



## Corrosion Inhibitors

### 2K High-Solids Epoxy Primers

*[Application Bulletin No. 9920]*

#### **MOLY-WHITE 331 AND MZAP IN THE DEVELOPMENT OF HIGH PERFORMANCE 2K HIGH SOLIDS EPOXY PRIMERS**

*Molybdate pigments outperform zinc chromate and other inhibitors in 1,000 hr salt-spray and 2,016 hr cyclic salt-spray/UV exposure tests*

Recent testing of MOLY-WHITE MZAP, a calcium zinc phospho-molybdate corrosion inhibitor, and MOLY-WHITE 331, a zinc molybdate corrosion inhibitor, demonstrates the excellent, cost-effective performance of these inhibitive pigments in 2K (two-component), high-solids epoxy primer formulations. MOLY-WHITE MZAP and 331 based systems were found to offer superior salt-spray and cyclic salt-spray/UV exposure results versus competitive inhibitors, all currently promoted for 2K epoxy systems.

Testing was conducted in a model formulation based on Reichhold's Epotuf 37-140/37-650 epoxy resin and hardener. The formula for the MOLY-WHITE MZAP and 331 containing systems are shown in Tables 1 and 2. All corrosion inhibitors were evaluated at an equal weight loading of 1.0 lbs/gal, with slight adjustments made in the extender levels (Barytes #1 and Nylal 300)

as needed to maintain constant PVC and volume solids.

All coatings were applied to hot-rolled blast steel test panels (1.5 – 2.5 mil profile) at a dry film thickness of 3.0 mils (approx. 75 microns), and allowed 1-week ambient cure before starting exposure tests.

Photographs of the test panels are presented in Figure 1. In both 1,000 hr salt-spray (ASTM B117) and 2,016 hr cyclic salt-spray/UV exposure (ASTM D5894), the MOLY-WHITE MZAP and 331 based formulations can be seen to provide superior corrosion resistant performance.

The use of the MOLY-WHITE 331 and MZAP inhibitors results in significantly reduced blistering and surface corrosion in salt-spray testing, and superior scribe line protection in cyclic salt-spray/UV exposure.



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**Table 1 2K High-Solids Epoxy Primer with MOLY-WHITE MZAP (4:1 A:B mix ratio)**

<u>material</u>	<u>lbs.</u>	<u>gal.</u>
<b>Component A</b>		
<b>**grind**</b>		
Epotuf 37-140 (1)	228.6	23.56
Dowanol PM (2)	29.2	3.81
Glycol Ether DPM (2)	29.2	3.69
Bentone 27 (3)	10.1	1.16
methanol	3.7	0.56
Beckamine 21-510 (1)	12.7	1.47
methyl-iso-butyl ketone	36.8	5.52
xylene	148.1	20.43
MOLY-WHITE MZAP (4)	100.0	4.00
R8098 RIO (5)	153.5	3.59
Nyral 300 (6)	144.6	6.09
Mica 325 (7)	35.6	1.52
Barytes #1 (8)	185.7	5.08
		<b>80.00 gallons</b>
<b>Component B</b>		
Epotuf 37-650 (1)	160.0	19.76
xylene	1.7	0.23
		<b>20.00 gallons</b>

**Table 2 2K High-Solids Epoxy Primer with MOLY-WHITE 331 (4:1 A:B mix ratio)**

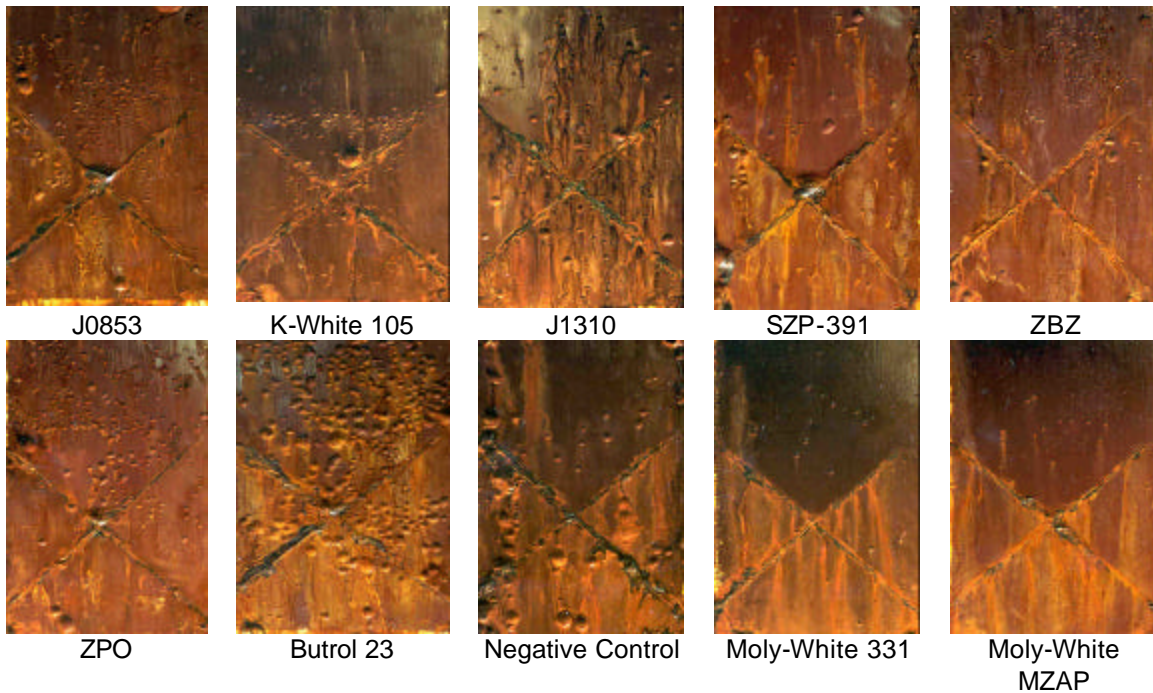
<u>material</u>	<u>lbs.</u>	<u>gal.</u>
<b>Component A</b>		
<b>**grind**</b>		
Epotuf 37-140 (1)	228.6	23.56
Dowanol PM (2)	29.2	3.81
Glycol Ether DPM (2)	29.2	3.69
Bentone 27 (3)	10.1	1.16
methanol	3.7	0.56
Beckamine 21-510 (1)	12.7	1.47
methyl-iso-butyl ketone	36.8	5.52
xylene	148.1	20.43
MOLY-WHITE 331 (4)	100.0	2.27
R8098 RIO (5)	153.5	3.59
Nyral 300 (6)	166.9	7.03
Mica 325 (7)	35.6	1.52
Barytes #1 (8)	214.6	5.87
		<b>80.00 gallons</b>
<b>Component B</b>		
Epotuf 37-650 (1)	160.0	19.76
xylene	1.7	0.23
		<b>20.00 gallons</b>

(Tables 1 and 2)

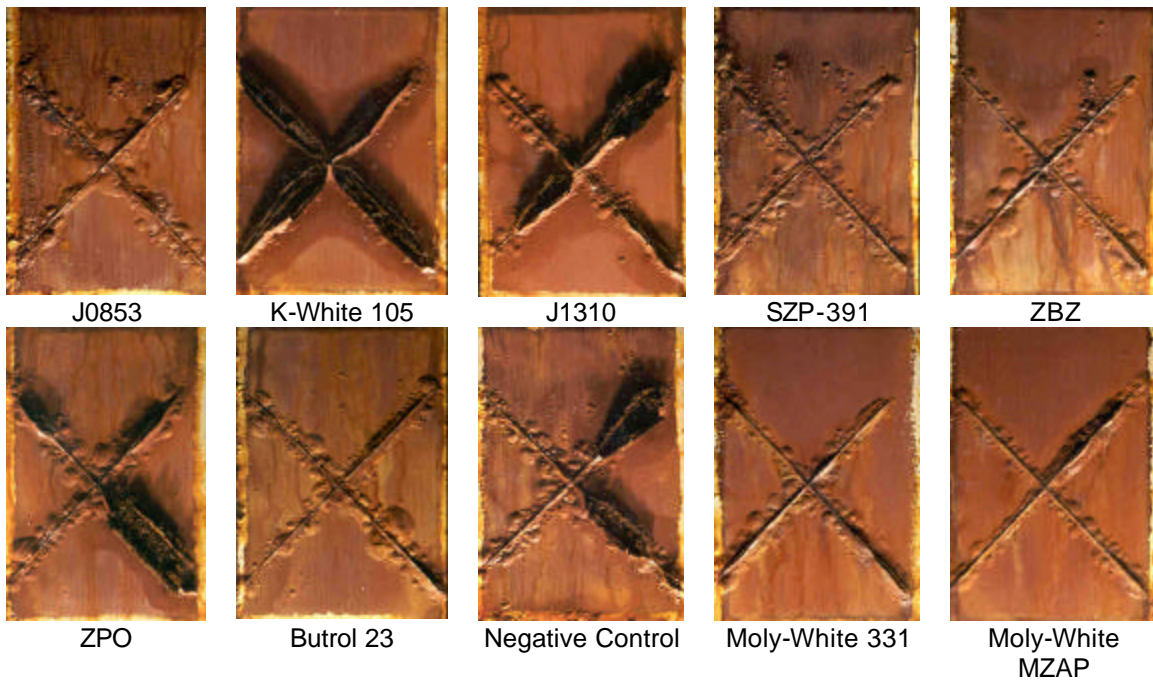
Formulation Constants Vol Solids (%): 64.99, VOC (g/l): 272, PVC (%): 31.2, P/B ratio: 1.576

Material Sources

(1) Reichhold, (2) Dow, (3) Rheox, (4) Moly-White Pigments, (5) Elementis, (6) R.T. Vanderbilt, (7) English Mica, (8) Pfizer



**1,000 Hour ASTM B117 Salt-Spray Results**



**2,016 Hour ASTM D5894 Cyclic Salt-Spray/UV Exposure Results**

**Figure 1 Appearance of Panels After Testing** (substrate: hot rolled blast steel, dft: 3.0 mils, inhibitor loadings: 1.0 lbs/gal)

These results show that MOLY-WHITE MZAP and MOLY-WHITE 331 provide an excellent, cost-effective route to the development of high performance, corrosion resistant 2K epoxy formulations. For more information, please contact the MOLY-WHITE Technical Service Department at 1-216-566-1294.

**Table 3 Corrosion Inhibitors Evaluated**

<u>Product Name</u>	<u>Composition</u>
Mineral Pigments J0853	micronized zinc phosphate
K-White 105	aluminum triphosphate
Mineral Pigments J1310	zinc chromate
Halox SZP-391	strontium zinc phosphosilicate
Heucophos ZBZ	barium/chromate mod. zinc phosphate
Heucophos ZPO	organic mod. zinc phosphate
Butrol 23	barium metaborate
Moly-White 331	zinc molybdate
Moly-White MZAP	calcium zinc phosphomolybdate

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All information is believed reliable; however, all recommendations are made without guarantee, since the conditions of use are beyond our control. All products are sold without warranty, expressed or implied, and on the condition that purchasers shall make their own tests to determine the suitability of such products for their purposes and that all risks are assumed by the user. Statements contained herein shall not be construed to be a recommendation to infringe any patent.



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