



# PTM&W Industries, Inc.

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## Recommendations for Constructing Vinylester-Faced Epoxy-Backed Molds

For the gel coat, purchase a *high-temperature vinylester tooling gel coat* from a well known manufacturer such as Ashland, Interplastic, Reichold, or Cook.

For molds with service temperatures of 150° F and below, use the following PTM&W epoxy systems: Surface Coat – PT1105 A/B, Laminating Resin – PT2114 A/B, Tooling Compound – RT<sub>2</sub>C A/B.

For molds with service temperatures of above 150° F, use the following PTM&W epoxy systems: Surface Coat– PT1554 A/B, Laminating Resin – PT2620 A/B, Tooling Compound – HT<sub>2</sub>C A/B.

**Note:** the following procedure is based upon using tooling compound for making a light-weight, low-cost sandwich construction laminate. A stronger, more durable tool can be made by using a solid laminate made with the appropriate laminating system and fiberglass cloth.

### PROCEDURE:

1. Spray on the vinylester tooling gel coat using normal procedures. Typically three 8-10 mil thick passes, wet on wet, for a total thickness of 25-30 mils.
2. Allow the gel coat to reach the “tack” stage, i.e., the curing phase of the resin to the point that the resin will not stick to your finger when touched, but is still soft enough to leave a fingerprint. Do not let cure progress to the point where the gel coat is hard to the touch. At that point you will not get a good chemical bond of the vinylester to the next layer.
3. Weigh out the epoxy surface system into a clean container and mix thoroughly. Empty this mixture into another container and remix. Then bush-coat this mixture against the tacky vinylester gel coat to a thickness of about 20 mils. This coating creates a chemical bond between the gel coat and the subsequent epoxy laminate.

**Note:** Always use the correct mix ratio by weight of the epoxy resin/hardener system as identified on the product data bulletin. Always mix thoroughly. Failure to do either can result in material that does not cure properly or contains soft spots.

For best results use PTM&W Surface Coat Brushes or use a clean natural-bristle brush and cut off 1/3 to 1/2 of the length of the bristle to create a firmer brush.

4. Let the epoxy surface cure to the “tacky” stage.

5. Use a clean container and weigh out and mix the epoxy laminating resin. Brush a thin coat over the tacky epoxy surface coat, being careful to not move the surface coat. Laminate a minimum of 3 plies of 10 oz. (style 7500) fiberglass cloth with the same epoxy resin using a stiff brush.
  - Do not apply laminating resin to excess. There should not be any areas where pooling of the resin occurs.
  - Butt the cloth together when laminating a sharp female radius to prevent air entrapment under the cloth. Follow the same procedure when joining together cut cloth sections.
  - Dimensional stability and strength of the mold will be maximized by altering the direction or angle of each laminate ply (0°; +45°; -45°; etc.)
6. At this point continue the laminate if you are making a solid laminate. If you are making a sandwich construction, proceed as follows.
7. Prepare the epoxy “bond coat”. To accomplish this, first mix together the tooling compound resin/hardener at the proper mix ratio. In another clean container, mix the epoxy laminating system together at the proper ratio.
  - Now blend the two catalyzed systems together until they are a “slurry” consistency. Use a 50/50 blend of laminating system to tooling compound. If you require a slightly thicker mixture for hanging on vertical surfaces, add more tooling compound; if you need a thinner version, reduce the amount of tooling compound.
  - Mix thoroughly until you have a homogeneous, lump-free “bond coat”. Wet out the back side of the wet laminate surface to a thickness of .060-.080 using a brush or squeegee.
  - This “bond coat” or slurry will create a strong chemical bond between the laminate and the subsequent tooling compound. It is very important that this “bond coat” be still wet when applying the next step.
8. Proceed with the sandwich core by applying the epoxy tooling compound. Mix A/B at the proper ratio in a clean container.
  - Hand mixing the epoxy tooling compound works well only when small volumes are being mixed. Knead the resin and hardener together until the color is uniform throughout. Wear neoprene rubber gloves for protection. Clean up with soap and warm water.
  - When large volumes of tooling compound are to be used, a mechanical dough mixer is more practical and cost efficient. These mixer are readily available.

9. Apply the thoroughly mixed tooling compound to the wet bond coat surface. Be careful to not trap air between the bond coat and the tooling compound.
10. Select one of the following application methods:
  - Hand-pack the mixed tooling compound into a soft-ball-size shape and press onto the wet bond coat surface. Flatten the ball into a patty until the desired thickness is reached. The compound will spread and mushroom over the mold surface. Hand pack a second ball and press onto contact with the inside leading edge of the previously applied material, again causing the material to mushroom. Continue this procedure until the entire mold surface is covered. This is the least labor intensive and quickest method of application. Maintain a relatively uniform mold thickness a minimum of 3/8-inch thick. Use a depth marker.

**OR**

- To achieve a uniform thickness, construct a board 3-4 feet long and 12-18 inches wide. Cut shims to simulate the thickness of the tooling compound required (3/8" minimum). Mount the shims along the length of the board on both sides. Place industrial wax paper over the tooling compound and roll the mixture out to the shim thickness using a 4-inch diameter PVC or steel pipe. Remove the wax paper and slice the compound into 8-12 inch sided squares. Apply the cut squares to the wet bond coat. Blend the sides of each square together without trapping air.
11. When the application of the tooling compound is complete, allow the material to firm up at room temperature for 1 – 1 ½ hours. Begin final lamination by applying a generous coat of well mixed laminating resin and hardener to the back of the tooling compound. Laminate 3 plies of 10 oz. fiberglass cloth using the epoxy laminating system as needed.
    - **Note:** To insure a balanced laminate, use the same number of plies on the back of the tooling compound as was used in step 5.
  12. Allow the entire tool to cure overnight prior to attaching the support structure. Attaching support structures to epoxy, polyester or vinylester laminated molds too soon can cause warping. Support structures can be made of steel tubing, plywood egg crating or laminated board stock.
  13. If you are making a high-temperature tool, give the tool a post-cure after consulting with a PTM&W representative.

**Vinylester-faced epoxy-laminated tooling will blend a Class-A highly polishable surface, normally associated with polyester, with the advantages of epoxy: dimensional stability, high mechanical properties, quick turnaround and high heat resistance.**

**Before beginning, consult with a PTM&W technical representative to discuss your specific requirements and determine which materials are best suited for your application.**

## Handling Properties for PTM&W Industries Resin Systems Mentioned Here

### For service at 150 F. and below

**PT1105 A/B White Room-Temp Epoxy Surface Coat**

Mix Ratio - 100:11 by weight

Mixed Viscosity - Light paste

Pot Life - 25-30 minutes

**PT2114 A/B White Room-Temp Epoxy Laminating**

Mix Ratio - 100:18 by weight

Mixed Viscosity - 4-5000 cps

Pot Life - 30-35 minutes

**RT<sub>2</sub>C A/B Room-Temp Epoxy Tooling Dough**

Mix Ratio - 1:1 by weight or volume

Mixed Viscosity - dough consistency

Pot Life - 60-90 minutes

### For Service Above 150 F.

**PT1554 A/B Gray High-Temp Epoxy Surface Coat**

Mix Ratio - 100:12 by weight

Mixed Viscosity - 100,000 cps

Pot Life - 40 minutes

**PT2620 A/B Gray High-Temp Epoxy Laminating**

Mix Ratio - 100:13 by weight

Mixed Viscosity - 4500 cps

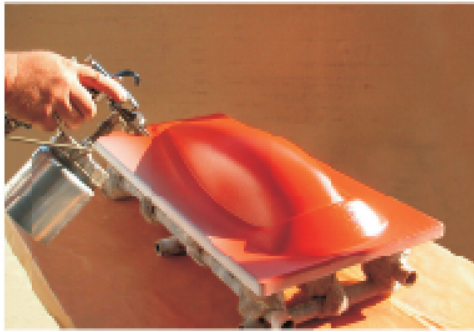
Pot Life - 50-60 minutes

**HT<sub>2</sub>C A/B High-Temp Epoxy Tooling Compound**

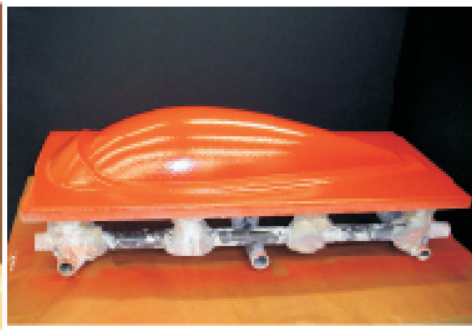
Mix Ratio - 100:33 by weight, 3:1 by volume

Mixed Viscosity - Dough consistency

Pot Life - 45-60 minutes



**Spraying The Vinylester Gel Coat Onto The Pattern**



**Vinylester Coated Pattern Ready for Epoxy Backup**



**Applying Epoxy Surface Coat To Pattern**



**Laying Up First Layer of Glass Cloth Reinforcement**



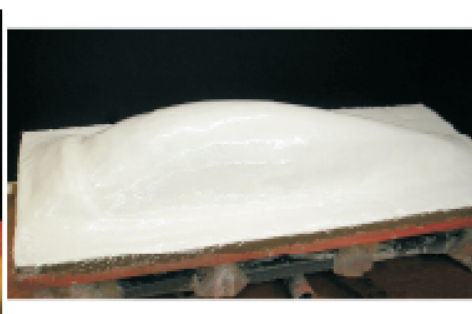
**Applying Epoxy Slurry Tie Coat To Pattern**



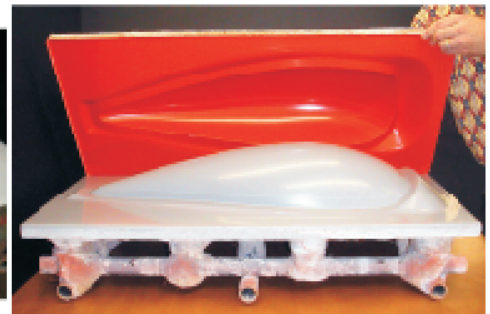
**Pressing RT2C Epoxy Tooling Compound onto Surface**



**RT2C Tooling Compound Applied to Entire Back of Tool**



**Final Two Layers of Glass Cloth Applied to Tool - Ready for Curing**



**Removing The Completed, Cured Tool From The Pattern**