Environment, Energy Security & Sustainability
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Case Study: Sustainable Greener Military Chemical Products

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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>1) reduced greenhouse gases, ↓ energy</td>
</tr>
<tr>
<td>i) use sustainable environmental practices</td>
<td>2) renewable energy</td>
</tr>
<tr>
<td>biobased environmentally preferable</td>
<td>3) water conservations</td>
</tr>
<tr>
<td>recycled-content energy and water</td>
<td>4) acquisition</td>
</tr>
<tr>
<td>efficient</td>
<td>5) pollution &amp; waste prevention, recycling</td>
</tr>
<tr>
<td>e) agencies:</td>
<td>6) ↓ toxic chemical acquisition &amp; use</td>
</tr>
<tr>
<td>i) ↓ toxic materials acquired used disposed</td>
<td></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.
- Water Score
- Air Score
- Soil Score

**HEALTH SCORE**
(0-100%)
___% A.W.
- Acute Health Score
- Chronic Health Score

**SAFETY SCORE**
(0-100%)
___% A.W.
- Fire Score
- Special Score
- Reactivity Score

**FINAL GREEN GRADE**
(0 - 100%)

"Endpoint" Criteria

**TOXICITY - AIR**
(\(V.P. \div \text{LC50} \div \text{BCF}\))

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

**TOXICITY - WATER**
(\(\text{Water Solubility} \div \text{W-LC50} \div \text{BCF}\))

**LONG-TERM EFFECTS - WATER**
- Eutrophication
- Theoretical Oxygen Demand

**TOXICITY - SOIL**
(\(K_c \div \text{O-LD50} \div \text{BCF}\))

**LONG-TERM EFFECTS - SOIL**
- Groundwater Mobility Factor
- CERCLA RQ

**FLAMMABILITY**
- Flash Point
- Boiling Point
<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>NAME</th>
<th># CHEMs</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>
</tr>
<tr>
<td>Sprayon Products</td>
<td>01951 Clear LAC</td>
<td>7</td>
<td>85.0</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>
</tr>
</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
Sustainable and Greener Chemical Product, cont.

“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
“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