Case Study: Sustainable Greener Military Chemical Products

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**Report Documentation Page**

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

| 1. REPORT DATE | MAY 2011 |
| 2. REPORT TYPE |
| 3. DATES COVERED | 00-00-2011 to 00-00-2011 |
| 4. TITLE AND SUBTITLE | Case Study: Sustainable Greener Military Chemical Products |
| 5a. CONTRACT NUMBER |
| 5b. GRANT NUMBER |
| 5c. PROGRAM ELEMENT NUMBER |
| 5d. PROJECT NUMBER |
| 5e. TASK NUMBER |
| 5f. WORK UNIT NUMBER |
| 6. AUTHOR(S) |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) | Fleet Readiness Center Southwest, NAS North Island, San Diego, CA |
| 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) |
| 10. SPONSOR/MONITOR’S ACRONYM(S) |
| 11. SPONSOR/MONITOR’S REPORT NUMBER(S) |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT | Approved for public release; distribution unlimited |
| 13. SUPPLEMENTARY NOTES | Presented at the NDIA Environment, Energy Security & Sustainability (E2S2) Symposium & Exhibition held 9-12 May 2011 in New Orleans, LA. |
| 14. ABSTRACT |
| 15. SUBJECT TERMS |
| 16. SECURITY CLASSIFICATION OF: | 17. LIMITATION OF ABSTRACT | Same as Report (SAR) |
| a. REPORT | b. ABSTRACT | c. THIS PAGE |
| unclassified | unclassified | unclassified |
| 18. NUMBER OF PAGES | 25 |
| 19a. NAME OF RESPONSIBLE PERSON |

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Presentation Outline

- FRCSW North Island Background
- Drivers
- Sustainability and Greener
- Case Study Spray Lacquer
- Applicable Standards
- Reformulation Resources
- Summary
Fleet Readiness Center Southwest
NAS North Island

- Navy Aircraft Maintenance & Repair (MRO)
- F/A-18 Hornet, E-2 Hawkeye, C-2 Greyhound, SH-60 Seahawk, AH-1 Super Cobra
- Shipboard Components
Fleet Readiness Center Southwest  
NAS North Island

- 71 buildings
- 2.2 million square feet
- 358 acres
- 33,000 equipment items
- Over $1.4 billion replacement value infrastructure and equipment
Drivers

Federal Government Terminology Transition
“Environmentally Preferable” to “Green” to “Sustainable”

1993 Executive Order 12873

“Environmentally preferable’ means products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose.”

1995 EPA Environmentally Preferable Products — Proposed Guidelines

“seven (7) general guiding principles designed to... identifying and purchasing EPPs.”

1998 Executive Order 13101

EPPs re-defined (as above)

“Biobased’ means a commercial or industrial product (other than food or feed) that utilizes biological products or renewable domestic agricultural (plant, animal and marine) or forestry materials.”

2000 Executive Order 13148

Implement environmental management systems by 12/31/05

2004 Joint Group on Environmental Attributes — November Meeting Minutes

Change DLIS-maintained Web site from Environmentally Preferred Purchasing (EPP) to Green Procurement Program (GPP)

2004 DOD Green Procurement Program (GPP)

Framework selected: an environmental management system

2007 Executive Order 13423

“Sustainable’ means to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit the social, economic, and other requirements of present and future generations of Americans”
**Drivers**

Executive Order 13423 Partial Summary
Chemical Products/Processes

<table>
<thead>
<tr>
<th>Goals</th>
<th>Sustainable Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>d) acquired goods:</td>
<td>i) reduced greenhouse gases, ↓ energy</td>
</tr>
<tr>
<td>i) use sustainable environmental practices</td>
<td>ii) renewable energy</td>
</tr>
<tr>
<td>biobased environmentally preferable</td>
<td>iii) water conservations</td>
</tr>
<tr>
<td>recycled-content energy and water efficient</td>
<td>iv) acquisition</td>
</tr>
<tr>
<td>e) agencies:</td>
<td>v) pollution &amp; waste prevention, recycling</td>
</tr>
<tr>
<td>i) ↓ toxic materials acquired used disposed</td>
<td>vi) ↓ toxic chemical acquisition &amp; use</td>
</tr>
<tr>
<td>ii) waste prevention &amp; recycling programs</td>
<td></td>
</tr>
</tbody>
</table>

“...create and maintain conditions, under which humans and nature can exist in productive harmony, that permit the social, economic, and other requirements of present and future generations of Americans”
Drivers
Executive Order 13514 Partial Summary
Chemical Products/Processes

- EO 13423 replaced all prior executive orders
- EO 13514 latest executive order
  - Utilizes EO 13423 and adds requirements
    - PERFORMANCE GOALS
      - Green House Gases
      - Fossil Fuel Reduction Goals
      - Sustainability Goals (e.g. environmental, energy, etc)
- Both EO’s
  - LCA
  - Green Procurement
Drivers

EPA Defined Environmental Performance Characteristics

1. Materials Hazard Factors
   - Human
     Acute/Chronic, Immunologic, Neurotoxin
     Carcinogenic, Sensitizer Irritant, Reproductive
   - Ecologic
     Aquatic, Avian, Terrestrial Species
   - Product
     Corrosivity, Flammability, Reactivity

2. Human Health and Ecological Stressors
   - Bioaccumulative
   - Ozone Depleting
   - TRI, Air Pollutants and GHGs

3. Positive Attributes
   - Recyclability
   - Reusability
   - Durability

4. Natural Resources Use
   - Ecosystem Impacts
   - Energy, Water and Resource Consumption
   - Renewable, Non Renewable and Rapidly Renewable

From: Federal Register, Vol. 60, No. 189, Appendix B1
Drivers

DLA Chaired Joint Group on Environmental Attributes

- Bio-Based
- CA Air Quality Compliant
- Comprehensive Procurement Guideline (CPG) Compliant (EPA)
- Energy Star Complaint
- Environmentally Friendly
- EPEAT (Electronic) Environmental Criteria (51)
- Environmental Technology Verification
- Federal Energy Management Program (EMP) Efficient
- Green Seal of Approval
- National Emissions Standards for HAPs Compliant
- Non-Toxic Item
- PRIME Item
- Recycled Content
- Significant New Alternatives Program (S.N.A.P.) Approved (EPA)
Drivers

GSA Criteria

- Asbestos Alternative Products
  Washers, Gaskets, Clamps, Insulators
- Energy Efficient Products (FEMP)
  Lighting, Food Equipment, Industrial Equipment, Residential Equipment, Plumbing
- Low Standby Power Products (FEMP)
  Audio/Video, Office, Major Appliances
- Energy Star Products (FEMP)
  Equipment, HVAC, Electronics, Office, Lighting, Food
- Low VOC Products
  Paints, Solvents, Coatings, Inks
- EPA Comprehensive Procurement Guideline (CPG)
  Guidance Information
- Recycled Content Guidelines
  Construction, Landscaping, Office (nonpaper), Paper, Transportation
- EPA Water Conserving Products
  Plumbing
- EPEAT (Electronic Products)
  Electronic Products
IS ANYONE CONFORMING TO EO 13514 FOR GREEN PROCUREMENT?

STANDARDS?
INFORMATION?
LABELS?

CASE STUDY REQUIRED!
WHAT IS A SUSTAINABLE AND GREEN PURCHASE FOR A CHEMICAL PRODUCT PER EO 13514?

CASE STUDY – “EIGHT SPRAY LACQUER USED BY THE US NAVY”
Chemical Product Sustainability

- Environment Footprint Information
  - Information typically missing
- Economic Footprint Information
  - Life cycle cost accounting
- Quality of Life Footprint Information
  - MIL-SPEC / Warrantee and or Design Life
  - Worker Safety and Rights
  - Fair Trade, Fair Labor
Chemical Product Sustainability, cont.

- Environmental Footprint
  - Life Cycle Assessment Footprint
    - Resource Footprint
      - Sustainable Resources
    - Regulated Waste Chemical Footprint
    - Green House Gases Footprint
  - In-product Greener Chemicals
Chemical Product Sustainability, cont.

- Environmental Footprint, cont.
  - Resource Footprint
    - Material Footprint
    - Water Footprint
    - Energy Footprint
  - Percent Sustainable
    - Renewable Resources
Chemical Product Sustainability, cont.

- Regulated Waste Chemicals Footprint
  - Solid Waste Footprint (containerized)
  - Petroleum Waste Footprint
  - Industrial Waste Footprint (wastewater)
  - Air Pollution Waste Footprint
    - Criteria air pollution footprint
    - Hazardous air pollution footprint
Chemical Product Sustainability, cont.

• Green House Gas Footprint
  – Carbon Dioxide Equivalent Footprint
  – $\text{CO}_2(e)$
    • $\text{CO}_2$
    • Nitrous Oxides
    • Methane
    • Refrigerants
Chemical Product Greener

• Product Greener Chemical Content
  – Greener Means Less Hazardous

• Greener Chemical Categories
  – Human Health
  – Physical Safety
  – Ecological Impact
Chemical Compliance System
Green Scoring

Significance of each sub-score can be individually weighted

ECOLOGICAL SCORE
(0-100%)
__% A.W.

HEALTH SCORE
(0-100%)
__% A.W.

SAFETY SCORE
(0-100%)
__% A.W.

FINAL GREEN GRADE
(0 - 100%)

“Endpoint” Criteria

TOXICITY - AIR
(V.P. LC50) BCF

LONG-TERM EFFECTS - AIR
Global Warming Potential
Ozone-Depleting Potential
Smog
Acidification

TOXICITY - WATER
Fish LC50
Daphne LC50
Green Algae EC50
(Solubility W-LC50) BCF

LONG-TERM EFFECTS - WATER
Eutrophication
Theoretical Oxygen Demand

TOXICITY - SOIL
(Koc O-LD50) BCF
14-day Worm LC50

LONG-TERM EFFECTS - SOIL
Groundwater Mobility Factor
CERCLA RQ

FLAMMABILITY
Flash Point
Boiling Point

Persistence
Exposure
Toxicity
Long-Term Effects

Persistence
Exposure
Toxicity
Long-Term Effects

Persistence
Exposure
Toxicity
Long-Term Effects

Flammability
Radioactivity
Oxidizer
Water-Reactive
Corrosive
Explosivity
<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>NAME</th>
<th># CHEM</th>
<th>TOTAL %</th>
<th>GREEN GRADE (0–100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Aerosol</td>
<td>Lacquer</td>
<td>5</td>
<td>86.0</td>
<td>79</td>
</tr>
<tr>
<td>Sherwin Williams</td>
<td>1951 Clear Lacquer Aerosol</td>
<td>7</td>
<td>87.0</td>
<td>79</td>
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<tr>
<td>Sprayon Products</td>
<td>01951 Clear LAC</td>
<td>7</td>
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<tr>
<td>Illinois BP&amp;P Co.</td>
<td>Lacquer TT-L-50G</td>
<td>3</td>
<td>84.3</td>
<td>79</td>
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<tr>
<td>LHB Industries</td>
<td>Clear (14-100)</td>
<td>6</td>
<td>91.8</td>
<td>77</td>
</tr>
<tr>
<td>Borden Inc.</td>
<td>Krylon Spray #1303</td>
<td>6</td>
<td>110.0</td>
<td>76</td>
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<tr>
<td>Seymour of Sycamore Inc.</td>
<td>Clear</td>
<td>11</td>
<td>90.0</td>
<td>76</td>
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<tr>
<td>LHB Industries</td>
<td>Aerosol 14B100 (G/O) Clear Lacquer</td>
<td>8</td>
<td>101.0</td>
<td>75</td>
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<tr>
<td>Borden Inc.</td>
<td>Krylon 1303 (Old Form)</td>
<td>5</td>
<td>94.0</td>
<td>75</td>
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</tbody>
</table>
Greener Chemical Product, cont

- Greener Chemical Categories
- Sustainable Materials
  - Renewable Materials
    - Bio-based Content (non-fossil)
- Re-utilized Content
  - Recovered Resource
  - Recycled
- Raw Sustainable Content
  - No net negative environmental impact
    - E.g. sustainable forest products, agriculture, mining etc
“Where is the information?”

- Standards
  - USA
  - Year 2011 ANSI Greener Chemicals and Process Information Standard
    - http://www.nsf.org/ National Sanitation Foundation
    - ACS Green Chemistry Institute
  - Other standards
- Data Sheet
  - Similar to LEED Report Card for Buildings
  - DOD, Navy, Industry May Request Information per ANSI Standard
Sustainable and Greener Chemical Product, cont.

“Reformulation Resources”

- EPA Design for the Environment (DfE)
  - Program to reformulate Chemical Products
- Program Name - CLEAN-gredients
  - Reformulate Products for Vendors and DOD
  - Sustain MIL-SPEC
Summary

• Sustainability and Green Chemical Product Evaluation

• ISO 13514 and 13423 Requires the Following
  – LCA Information
  – Sustainable Resource Information
  – Greener Chemical Information
Summary, cont.

- ANSI Greener Chemicals and Information Standard Addresses the Required Information
- The Standard Provides the Information and Label
  - May request information similar to LEED
- Reformulation Resources
  - EPA DfE
  - Clean-Gradients