



TECHNICAL INFORMATION SHEET 4

Equipment Requirements for Vacuum Forming Aristech Surfaces Acrylic Spas, Tub-Showers, Whirlpool Baths, & Small Marine Craft

Introduction

This Technical Information Sheet was prepared to supplement Aristech Surfaces Technical Bulletins 140, 142, 144, and 152 covering acrylic FRP spas, tub-showers, whirlpool baths, and small marine craft. These bulletins outline the complete process, equipment required and costing information in enough detail to allow a potential manufacturer to design an operating facility provided the technical service offered by the many materials and equipment suppliers is utilized. This document will describe in more detail the equipment required for vacuum forming and supporting the formed unit for fiberglassing. Two types of vacuum forming machines will be specified; a low cost outfit and a higher priced semi-automatic machine. This document is directed to manufacturers of polyester gel coated units who are interested in converting to acrylic surfaced units or wish to add acrylic surfaced units to their current line of products. It is assumed that a manufacturer of gel coated units will not need assistance in fiberglassing the acrylic vacuum formed part once it is jugged since the two processes are nearly identical from that point. After the part is fiberglassed it can be trimmed as gel coated parts are, therefore, no additional information beyond that given in the technical bulletins is supplied.

Molds

The most economical vacuum forming mold is an exact replica of the finished product made from either tooling grade polyester or epoxy. The master tool used for making Gel Coat molds often will serve as a working vacuum forming mold with minor modifications. More often, a Gel Coat mold which is male, the opposite of the finished product, is used to lay-up a vacuum forming mold from tooling grade polyester or epoxy. This is done as follows:

1. The male mold is waxed for release.
2. Approximately 30 dry mils (0.76 mm) of tooling grade polyester or epoxy is sprayed on the mold.
3. Alternate layers of 2 oz. glass mat and glass cloth in the ratio of 6:1 are applied with the selected resin system until the total mold thickness is at least 0.5 inch (12.7 mm).
4. If a manifold vacuum system is desired, then 2 inch (5 cm) internal diameter half round cardboard tubes are fiberglassed on all outside radii as one views the backside of the mold. These tubes must connect to each other and form a continuous open line to the vacuum source.
5. If a vacuum box technique is selected, step (3) completes the lay-up of the mold.
6. After the mold has cured and is removed from the master tool, vacuum holes can be drilled in all inside radii (as viewed from the inside of the mold). These holes should be 0.020" to 0.032" (0.5 to 0.8 mm) in diameter and drilled on 1" (25 mm) centers. These holes are drilled the same whether the mold has a manifold or put in a vacuum box. However, if the mold has a manifold care should be taken not to drill into the manifold.
7. A mold with a manifold needs only a vacuum connection and perhaps legs to keep the mold level to be operational.
8. If a vacuum box is used it is best to use 1/4" (6.5 mm) steel plate or 1/2" (13 mm) aluminum plate and weld a box as illustrated in TB-140. Additional vacuum holes will be needed around the outside perimeter of the spa flange. The vacuum box can also be made from 1" (25 mm) thick plywood reinforced with 2" x 4" (5 x 10 cm) wood beams. If plywood is used it is best to chop a thin layer of polyester resin and glass over the entire outside surface of the box to make it airtight.

Vacuum Forming Equipment

The most economical vacuum forming equipment is a single top oven with a track for sheet clamping frames and an adequate vacuum system. This equipment can be used with two molds, one on each side of the oven and is capable of forming 40 to 50 parts per 8 hour shift using 4 operators.

Such equipment as described above can be purchased from several suppliers listed in TB-159.

If more automatic equipment is desired then the equipment manufacturers should be contacted and the equipment customized for the application.

Support Jigs

The simplest and best support jigs are thin 1/8" (3.2mm) polyester/glass "male" shapes taken from a vacuum formed acrylic part. This is done as follows:

1. Vacuum form an acrylic part and fiberglass the back side for strength and rigidity
2. Wax inside of acrylic part with a mold release.
3. Spray up or lay-up by hand a 1/8" (3.2 mm) thick laminated and let cure.
4. Remove fiberglass part and mount on a plywood base.
5. Add casters to underneath side of plywood base. This completes the jig.

Vacuum formed acrylic parts can now be removed from the vacuum forming mold and placed upside down on this fiberglassing jig. The jig will support the acrylic part until it is reinforced with a polyester glass laminate. The jig can be used over and over many times.

The master acrylic part from which the jig was made should be retained so that additional jigs can be produced when needed.

For cautions and other information relating to handling of an exposure to this product, please see the applicable material safety data sheet published by Aristech Surfaces

These instructions are based upon experience with Aristech Surfaces products only. Experience with products of other manufacturers is specifically disclaimed. For most uses, check for local code approval and test for application suitability. These procedures, techniques and suggested materials should only be used by personnel who are properly trained in the safe handling of the chemicals and the equipment with which they are working. Avoid aromatic solvents, clean with mild soap and water, avoid abrasives. These suggestions are based on information believed to be reliable, however, Aristech Surfaces makes no warranty, guarantee, or representation and assumes no obligations or liability as to the absolute correctness or sufficiency of any of the foregoing, or that additional or other measures may not be required under particular conditions or circumstances.

