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Two-Part Urethanes & Clear-Coats

By Paul Oman
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The following is an introduction into 2-part urethanes and 2 part urethane clear-coats. These 2-part paints are perhaps the best performing coatings (low yellowing, high gloss, durable and tough physically and chemically) available for brush, roller or conventional spray application. We'll apologize up-front for any errors that our more urethane knowledgeable readers are certain to find!

Most, of not all, 2-part urethanes are either acrylic polyurethanes or polyester polyurethanes. Sometimes the prefix "poly" is left off. These are also called linear (or aliphatic) urethanes, or LPU's (linear poly-urethanes). In any case, lots of 'keywords' for generally two kinds of 2-part polyurethanes.

Polyester (poly) urethanes are considered the 'best'. Compared to acrylic (poly) urethanes the polyesters are more abrasion resistant and more chemical resistant. You'll find polyester urethanes on jet airplanes, and on the floors of the hangers these airplanes live in. Boat owners should note that operating a boat in water, especially seawater, is very much a chemical environment. Two very well known 2-part marine paints, (we will not say their names) are polyester urethanes.or acrylic/polyester urethane blends.

Acrylic urethanes are a bit cheaper and generally one notch down from the polyester

urethanes in terms of toughness and chemical resistance, but still above 'regular' paints. Acrylic urethanes are found in clear-coats used in the automobile industry and 'city water towers' that grace many small towns in America. Boat owners should note that Awlcraft 2000 (tm) is an acrylic urethane, as probably are most of the 2 part urethanes sold in marine catalogs that don't specify if they are polyester urethanes or acrylic urethanes.

APPLICATION PROPERTIES: Both kinds of urethanes contain large amounts of solvents and thus have a strong solvent smell. That said, additional solvents are often added during application. In the urethane world solvents are called reducers. There are 'fast reducers' for spray application. These speed up the time it takes for the urethane to 'gel' on the surface. "Slow reducers" slow down the gel time for more working time when applying by brush.

Brushing on a two-part urethane is not like brushing on a varnish or oil based enamel. The thin, almost watery urethane (you'll probably need two coats or more to cover) starts to 'gel' on the surface quickly. Unlike varnish, you'll get 2 or 3 brush strokes and then, like it or not, it's time to move on. An application method called 'tip and roll' gets almost sprayer like results by applying the urethane with a roller and then gently removing the roller marks with the tip of a brush.

In my experience, both the acrylic and polyester urethanes go on about the same, but the general view is that the acrylics are slightly easier and friendlier to apply and, perhaps, repair.

Urethane's weakest link is their adhesion. Because of that they are often applied over an epoxy primer. Besides priming the surface the epoxies tend to 'level the surface' too, important because the high gloss urethanes will show every flaw in the subsurface.

Recoat window for two-part urethanes is about 6 to 16 hours. Beyond that, sand lightly. Apply only in good, dry weather, as urethanes are moisture sensitive during application and curing. The coating will become dry overnight, hard in about 3 days, with maximum hardness in 7-10 days.

EVALUATING YOUR TWO-PART URETHANE: Obviously, the first question is, is it an unmodified polyester polyurethane or an acrylic urethane? Next, what is the price (two part urethanes sold in marine catalogs are priced sinfully high)? Finally, look at percent solids.

Percent Solids: these coats, like most other coatings, consist of some amount of solvents which evaporate away (called VOCs - volatile organic compounds) and what is left behind is the 'solids' of the coating. A coating with 40% VOC has 60% solids. Apply a 10 mil (1/1000 times 10 in inch units) coating of this product and when dry you will have 6 mils on the surface. Some manufacturers describe it in terms of coverage for 1 dry mil of their product. A coating with 0% VOC (most epoxies) will have a dry 1 mil coverage amount of 1604 square feet. A coating with 50% VOC will have a 1 mil dry thickness coverage rate of 802 square feet (you applied 2 mils over the 800 square feet and 50% of it evaporated away).

The higher the solids (the lower the VOC) the more paint you are actually getting on your surface. One of the leading vendors of 'boat hull' 2-part urethanes does a wonderful job of providing their technical product information on their web site. Their web site reports 1 mil dry film thickness of 570 square feet for their original polyester urethane and 846 square feet for their version 2 polyester polyurethane. Their acrylic urethane product (introduced around

2000) reports 512 square feet at 1 mil dry coverage.

Progressive Epoxy Polymers (www.epoxyproducts.com) sells a white unmodified (i.e. not a blend, but 100% polyester) polyester polyurethane with a 1 mil dry coverage rate of 960 square feet (40%VOC – \$135 for 1.5 gallon unit). Our white acrylic urethane has the same coverage and VOC level (\$70 per 1 gallon unit) while our clear acrylic urethane UV Plus (contains max. UV blockers) has 800 square foot 1 mil dry coverage (50% VOC). The difference between the clear and the white is the addition of the white pigment to the polyurethane which increases the percent solids.

URETHANE CLEAR-COATS:

Urethane Clear-coats are almost a different topic from pigmented urethanes and much of that is due to UV blocking. UV rays damage and fade coatings. It yellows and damages epoxies. One of the best blockers of UV rays is pigmented paint. The pigments block the UV, limiting their affect to the very surface only. Clear coatings, of course, have no pigments to block UV, hence, while they add additional gloss and 'depth' to a fine paint job, they are generally considered to be performance inferior to the pigment coatings they commonly go over.

There are UV blockers that can be added to clear 2-part urethanes, but surprisingly a very minimal 'UV Package" is generally added to these clear urethanes (I've heard that automobile Clear-coats are an exception). The additives are expensive (about \$8 per gallon) and since most clear urethanes are applied over pigmented urethanes the manufacturers tend to let the pigments in the bottom coating perform the UV blocking.

The Acrylic Poly UV Plus offered by Progressive Epoxy Polymers (mentioned above) is also an exception. This clear-coat acrylic polyurethane has the maximum amount of UV blockers that can be added (\$78 gallon), while their regular Acrylic Poly - available in white only - (\$70 per gallon) has the tradition minimal amount of UV blockers found in most other pigmented acrylic urethanes. Progressive Epoxy also sells both 'fast' and 'slow' urethane reducers, as well as moisture cured urethanes and, of course, all kinds of epoxies!

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