



ESPERSE AND ACRYLIC SOLUTION POLYMERS

Esperse 100, Esperse 506, or blends of the two markedly decrease viscosities of solution resins and the resultant products made from them. This can yield different results than merely adding the Esperse dispersant to the dispersion formula.

The Esperse was added at the point at which the solution resin was neutralized and expanded in the water phase (i.e. when the solid resin was solubilized into water).

Some example formulas are:

	Control Formula	Test 1	Test 2	Test 3
Joncryl 67	30.12	30.12	30.12	30.12
Byk 022	0.99	0.99	0.99	0.99
Water	59.51	57.53	57.53	57.53
Ammonium hydroxide	9.38	9.38	9.38	9.38
Esperse 100	0.00	1.98	0.99	0.00
Esperse 506	<u>0.00</u>	<u>0.00</u>	<u>0.99</u>	<u>1.98</u>
	100.00	100.00	100.00	100.00

The control formula has no additive; the remainder of the formulas have 1.2% surfactant actives.

Joncryl 67 is a 12,000 molecular weight, 213 acid number resin commonly used for pigment dispersion. The 30% (nominal) solutions above were prepared by mixing the liquid ingredients together in a blender; next, the resin was added to the blender and chopped finely. Then the ammonium hydroxide was added, which caused the resin to begin solubilization and increased the viscosity of the solution. Actual measured solution solids were 32.32 – 33.77%.

After the solutions were made and cooled, their 3 rpm Brookfield viscosities were:

	<i>Viscosity, cps</i>
Control	90,000
Esperse 100	11,120
50/50 E100/E506	14,220
Esperse 506	26,690

Clearly, the inclusion of any of the surfactants had a large impact on viscosity. However, the greatest viscosity reduction was for Esperse 100 and the 50/50 blend of Esperse 100 and Esperse 506.

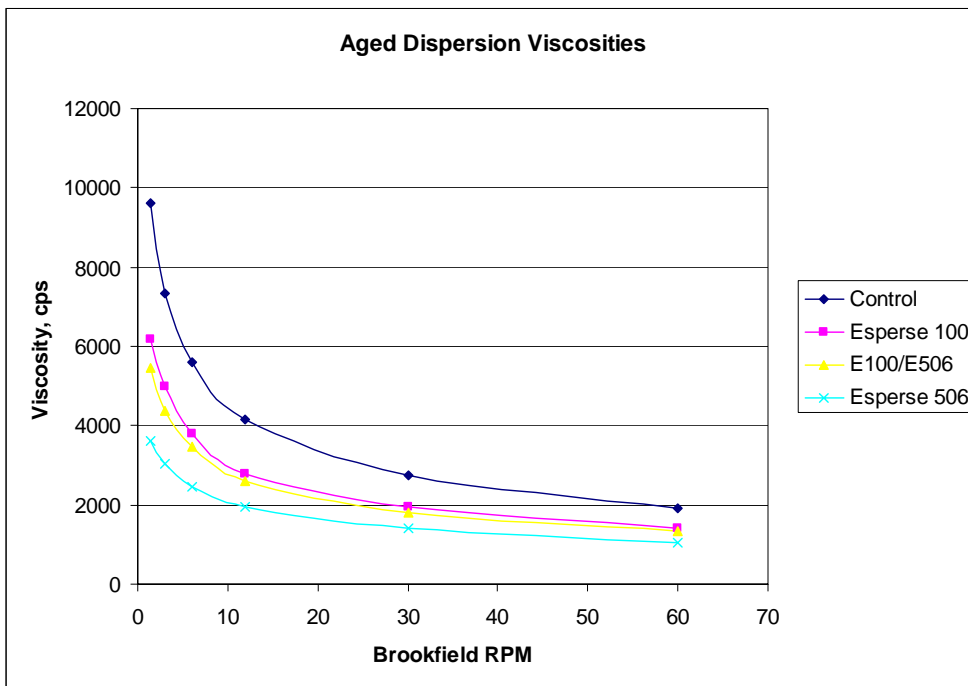
Next, dispersions were made from these solutions without the incorporation of additional dispersant. These dispersions had approximately 0.3% active dispersant and the formulas are:

PHTHALO BLUE DISPERSIONS

	Control	Test 1 Dispersion Esperse 100	Test 2 Dispersion 50/50 E100/E506	Test 3 Dispersion Esperse 506
BW 1531*	152.00	152.00	152.00	152.00
Control resin solution	102.39			
Test 1 solution resin		104.51		
Test 2 solution resin			104.09	
Test 3 dispersion resin				101.83
BYK 020	4.00	4.00	4.00	4.00
Water	<u>141.61</u>	<u>139.49</u>	<u>139.91</u>	<u>142.17</u>
TOTAL	400.00	400.00	400.00	400.00
Pigment	38	38	38	38
P/B	4.5	4.5	4.5	4.5
Resin, %	8.44	8.44	8.44	8.44
Additive, % actives	0.00	0.31	0.31	0.31

* BW 1531 is available from Pacific Coast Enterprises, 713-914-0355

Actual percent active of the surfactants in each case was far less than what was used in prior experiments that involved adding surfactant to the dispersion before milling. Generally, 2% surfactant (actives) was found to be optimal for viscosity reduction of the dispersions when the surfactant was incorporated as a formula component. However, when the surfactant was incorporated into the solution resin, these minimal amounts were seen to have a dramatic effect. This is evidence that the primary way in which the surfactant reduces pseudoplastic character of highly pigmented dispersions is by affecting polymer conformation in solution and subsequent interactions with pigment surfaces. Note this effect in the viscosity profiles of the dispersions below:



The control dispersion had the highest viscosity and pseudoplastic behavior; the formula containing Esperse 506 had the lowest. The Esperse 100 and 50/50 Esperse 100/506 formulas had similar profiles.

Tint strength results showed that the Esperse 100 alone showed a slight increase in color development over the other formulas, which were equivalent to the control:

Additive	Avg. O.D.	Reflectance	Tint Strength, %
none	0.766	0.1714	100.0
Esperse 100	0.79	0.1622	103.4
E100/E506	0.77	0.1698	100.5
E506	0.77	0.1698	100.5

Making inks from the dispersions further diluted the amount of surfactant in the formulations to 0.1%, and the initial ink viscosities as a result were fairly similar. In the future, adding a small additional dose of surfactant when the inks are made could be fruitful in suppressing viscosities. The lowest viscosity ink was that of the 50/50 Esperse 100/Esperse 506 blend:

