

Formulating amine salts of LUBRIZOL® Adhesion Promoters for use in water based applications

Introduction

Lubrizol® 2062H, 2063H, and 2065 adhesion promoters are complex organic phosphate acid esters that can contribute to superior adhesion between organic coating systems and metallic substrates. Though developed primarily for solvent based solids coating systems, these additives are widely used in water based coatings and can be incorporated into alkali neutralized aqueous coatings with good agitation as supplied, or in the form of an amine salt solution to avoid shock or incompatibility. This applications guide describes how to prepare the amine salt.

Amine Selection

The selection of amines as neutralizers is an important factor in the use of these adhesion promoters in aqueous systems and depends on a number of variables. Factors include not only the volatility of the amine but also the basicity, the nature and level, if any, of an acid catalyst contained in the coating; cure conditions; film thickness; and potential side reactions of the amine and other system components.

Tertiary amines find greater acceptance than primary and secondary amines, although there are some exceptions. Ammonia 28% and AMP-95™ (2-amino, 2-methyl, 1-propanol) are used in air-dry systems. Alkylamines (e.g., triethyl-amine) are used in intermediate cures up to 175°F (79°C) while alkylalkanolamines (e.g., dimethylethanolamine) are often the choice in high-temperature baked systems.

Procedure

Use an appropriate cosolvent (e.g., glycol ether) to prepare a less viscous solution of the selected adhesion promoter. Gradually add the amine under agitation, followed by incorporation of D.I. water under agitation. As a starting recommendation, amine addition should be about 90% of theoretical equivalency. At this level of neutralization, pH should be slightly less than 7.0. To ensure complete conversion of the acid ester to the salt, additional small amounts of the selected amine should be added to produce a pH of 8.0 to 8.5.

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Example: Preparing a DMEA (dimethylethanolamine) salt of 10g of Lubrizol 2063H:

The acid value of Lubrizol 2063H as supplied at 56% NVM by weight is 96.
The equivalent weight of DMEA is 89 (see table below).

Calculate the theoretical amount of amine to use for neutralization:

$A_n = (A_e) \times (L_a) \times (L_w) / 56,100$ where:

A_n = grams of amine needed for neutralization,

A_e = Equivalent weight of amine,

L_a = Adhesion promoter acid number,

L_w = grams of Lubrizol® adhesion promoter.

In this case, the quantity of DMEA needed to neutralize 10g of Lubrizol 2063H is 1.5 g.

In practice, the addition of 1.35g of DMEA (90% of theory) will be sufficient to achieve solubility in water. The amine should be added slowly under mild agitation to the solution of the acid ester in any required cosolvent. Continued mixing and addition of distilled water should yield a stable solution or emulsion, depending on the solubility of the co-solvent in water. A slight exotherm is characteristic of most acid reactions. Following final adjustments to pH 8.0-8.5, the salt solution may be added under mild agitation to any stage of coating manufacture.

<u>Amine</u>	<u>Equivalent Weight (g)</u>	<u>Boiling Point (°C)</u>
Ammonia	17	33
Triethylamine	101	89
Dimethylethanolamine	89	134
AMP Aminomethylpropanol	89	165
Triethanolamine	149	335

<u>Adhesion Promoter</u>	<u>% Solids</u>	<u>Acid Value (mg KOH / g)</u>
Lubrizol 2062H	17	33
Lubrizol 2063H	101	89
Lubrizol 2065	89	134