

Eastman Optifilm™ additive OT1200: Low VOC solution for improved open time in interior flat paint

Eastman Optifilm™ additive OT1200 has been designed to enable formulators to produce low VOC architectural paints with good open time without compromising paint performance.

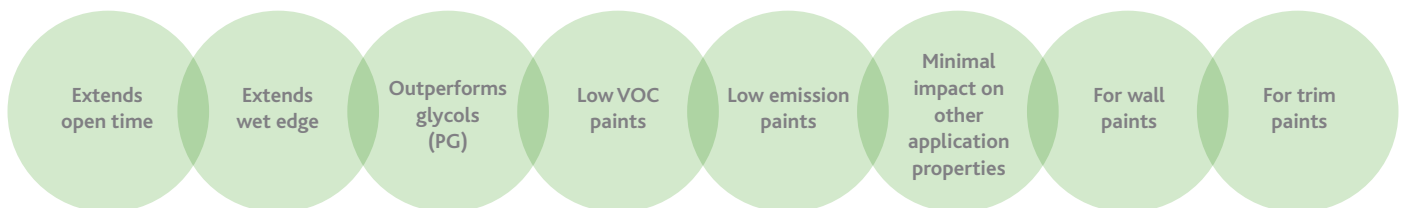
Optifilm OT1200 significantly extends the open time and wet edge of many water-based architectural paint systems. OT1200 has been evaluated in a variety of trim and wall paint systems including pure acrylics, styrene acrylics, vinyl acrylics, and vinyl acetate ethylenes.

Ethylene glycol (EG) and propylene glycol (PG) are commonly used as open time extenders. However, these glycols are considered to be volatile organic compounds (VOCs) according

to EPA Federal Reference Method 24 and ASTM Standard Practice D3960. Open time, wet edge, and workability are often compromised when glycols are removed from a formulation. Optifilm OT1200 provides an effective low VOC option to replace these glycols. Formulation and application results have demonstrated that Optifilm OT1200 can match or improve the performance of PG in a variety of paints while maintaining other key coating properties.

Various wall and trim paints have been prepared and tested. This technical tip will outline the improvement in open time and wet edge for one of the wall paints which was evaluated.

Features and benefits of Eastman Optifilm™ additive OT1200



Evaluation of Eastman Optifilm™ additive OT1200 in a flat wall paint formulation

Eastman Optifilm™ additive OT1200 has been fully evaluated in numerous wall and trim paint formulations. In all cases, the open time and workability of the paint is matched or improved at lower VOC. Detailed on the following pages are the application results for a 32 g/L flat wall paint based on Arkema's UCAR™ Latex 379G vinyl acrylic binder with a pigment volume concentration (PVC) of 63% and non-volatiles by volume (NVV) of 36%. PG was used at 1% on total solids in

the control, while two additional paints were prepared by replacing the PG with 1.5% and 3% actives OT1200 while maintaining water content and adjusting back to target viscosity. Details regarding the formulations are provided in Appendix I, and guidelines for incorporation of Optifilm™ additive OT1200 are summarized in Appendix II. The results which follow provide insight as to the extension of open time that can be achieved in the flat wall paint with OT1200.

Results

Open time and wet edge

One of the most common techniques for evaluation of open time and wet edge requires a paint film to be drawn down on a sealed chart using a 3-mil Bird bar. A column of "X" marks is made in the center of the drawdown in accordance with Figure 1. After fixed periods of time, paint is brushed four cycles back and forth across the film. The point at which the edge of the drawdown can no longer be worked into the body of the paint is referred to as the wet edge time, while the time at which the "X" begins to show through the paint is deemed the open time.

Figure 1. Typical test method for evaluation of open and wet edge times

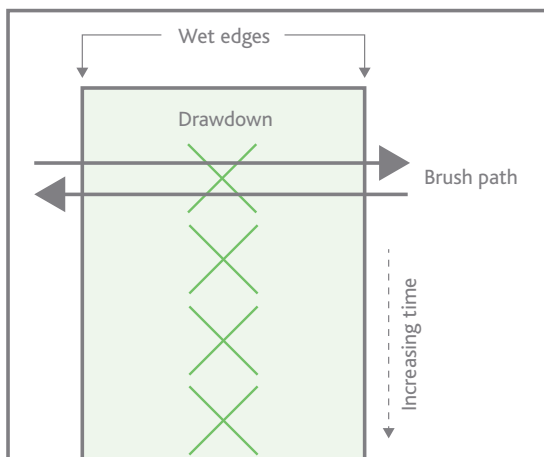
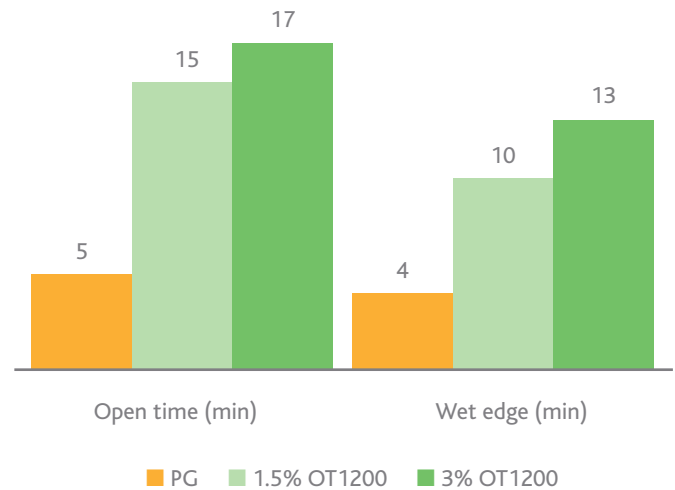


Figure 2 provides a graphical view of the improvement in open time and wet edge achieved in the flat wall paint formulation with OT1200. Photos of panels illustrating the improved workability that is possible with OT1200 are provided in Appendix III.

Figure 2. Flat wall paint: open and wet edge times



Note: Wet edge time is reported as an average of the left edge and right edge values.

Eastman Optifilm™ additive OT1200 significantly improves the open time and wet edge of the paint while reducing VOC.

Application performance of flat wall paint

In addition to the open time tests, a range of other application tests were conducted and the differences against the PG control recorded in Table 1.

The results show that with Eastman Optifilm™ additive OT1200 it is possible to significantly improve open time, wet edge, and workability without compromising paint performance as compared with the PG control.

Table 1. Comparison of properties between Eastman Optifilm™ additive OT1200 and PG control paints

Property evaluated	OT1200 vs. PG control	Comments	Test method
Open time	↑	Significant improvement with OT1200	See Figure 1
Wet edge	↑	Significant improvement with OT1200	See Figure 1
Workability	↑	Significant improvement with OT1200	Internal test method
Scrub	≈ / ↓	Similar for 1.5% OT1200, lower for 3%	ASTM D2486
Block resistance	≈	No major difference in block resistance	ASTM D4946
Wet adhesion	≈	No major difference in wet adhesion	ASTM D6900
Sag	↓	2 mil reduction in sag resistance	ASTM D4400
Levelling	≈	No difference in levelling	ASTM D4062
Colorant acceptance	≈	Slightly larger ΔE for 3% OT1200	ASTM D5326
Heat stability	≈	Storage stability good	pH and viscosity 4 wks @ 120°F

Conclusion

Architectural paints tend to be formulated with glycols such as propylene or ethylene glycol to control open time and wet edge. These glycols are VOCs according to EPA Reference Method 24. Eastman's open time additive, Eastman Optifilm™ additive OT1200, is low in VOC. Its incorporation into a variety of paint formulations enables formulators to produce low VOC coatings.

In this technical tip, Optifilm™ OT1200 has been demonstrated to be an effective low VOC option to replace PG in a flat wall paint without compromising paint performance. It has also been shown that not only can Optifilm OT1200 match the performance of PG, it can also significantly improve upon it by further extending open time, wet edge, and workability of the paint.

Appendix I. Flat wall paint formulation^a

Ingredient	Control		1.5% Optifilm™ OT1200		3% Optifilm™ OT1200	
	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
Pigment grind						
Water	295	35.40	295	35.36	296	35.57
Rhodoline™ 226/35 ^b	6	0.61	6	0.61	6	0.61
Tergitol™ NP-9 ^c	2.2	0.25	2.2	0.25	2.2	0.26
Drewplus™ L-475 ^d	8	1.07	8	1.07	8	1.08
Ti-Pure™ R-900 ^e	203	6.11	203	6.10	204	6.14
Snowflake™ P.E. ^f	178	7.84	178	7.83	179	7.88
Minex™ 4 ^g	178	8.20	178	8.19	179	8.24
Ammonium hydroxide (28%)	2	0.24	2	0.24	2	0.25
Proxel™ GXL ^h	0.5	0.05	0.5	0.05	0.5	0.05
Letdown						
UCAR™ Latex 379G ⁱ	224	26.86	223	26.82	225	26.99
Eastman Optifilm™ additive OT1200 ^j	0	0.00	26	2.93	53	5.90
Propylene glycol	10	1.13	0	0.00	0	0.00
Eastman Optifilm™ enhancer 400 ⁱ	3	0.39	3	0.39	3	0.39
Water	91	10.86	74	8.90	48	5.34
Natrosol™ Plus 330 ^d	6.1	0.98	7.7	1.24	8.2	1.32
Totals	1206.8	100.01	1206.8	100.00	1214.6	100.01
Viscosity (KU)	100		84		85	
Viscosity (ICI)	0.6		0.7		0.9	
Density (lb/gal.)	12.1		12.1		12.1	
PVC (%)	63		63		63	
NVV (%)	36		38		40	
VOC (g/L)	32		7		12	

^aFormulation adapted from Arkema Good Quality Interior Flat Paint Formula I-2230A, ^bRhodia, ^cDow Chemicals, ^dAshland, ^eDuPont, ^fImerys, ^gUnimin, ^hArch Chemical, ⁱArkema, ^jEastman Chemical Company

Appendix II. Recommendations for the incorporation of Eastman Optifilm™ additive OT1200

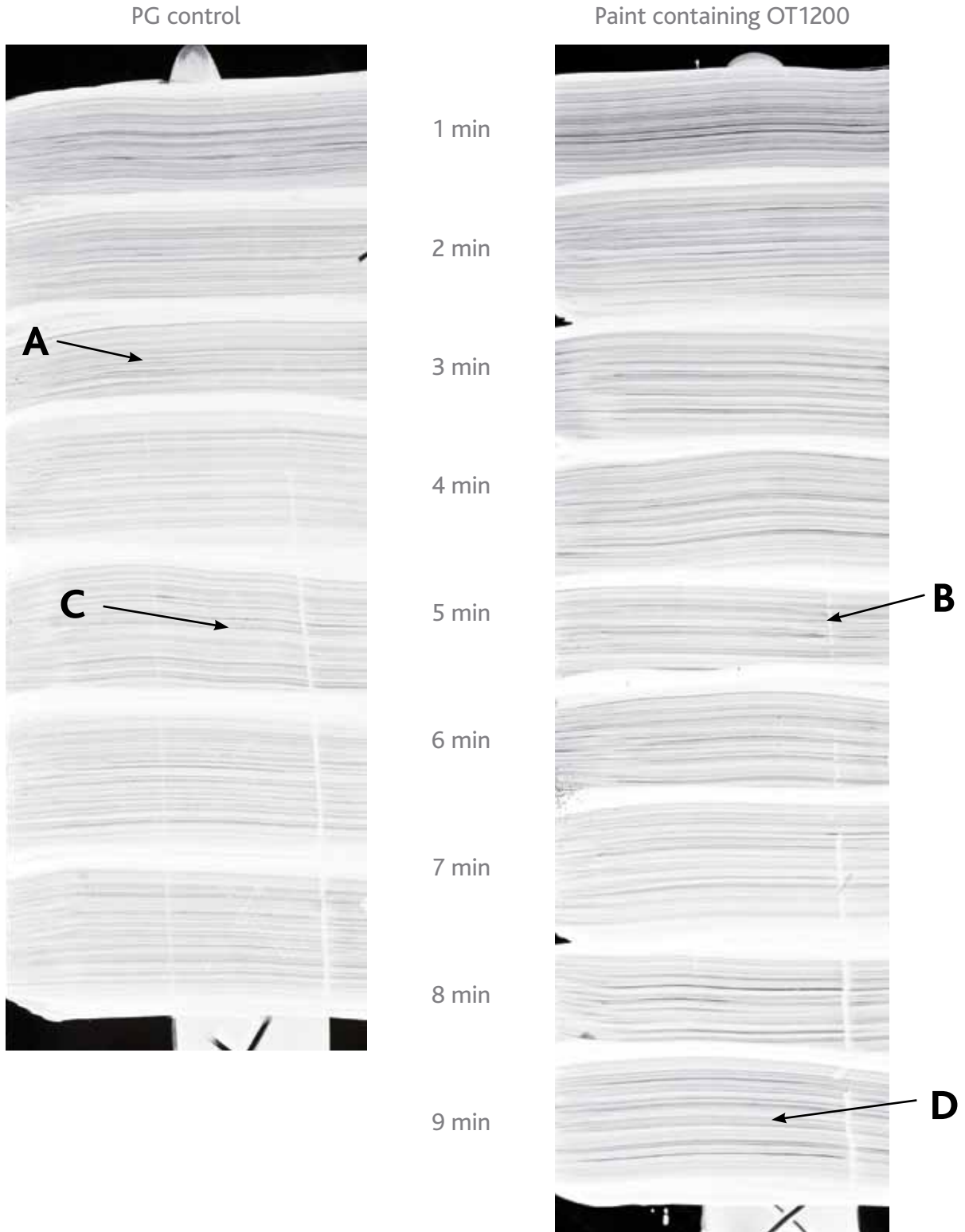
The level of Eastman Optifilm™ additive OT1200 required to improve workability of an architectural paint formulation is typically in the range of 1.5% to 3% actives on total weight. This is only a guideline, as properties are paint dependent.

Since Eastman Optifilm™ additive OT1200 contains approximately 30% water, an equivalent amount of water should be withheld from the formulation in order to keep total water content on target. Optifilm OT1200 additive should be mixed prior to incorporation. OT1200 is typically used in the

letdown and should be added slowly, under good agitation. If desired, OT1200 may readily be diluted with water prior to incorporation. Optifilm OT1200 may impact the rheology of the paint, and in some systems, thickener may have to be adjusted in order to meet viscosity targets.

Eastman Optifilm™ additive OT1200 has some mild coalescent activity, and as a result, an MFFT ladder may be utilized to ensure that the overall coalescent content of the paint is appropriate.

Appendix III. Comparison of workability for PG control with paint containing Eastman Optifilm™ additive OT1200



A indicates wet edge line appearing after 3 minutes

B indicates wet edge line appearing after 5 minutes

C indicates open time lines cannot be brushed through after 5 minutes

D indicates open time lines can still be brushed through after 9 minutes



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