Evaluation of HCFC AK 225 Alternatives for Precision Cleaning and Verification

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REGULATORY IMPACTS:

Requirements imposed by the Louisiana Department of Environmental Air Toxic Regulations and the Clean Air Act have combined to limit/restrict the use of critical cleaning and verification solvents such as Freon 113 (PCA)

Interim replacement of HCFC AK 225 has been qualified; however, toxicity and future phase-out regulations necessitate longer term solutions
Maintaining qualified cleaning and verification processes are essential in an production environment. Environmental regulations have and are continuing to impact cleaning and verification processing in component and large structures, both at the Michoud Assembly Facility (MAF) and component suppliers.

The goal of this effort is to assure that the cleaning and verification proceeds unimpeded and that qualified, environmentally compliant material and process replacements are implemented and perform to specifications.
OBJECTIVE:

Implement environmentally friendly cleaning and verification processes for critical surface hardware

Short Term Alternatives

- HCFC 225

Long Term Alternatives

New cost effective, less toxic alternatives
Supersonic Cleaning Applications
Surface Verification Technology
LOX Critical Surface Cleaning and Verification Alternatives

APPROACH:

Selected Supersonic Gas - Liquid Cleaning System for evaluation in FY '97

Selected and evaluated three (3) cleaning and verification solvents as candidate alternatives to HCFC 225

- Vertrel 423 (HCFC)*
- Vertrel MCA (HFC/1,2-Dichloroethylene)
- HFE 7100DE (HFE/1,2-Dichloroethylene)

Product removed from market place

Evaluated an analytical instrumental post cleaning verification technique
Perform qualification of LOX compatible and environmentally friendly critical cleaning and verification alternatives

- Support the validation of HCFC 225 in Clean Room and Verification Wipe Applications

- Continue pre-qualification of solvent alternatives such as Vertrel MCA, or those recommended or approved by:
  - SNAP (Significant New Alternatives Program)
  - RT2 (Replacement Technology Team)

- Continue pre-qualification testing of Supersonic Gas-Liquid cleaning system

- Support design modifications of surface verification technology
**HCFC AK 225 Critical Surface Cleaning and Verification Alternatives**

**Average % Cleaning Efficiency of Twenty Test Panels**

<table>
<thead>
<tr>
<th>Solvent</th>
<th>Safe-Tap</th>
<th>CRC 2-26</th>
<th>J-414</th>
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<tbody>
<tr>
<td>Vertrel MCA</td>
<td>54.6</td>
<td>88.6</td>
<td>58.8</td>
</tr>
<tr>
<td>Vertrel 423</td>
<td>95.2</td>
<td>94.3</td>
<td>79.5</td>
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<tr>
<td>3M HFE71DE</td>
<td>45.1</td>
<td>78.7</td>
<td>55.1</td>
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<td>Gas-Liquid</td>
<td>98.06</td>
<td>70.0</td>
<td>0.0</td>
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<tr>
<td>HCFC AK 225</td>
<td>96.6</td>
<td>91.8</td>
<td>31.5</td>
</tr>
</tbody>
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Surf-Map Results of Safe-Tap Lubricant Cleaned Test Panels with Vertrel MCA

Before

After
Optical Schematic of the Surf-Map II Apparatus