

PLASKOLITE

THERMOFORMING GUIDE

Lucite® SPA

OPTIX® XL SPA
by PLASKOLITE



CONTENTS

- 3 SUMMARY TEMPERATURE GUIDE TO THERMOFORMING
OPTIX XL AND OPTIX XTRA
- 3 TYPE OVEN: EFFECT OF THERMOFORMING OVEN, TOP ONLY
OR TOP AND BOTTOM OVEN
- 3 TEMPERATURE: EFFECT OF VACUUM ON PART DETAIL
- 3 VACUUM: EFFECT OF VACUUM ON PART DETAIL
- 3 ZONING: TEMPERATURE CONTROL AND SCREENING
- 3 CLEANING
- 3 MASKING: EFFECT OF TEMPERATURE ON MASKING
- 3 BLISTERS: EFFECT OF MOISTURE ABSORPTION
- 3 STORAGE OF SHEET
- 3 THERMOFORMING MACHINE
- 3 MOLDS USED FOR SPAS AND BATH
- 3 REMOVING THE THERMOFORMED SHEET FROM THE MOLD
- 3 BACKING
- 3 TROUBLESHOOTING GUIDE

SUMMARY TEMPERATURE GUIDE TO THERMOFORMING OPTIX XL AND OPTIX XTRA

TOP AND BOTTOM HEATED THERMOFORMER, °F

PRODUCT	TOP TEMPERATURE			BOTTOM TEMPERATURE		LOW ZONING OR SCREENING	
	TARGET	MIN	MAX	TOP	BOTTOM	TOP	BOTTOM
ALL PRODUCT EXCEPT GRANITES	400-410	390	420	360	410	330	320
GRANITES	380-390	370	390	340	390	330	320

TOP HEAT ONLY THERMOFORMER

PRODUCT	TOP TEMPERATURE			BOTTOM TEMPERATURE		LOW ZONING OR SCREENING	
	TARGET	MIN	MAX	TYPICAL		TOP	BOTTOM
ALL PRODUCT EXCEPT GRANITES	400-410	390	420	280-360		330	270
GRANITES	380-390	370	390	280-360		330	270

XTRA - TOP AND BOTTOM HEAT

PRODUCT	TOP TEMPERATURE			BOTTOM TEMPERATURE		LOW ZONING OR SCREENING	
	TARGET	MIN	MAX	TOP	BOTTOM	TOP	BOTTOM
ALL PRODUCT EXCEPT GRANITES	400-410	390	420	300	360	330	290
GRANITES	380-390	370	390	300	360	330	290

HEAT CYCLE TIME

The best determination of when to pull the sheet out of the oven is using an IR sensor in the center of the oven. Once you do your initial set-up, this will give very reproducible results sheet after sheet. The next best method would be through using an IR thermometer to measure the bottom sheet temperature. Not as reliable, is heating the sheet to a consistent time. However, the oven time technique can be combined with the use of an IR thermometer or hitting the bottom of the sheet to check its flexibility.

THERMOLABELS

Thermolabels should be used to verify the performance of the oven and to assure the sheet is not being over or insufficiently heated. Although if the sheet is not heated enough, you usually can tell by the loss of detail in your part. Overheating the sheet can lead to blisters.

HEAT SOAK

Heat soak is the practice of holding the sheet at a temperature for a specified time. The purpose of this practice is to ensure the sheet has reached uniform temperature. All the information contained in this guide was done without using heat soak. Using heat soak can increase the possibility of getting blisters or getting "orange peel" in thinner drawn portions. In most cases heat soak is not required and should not be used for Granites or Xtra.

TYPE OVEN: EFFECT OF THERMOFORMING OVEN, TOP ONLY OR TOP AND BOTTOM OVEN

Does your oven only have heat coming from the top side? Or does your oven have heat coming from the top and bottom side? This makes a big difference. For products thicker than 125mils, the best oven is one that heats from the top and the bottom side. For products 125mil and thinner, you can use ovens that heat from just the top, but realize that depending upon oven enclosure, environment or wind coming through a large opening, that the bottom side temperature will be less controlled. Here's data on how the intensity of the heat and the design of your oven affects the resulting heat cycle time and temperatures. Note how for 187mil sheet heating with just the top oven and increasing the heat intensity results with a lower bottom temperature. Turning up the heat has a "broil" affect. Not so with 125mil sheet.

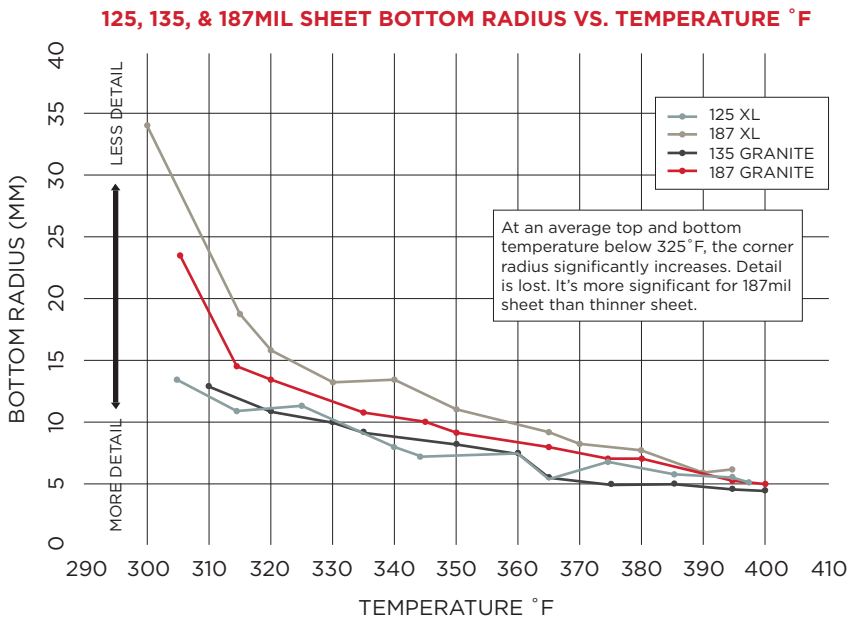
OPTIX XL 125	HEATER SEATING	TOP TEMP °F	BOTTOM TEMP	AVERAGE TEMP	CYCLE TIME	AVERAGE RADIUS (MM)
TOP HEAT ONLY	80/0	410	340	375	4:05	6.5
	90/0	410	330	370	3:08	6.6
	100/0	410	330	370	3:13	6.4
TOP AND BOTTOM HEAT	80/50	410	355	383	3:22	6.0
	90/60	410	360	385	2:04	6.4
	100/70	410	370	390	1:44	6.1

OPTIX XL 187	HEATER SEATING	TOP TEMP °F	BOTTOM TEMP	AVERAGE TEMP	CYCLE TIME	AVERAGE RADIUS (MM)
TOP HEAT ONLY	80/0	410	290	350	4:58	9.9
	90/0	410	280	345	3:53	10.8
	100/0	410	270	340	3:43	11.5
TOP AND BOTTOM HEAT	80/50	410	320	365	4:24	8.6
	90/60	410	330	370	2:54	9.6
	100/70	410	365	387.5	2:48	7.5

The heat setting and cycle time is very dependent on the controls and type of oven you have. The sheet distance from the heater elements also has an effect. The zone settings and heat cycle times above only apply to the R&D thermoformer we have in our lab. However, the same general principles apply to your thermoforming oven.

TEMPERATURE: EFFECT OF TEMPERATURE ON PART DETAIL

With top and bottom heat ovens on, 125, 135 and 187mil sheet were heated and vacuumed formed. The resulting bottom radius were measured. The results show below a specific temperature, detail is lost (the bottom radius increased significantly). More so for thicker sheet than thinner sheet. Each oven and molds are different. The temperatures used must be fine-tuned to ensure the resulting detail and thickness meets your needs.

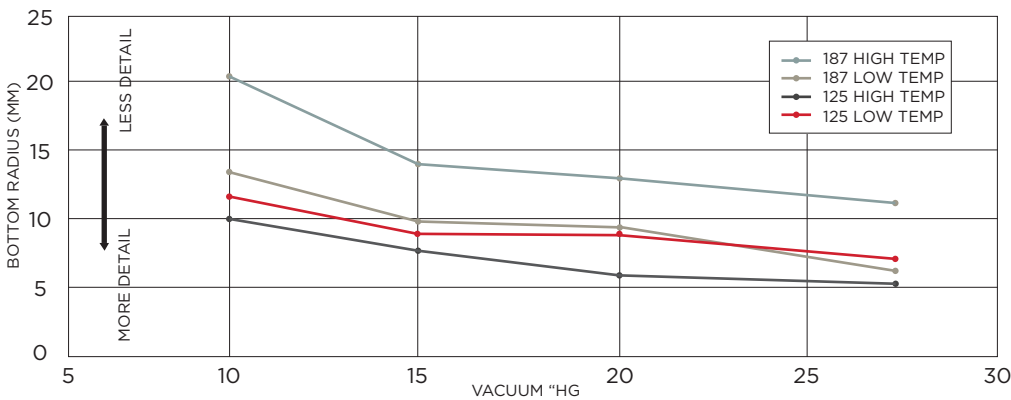


LOW TEMPERATURE ZONING AND SCREENING

Low zoning and screening are the application of reduced heat in a specific area. This will cause other areas to stretch more but will also reduce the heat in the area that's low zoned or screened. As temperature is reduced, corner radius also gets larger and the part gets thicker in the area that's low zoned or screened. It is a very effective way of thickening areas that are coming out too thin. Typically, several trials need to be run to determine proper application of this technique.

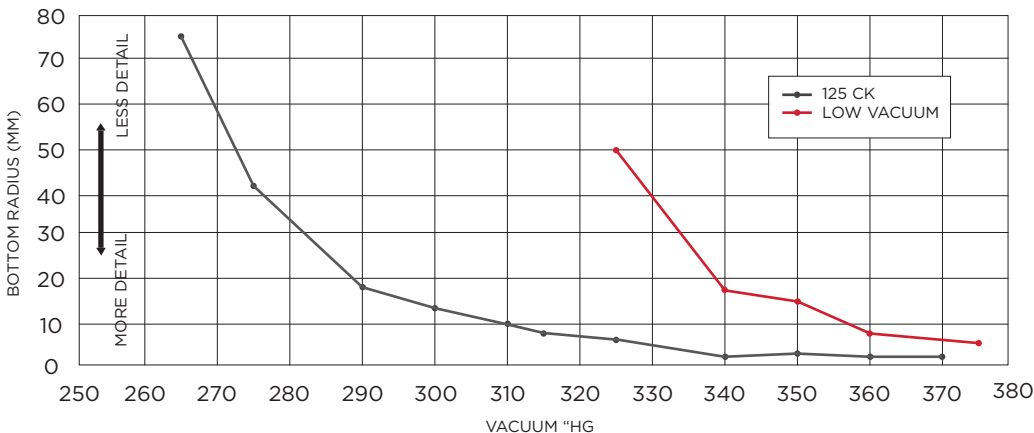
VACUUM: EFFECT OF VACUUM ON PART DETAIL

Vacuum can affect the amount of detail you get from our acrylic. Vacuum tanks need to be sized to deliver the amount of vacuum needed throughout the vacuum forming process. Rule of thumb, the volume of the tank should be 4 times the volume of the mold. In the graph below, different levels of vacuum were used to thermoform 125 and 187mil sheet and the resulting corner radius was measured to illustrate the affect of vacuum on detail.



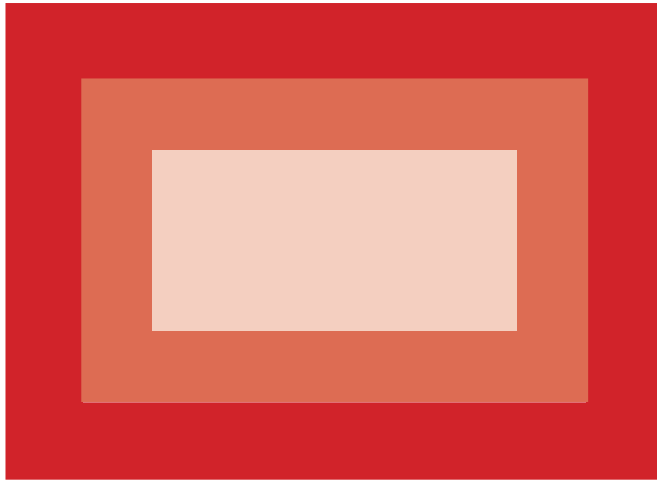
Vacuum flow rate can also affect the amount of detail you get in your part. Here is an extreme example of how vacuum flow rate can affect the amount of detail in a part. Full 27" Hg vacuum was applied, only one had super low vacuum flow rate while the other had very high vacuum flow rate.

HIGH VACUUM FLOW RATE VS LOW VACUUM FLOW RATE



ZONING: TEMPERATURE CONTROL AND SCREENING

Zone settings are typically set up with the hottest zones on the perimeter. This is where the majority of the heat loss takes place due to that location being close to the edges of the oven and the heat loss due to the clamps. The top oven is typically 14-16" away from the sheet, while the bottom oven (if it's a dual oven thermoformer), 36 to 40" away. The bottom oven has to be further away from the sheet to prevent the sheet from touching the elements as it sags upon heating. With the bottom oven being further away from the sheet, the bottom oven should be set slightly higher than the top oven. This can be fine tuned using thermolabels on the top and bottom oven. It also depends on what elements are used for the top and bottom oven if they are not the same.

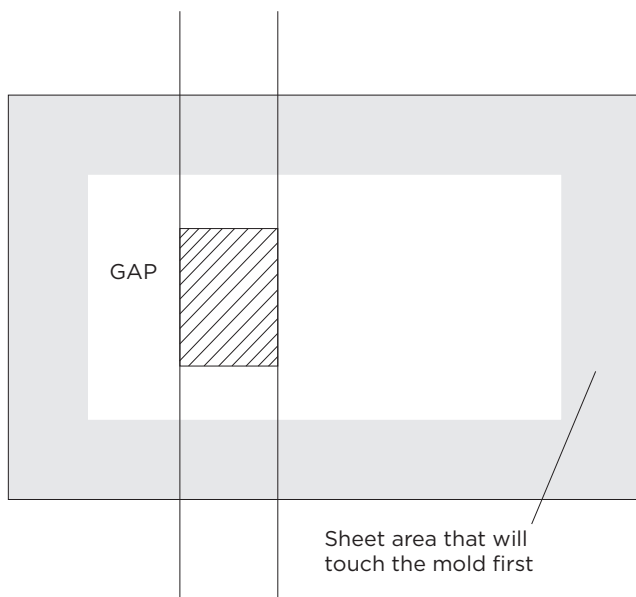


Typical top and bottom zone setup.

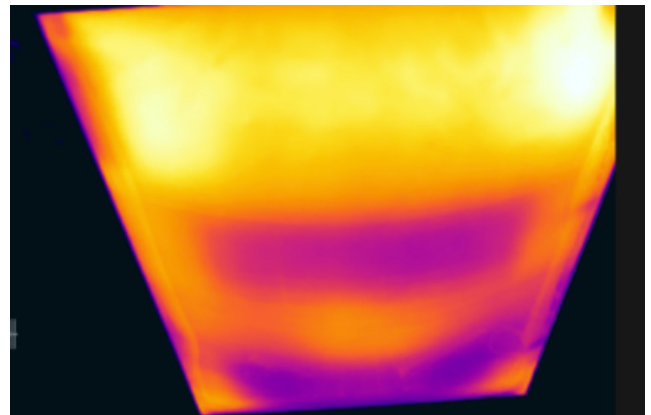
Low temperature Zoning and screening

If the thermoformer you have has multiple zones 12" x 12" or less, then it's possible to do screening with the zone settings. If not, the best way to do screening is by using screens. Even if you have lots of zones, it's sometimes easier keeping up with screens instead of having multiple recipes stored in the operating panel for each mold. The screens can be purchased at the hardware store and should be made of aluminum, not the plastic screen material. The placement of the screens goes between the acrylic and the top heat elements. Multiple screens can be used to achieve the temperature reduction desired. Screens should be kept as small as possible, sufficient to cover the area you want to come out a little thicker. The areas on either side of the screen should be areas that do not touch the mold first.

This is shown in the following diagram.



Thermal Image of sheet with screens placed to reduce the heat in specific areas of the sheet.



CLEANING

Carefully cleaned sheets and molds will minimize irregularities and blemishes and ensure production of a smooth, glossy part. However, acrylic sheet usually carries a static charge and attracts airborne dust, saw chips, and dirt. The best way to control this is to maintain a very clean thermoforming area and try to isolate dirt and dust from the spray-up area. The acrylic sheet may be cleaned effectively with diluted solutions of isopropyl alcohol. That method has the advantage of reducing static and removal of small particles and fibers, sometimes can leach colored dye to the sheet at thermoforming temperatures.

A possibly faster, and common method of cleaning is to use an ionized air gun which tends to reduce static charges buildup somewhat versus non-ionized air, as it blows contaminants off the sheet. Numerous other static eliminating cleaning agents exist, but none of these methods is more effective than a scrupulously clean thermoforming area.

It's also important to clean the mold surface prior to vacuum forming. The most effective way to clean the mold is by use of a vacuum cleaner vacuuming out the mold followed by the use of tack cloth to get any remaining fine particles. The tack cloth is also very useful in cleaning sheets.



Tack cloth to clean sheets and molds.

MASKING: EFFECT OF TEMPERATURE ON MASKING

Masking adhesion is directly affected by thermoforming temperatures. Good temperatures and heat cycle times and the masking comes off easily. Too much heat or extra-long heat cycle times and the masking is hard to remove and comes off in strips. Masking coming off in strips is a good indication that the top surface of the acrylic was overheated.

To understand how our masking works, several samples were prepared ahead of time demonstrating how thermoforming temperatures affects masking adhesion. At normal thermoforming temperatures the masking is very easy to remove and comes off in one piece. As the thermoforming temperature increases above recommended thermoforming temperatures, the masking adhesion goes up significantly. Thermoforming temperatures should be kept at or below 420°F to be able to remove masking easily.

The best way to tell if the top surface of the sheet is being overheated is with the use of thermolabels. Please see Plaskolite's bulletin on how to use thermolabels.

Samples were prepared at different temperatures and the masking adhesion measured. This was the data collected:

THERMOFORMING TEMPERATURES AFFECT ON MASKING ADHESION

PIECE	GMS/INCH	COMMENTS
NO HEAT	26	EASY TO PULL OFF
400	80	EASY TO PULL OFF
410	65	EASY TO PULL OFF
420	75	EASY TO PULL OFF
440	170	(VARIABLE)
450	175	(VARIABLE, MASKING BROKE IN THE 1 INCH PULL TEST)

The comments in the above table were observed when the sample strip was pulled by hand.

What this table shows is above 420°F the masking starts to adhere very hard, in spots, to the acrylic sheet. At certain points it adheres so much that the masking breaks off in strips. To avoid this happening to the masking the top surface temperature should be kept at or below 420°F. Thermolabels should be used to ensure the sheet is not overheated.

For 187mil sheet and top oven only heating, its standard that the thermoforming time is increased to try to improve the resulting detail. Heating times greater than 8 minutes, even though the temperature is kept under 420°F, can also result in the degradation of the masking due to heat.

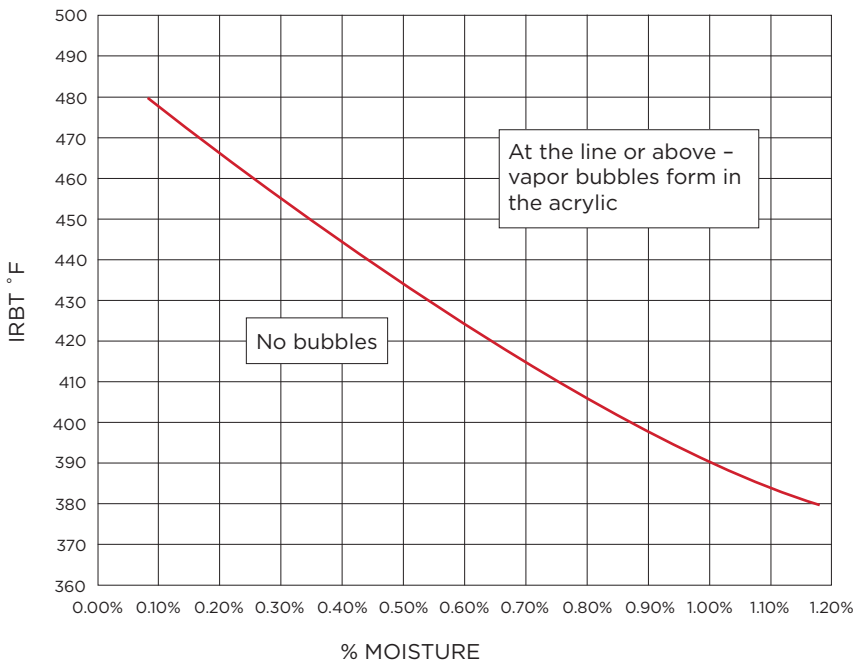
BLISTERS: EFFECT OF MOISTURE ABSORPTION

Moisture absorption can result in blisters when the sheet is heated. It's important to re-wrap the acrylic after use and perhaps use lower temperatures for the top and bottom sheets.

When acrylic absorbs moisture, the highest temperature that can be used is reduced. Consider the graph below, at 410°F, and 0.5% moisture you won't get any blisters in the acrylic sheet. But if the amount of moisture in the sheet goes up to 0.8%, you will start getting blisters. This is without using the technique "Hold Time". An acrylic sheet that doesn't blister at 410°F, can start to blister after being held at that temperature for more than 1- 3 minutes depending upon moisture level.

Blisters are vapor pockets in the material. Moisture being in the sheet, is suppressed from forming bubbles due to pressure. However, if enough moisture pressure builds up, a bubble will form. This can happen rapidly with too high of a temperature for % moisture contained in the sheet or slowly from building up pressure from being held at a temperature for a period. This concept is easier to understand by watching how bubbles form in water while it's being heated. Even before reaching boiling, the trapped gases are constantly forming bubbles as temperature is increased. The dissolved gasses form bubbles in the water as temperature is increased. This can also happen in acrylic but at higher temperatures.

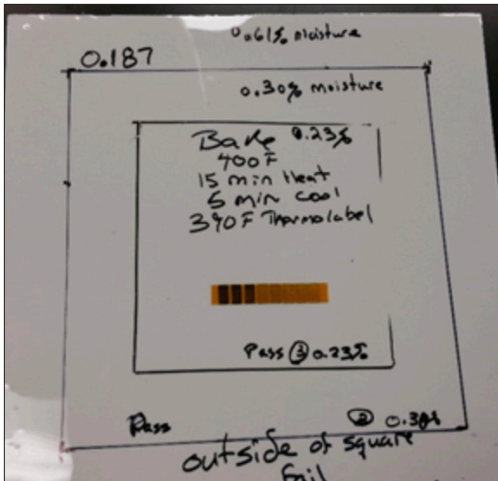
INFRARED BUBBLE TEMPERATURE VS. % MOISTURE



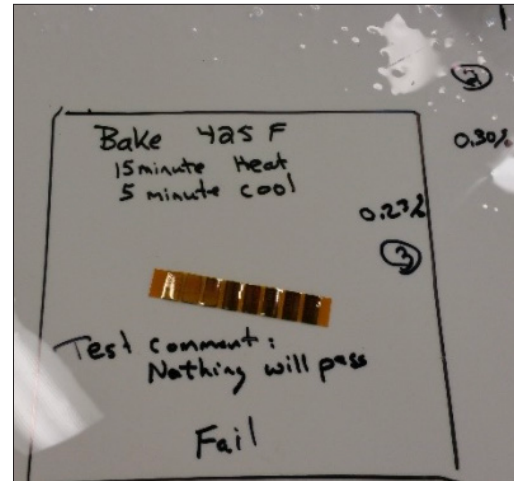
If a pallet of acrylic is left exposed to the environment, then consider using lower temperatures for the first and last sheet.

BLISTER TESTING: SHEET LOCATION IN AN OPEN PACKAGE				
TOP	2ND SHEET DOWN	MIDDLE SHEET	NEXT TO LAST	LAST SHEET
420	435	450	450	435

The following 10" x 10" sheet was in a stack for a period. The moisture levels at the edges of the sheet was higher than the moisture levels in the middle of the sheet. The moisture levels along the edges was 0.6%, then further in was 0.3% and in the center 0.23%. Heating and holding the sheet at 400°F resulted in blisters along the edges. A separate sheet was heated at a higher temperature and held at that temperature for 15 minutes. More blisters developed. This is why the use of heat soak needs to be only used when required to achieve the desired results.



Circulation oven testing of 187mil sheet at different moisture levels of 0.61%, 0.30% and 0.23%.



Oven testing: Acrylic held at 425F for 15 minutes

STORAGE OF SHEET

All sheets should be stored indoors. Ideally, Xtra, which has an ABS backing, should be stored in a heated dehumidified room.

Our acrylic sheet is protected from picking up excessive moisture by being wrapped in foil. When opening the package, the foil should be opened where it was taped. If all the sheet is not immediately used, the remaining sheets should be recovered with the foil and for further protection, the cardboard it was shipped with.

THERMOFORMING MACHINE

THERMOFORMING MACHINE CONSIDERATIONS

1. Top oven
2. Bottom oven (for products over 187mil and thicker)
3. Sag eye for safety
4. IR Sensor for heat cycle control
5. Zone control (Coarse vs. fine)
6. Clamp system
7. Clamp frame movement vs. platens
8. Vacuum System and Tank capacity
9. Safety

HEATING ELEMENTS

Elements that are be used to create a high number of zones, and the two best choices for ovens.

- Quartz tube: These elements have a quartz tube surface. Due to brittleness, they are better suited for upper heating surfaces than on the bottom. They have a very response time to heat up.
- Ceramic elements: Very good heating and longevity, and less costly then quartz tubes.

ELEMENTS USED ONLY FOR LARGE ZONES

Commercial type metal-sheathed rods containing a coiled wire (CalRod™ by GE). Very good to use in bottom ovens where you don't need a lot of zones. Lower cost then Quartz and Ceramic and simplifies control system.

PROVIDING HEATING, AT LOW COST BUT WITH SOME DRAWBACKS

Bare coiled nickel/chrome wire. Life expectancy is not great and can lead to higher energy cost.

Gas flame or catalytic panels can have low energy costs, but they are hard to use in zones and can be affected greatly by drafts.

CLAMP FRAME

Moving clamp frames, stationary molds are the most popular in the Spa and Bath manufacturing industry. Some thermoforming manufacturers do not provide this option and instead require stationary clamps with a platen that moves the mold into the material.

CLAMP

Clamp frames need to be robust enough to withstand the amount of force encountered when the sheet meets the mold. The clamp pistons need to be strong enough to hold the sheet in the clamp frame so good vacuum lock is obtained.

UPPER PLATEN

An upper platen is desirable if one wants to automate plug assist. A plug assist can be used instead of screen to thicken up critical areas.

IR SENSOR

Having an IR Sensor to sense when the sheet is at the right temperature and to control the heat cycle time should be a requirement and not an option. Thermoforming manufacturers offer this as optional equipment. In the long run, the IR sensor will pay for itself in avoiding losses due to over or under heating the sheet.

VACUUM

The vacuum volume space should be at least 4 x the volume of your largest mold. A vacuum gauge should be placed in a location easily visible to the operator.

MOLDS USED FOR SPAS AND BATHS

The most common molds used in the Spa and Bath markets are polyester molds. These are constructed of fiber reinforced polyester with a tooling polyester resin surface. The tooling polyester provides high strength durability and high durability. The most common colors for tooling gel coats are red, orange, and black gel coats backed by FRP (fiber reinforced polyester).

Less common are aluminum molds. With the variety of models most manufacturers have, aluminum molds only make sense for high volume models. The benefit of aluminum molds is that they can be temperature controlled by running heating/cooling channels.

Products that have a large top rim should use a 4 to 7° draft angle to the mold. In the interior, 6 – 8 degrees should be used.



6-degree draft angle

To prevent the cooled acrylic sheet from sticking in the mold, undercuts should be avoided. With the complexity of certain models, some undercuts can be achieved by using mold inserts. These mold inserts come out with the formed piece when separating from the mold and then are removed from the sheet by hand.

Some complex designs with large undercuts can be achieved by using two part molds. The mold separates from the formed sheet prior to part removal.

REMOVING THE THERMOFORMED SHEET FROM THE MOLD

The finished acrylic part can be removed safely from the mold at a temperature of 150°F to 170°F. The actual temperature is dependent upon the part geometry and mold complexity. If the formed acrylic is allowed to cool too much, the acrylic can grab on to the top rail and make it harder to be removed from the mold. This happens due to thermal expansion/contraction of the acrylic. So it's important to demold when the temperature is between 150 to 170°F.

Although many thermoforming machines has air eject, this should only be used to break the vacuum lock. Too much air eject and you can end up with a broken piece.

BACKING

Acrylic is typically backed by FRP. In spas this is done in 2 layers. The first layer contains vinyl ester and chopped glass. After that sets, it's followed by another layer of FRP that is mineral filled and uses general purpose polyester. For spas, the first layer should always use vinyl ester instead of general-purpose polyester. Vinyl ester is more water resistant and does not result in blistering of the acrylic. General purpose polyester as a first coat in Spas has resulted in blistering. This is not the case for bath tubs that intermittently have water in them.

The backing used for Xtra, which has ABS on the bottom is polyurethane which doesn't have the emissions issues that FRP backing has.

TROUBLE SHOOTING GUIDE

AFTER THERMOFORMING

PROBLEM	CAUSE	PREVENTION
COLOR VARIATION	Part pulled thin and backing color is showing through	Use screening to thicken up the part in the problem area. Use a colorant in the backing material
EXCESSIVE THINNING IN AREAS	Sheet is too thin	Use thicker sheet
	Sheet is too hot in thinning area	Use lower zone temperature or screening
BLISTERS	Excessive heat	Reduce heat. Use thermolabels to check the thermoforming temperatures Reduce heat cycle time Monitor bottom sheet temperature using an IR thermometer
	High moisture content in sheet	Use lower temperature. Keep acrylic covered with foil packaging
	Hot spot in oven	Fix elements. Use Thermoimager to discover any heat element issues
	Heat Cycle Time too long Dirt in mold	Use higher heat settings and reduce heat cycle time
BUMP ON SURFACE		Use vacuum and tack cloth to clean mold
	Water droplets on sheet	Make sure sheet is dry prior to thermoforming
	Contamination	Contamination in sheet, replace if severe
BLUE OR COLOR SPOT ON SURFACE	Blue jean fiber on sheet prior to thermoforming	Have a "No Jean Policy"
		Use tack cloth to clean sheet before thermoforming.
ORANGE PEEL IN THINNER AREA	Sheet was heated too hot or had excessive moisture	Reduce heat in the areas where the part pulls thinner or implement screening

AFTER BACKING:

PROBLEM	CAUSE	PREVENTION
BLISTERS AFTER BACKING	Backing	Excessive gas generated by backing Improper backing chemistry Exposure of empty unit to high temperatures or direct sunlight may cause the backing to post cure and generate gas Storing units outside in the sun with heat trapping packaging
WRINKLES IN ACRYLIC SURFACE AFTER BACKING	Backing Exotherm after application	Excessive backing temperature -- peak exotherm temperature should be kept below 180F.
	Uncured polyester	The polyester backing should cure in a hour or less where it's hard to the touch.

AFTER SPA IS FINISHED:

PROBLEM	CAUSE	PREVENTION
CRAZE	Stress + Solvent	Craze is caused by the exposure to stress and solvents
	In the manufacturing facility	Minimize stress in the sheet by following good thermoforming practices: Warm mold and acrylic up to temperature Do not wipe down the acrylic surface prior to glassing with acetone or IPA
	At shows, dealers	Do not wipe down the acrylic with IPA or rubbing alcohol. Use soap and water.
	At end user	Use mild soap and water to clean the acrylic surface. Use of non-acrylic safe cleaner
	Prolong UV exposure	Keep spa covered with insulating cover when not in use.
CRACKS	During shipment and cold weather	Make sure packaging protects against strap damage.
	At time of installation	Do not let the unit drop in place.
	Unlevel installation	Make sure pad remains level. Make sure the spa is well supported in the seats and along the rim.
	Fatigue: Thermal expansion/contraction	Keep spa covered with insulating cover when not in use.
	Poor FRP adhesion to the acrylic	Consult with resin supplier
BLEACHING OF THE SURFACE	TriChlor	Do not use TriChlor in spas. See Lucite Inc, bulletin.
	Excessive Oxidizer	Oxidizers should be used per manufacturer's instructions
	Other incompatible chemicals	Chemicals such as MeSal, an essential oil, is not compatible with acrylic. Ointments, essential oils and aromatherapy fragrances may damage the acrylic surface.
	Prolong UV exposure	Keep spa covered with insulating cover when not in use.

This manual is a general guide for working with PLASKOLITE VIVAK® PETG sheet. Because actual results vary with differences in operating conditions, thickness, color, and composition of the VIVAK sheet, nothing contained herein can be construed as a warranty that PLASKOLITE's VIVAK sheet will perform in accordance with these general guidelines.

Important Notice: Our recommendations, if any, for the use of this product are based on tests believed to be reliable. The greatest care is exercised in the selection of raw materials and in the manufacturing operations. However, since the use of this product is beyond the control of the manufacturer, no guarantee or warranty expressed or implied is made as to such use or effects incidental to such use, handling, or possession of the results to be obtained, whether in accordance with the directions or claimed so to be. The manufacturer expressly disclaims responsibility. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use. Anyone experiencing problems fabricating VIVAK sheet should refer those questions to the PLASKOLITE Inside Sales Department. This manual does not constitute an offer to sell by the Company. The Company sells ONLY under its current Terms and Conditions of Sale, which appear on its Acknowledgements and invoices. A current copy of the Company's Terms and Conditions of Sale will be supplied upon request. The details provided are believed to be accurate at the time of publication; however, no description is a warranty that the product is suitable for any application. THE COMPANY MAKES NO WARRANTIES, AND UNDERTAKES AND ACCEPTS NO LIABILITIES, EXCEPT ONLY AS SET FORTH IN ITS CURRENT TERMS AND CONDITIONS OF SALE.

PLASKOLITE

NORTH AMERICA'S LEADING MANUFACTURER OF THERMOPLASTIC SHEET

FOUNDED IN 1950

Our Mission: to deliver superior thermoplastic sheet, coatings and polymers to the world, through long-lasting customer relationships and hands-on customer service.

MANUFACTURING LOCATIONS



From our founding, PLASKOLITE strives to treat our employees, our customers, our community and the world, with kindness, dignity and respect. This drives our continuing effort to create sustainable products, in a sustainable manner, for future generations. This on-going commitment is expressed in the

PLASKOLITE Sustainable Ecosystem:

QUICK FACTS

STATUS: Privately held

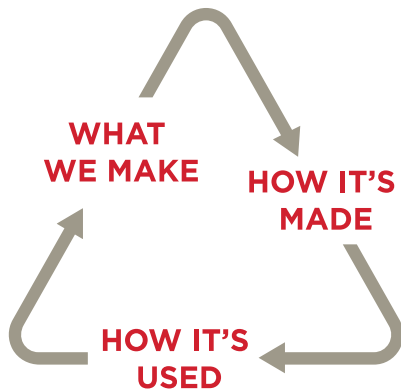
GLOBAL HEADQUARTERS: Columbus, OH

EMPLOYEES: 2200 Worldwide

MARKETS SERVED: Signage, Lighting, Retail Display, Construction, Transportation, Security, Bath & Spa, Industrial, Architecture, Green Houses

OUR PILLARS OF SUSTAINABILITY

EACH CONTRIBUTES TO MAKING THE WORLD A BETTER PLACE



WHAT WE MAKE

Versatile, high-quality, durable thermoplastic materials...not single-use plastics

HOW IT'S MADE

How we make our products reflects our overall philosophy of continuous environmental improvement

HOW IT'S USED

Our thermoplastics play an important role in advancing human well-being, energy conservation and quality of life

These suggestions and data are based on information we believe to be reliable. They are offered in good faith, but without guarantee, as conditions and methods of use are beyond our control. We recommend that the prospective user determines the suitability of our materials and suggestions before adopting them on a commercial scale.

© 2023 PLASKOLITE, LLC 102023
OPTIX® and LUCITE® is a registered trademark of Plaskolite LLC

PLASKOLITE

400 W Nationwide Blvd, Suite 40C
Columbus, OH 43215
800.848.9124 • Fax: 877.538.0754
plaskolite@plaskolite.com
www.plaskolite.com

FAB073_PSK_Thermo