



## W1K® 1000 WATER REDUCIBLE POLYESTER RESIN

### INTRODUCTION

W1K®1000 is a water reducible polyester polyol intended for use in a single package bake system. This polyester polyol is supplied at 45% non-volatile in water and N-Methyl Pyrrolidone. Conventional melamine or urea-formaldehyde crosslinking resins like hexamethoxy methyl melamine are recommended. The need for special melamines is not necessary. Other crosslinkers that may find use, are blocked isocyanate resins designed for water based systems.

When properly formulated and processed, US Polymers W1K®1000 can produce VOC compliant, melamine crosslinked baking enamels with an excellent balance of hardness, flexibility and adhesion over a variety of substrates.

### APPLICATIONS

Water based polyester polyol for baking applications (low VOC)

### TYPICAL PROPERTIES

<b>Viscosity (Gardner-Holt)</b> .....	<b>Z2-Z4</b>
<b>Non-Volatile content</b> .....	<b>45% ± 3%</b>
<b>Pounds per gallon</b> .....	<b>8.9 ± 0.2</b>
<b>Color</b> .....	<b>3 Max</b>
<b>Acid Value</b> .....	<b>6 Max</b>
<b>Hydroxyl EQ Wt.</b> .....	<b>391</b>
<b>Solids (+/- 2)</b> .....	<b>45</b>
<b>Solvent</b> .....	<b>10.3% N-Methyl Pyrrolidone / 45.2% Water</b>
<b>VOC of Polyol</b> .....	<b>1.75 lbs/gal</b>
<b>pH</b> .....	<b>7.5-8.0</b>

### PERFORMANCE HIGHLIGHTS

- Low Odor
- VOC compliant (2.3 lbs/gal)
- Low HAPS (less than 2 lbs/100 gal. due to catalysts and additives)
- Excellent hardness (2H)
- Excellent adhesion to various substrates
- Excellent flexibility
  - Direct Impact — exceeds 160 in/lbs.
  - T-Blends — passes 4-T on aluminum, TFS, and Tin plate
- High Specular Gloss (60 degree = greater than 90 units)
- Excellent Chemical Resistance — 100+ MEK DOuble Rubs

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## W1K® 1000 *(continued)*

### **FORMULATION**

US Polymers W1K®1000 can be utilized to produce water reducible clear or pigmented coatings using conventional melamine crosslinkers. Areas that require particular attention for successful coatings formulations include processing procedures, dispersants, co-solvents, and catalyst selection.

### **PROCESSING**

Studies have shown that successful manufacturing of W1K®1000 based coatings is dependent on proper mixing. Pigment is incorporated into the coating using a pigment slurry grind of the pigments selected. The recommended dispersant, Disperbyk 190, is quite effective at a level of 7.5% based on dry pigment. The pigment slurry is then added to the resin under high shear at the appropriate time in the processing. This shear is needed to insure optimum compatibility of the grind base and the polyol.

### **CO-REACTANT / CROSSLINKING RESINS**

After a series of cross-linker studies, Hexamethoxy Methyl Melamine was selected as the crosslinker of choice for our work. Commercial material used in the evaluation was Cymel 303. Optimum performance is achieved with a stoichiometry of 70% polyol to 30% cross-linker based on solids. The use of water borne isocyanates is also a feasible alternative, however investigative work with these materials has not yet been completed.

### **CATALYSTS**

Stable W1K®1000 based coatings should be catalyzed with blocked acid catalysts. The selection should be determined by the application parameters. The catalyst of choice for film appearance and performance is a blocked dinonyl naphthene sulfonic acid, such as Nacure 1323. The unblocking temperature of this catalyst is 150°F which gives favorable reaction profiles yielding excellent flow and gloss. Improper selection of catalysts will result in unacceptable stability, solvent popping, and/or a loss of gloss.Δ

### **CO-SOLVENTS**

Co-solvent adds are recommended to improve coating stability and film formation. Of the solvents tested, N-Methyl Pyrrolidone or N-Butanol produce the most compatible systems. N-Methyl Pyrrolidone is the most user friendly. The odor of N-Butanol may be an issue in many operations. While glycol ethers were not generally suited as a sole solvent for W1K®1000 based coatings, they might be considered in blends with other solvents.

### **AMINE SELECTION**

The recommended neutralizing amine is Dimethyl Ethanol Amine. This amine promotes compatibility and desirable flow characteristics. There has been an excess of DMEA added which functions as a neutralizer for the resin and for added shelf stability. Inappropriate selection of amines may cause loss of gloss when using fast evaporating amines, or soft films when using a very slow amine. The order in which the amine is added is critical. The addition of the amine should be made after the addition of the pigment slurry.

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W1K® 1000 *(continued)*

### **ADDITIVES**

The addition of anti-cratering additive may be desirable in some W1K®1000 based coatings. BYK 341 has been successfully used with W1K®1000 at relatively low (0.1 to 0.2%) levels. Other additives similar to BYK 341 may be used with success. When a pigment slurry has been utilized, a defoamer had not been found to be necessary if careful processing to reduce foam generation is employed. If defoamers are found to be necessary, minimum levels of defoamer should be used, identified with additions made in the grind base, and in the letdown after the grind base addition.

### **SUBSTRATES**

Excellent results have been obtained on a number of diverse metal substrates. These substrates include cold rolled steel, iron phosphate treated steel, aluminum, smooth tin free steel, and tin plated steel.

### **APPLICATION OF FILMS**

Application by spray equipment is recommended with either suction guns or pressure feed equipment. Film thickness of 1.0-2.0 mils dry film thickness are recommended. The coated substrate should be given a flash of up to 15 minutes and then baked at sufficient temperatures and time to give necessary cure. The recommended baking schedule is 15 minutes at 300°F for films of 1.0 mils. DFT. Coatings approaching 2.0 mils DFT may require additional oven time to remove residual solvents. System viscosities of 55-60 sec #4 Ford cup, gave acceptable atomization and film properties.

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W1K® 1000 (continued)

### W1K®1000 Water Reducible Polyester Single Package White Baking Enamel

( FORMULA NO. TEW 273 )

Note: All ingredients are to be mixed on a high speed disperser for 5 minutes following addition. The slurry grind should be prepared in advance.

#### SLURRY GRIND

MATERIAL	POUNDS	GALLONS
De-Ionized Water	32.40	3.89
BYK 190	9.87	1.12
Kronos 2160	130.98	4.03
<b>TOTAL</b>	<b>173.25</b>	<b>9.04</b>

High speed disperse to Hegman 7.0-8.0 N.S.

Store this grind slurry for addition later. Make appropriate quantify adjustments to allow for loss due to manufacture/transfer.

#### COATING PREPARATION

MATERIAL	POUNDS	GALLONS
US Polymers-Accurez W1K®1000	452.04	50.83
N-Methyl Pyrrolidone	46.73	5.47
Cymel 303	87.50	8.75
Nacure 1323	1.34	0.18
Add previously prepared pigment slurry grind	173.25	9.04
Dimethy; Ethanol Amine	1.33	0.18
BYK 341	1.86	0.23
De-Ionized Water	200.09	4.02
Dimethyl Ethanol Amine	9.69	1.31
Mix well and discharge		
<b>TOTAL</b>	<b>972.82</b>	<b>100</b>

#### TYPICAL PROPERTIES

Viscosity	60 sec. #4 Ford cup
Weight Non-Volatiles	43.6%
Volume Non-Volatiles	35.8%
Weight per Gallon	9.73

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