an excellent chromate replacement for paint, rubber, and other material. Can be applied to magnesium, zirconium, steel, stainless steel as well as most other metals
- ▶ Meets or exceeds dry tape adhesion requirements for ASTM D 3359 method A & B
- ▶ Test results rated 5 out of 5 for tests on all substrates

<u>Material</u>	<u>Force (lbs.)</u>	<u>C/F max</u>	<u>D 3359</u>
Powder Coated Steel	.6121	8.17	Pass
Powder Coated Copper/Brass	.408	12.25	Pass
Powder Coated Aluminum	.7517	6.65	Pass
Wet Painted Steel	2.405	2.08	Pass
Wet Painted Copper/Brass	2.523	1.98	Pass
Wet Painted Aluminum	2.974	1.68	Pass

CHEMEON TCP-HF as an anodize seal

- ▶ CHEMEON TCP-HF excels as a replacement for different seal applications on anodized aluminum:
 - ✓ boiling hot water
 - ✓ nickel acetate
 - ✓ chromic acid sealers
- ▶ 500 to 1000 hours of salt spray on thin film sulfuric vs. current technology corrosion failures at 500 + hour
- ▶ NO FAILURE after 1000 hours on 6000 and 7000 series alloys-conventional Type II anodize
- ▶ Has eclipsed 3000 hours in independent testing per ASTM B117

CHEMEON TCP-HF EPA: "EPA" = Extended Protection Additive

- ▶ Developed for enhanced performance, offers better corrosion resistance
- ▶ Designed for consistent results specially for difficult alloys such as 2024
- ▶ Contains 25% CHEMEON TCP-HF plus 25% EPA additive
- ▶ QPL Approved

CHEMEON TCP-HF EPA Application

- ▶ Same pre-treatment as CHEMEON TCP-HF
- ▶ Cleaning in mild alkaline detergent at 120°F(49°C)
- ▶ Etch in appropriate chemistry
- ▶ Corrosion resistance better with etch for 2024
- ▶ Surface activation in Nitric Acid @ 50%
- ▶ CHEMEON TCP-HF EPA @ 25% for 5 minutes
- ▶ CHEMEON TCP-HF EPA contains 25% CHEMEON TCP-HF plus 25% EPA additive

REPLACE HEX CHROME NOW WITH CHEMEON TCP-HF

In Conclusion

- ▶ CHEMEON TCP-HF & CHEMEON TCP-HF EPA and CHEMEON TCP-HF SP (Spray) are viable alternatives to replace hexavalent chromate
- ▶ Performance is equal or better than conventional trivalent chromate
- ▶ It is conductive, harder deposit and cost effective
- ▶ It complies with ALL European Union Directives
- ▶ It conforms to MIL-DTL-81706B and MIL-DTL-5541F
- ▶ It conforms to ASTM D3359 and B921
- ▶ CHEMEON TCP-HF and CHEMEON TCP-HF EPA are QPL approved
- ▶ Our Trivalent chromium and zirconate chemistry provide superior performance and efficiency

About CHEMEON Surface Technology

CHEMEON Surface Technology is the only Woman Owned Small Business in the world that is licensed by the US Navy to manufacture and provide MIL-SPEC QPD/QPL Hex Free/Trivalent Chromate Conversion Technology. CHEMEON's patented and proprietary chemistries are internationally recognized for providing environmentally responsible hard material, surface engineering treatments and solutions.

Learn more at: www.chemeon.com

If you would like further information on the content of this article/document, please contact us at info@chemeon.com or call (888)782-8324.