Novel Functional Co-stabilizing and Matting Lubricant Packages for Rigid PVC Applications

Presented by:
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Struktol Company of America
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Struktol Company of America
Member of the Schill & Sellacher family of companies
Manufacturing in:
• Stow, OH
• Hamburg, Germany
• Böblingen, Germany
• Pirna, Germany
Representation in over 100 countries around the world
STRUKTOL® trade name known around the world
Products can be found in plastics and rubber as well as man-made fibers, textiles, leather and paper products
Development of Co-stabilizer Packages
- First to increase level of recycled PVC content
- Progressed to virgin compounds to reduce level of Tin stabilizer

Development of Matting Packages
- First product developed in 2002 – STRUKTOL® V-MAT G
- Markets continue to move toward lower gloss products
- Development recently evolved around trim products
- New developments for engineered profiles

General Chemistries of Lubricants:
- Acid Amides
  - Primary Amides: Erucamide, Oleamide, Stearamide
  - Secondary Amides: EBS, EBO
- Acid Esters
  - PEMS, PEDS, PETS, PEAS, GMS, GMO, Montan Wax,
  - Stearyl Stearate, Distearyl Phthalate
- Fatty Acids and Alcohols
  - Saturated: Lauric (C12), Myristic (C14), Palmitic (C16),
    **Stearic (C18)**
  - Unsaturated: Oleic (C18), Erucic
- Hydrocarbon Waxes
  - Polyethylene, Polypropylene, OPE, Paraffin, Mineral Oil
- Metallic Soaps
  - Calcium, Zinc, Magnesium, Lead, Aluminum, Sodium, Tin,
    Barium, Cobalt, etc. Stearate
COSTABILIZER PRODUCT DEVELOPMENT

Why Costabilizer Packages?

- **Increase level of recycled PVC content**
  - Reduce color shifts when using high levels of “recyclate” (regrind and/or post industrial or consumer scrap)
  - Improve incorporation of recyclate
  - Minimize physical property loss with high recyclate levels

- **Reduce level of tin stabilizer needed**
  - Primarily a cost reduction issue
  - Price of tin and other metals have soared over the last 2 years
  - Alternative also to mixed metal stabilizers
**Experiment 1**

- Relate the loading of lubricant/costabilizer package needed to the level of recyclate addition in a rigid, clear sheet product.
- Done by Brabender bowl mixing at 190°C, 60 rpm and 65 gram load.
- Sample buttons pulled every 4 minutes for 40 minutes.

**Formulation**

<table>
<thead>
<tr>
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<th>1</th>
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<th>3</th>
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<td>GG 7045 NATURAL</td>
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<td>STRUKTOL® VCS-526A</td>
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**Results**

<table>
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<td>VCS-526A</td>
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<tr>
<td><strong>RESULTS</strong></td>
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<tr>
<td>TIME TO ON-SET DEG (min.)</td>
<td>36</td>
<td>19</td>
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<table>
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<th>12</th>
<th>16</th>
<th>20</th>
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</table>
**Experiment #2:**

- Find the loading of costabilizer needed to equal process stability using gradual reductions of primary tin stabilizer
- Done by Brabender bowl mixing, pulling sample buttons every 5 minutes for 30 minutes

**Formulations:**

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<td>Struktol CoStab</td>
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<td>0.4</td>
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**Lube/CoStab Blend**

2.6

**Results:**

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MATTING AGENT PRODUCT DEVELOPMENT
**Why Matting Agent Packages?**

- **Trends in certain products to reduce gloss (aesthetic) and increase surface roughness (functional)**
  - Interior trim applications
  - Drywall trim products – anything that is painted, glued, etc.
  - Also for printed products
- **Changing surface roughness to change fluid transport characteristics**
  - This is done in the downspout and gutter/gutter cover industries
  - A rougher surface can make the flow of the water over the surface of a PVC part more consistent and predictable

**Experiment:**

- Reduce the gloss of an extruded, rigid trim product
- Improve the heat stability performance

**Formulations:**

- Customer submitted proprietary rigid compound
- Matting agent optimum level 1.5%
- Co-stabilizer package optimum level 1.5%
- Matting agent and Co-stabilizer combination package SA0510
Results:

- Heat stability time to degradation improved from 20 minutes to 28 minutes using the combination matting agent/costabilizer package at 3.0% when tested in a Brabender bowl at 190°C and 60 rpm with plugs taken every 4 min. for comparison.

Further Planned Work:

- Impact strength evaluations
- Weathering data
- Product has already evolved into commercial product: **STRUKTOL® VM-512**
Conclusions:

- Struktol has developed new, effective technology for costabilizers and matting agents.
- The costabilizer product can be put into most lubricants and lubricant packages that we produce up to approximately 40% loading in the lubricant.
- The costabilizer lubricant package can result in significant cost savings to the manufacturer by reducing the usage level of the primary tin stabilizer.
- The matting agents are supplied in a polymer or lubricant carrier which can also have the costabilizer technology included as a single package.

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- Mike Mikolay, Struktol Company

Thank You!!