EASTMAN

Eastman Texanol™ ester alcohol and Eastman Optifilm™ enhancer 400

Optimizing the performance of low emission silk paints using blends

Introduction

For the last 50 years, Eastman Texanol™ ester alcohol has been, and continues to be, the premier coalescing aid for architectural coatings. The popularity of Texanol can be attributed to its ability to meet many of the VOC (volatile organic compound) regulations while providing the highest level of film integrity at low addition levels. Texanol is a very efficient coalescent which is suitable for use in a broad range of different latex types.

In 2014, following on from several years of successful sales in the US, Eastman launched Optifilm™ enhancer 400 into Europe. As a potential full/partial replacement for conventional volatile coalescing aids this zero-VOC, near-zero emission coalescing aid gives formulators the opportunity to reduce the amount of resources spent on the (re) formulation of low emission coatings. Texanol will continue to be the leading choice for many formulators; however, offering an enhanced portfolio of coalescents provides the coatings formulator with more options for designing a range of products from traditional coalesced systems to the latest low emission systems. While paints that meet the highest emission standards can be formulated with traditional coalescents, adding a new low emission coalescent to our portfolio allows formulators options for transitioning away from volatile to non-volatile coalescents when required.

Optifilm 400 is an extremely low emitting, low odour coalescing aid. Unlike conventional volatile coalescing aids, Optifilm 400 remains in the paint film which, in silk formulations that contain very high levels of polymer, can potentially negatively impact the block resistance and hardness development of the coating. It is to be noted that in the majority of paints, the use of Optifilm 400 does not negatively impact the block resistance or hardness of the coating.

This technical tip illustrates why Texanol is the perfect blending partner for Optifilm 400 when formulating low emission silk paints. The combination of a volatile with a non-volatile coalescing aid helps to reduce emissions while maintaining excellent final paint film properties.

When formulating with a non-volatile coalescing aid it is important that the formulator determines the optimum coalescent demand for the paint system. Too little Optifilm 400 can result in insufficient coalescence of the film while too much will have an adverse effect on the final paint film properties. It is advised that formulators conduct a ladder study to define the optimal amount of coalescent for their paint system.

For laboratory testing, we recommend that the coalescent is added to the paint and left to equilibrate for **a minimum of 24 hours** before any evaluations are conducted (including minimum film formation tests).

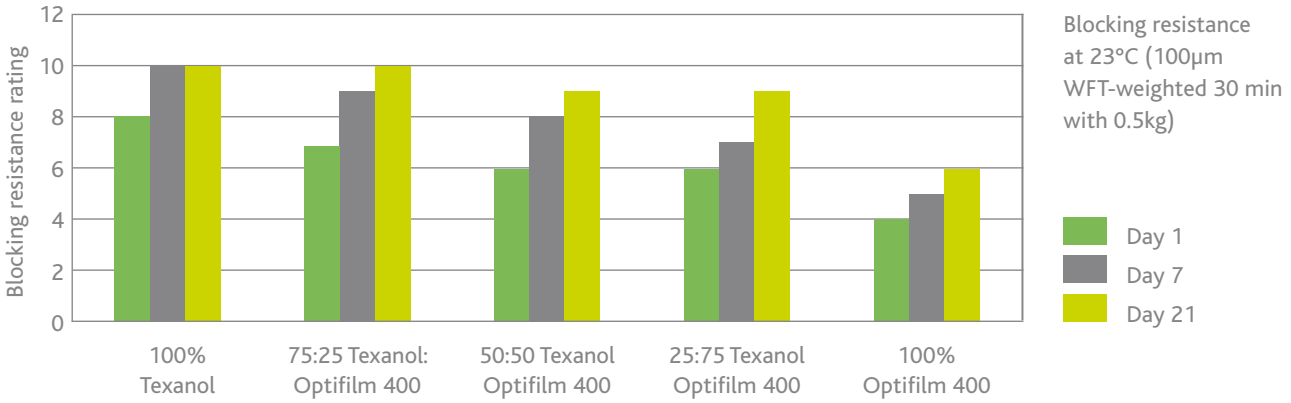
Experimental

To demonstrate the benefits of blending Eastman™ ester alcohol Texanol with Eastman Optifilm™ enhancer 400, silk wall paints were formulated using blends of 75:25, 50:50, 25:75 (Texanol: Optifilm 400). See Table 3 for formulations.

The emissions were tested in accordance with "Le Grenelle de l'environnement" French regulation and the TVOC content (total volatile organic compounds) was determined after 28 days. Hardness development, block resistance and wet scrub resistance were also evaluated. The results are as follows.

Final paint film properties

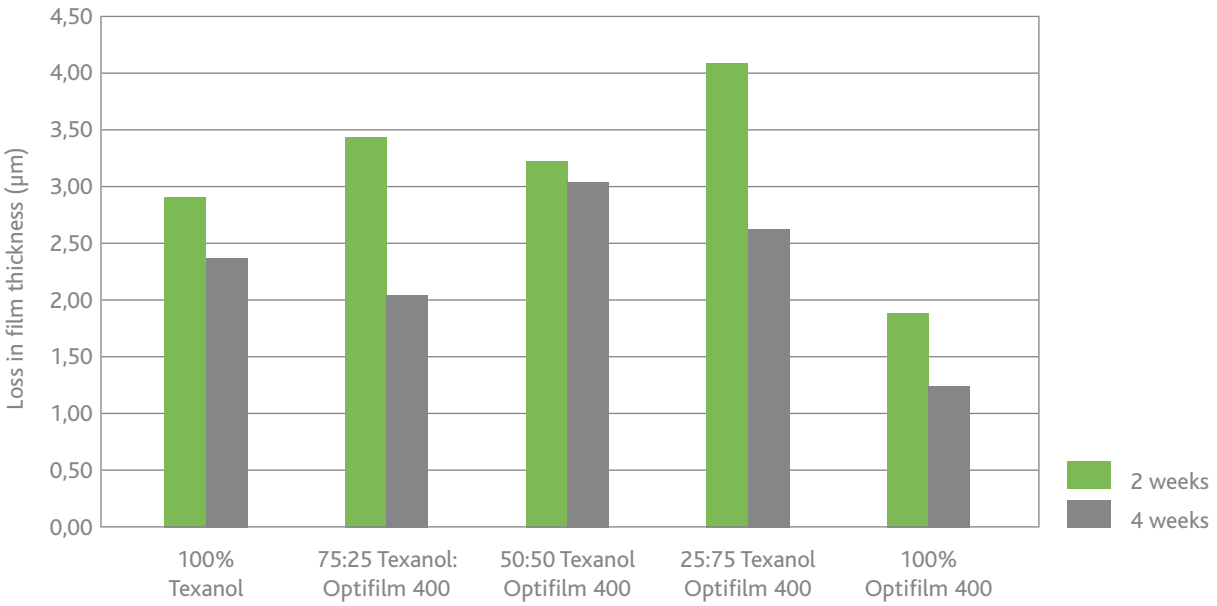
Figure 1. **Blocking resistance (23°C)**



The test paint containing 100% Texanol showed the best block resistance over the 21 day test period. See Table 5 for blocking resistance ratings.

The optimum blend ratio for good block resistance is 75:25 Texanol to Optifilm 400.

Figure 2. **Wet scrub resistance (EN ISO 11998)**



All five paint samples exhibited similar wet scrub resistance and produced the highest wet scrub ISO classification of class one (<5µm paint loss after 200 scrub cycles). After conditioning the paint films for 4 weeks the 75:25 (Eastman Texanol™ ester alcohol: Eastman Optifilm™ enhancer 400) blend exhibited marginally better wet scrub resistance than the other Texanol: Optifilm 400 blend ratios tested. The 100% Optifilm 400 paint had better wet scrub resistance at both 2 weeks and 4 weeks.

Table 1. **Paint emissions results (ISO 16000, see appendix for method)**

Paint sample (silk)	TVOC (µg/m³)	Classification
100% Texanol	2500	C
75 Texanol: 25 Optifilm 400	2100	C
50 Texanol: 50 Optifilm 400	1800	B
25 Texanol: 75 Optifilm 400	770	A+
100% Optifilm 400	26	A+

All of the silk test paints met the criteria set out in "Le Grenelle de l'environment" French regulation. The sample of paint containing 100% Optifilm 400 and the 25:75 blend of Texanol:Optiflm 400 meet the requirement of the A+ classification.

It is to be noted that the TVOC level is comprised of volatiles from the various ingredients of the paint formulation. For example, in the 100% Optifilm enhancer 400 paint, out of the 26 µg/m³ of TVOC only 2 µg/m³ was attributed to Optifilm 400.

Conclusion

This evaluation demonstrates the benefits of blending Eastman Texanol™ ester alcohol and Eastman Optifilm™ enhancer 400 in a high polymer content silk wall paint formulation. The volatility of Texanol helps to boost the early hardness development and block resistance of the coating whilst the addition of Optifilm 400 helps to reduce the emissions from of the coating.

The 25:75 blend (Texanol:Optifilm 400) had a significantly lower TVOC value than the paint sample formulated with 100% Texanol, taking the paint from a C classification to an A+ classification.

For more information on the benefits of using Optifilm 400, please refer to http://www.eastman.com/Literature_Center/T/TTEU143.pdf.

To find out more about Texanol, please refer to http://www.eastman.com/Literature_Center/M/M329.pdf and http://www.eastman.com/Literature_Center/M/MEU596.pdf

Appendix

Method for "Le Grenelle de l'environnement" emissions testing

The TVOC content (total volatile organic compounds) was measured in accordance with "Le Grenelle de l'environment" regulations. The French mandatory VOC regulation forces any listed product placed on the market to state its emission class based on the emissions from the product after 28 days.

The testing of the paints was carried out in accordance to ISO 16000 at an independent, fully accredited laboratory in France. Two films were applied onto a test plate to give a total wet film thickness of 210µm. The coated test plate was transferred to a test chamber which had a volume of 110 litres.

It is to be noted that the 100% Optifilm 400 paint was tested internally on a different occasion in accordance with ISO 16000. The paint was coated onto an aluminium sheet using a No.8 K-bar to give a nominal wet film thickness of 100µm.

For further information on the emissions test results please contact your Eastman representative.

Table 2. **Classification criteria for "Le Grenelle de l'environnement" regulation**

Classes	C (µg/m³)	B (µg/m³)	A (µg/m³)	A+ (µg/m³)
TVOC	**> 2000**	**< 2000**	**< 1500**	**< 1000**
Formaldehyde	> 120	< 120	< 60	< 10
Acetaldehyde	> 400	< 400	< 300	< 200
Toluene	> 600	< 600	< 450	< 300
Tetrachloroethylene	> 500	< 500	< 350	< 250
Xylene	> 400	< 400	< 300	< 200
1,2,4-Trimethylbenzene	> 2000	< 2000	< 1500	< 1000
1,4-Dichlorobenzene	> 120	< 120	< 90	< 60
Ethylbenzene	> 1500	< 1500	< 1000	< 750
2-Butoxyethanol	> 2000	< 2000	< 1500	< 1000
Styrene	> 500	< 500	< 350	< 250

Table 3. **Silk paint formulations with different blend ratios of Eastman Texanol™ ester alcohol to Eastman Optifilm™ enhancer 400**

		Blends of Texanol: Optifilm enhancer			
Raw material	**100% Texanol**	**75 : 25**	**50: 50**	**25 : 75**	**100% Optifilm 400**
Millbase					
Deionised water	112.50	112.50	112.50	112.50	112.50
Dispex™ CX 4240 (NH_3 neutr)[a]	3.00	3.00	3.00	3.00	3.00
AMP-95™[b]	1.00	1.00	1.00	1.00	1.00
Acticide™ MBS[c]	2.00	2.00	2.00	2.00	2.00
BYK™ 1615[d]	1.00	1.00	1.00	1.00	1.00
Tiona™ 595[e]	192.10	192.10	192.10	192.10	192.10
Microdol™H600[f]	39.40	39.40	39.40	39.40	39.40
Letdown					
Bermocoll™ E320 FQ[g] 3% solution in deionized water	151.60	151.60	151.60	151.60	151.60
BYK™ 1615[d]	1.00	1.00	1.00	1.00	1.00
Vertec™ AT33[h]	3.00	3.00	3.00	3.00	3.00
Ropaque™ Ultra[j]	70.80	70.80	70.80	70.80	70.80
Acrona™l S790 (50% solids)[k]	400.30	400.30	400.30	400.30	400.30
BYK™ 348[d]	2.30	2.30	2.30	2.30	2.30
Texanol™[l]	20.00	15.00	10.00	5.00	0.00
Optifilm™ 400[l]	0.00	5.00	10.00	15.00	20.00
Total (g)	**1000.00**	**1000.00**	**1000.00**	**1000.00**	**1000.00**

[a] Basf, [b] Angus, [c] Thor, [d] Byk, [e] Cristal, [f] Sibelco, [g] AkzoNobel, [h] Johnson Matthey Catalysts, [j] Dow, [k] Basf, [l] Eastman Chemical Company

Table 4. **Scrub test classification/evaluation of loss of dry film thickness after 4 weeks drying (DIN EN 13 300)**

Loss in film thickness	Scrub cycles	Class
< 5 µm	200	1
> 5 µm and < 20 µm	200	2
> 20 µm and < 70 µm	200	3
< 70 µm	40	4
> 70 µm	40	5

Table 5. **Blocking resistance ratings**

Rating	Adhesion
10	No tack-perfect
9	Trace tack-excellent
8	Very slight tack-very good
7	Very slight tack-good to very good
6	Slight tack-good
5	Moderate tack-fair
4	Very tacky/no seal-fair to poor
3	5-25% seal-poor
2	25-50% seal-poor
1	50-75% seal-very poor
0	75-100% seal-total failure

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