ARISTECH™ Composite and AVONITE™ Flex Co-laminated Sheet Thermoforming Bulletin

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ABS-backed continuous cast acrylic is an original innovation of Aristech Surfaces (United States Patent 5,069,851). This product is created by using heat and pressure to intimately bond, or laminate, monolithic cast acrylic to extruded ABS, creating a product that retains the desirable qualities of both products. It has the acrylic layer on the show surface — retaining the solvent resistance, gloss, and hardness of the acrylic — but gains tremendous structural stability due to the ABS. Also, the ABS backing will allow adhesion with a broader range of chemistries, allowing dense urethane backing in the products. This has made it the product of choice for many luxury spa and swim spa products. While thermoforming ABS-backed acrylic is very similar to the thermoforming of monolithic acrylic, there are notable differences.

- Greater care must be applied in the prevention of moisture uptake. Refer to Aristech Bulletin 165.
- The product should be used in a "first-in, first-out" inventory control.
- Packaging should remain intact until ready for use. If all sheets are not consumed in that production run, then the packaging should be resealed before returning it to inventory to prevent moisture absorption.
- The heating cycle should range from approximately 3 minutes at the shortest to 5 minutes at the longest.

Thermoforming equipment and tooling designs vary greatly, so the following recommendations should be used as guidelines only.

Using equipment with a double-oven (top and bottom heat) allows for the best results regarding heating cycle times. This also provides for a bit more forgiveness in the thermoforming cycles. Target temperatures of 370° to 390°F (188 to 199°C) for the top surface are good, with a target of 340° to 360°F (171° to 182°C) for the bottom surface. Heating cycle times of approximately 2 minutes are possible with this set-up. Again, should your equipment require more time, you would target the lower range and the higher range if your equipment allows for faster heat-up. If the equipment allows for processing at shorter heating cycles, then there is more leeway for higher processing temperatures.

To ensure the integrity of the product, there is a physical limit to how thin a sheet can be drawn. The recommended minimum draw thickness should be no less than 0.020 inches (.5mm) for each layer. If the product is drawn thinner than those recommended thicknesses, Aristech cannot credit or warranty any failed parts.

> **Note: For cautions and information on exposure to any Aristech Surfaces' product, please see the applicable Material Safety Data Sheet.**

AVONITE™ Flex Co-laminated Sheet

AVONITE™ Flex has a different composition than standard monolithic acrylic. It has a lower thermoforming temperature, which means it can be thermoformed at a lower temperature when co-laminated to ABS. It is difficult to provide absolute numbers due to differences in oven design. In general, the oven time and/ or temperature can be reduced by at least 10%,

often more. The exact reduction must be determined through trials in the specific oven arrangement.

A specific case is AVONITE™ Flex Pure Ebony. This product consists of black acrylic on black ABS. Consequently, it absorbs infrared heat at a much more rapid pace than other colors. The co-laminate can experience heat-related delamination between the acrylic and ABS layers when overheated. Overheating causes off-gassing of the ABS. This off-gassing occurs at the acrylic/ABS interface, resulting in a delamination effect, especially in tight-radius areas at the thinnest draw of the part. In lighter colors, severe overheating is required to force this delamination to occur. In AVONITE™ Flex Pure Ebony, overheating can occur much more rapidly.

For AVONITE™ Flex Pure Ebony, we recommend that the temperature on the bottom of the sheet be just over 300°F. The top surface temperature should not exceed 350°F. In addition, off-gassing can occur if the sheet remains in the oven too long. We recommend that the sheet be in the oven no more than five minutes, and depending on the oven, as little as four minutes.

Special caution is required when using infrared temperature gauges, whether handheld or built into the thermoforming oven. In lighter colors, infrared gauges provide reasonably accurate readings. However, the darker the color, the less accurate they become. With black acrylic, an infrared sensor can read as much as 30°F lower than the actual temperature. When setting up the heat profile for forming dark colors, it is better to use temperature labels and note the difference between the infrared reading and the actual temperature.

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