POLYSTEP® P-12A is a tridecyl ethoxylate phosphate ester, ammonium salt for use in emulsion polymerization. When compared to an alkyl phenol ethoxylate (APE) type phosphate ester as the primary emulsifier, POLYSTEP P-12A can improve performance attributes in both the emulsion polymerization process and downstream coating applications.

Key Attributes:

- ✓ Low coagulum formation in small particle latexes
- ✓ Improves mechanical stability
- ✓ Alkyl phenol ethoxylate (APE) free
- ✓ Improves color acceptance
- ✓ Improves washability
- ✓ Improves RT¹ block resistance

Latex Performance

<table>
<thead>
<tr>
<th>Polymer</th>
<th>52BA/46MMA/2MAA</th>
<th>Surfactant</th>
<th>POLYSTEP P-12A</th>
<th>NP-6PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level BOM, %</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Final PSD, nm</td>
<td>113</td>
<td>111</td>
<td>111</td>
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</tr>
<tr>
<td>Ca²⁺ Stability, g 10% CaCl₂</td>
<td>8.5</td>
<td>8.4</td>
<td>8.4</td>
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</tr>
<tr>
<td>Shear Stability, min</td>
<td>6.0</td>
<td>4.0</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Heat Stability, 49°C for 30 days</td>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
<td></td>
</tr>
</tbody>
</table>

BA = Butyl Acrylate      MMA = Methyl Methacrylate      MAA = Methacrylic Acid

¹RT = Room temperature

POLYSTEP P-12A is comparable to a nonyl phenol (POE-6) phosphate ester (NP-6PE) as the sole primary emulsifier in an acrylic polymer (Tg = 2°C) stabilized with MAA and no additional post-additive latex stabilizers.

POLYSTEP P-12A provided comparable results in the emulsion polymerization process and resulting latex as NP-6PE.
The coatings containing POLYSTEP P-12A and NP-6PE do not contain any additional wetting agents added to the paint formulation. The examples that follow show how the choice of surfactant in the latex impacted coating applications.

**Color Acceptance**

POLYSTEP P-12A improved performance for red iron oxide and provided equivalent performance to NP-6PE for carbon black color acceptance.

<50 g/L VOC, PVC = 29.8%, Volume Solids = 33.7%

**Washability**

POLYSTEP P-12A improved #2 pencil stain removal compared to NP-6PE and provided comparable red lipstick removal.

ASTM D4828

<50 g/L VOC, PVC = 29.8%, Volume Solids = 33.7%

**Block Resistance**

POLYSTEP P-12A improved 1-day and 7-day RT block resistance compared to NP-6PE.

ASTM D4946

<50 g/L VOC, PVC = 29.8%, Volume Solids = 33.7%