USMC Environmental and Corrosion Control Issues

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The United States Marine Corps (USMC) Corrosion Prevention and Control (CPAC) Program is responsible for corrosion control issues for all ground vehicles and support equipment. In this role, the CPAC Program addresses issues through three main areas: Applied Research Development, Testing and Engineering (RDT&E); Corrosion Control Guidance and Support During Acquisition; and Organizational Level Corrosion Maintenance on Fielded Systems. In each of these areas the CPAC Program is striving to reduce the cost and impact of corrosion while supporting the use of environmentally friendly and compliant materials. Currently the areas of greatest need for the USMC are for: Hydraulic Cylinder Coatings, Fasteners, Pretreatments and Primers. Each of these areas has presented a challenge to finding environmentally friendly alternatives to legacy materials or implementing those materials into vehicle production or repair processes. This presentation will discuss some of the challenges the USMC is facing in these areas, some of the internal progress towards implementing new technologies, how the CPAC Program is leveraging the successes of other services in these areas and our overall needs with respect to these issues.
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The CPAC program is the manager for corrosion control issue within the Marine Corps.

CPAC provides support to the Marine to reduce the burden caused by corrosion through:
- Applied RDT&E to evaluate new technologies
- Acquisition support on new systems
- Organizational maintenance activities
CPAC Program

• CPAC is the voice of the Marines
• Annually hold a 3-day Working Group for Active Duty Marines
  – Display accomplishments
  – Voice concerns
  – Communicate policy
  – Identify opportunities and priorities
• Field Service Representatives (FSRs) at all major installations and for reserve units
Leading Issues for the USMC

- Hydraulic cylinders
- Fasteners
- Environmentally friendly pre-treatments
- More durable primers
Hydraulic Cylinders

- Coating performance and quality leading issue
- Classical pitting corrosion of porous platings
- "Crap shoot" how plating will perform
- Corrosion causes damage to seals and failure of hydraulic system

Two similar aged M9 ACE vehicles, one with intact chrome plating, one with heavily pitted cylinder rod.
Hydraulic Cylinders

- CPAC has looked into alternative coatings and processes
- Potential environmental benefits
- Some possible performance benefits
- Larger issue appears to be quality and consistency
  - How do we eliminate variations in process?
  - What are the right ways to evaluate and ensure quality?
  - The real savings may be from improving overall performance.
Fasteners

- Same issues, different service
  - Prevalence of cadmium
  - Use of hexavalent chromium
  - Potential incompatibilities with alternatives
  - Use of non-corrosion resistant hardware in harsh environments
Fasteners

- Fully support DoD Cr\textsuperscript{6+} policy memo
- Endorse the use on non-chrome and trivalent-chrome alternatives
- Favor non-cadmium hardware
- Concern with logistics and supply chain of many alternatives
Pre-treatments

• Repainting is a large part of the Marine Corp’s corrosion control strategy
• Established Corrosion Repair Facilities (CRFs)
  – Each major installation (4 centers)
  – Mobile CRFs for reserve units and overflow capacity
• Annually repainting 5,000-7,000 vehicles
• Spot touch-up operations on fielded systems
Pre-treatments

- Current operations is not to use pre-treatments
- Facilities not permitted / allowed to use Cr\(^6^+\) containing products
- Perform abrasive blasting where possible
- Mechanical sanding also used
- Pre-treatments desired to enhance performance of primers / promote adhesion
Primers

- CARC primers are thin, don’t withstand abrasion / impact and only provide barrier protection
- Have enhanced our systems with supplemental materials
  - Zinc-rich coatings
  - Chip resistant coatings
- Proven to be effective with the CARC system
- Exploring other applications and materials
USMC User Perspective

- What is the user’s perspective?
  - They want a system that works
    - Low cost of ownership
    - Low maintenance burden
    - Minimizes exposure risk
    - Is available to perform the mission at hand
- CPAC’s focus is to provide the system that works
- We work on the details and specifics and provide the Marine a vehicle ready to go