

Eastman Solus™ 2100 performance additive for industrial alkyd coatings



Introduction

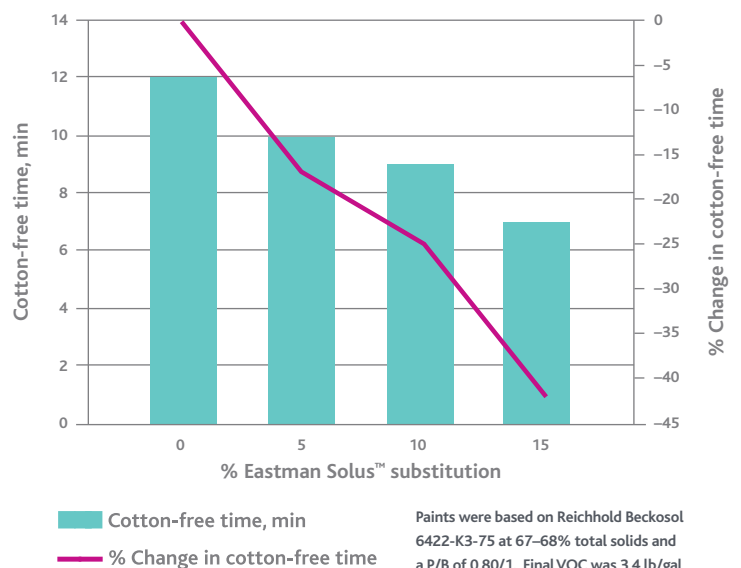
Alkyd resins continue to be used in a broad variety of industrial coatings applications, and are preferred for their gloss, flow and leveling properties. The continued pressure of lower VOC limits has forced resin producers to manufacture lower molecular weight resins in order to meet these new targets. The results are slower drying systems especially in the applications using high solid short-oil alkyds. Paint formulators can offset these deficiencies by incorporating additives such as high Tg acrylics, medium-oil alkyds, cellulose acetate butyrates and polyisocyanates; but often find that they are marginally compatible and could possibly increase the VOC content of the finished coating. As for the latter, polyisocyanates make it a two component coating introducing pot life issues and are more often used to offset slower property development than to reduce early dry time.

Eastman Solus™ 2100 performance additive allows formulators to reduce the cotton-free time of an alkyd system yielding a cleaner contaminate-free surface and fewer defects. Solus™ 2100 is supplied as a free flowing powder and has a broad compatibility with typical solvents used with alkyd systems. This allows it to be incorporated even in high solids systems. Figure 5 illustrates the viscosity of Solus™ 2100 in a variety of solvents.

Performance

Laboratory testing was conducted with a commercially available chain-stopped short-oil alkyd. Three levels of alkyd resin solids were substituted: 5, 10 and 15%. Improvements in the cotton-free times were observed, as shown in Figure 1, without sacrificing key performance properties such as gloss, durability or early water resistance.

Figure 1 Observed cotton-free times with Eastman Solus™ 2100



Paints were based on Reichhold Beckosol 6422-K3-75 at 67–68% total solids and a P/B of 0.80/1. Final VOC was 3.4 lb/gal and DFT for the test panels was targeted at 2.0 mils. Complete formulation located at the end of the brochure.

The graphs in Figures 2 and 3 also depict the drying characteristics of the same alkyd control paint and 10% Eastman Solus™ 2100 substituted paints seen on the previous page, but measured with a TA Instruments AR2000 rheometer. In Figure 2 the viscoelastic character was measured using a “T-bar” and cup attachment on the rheometer.¹ Dry-to-touch (DTT) or gel point can be defined as the time when the elastic component (G') is equal to the viscous component (G'').² The rapid increase in the elastic modulus (G') for the Solus™ 2100 containing system as compared to the control formulation indicates superior film forming behavior. The 10% Solus™ 2100 substituted paint measured a DTT of 18.5 minutes versus 25 minutes for the control paint, or approximately 26% reduction in time. This is comparable to the cotton-free time observed in Figure 1, where a 25% reduction in DTT was observed at the same substitution level.

A rapid rise of $\text{Tan } \delta$ is often an indication of better flow and leveling properties during the initial stages of film formation. Figure 3 reveals a pronounced increase in $\text{Tan } \delta$ for the Eastman Solus™ 2100 containing system as compared to the alkyd control. This is indicative of improved flow once the coating has been applied onto the substrate. Thereafter the steep decline in $\text{Tan } \delta$ for the Solus™ 2100 formulation also shows a greater dominance of the elastic component during the subsequent drying phase.

Early hardness improvement can be observed with the use of Eastman Solus™ 2100 as seen in Figure 4. This data set depicts hardness development of a short-oil alkyd and Solus™ 2100-alkyd solutions cast as clear films in order to negate the influence of pigments such as TiO_2 on the film's hardness. Solus™ 2100 provides an increase in the coating's early hardness, allowing applicators an earlier handling of finished parts.

¹ Bhattacharya, D., Seo, K., Germinario, L.T., Clark, M.D., McCreight, K.W., Williams, C., "Novel Techniques to Investigate the Impact of Cellulose Esters on Rheological Properties and Appearance in Automotive Basecoat Systems." *J. Coat. Technol. Res.* 4 (2) 139–150 (2007)

² Baghdachi, J. et al, *J. Polymer Sci., Part B: Polymer Physics*, 43, 233 (2005)

Figure 2 Effect of Eastman Solus™ 2100 on viscoelastic properties during drying

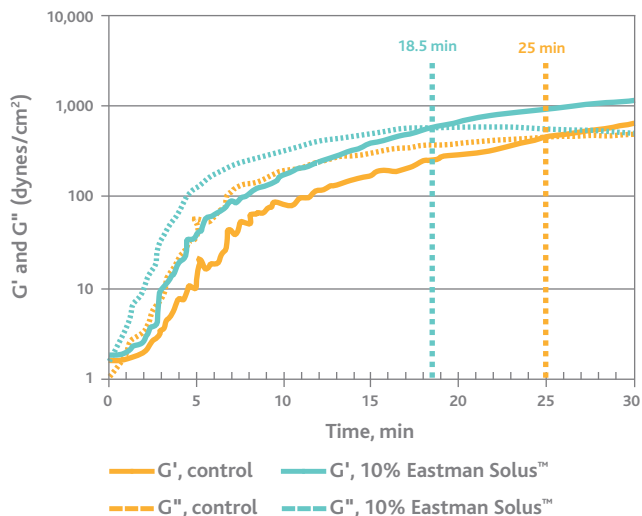


Figure 3 Eastman Solus™ 2100 influence on $\text{Tan } \delta$ during drying phase

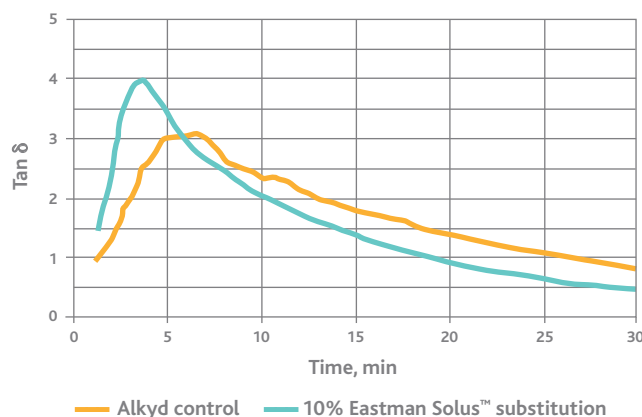


Figure 4 Pendulum hardness development

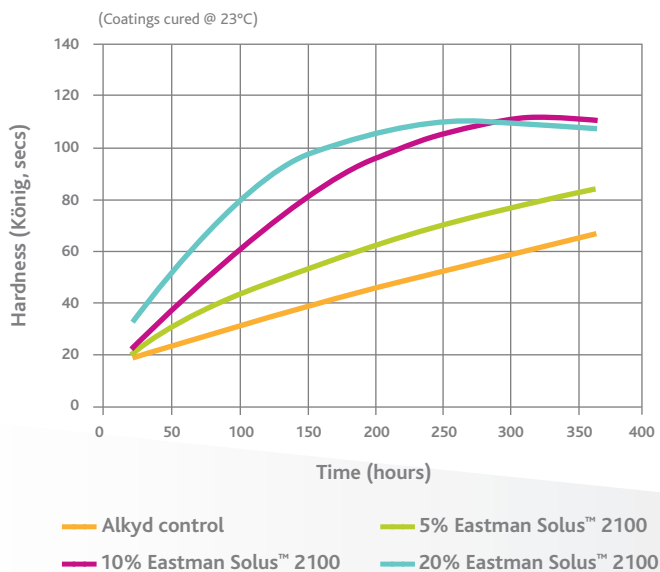
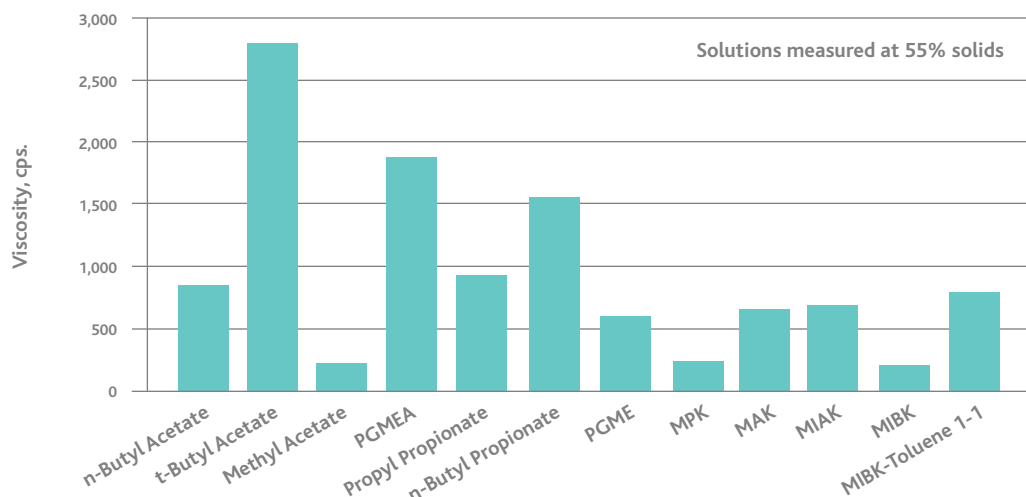


Figure 5 Eastman Solus™ 2100 viscosities in various solvents



Eastman Solus™ 2100 does exhibit a good tolerance to aromatic and aliphatic hydrocarbons. When formulating into an alkyd system, one should select a more active solvent as the tail solvent to maximize the compatibility and gloss in final coating appearance.

Value

Eastman Solus™ 2100 is an ideal additive for those formulators of alkyd systems who are looking for ways to speed up their dust-free times, reduce the window for contamination on the coating's surface and increase

production rates. As a coating additive, Solus™ 2100 has also found benefits for use in a variety of chemistries (2K-PU, UV resins, and acrylic lacquers) and applications (industrial finishes, clearcoats and primers).

Table 1 Control formulation used in determining cotton-free times

Control Alkyd		
Raw material	Wt.	Vol.
Titanox™ 2160 ¹	308.20	9.01
Beckosol™ 6422-K3-75 ²	123.26	14.34
Xylene	61.63	8.56
Nuosperse™ 657 ³	7.35	0.94
Disperse to 7+		
Beckosol™ 6422-K3-75 ²	390.35	45.39
6% Cobalt HexCem ⁴	3.20	0.44
6% Zirconium HexCem ⁴	6.41	0.90
5% Calcium HexCem ⁴	6.41	0.86
Exkin #2 ⁴	0.76	0.10
Xylene	140.12	19.47
Total	1,047.69	100.00

Substitutions of Eastman Solus™ 2100 for the alkyd resin was conducted on a resin solids basis. Solus™ 2100 solutions were prepared at 50% solids in MIAK.

¹ Kronos, Inc. ² Reichhold Chemical, Inc. ³ Condea Servo LLC ⁴ OM Group, Inc.



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