GUIDE TO ROTOMOLDED KAYAK & CANOE REPAIR

It’s safe to say that rotomolded polyethylene canoes and kayaks have revolutionized paddling. Boats made of this relatively inexpensive material are incredibly durable and abuse-tolerant as well as near maintenance free. If there is a downside to “roto” or “poly” boats, it is that should they be damaged, they are more difficult to repair compared to their ABS Royalex® and composite (fiberglass, Kevlar®, etc.) brethren. Indeed, some polyethylene boats are impossible to repair and some types of damage pose a major challenge whether it be a “home” based repair, a shop repair, or even factory based.

The intent of this brochure is to provide guidelines for evaluating the repair possibilities and to outline available repair techniques. It is recommended that you honestly evaluate the task at hand as well as your abilities and perhaps seek the help of artisans or professionals.

Damage can result from wear and tear, impact, abrasion, and/or compression by mechanical fasteners such as rivets and bolts. It is best to accept and live with it. If you’d like to try to fill the gouge, you can follow the instructions for filling cracks included in section on structural repair.

Cosmetic damage is defined as something that impairs the boat’s appearance but not its function. On rotomolded polyethylene boats cosmetic damage usually takes the form of abrasion, superficial silts, cuts or gouges, and localized dents in the hull panels.

Abrasions Abrasions are basically due to wear and tear and if often localized. Common locations include the stems or ends of the boat and under the seat in kayaks. Much of polyethylene’s durability comes from its elasticity and capability to flex and absorb impact and contact. That flexibility is limited under the seat due to the seat structure and the concentration of the paddler’s weight.

Abrasions often take the form of a series of scrapes and shallow gouges and in most cases doesn’t need to be addressed unless it is so severe that it removes a significant amount of the hull material. It’s more than likely that the abrasions are cosmetic in nature and the inherent flexibility of the material poses a challenge to the bond between original material and filler or new material. If you’re smoothing the edges of the gouges as you work with fills and cuts, it’s best to accept and live with it. If you’d like to try to fill the gouge, you can follow the instructions for filling cracks included in section on structural repair.

Dents Dents can result from impact while paddling or a weight left resting on the boat. Long term storage in one position can also produce hull distortions. Prolonged or continual exposure to sunlight can distort or stress the hull and create depressed sections of the hull. Tying your boat down tightly on your roof racks for a lengthy time, particularly on sunny hot days can result in dents and deformations. Generally, prevention is the best solution to this type of damage. Periodically ease your boat down ropes or straps. Store your boat suspended in web straps or resting on rigid sections of hull.

Getting an idea of the source of the dents in the hull can help with preventative future damage but doesn’t help deal with those already in existence. Just as heat is the source for some dents and deformation, it can also provide the solution. Polyethylene has some memory and its’ recall can be encouraged by heat and pressure.

Minor dents can sometimes be removed simply by leaving the boat exposed to bright sunlight and applying a gentle pressure on the inside of the hull. If the dent protrudes enough, you can increase the heat by using a hair dryer. If still more is needed, a hot air gun may be suitable but must be used with care. Keep the gun at least 6” away from the hull surface. Carefully watch for any signs of glistening or melting of hull surface. Apply pressure from inside of hull while applying heat to a dent. Have leaves available to protect your hands while hull heats.

An alternative approach is to rig a brace to apply consistent pressure to inside of hull while boat is exposed to sunlight or heat.

Structural damage can affect the hull or such fittings as hatch rims and the connections between them and the hull.

A caulk or sealant would seem a likely candidate as a repair material but unfortunately, polyethylene does not lend itself to a long-term bond with any sealant. Probably the caulk that performs best with polyethylene is Lexel®, used by many manufacturers to seal the junction between miniscule bulkheads and the interior of the hull. However, even the best sealant will not adhere well to polyethylene by itself. It just isn’t strong enough to make the bond between bulkhead and hull is reinforced by the compression of the fitting. The same goes for sealing cockpit rims or similar applications. Caulk or sealant can make the junction between fitting and hull drier but only if used as the filling between the fittings, contained and compressed by suitable mechanical fasteners such as rivets and bolts.

NOT ALL POLYETHYLENE IS THE SAME….. First step in evaluating repair possibilities is to determine whether your boat constructed of crosslink or linear polyethylene. The terms crosslink and linear refer to the molecular structure of the material. In years past, most kayaks were constructed of crosslink polyethylene. Compared to linear poly, crosslink is stronger and stiffer but it has its’ disadvantages, one of the biggest of which is the fact that it’s not repairable. Serious additional issue is that it is not as heat resistive as poly and significantly more hazardous to work with. The development of the new “super” linear polyethylene has allowed manufacturers to compete with the use of crosslink. The performance capabilities of super linear poly approach those of crosslink and retain the advantages of their linear origin: reparability, recyclable, and less hazardous to work with.

It follows then that the first step in assessing the possibilities of repair is to determine if your boat is linear or crosslink polyethylene. Unfortunately, the differences are not readily apparent to the eye. Nor did manufacturers premark or label to linear or at least provide some casual means to tell them apart. The best way to determine if your boat is crosslink or linear is to check the material mill’s data sheet and ask them to check their production number and ask them to check their production number and ask them to check their production number.

If it is determined that your boat is crosslink, it may be time to bid a fond farewell to it. You can certainly try to apply repair techniques for linear polyethylene but realistically, the boat will never be the same and should not be subject to the same expectations or the extreme or hazardous use.

CRACKS

The most common structural damage “poly” boats suffer are cracks or linear breaks. In many cases, these are repairable but the process is challenging. You will need the proper tools and materials to attempt a repair of this type of damage:

- hot air gun with reducing nozzle or propane torch
- wire cutters
- drill (can be done without)
- drill bit (1/16” – 1/4” – ½”)
- file or rasp
- sharp knife
- sharp metal putty knives (2)
- vise grips (pliers can work)
- coarse grit sandpaper
- polyethylene putty rod can be obtained from most manufacturers. Its best to use rod provided by the manufacturer of the kayak to be repaired.
- denatured alcohol
- gloves

First, thoroughly clean area around crack. Make sure area is very dry. Use heat gun or torch to dry area but use them carefully. Lightly sand area allow each side of crack, sufficient to raise small fibers on surface of hull. Wipe down surface with alcohol and allow to dry.

Dent hole at either end of crack with 1/8” drill bit. If drill is not available, heat end of drill bit with torch, holding bit with vise grips, and melt hole at each end of crack. Function of the hole is to prevent the crack from “walking” or extending after the repair.

If your “tool” kit contains a hot air gun:

Insert a putty knife into crack so that a slight gap is created. A putty knife is crank is necessary to open full length of crack. Position knife so that they are at least 1” hole from one end of crack. Position the hot air gun, apply weld rod to point where rod gets limp and clear as poly liqueurs.

Starting ¼” beyond one end-hole, apply hot end of weld rod to the hull. Holding the weld rod at an angle away from the crack, begin to push the rod onto the crack, gradually force the melted putty into the crack, into hull and rotate, keeping contact with hull at all times. Make sure melted poly enters the gap created by the putty knife. Hold the hot air gun approximately 1” away from hull at a complementary angle to the welding rod and heat rod and crack as you proceed.

As you approach the putty knife, if possible slide it further along the crack or withdraw it an angle, always providing....
a slight gap to allow melded poly to enter. Make sure to apply enough poly so that a slight bead is left on the surface.

Continue applying weld rod to crack, removing the putty knife(s) as required. Crack should close as you remove spacers. Make sure that the applied poly from the rod is still hot and liquid as the crack closes behind the point at which you are working. At end-hole opposite of where you started, meld enough rod to overfill hole (insert rod into hole and rotate rod. Make sure you keep end of rod in contact with hull as you push it down into hull and pull it out. Apply rod to hull approximately ¼" beyond hole.

Do not pull the rod away as you finish as this may pull some of the applied poly with it. Cut unmelted rod with wire cutters or crimpers.

Smooth out the bead of poly sitting on top of crack, using gloved hands. Judiciously heat bead with hot air gun and press and smooth with hands if you want a smoother surface.

Allow hull to cool completely before moving or disturbing. Test the quality of bond by pushing corner point of putty knife under edge of applied polyethylene and prying up. If lift easily or bead rises down along the crack, you have not achieved a good quality repair.

Alternative method using Propane Torch

A torch with open flame is fine for generating heat necessary to conduct repair but it is not recommended to melt the weld rod poly directly with a torch. Use a drill bit as described to melt the rod.

Drill end-holes at end of crack as described above. Insert putty knives as described to slightly open crack (no more than 1/16").

Clamp drill bit in vise grips so that shank or smooth end of bit extends from jaws of vise grip. Heat end of bit until it glows red hot.

Apply end of bit to crack in hull and heat the plastic until it begins to melt. Rolling the bit or working in a circular motion is effective.

Holding the poly weld rod against hot bit, meld end of rod and dip onto crack in hull. Alternate heating rod and hull surface to keep both hot. It will be necessary to periodically reheat the drill bit to keep it hot enough to do its job.

Proceed along the length of the crack, removing putty knife spacers as required. Slightly overfill the end holes and make sure the filler poly from the weld rod bonds well to edges of holes.

Once crack and end-holes have been filled, cut end of weld rod with wire cutters. Pass the torch quickly over the repair several times until the repair poly glintens slightly and then smooth with gloved hands. Do not allow flame on torch to contact hull and keep torch moving at all times. Severe hull damage can result from excess exposure to flame or excess heat.

Allow hull to cool completely before moving. Test quality of bond as described previously.

SMALL HOLES

Repair of small punctures is similar to filling the end-holes on cracks. For tiny holes, it may be necessary to slightly overfill hole to allow the melted poly to enter and seal the hole. You can enlarge the hole by drilling with small bit or by heating drill bit and melting hole slightly.

For best results, heat area around the hole and apply the melted poly from the weld rod to surface while hull is hot. This allows repair poly to bond with hull material as repair cures.

Press melded end of poly rod against hole and rotate rod in hole to spread adequate repair material in place. Cut off unmelted part of poly rod. Do not try to pull rod away as this could pull melded poly from hole.

LARGE HOLES

It is possible to weld a patch to your hull but can be a tricky process. As its necessary to melt your existing hull surface at point of repair, the possibility of inadvertently further damaging your hull does exist. If possible, rehearse the process on a couple of scrap pieces of polyethylene before attempting on our boat. For best results, obtain a patch of adequate size from your boat’s manufacturer.

A hot air gun is preferable to an open flame torch for this repair.

Cut the patch so that it is slightly oversized compared to the hole. The patch material can be cut with large wire cutters, jigsaw, or circular saw. Shape the patch so that it is rounded to eliminate sharp edges or corners that could lift if struck by an obstruction.

Heat patch until it becomes slightly pliable. With gloved hands hold it in place over area to be patched until it cools and holds a matching contour to that section of hull.

Sand the hull surface to be covered with the patch to roughen the surface and small amount of material. Wipe clean with denatured alcohol and let dry. Take weld rod and melt a bead of polyethylene in a circle around the hole in hull.

Heat the area to be patched until hull surface softens slightly, alternately heating underside of patch as well so that both attain temperature at about the same time. Make sure that bead surrounding the hole is soft and melded. While all surfaces are hot, press patch onto hull and hold in place.

Take weld rod and melt a bead along exterior edge of patch, melting patch and hull into one piece. Using gloved finger or flat tipped screwdriver shape bead of polyethylene from weld rod so that it smooths transition from original hull to patch, eliminating sharp edges.

Allow patched area to fully cool before moving or disturbing.

An alternative to melting a patch and possibility of damaging the hull

It is possible to mechanically attach a patch to your hull. Cosmetically, it won’t look as nice but it can make your boat serviceable again. The process involves riveting a patch in place.

To perform this repair you will need the following:
- patch
- drill with bit sized appropriately for rivets selected
- sufficient rivets to secure patch, spaced about 1” apart along circumference of patch
- Length of rivets should be just long enough to secure the patch and hull material.
- Longer rivets can create sharp edges on interior of hull that can pose a danger to you or your gear.
- rivet gun
- tube of Lexel ® or comparable sealant
- duct tape

Obtain a patch approximately 2” larger in all dimensions than the hole. If possible, cut edge of patch at an angle to produce a softer edge. You might want shape edge with rasp or file or grinder to angled edge. For best results, heat patch to pliable and hold it against hull to conform to hull shape. If you don’t have a heat gun, you can place patch in hot water and heat until it becomes pliable.

Once patch is conformed, apply a bead of sealant around hole. Apply a second bead to patch, approximately ¼” inside outer edge. Apply patch to hull and tape in place with duct tape.

Mark and drill holes for rivets within ½” of edge of patch, spacing holes no further than 1” apart. Press firmly on the patch next to hole to be riveted. Insert rivet in gun, place shank in hole and install.

For best results, if rivet does not snap at first pull, release trigger and push head of rivet gun firmly against patch and pull trigger again. The integrity and dryness of this repair process is entirely dependant on the tightest possible seal between patch and hull. A tight seal will compress the sealant placed between the patch and hull.

Allow repair to fully cure as indicated by manufacturer’s instructions on tube of sealant. If you’d like to maximize the dryness of the seal, melt a bead of polyethylene from a weld rod along the junction of patch and hull. Shape with angled straight edge to provide smooth transition between patch and hull.