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TECHNICAL BULLETIN

ESPERSE 355

Esperse 355 is an exciting new dispersing agent that will minimize pigment dispersion viscosities, allowing for higher pigment loadings. In addition, this product imparts colloidal stability to pigment dispersions so that shock-stable inks can be prepared, even at high pigment-to-binder ratios. It is suitable for use in water-based systems, with all organic pigments. The systems in which this product has demonstrated its utility are:

- ✓ ***Anionic resin solutions – enhancing resin solubility and promoting fluid solutions***
- ✓ ***Emulsion polymers – increasing colloidal stability and minimizing pseudoplastic character***
- ✓ ***Pigment dispersions***
- ✓ ***Industrial coatings and trade sales paints***
- ✓ ***Printing inks***

In addition, use of Esperse 355 minimizes air entrainment and can reduce the amount of additional defoamer needed in the formulation.

As with all additives, a ladder study is appropriate to determine the right level of Esperse 355 for your formulation. Some preliminary labwork with phthalo blue, diarylide yellow, and lithol rubine pigments has demonstrated that a 1.25% use level (based on actives) is ideal. This level of additive has proved to maximize pigment dispersion properties and those of the inks/coatings that result from these formulations.

OPTIMIZATION STUDY: ESPERSE 355

Esperse 355 is supplied as a ready-to-use flake that is easily soluble in water. A 30% gel of Esperse 355 was prepared by combining 30 parts of Esperse 355 with 70 parts of

water. The mixture was heated slightly (to approximately 120° F); this formed a clear, pourable liquid which gelled upon cooling.

A series of dispersions was made on an Eiger Mini-100 horizontal media mill in the following colors: Pigment Blue 15:3 (phthalo blue), Pigment Red 57:1 (lithol rubine) and Pigment Yellow 14 (diarylide yellow). Levels of active Esperse 355 used in the formula were: 0.75%, 1.0%, 1.25%, 1.5%, 1.75%, and 2.5%.

The formulas for the 1.25% level of Esperse 355 are shown here. Each of the formulations had 37% pigment, and approximately a 5/1 pigment-to-binder ratio (the phthalo blue formula had a 5.5/1 pigment-to-binder ratio).

	Blue Formula ETH 32007-3	Red Formula ETH 32907-3	Yellow Formula ETH 40207-3
BW 1531	37.0	-----	-----
57 DT 688	-----	37.0	-----
YE 1403	-----	-----	37.0
30% Esperse 355 gel	4.17	4.17	4.17
Joncryl 63 resin solution	22.02	24.29	24.29
Defoamer 31 0.71	0.71	0.71	
Water	36.1	33.83	33.83
TOTAL	100.0	100.0	100.0

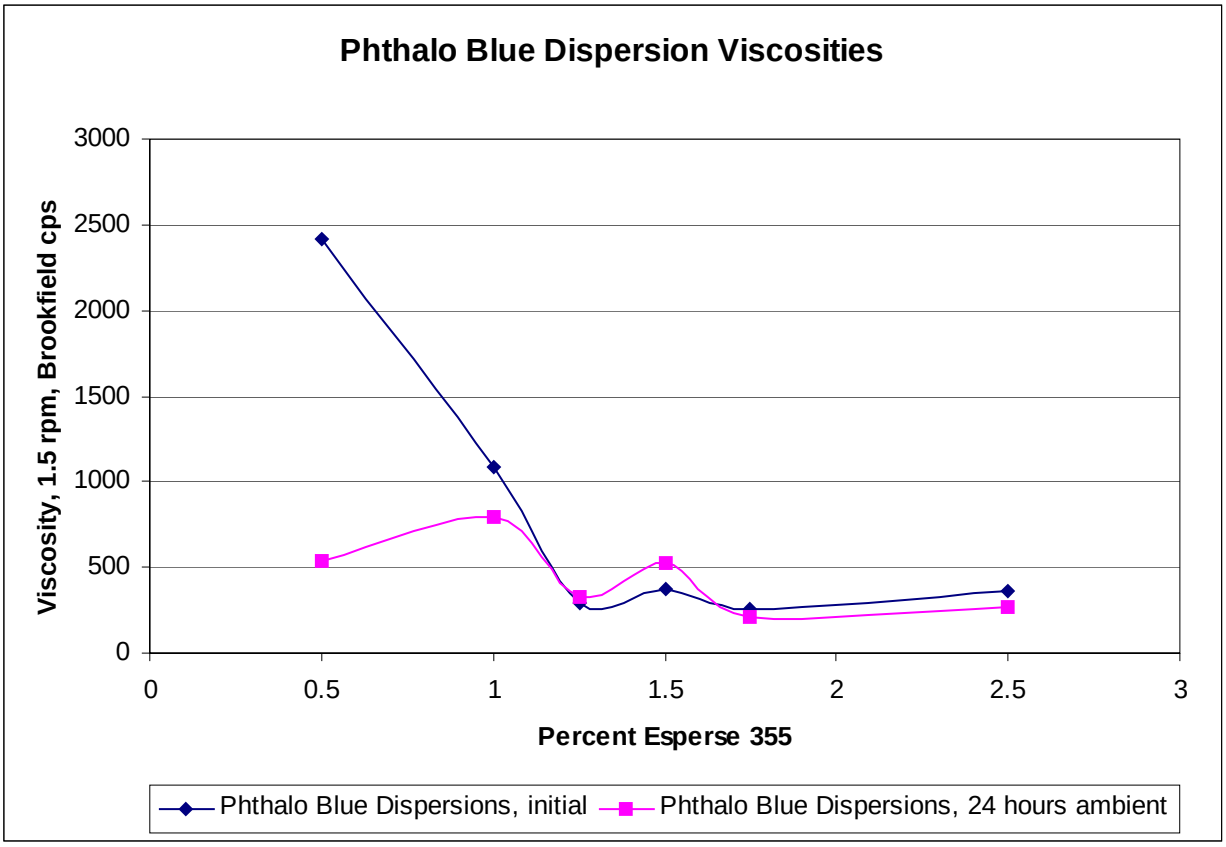
BW 1531, YE 1403: Pacific Coast Enterprises, 713-914-0355
57 DT 688: CDR/Flint
Joncryl 63: BASF
Defoamer 31: ETHOX Chemicals, LLC

Viscosities of each dispersion were measured initially and after aging. The lowest viscosity dispersions in each set were heat aged at 120° F overnight and rechecked for stability.

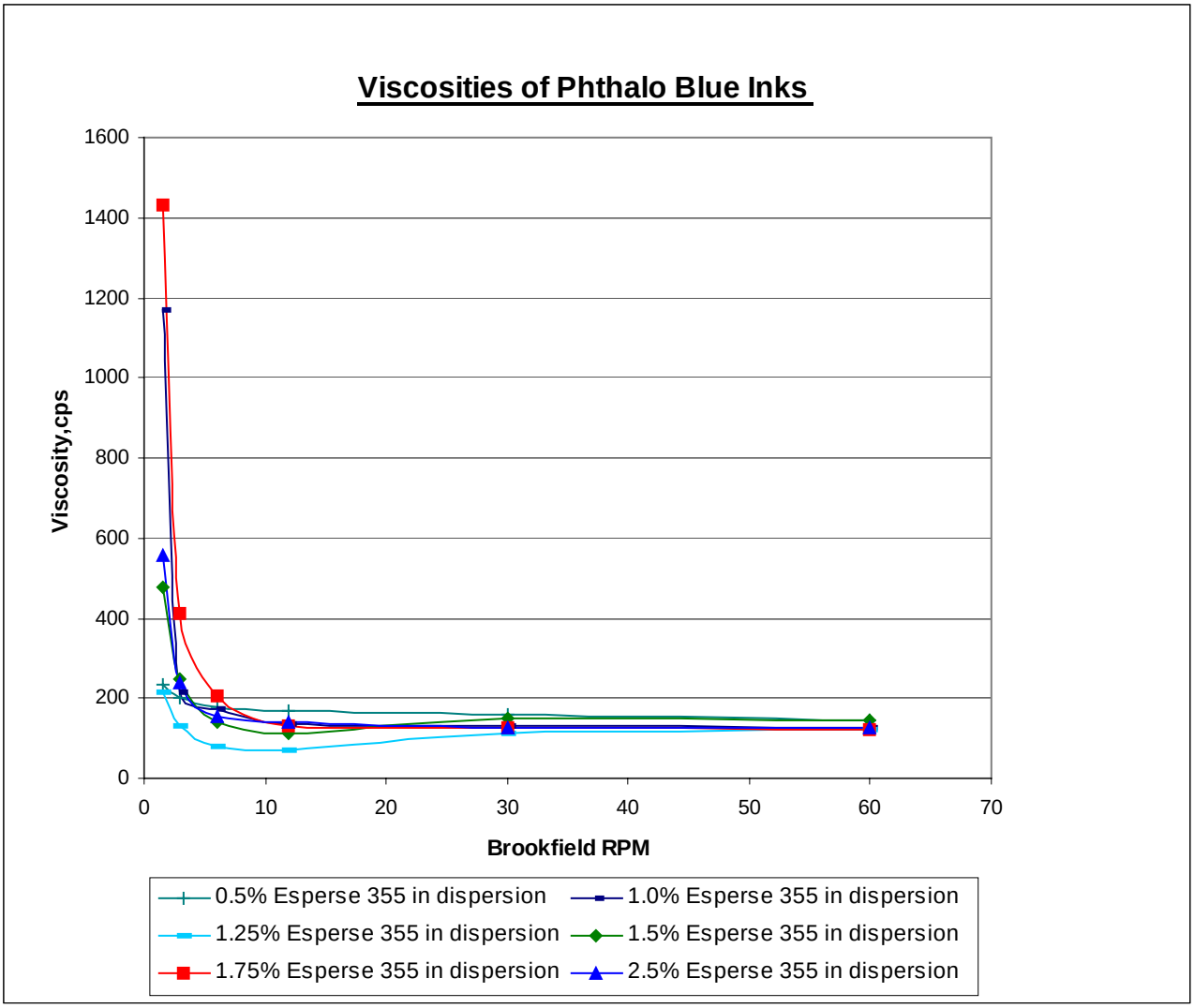
Inks were made by combining 17.5 parts of dispersion with 32.5 parts of vehicle with composition:

ECO 2177 (BASF)	68.42
Joncryl 63 (BASF)	26.32
Water	5.26
TOTAL	100.0

PHTHALO BLUE DISPERSIONS: Though from the viscosity data for the dispersions it appeared that all levels of Esperse 355 promoted low viscosities, some air entrainment occurred at lower E355 levels. It can be seen in the 24 hour data that the viscosities of dispersions with E355 levels below 1.25% dropped, most likely due to air dissipation. The viscosities of the dispersions with higher levels of E355 did not increase:

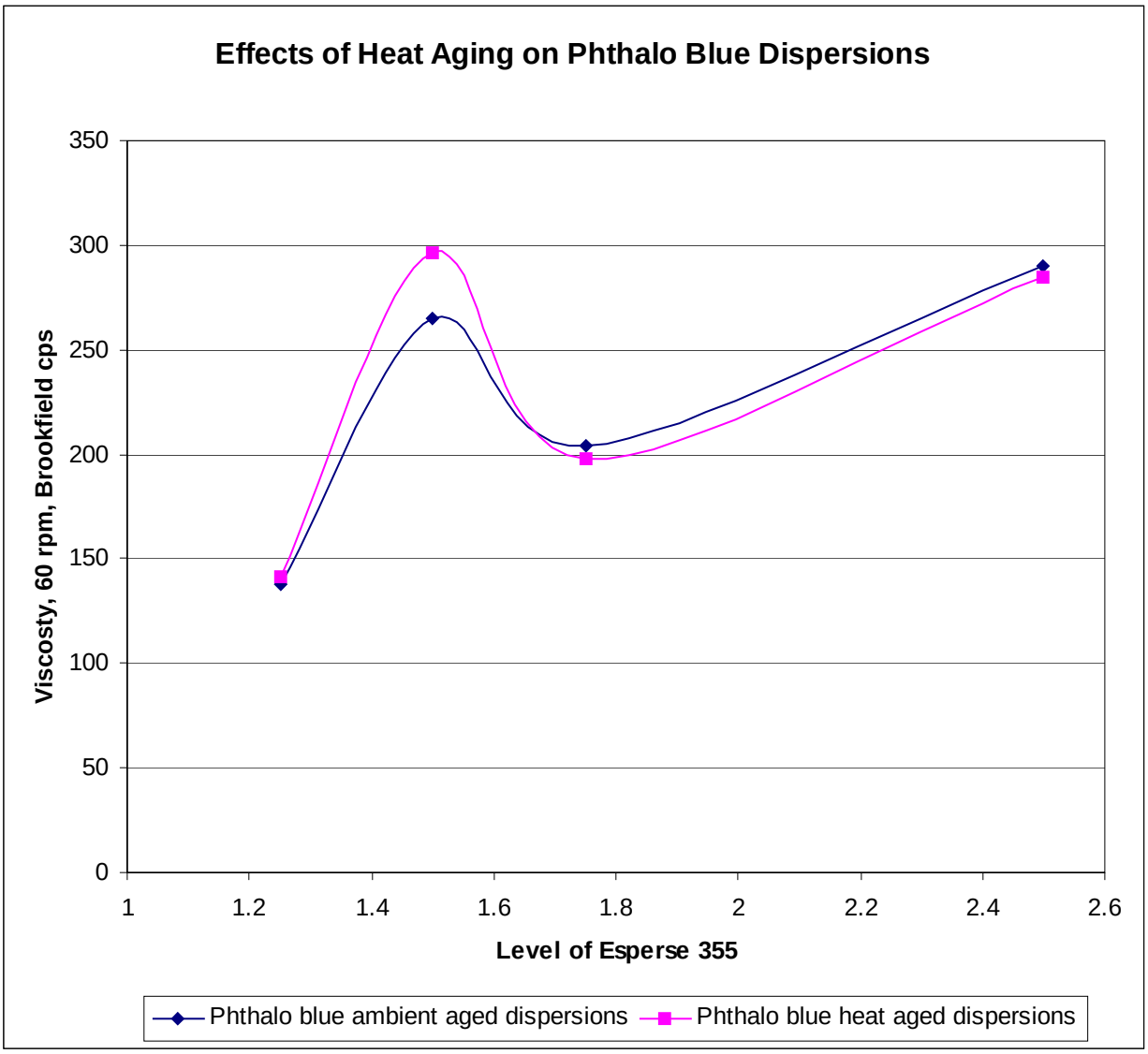


Inks made from these dispersions showed the most optimum viscosity behavior (least pseudoplasticity) with levels of E355 at 0.5% and 1.25% in their respective dispersions:

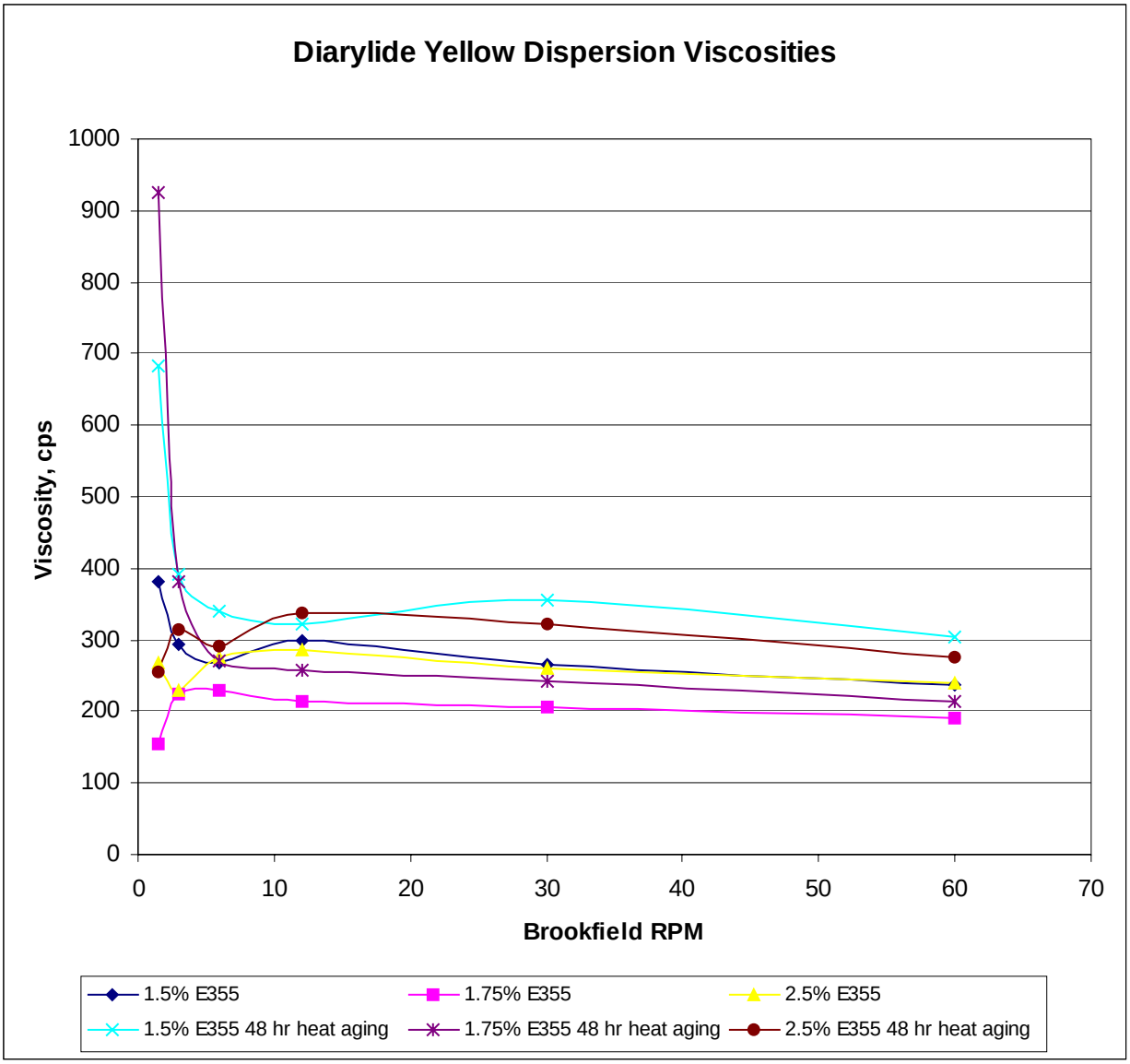


The inks were checked for water resistance issues; no water sensitivity was noted for any of the use levels of Esperse 355.

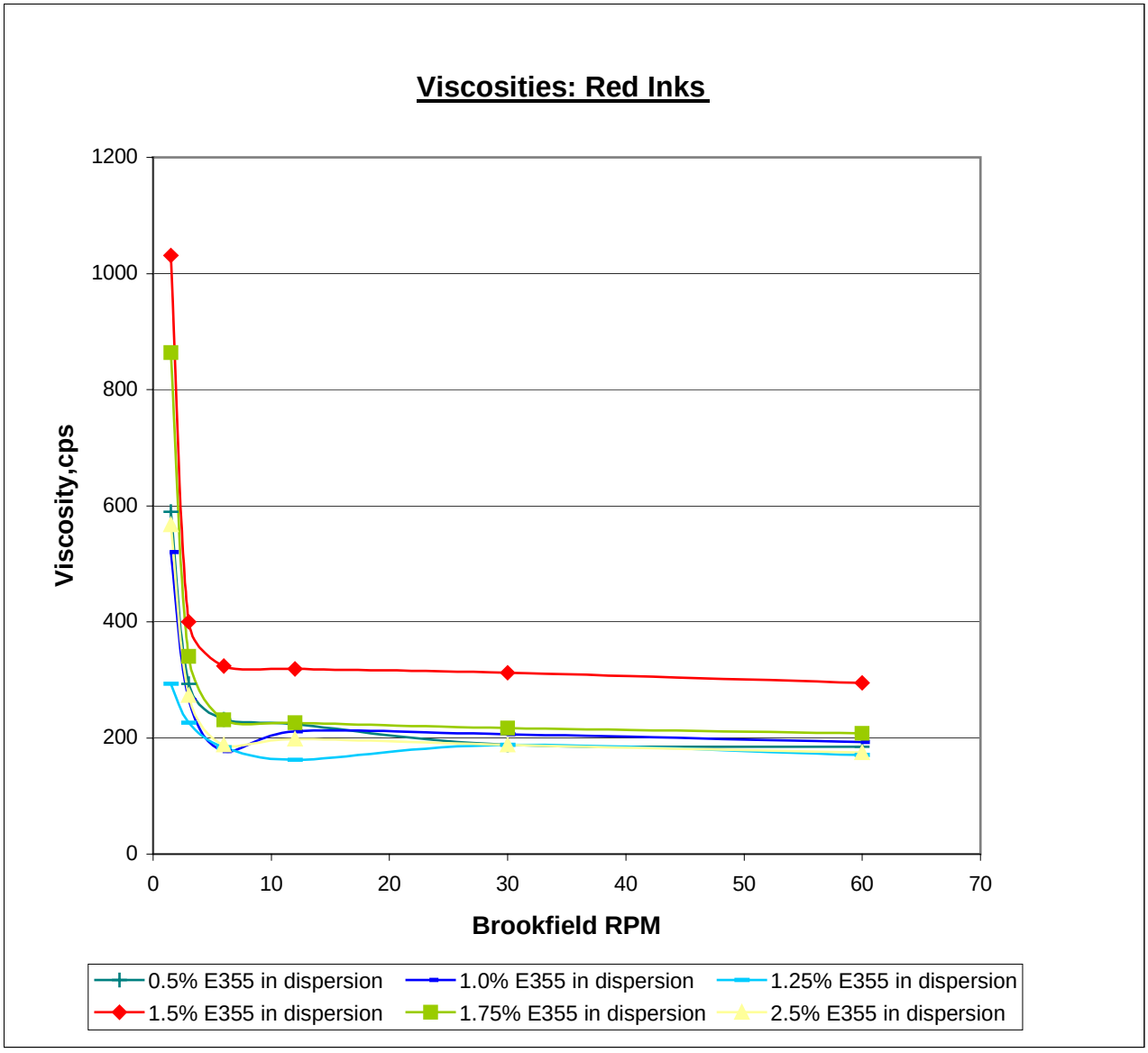
Dispersions –3, –4, -5, and –6 (those with 1.25%, 1.50%, 1.75%, and 2.5% E350 respectively) were heat aged in a 120° F oven for 72 hours, and their viscosities rechecked. The viscosities of all four dispersions were very stable; no increases were noted:



DIARYLIDE YELLOW DISPERSIONS: Levels of Esperse 355 from 1.5% and up mitigated air entrainment in the dispersions. All levels of Esperse 355 with this yellow produced very stable dispersions and inks. Heat aged tests showed the dispersion with 2.5% Esperse 355 to be most viscosity stable; only slight viscosity increases occurred at lower levels of E355:



LITHOL RUBINE DISPERSIONS: At 1.25% Esperse 355, a low viscosity 37% lithol rubine dispersion was prepared with CDR/Flint's 57DT 688 pigment. It was clear from the ensuing ink formulations that having this level of additive in the grind minimized ink pseudoplasticity:



In summary, use of Esperse 355 –

- ✓ Minimizes air entrainment
- ✓ Lowers dispersion viscosity so that higher pigment loadings can be attained
- ✓ Does not increase water sensitivity at the recommended use levels
- ✓ Decreases pseudoplastic behavior of dispersions and inks
- ✓ Does not detract from gloss and transparency of inks and coatings
- ✓ Provides colloidal (shock) stability
- ✓ Provides heat stability to pigmented dispersions