Post-Addition Of SMA® Resins In Water-Based Inks To Stabilize And Suppress Viscosity

Post-addition of very small amounts of certain grades of SMA® Resins to water-based, flexographic ink formulations can give finished inks with a lower, more stable viscosity. Addition of 0.35 – 2.00 wt. percent of SMA® 2625H or 3000H (percent SMA® resin solids relative to total ink weight) can lower the viscosity of finished inks by greater than 40% and maintain the lower viscosity for greater than 1 month.

SMA® Resins Function As Polymeric Surfactants
SMA® Resins are low molecular weight styrene-maleic anhydride copolymers. Hydrolyzation of these resins in an aqueous base such as ammonium hydroxide gives a carboxylate salt solution which is widely used as a polymeric surfactant in applications such as pigment dispersion and emulsion polymerization. Sartomer offers a number of hydrolyzed solution products (H grade) to facilitate their direct use in waterborne formulations.

Post-Addition Of SMA® Resins To A Flexographic Ink Formulation
The effect of adding low concentrations of SMA® Resin solutions to a typical flexographic ink formulation has been studied. This ink formulation was prepared by mixing a phthal blue dispersion with styrene-acrylic solution and emulsion resins. Two different concentrations of different SMA® Resins (1000H, 2000H, 17352H, 2625H or 3000H) were added with the vehicle and differences in properties of the finished inks were evaluated. One of the results noted during this study was the suppression and stabilization of the viscosity of the ink when small amounts of SMA® 2625H or, in particular, SMA® 3000H were added.

All inks formulated with SMA® Resins maintained the same color strength as the control ink, and did not exhibit any shock or kick-out from interaction with the other components in the formulation.

Formulation And Characterization Of Inks

Dispersion:
Cyan blue dispersion (Alper DB 153-1641),

Stock Vehicle (40% solids, pH adjusted to 9):
<table>
<thead>
<tr>
<th>Emulsion Resin</th>
<th>Joncryl 63²</th>
<th>Stock Vehicle (40% solids, pH adjusted to 9):</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECO 2177²</td>
<td>6.7 parts</td>
<td>Solution Resin Joncryl 63² 32.8 parts</td>
</tr>
<tr>
<td>Defoamer Dee Fo PI-45³</td>
<td>0.5 parts</td>
<td></td>
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</tbody>
</table>

1 Product of Flint Ink
2 Products of Johnson Polymer
3 Product of Ultra Additives Incorporated

Inks were prepared by mixing dispersion, stock vehicle and, except for in the control, SMA® H solution. All final ink formulations have 12.25 % pigment solids.

Preparation of Control Ink:
Add, with mixing, 65 parts Stock Vehicle to 35 parts of dispersion.

Preparation of Ink With 2.5 parts SMA® 3000H (0.25 wt. % SMA® solids):
Add 2.5 parts SMA® 3000H to 62.5 parts Stock Vehicle. Add, with mixing, SMA®/Vehicle solution to 35 parts of dispersion.

Preparation of Ink With 5.0 parts SMA® 3000HD (0.50 wt. % SMA® solids):
Add 5.0 parts SMA® 3000H to 60.0 parts Stock Vehicle. Add, with mixing, SMA®/Vehicle solution to 35 parts of dispersion.
Ink viscosities were measured at initial, 24 hr, 48 hr, 1 week, 2 week and 1 month aging.