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(Restricted Substance Advisor to Pentland Brands)
AFIRM Seminar, Vietnam
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A world renowned chemical expert

A highly valued advisor to the footwear and apparel sector
It’s not a chemistry lesson!

My Job: To tell you what is in the document

You don’t need to understand the detailed chemistry but ..........

you need to understand the importance of chemical detail
The Document

It is not a novel......

.....it is a fabulous resource for experts in your team
The Aim
What’s in there?

- Chemicals associated with textiles
- Chemicals associated with leather
- Chemicals associated with polymers
- Process Chemicals
- Adhesives / coatings
- Printing
What’s in there?

- The Chemicals in every type of formulation:
  - Dyes
  - Lubricants
  - Softeners
  - Resins
  - Anti-stats
  - Flame Retardants
  - Water-repellents
  - Anti-microbials
  - Pigments
Forget the chemicals for a moment.....

.....it is a an excellent text book for understanding textile and leather manufacturing processes
<table>
<thead>
<tr>
<th>Beyond RSL Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• EVERYTHING you need to know about apparel and footwear chemicals</td>
</tr>
<tr>
<td>• RSL compliance</td>
</tr>
<tr>
<td>• Chemical management <strong>best practice</strong></td>
</tr>
</tbody>
</table>
An Holistic Approach

- Aimed at reducing chemical consumption and chemical emissions and not just meeting Restricted Substance Standards
Environmental Impacts

• A sense of perspective given for different products and processes

• Indicative water and energy consumption for most common processes
The Importance of Full Information

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Typical Composition of Flame Retardant Formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 g/l</td>
<td>Polysiloxane formulation</td>
</tr>
<tr>
<td>20 g/l</td>
<td>Stearylurea formulation</td>
</tr>
<tr>
<td>2 g/l</td>
<td>Phosphoric acid ester formulation</td>
</tr>
<tr>
<td>20 g/l</td>
<td>Melamine resin</td>
</tr>
<tr>
<td>70 g/l</td>
<td>Dimethylol dihydroxy ethylene urea resin</td>
</tr>
<tr>
<td>25 g/l</td>
<td>Phosphoric acid</td>
</tr>
<tr>
<td>400 g/l</td>
<td>Alkylphosphonic acid ester</td>
</tr>
<tr>
<td>458 g/l</td>
<td>Water</td>
</tr>
</tbody>
</table>
# The Importance of Full Information

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Typical Composition of Flame Retardant Formulation</th>
<th>Actual Composition of Substances Listed in Flame Retardant Formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 g/l</td>
<td>Polysiloxane formulation</td>
<td>20 % Polysiloxane with chain distribution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 % Oligosiloxane, cyclic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 % Acetic acid, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 % Fatty alcohol, ethoxylate, by-products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 % Glycerol, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 % Fatty amine, ethoxylate, by-products</td>
</tr>
<tr>
<td>20 g/l</td>
<td>Stearylurea formulation</td>
<td>20 % Methylolated stearylurea, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.7 % Ethanediol, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.3 % Methanol, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 % Disobutoxymethane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 % Isobutanol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2 % Formaldehyde</td>
</tr>
<tr>
<td>2 g/l</td>
<td>Phosphoric acid ester formulation</td>
<td>50 % Phosphoric acid butylester, technical</td>
</tr>
<tr>
<td>20 g/l</td>
<td>Melamine resin</td>
<td>50 % Trimethyl(methylol)melamine ether, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 % Ethanediol, technical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 % Toluenesulfonic acid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 % Formaldehyde</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 % Inorganic salts</td>
</tr>
</tbody>
</table>
Consider Inputs

Figure 1.3: Basic Scheme of Inputs to Textile Finishing Industry (Austria)

Total inputs: 28,000 tons/year (organics and inorganics)

- Approx 5400 t organics from raw materials
- Pre-treatment
  - 8435 t inorganics
  - 1348 t organic formulations
- Dyeing
  - 4550 t inorganics
  - 2045 t organics
  - 105 t organic detergents
- Printing
  - 730 t inorganics
  - 970 t organic formulations
- Finishing
  - 4183 t organics
Consider Outputs

Figure 1.4: Basic Scheme of Outputs from Textile Finishing Industry (Austria)

Total emissions to water and air: about 16,000 tons/year (organics and inorganics)

- 3580 t inorganics (water)
- 545 t organics (water)
- 5200 t organics from raw materials (water)
- 200 t organics from raw materials (air)
- 450 t inorganics (water)
- 110 t organics (air)
- 470 t organics (water)
- 4340 t inorganics
- 90 t organics (air)
- 890 t organics (water)
- 55 t organics (air)
- 35 t organics (water)
Inputs / Outputs

- Managing inputs
  - Manages RSL compliance
  - Manages effluent and air emissions to a large extent
Consider Harmful Chemicals

- Hazard
- Understand where harmful chemicals are present
- Look for lower impact alternatives
- Risk
- Learn how to minimise exposure
Consider Chemical Volumes

• Reduction of volumes used reduces exposure

• Achieved by:-
  – Removing unnecessary chemical use
  – Reducing water consumption
  – (Reducing energy consumption)
Where are Harmful Chemicals Hiding?

• Many Places
  – In fibres
  – In oils
  – In lubricants
  – In dye formulations
  – In chemical formulations
  – In adhesives
  – In coatings

• AND................................
Consider Further Reactions

- It’s not just what’s in the formulation

- In chemistry....

\[ A + B = A + B + C + D + \text{Cousin of } A \text{ etc!!} \]
The Chemical Guidance Document

• Helps
  – Understand where you may find harmful chemicals
  – Learn how to minimise use harmful chemicals
  – Learn how some harmful chemicals are formed during processing
The Chemical Guidance Document

- The concept of zero harmful chemicals has zero credibility
- Makes it clear that complete avoidance of chemicals is impossible
- Chemicals are a necessary part of the modern world but they need to be understood and managed
Where can you find this information?

- AFIRM website
  http://afirm-group.com/suppliersltool.htm