MINEX®
Functional Filler

Accelerated exposure studies of industrial maintenance coatings formulated with MINEX® functional fillers

Abstract

Results from accelerated weathering and corrosion evaluations verified that MINEX functional fillers are a useful tool in the development of non-silica industrial maintenance formulations. In particular, MINEX offered superior gloss protection in polyurethane top coats and corrosion resistance in alkyd primers when compared with alternative minerals.

Objective

Determine the relative performance of industrial maintenance coatings formulated with MINEX and alternative functional fillers after QUV and salt-fog exposure.

Materials and methods

This study was performed using two commonly used binder systems for industrial maintenance coatings, a 2K polyurethane and a conventional solvent based alkyd. The 2K polyurethane was formulated in two parts, and mixed just prior to painting. The panels were sprayed at a thickness of 2-3 mils (25 to 75 microns) and allowed to cure for one week prior to placing them in the QUV/Q-Fog exposure chambers. The fillers tested in this study were MINEX 7 (nepheline syenite), IMSIL® A-10 and A-15 (microcrystalline silica), Min-U-Sil® 30 (silica), Safsil CT-450 (volcanic ash), Nytal 7700 (talc), and Vansil W-30 (wollastonite).

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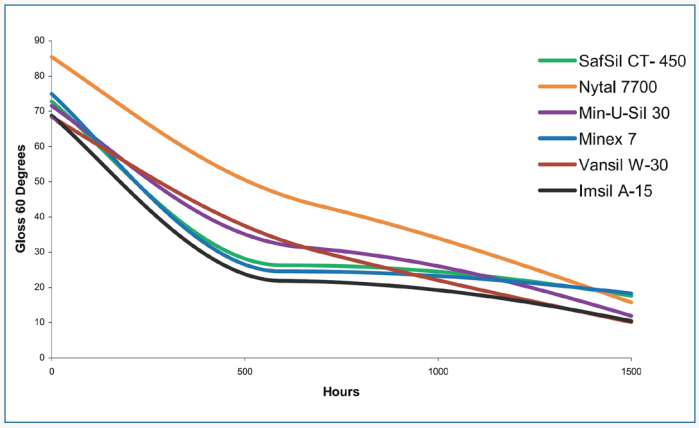
QUV exposure was performed per ASTM G154 Cycle 1. Panels were subjected to 8-hours of UVA-340 UV light at 0.77 W/m_2 at 60˚C followed by 4-hours of dark condensation at 50˚C. It is generally accepted that 1000 hours of QUV exposure is equivalent to 1 year of exposure in South Florida. Gloss was determined with a Hunterlab Progloss instrument. For the salt-fog testing, an indicator of the corrosion resistance of a coating, a large X was scribed into the paint after cure making sure to penetrate the paint down to the metal. After each exposure interval panels were pulled from the chamber and brushed off. The widest point on the scribe line where metal is visible (the “creep”) was then measured. Lower creep equates to better corrosion resistance of the coating. Visual assessments were also made.

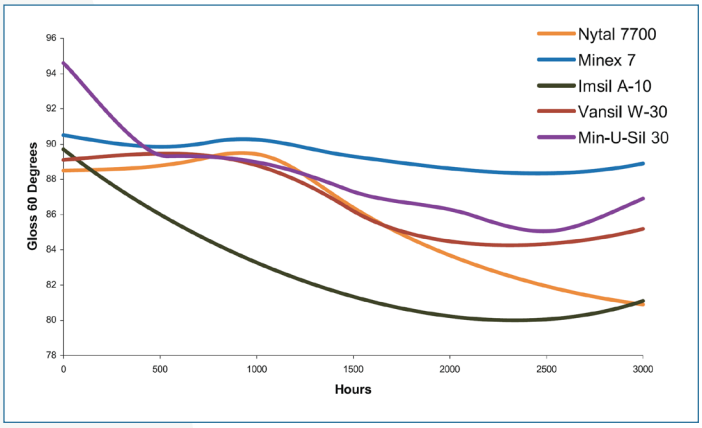
Results and conclusions

A. QUV evaluation:

In the alkyd system (Graph 1) the formulations did not show a great difference in gloss retention. However, MINEX 7 showed the best overall performance in the 2K PU (Graph 2), retaining the highest gloss after 3000 hours of QUV exposure. In this study, the performance of the system was found to be more dependent on the resin type than on the filler, with the polyurethane system providing superior performance to the alkyd as expected. B. Salt-Fog Evaluation: Results are summarized in Table 1. After 500 hours of exposure most panels showed good performance with MINEX 7 performing the best in the alkyd. Min-U-Sil 30, Nytal 7700, and IMSIL A-10 showed the best performance in the polyurethane with no change in the panels.



Graph 1 .Gloss vs. hours in QUV cabinet conventional alkyd formulation



Graph 2. Gloss vs. hours in QUV cabinet polyurethane formulation

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B. Salt-fog evaluation:

Results are summarized in Table 1. After 500-hours of exposure most panels showed good performance with MINEX 7 performing the best in the alkyd. Min-U-Sil 30, Nytal 7700, and IMSIL A-10 showed the best performance in the polyurethane with no change in the panels.

At 1000 hours of exposure most panels were significantly degraded. Safsil CT-450 showed total failure in the alkyd formulation. All the polyurethane panels showed adhesion loss around the scribe lines. This was likely a result of the relative hardness of the PU coatings.
Based on visual inspection (Photos 1 and 2), coatings containing MINEX 7 showed the best overall performance.

Table 1

Solvent-based Alkyd		
	Creepage in inches	
Filler	500 hours	1000 hours
MINEX 7	1/16	1/8
IMSIL A-10	3/8	5/8
Min-U-sil 30	1/8	1/4
Safsil CT-450	3/8	Total Failure
Nytal 7700	1/8	1/4
Vansil W-30	1/8	1/4

Table 2

2K Polyurethane		
	Creepage in inches	
Filler	500 hours	1000 hours
Vansil W-30	1/8	Total Failure
Min-U-sil 30	No Change	Total Failure
MINEX 7	1/16	Total Failure
Nytal 7700	No Change	Total Failure
IMSIL A-10	No Change	Total Failure

Photo 1 – Polyurethane coatings after 1000 Hours salt fog exposure

Photo 2 – Alkyd coatings after 1000 hours salt fog exposure

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