

## **Blister Repair**

*by Don Casey*

Fiberglass blisters occur because water passes through the gelcoat. Water soluble chemicals inside the laminate exert an osmotic pull on water outside, and some water molecules find a way through the gelcoat. As more water is attracted into the enclosed space, internal pressure builds. The water molecules aren't squirted back out the way they came in because they have combined with the attracting chemicals into a solution with a larger molecular structure. Instead, the pressure pushes the covering gelcoat into a dome-a blister.

There has been a great deal of hysteria about blisters, but the reality is that the number of boats that develop serious blister problems is extremely small. An occasional blister or two is not a serious problem, any more than is an occasional gouge in the hull. Some boats seem to exhibit a greater propensity to blister, presumably due to the chemical components used and/or the layup schedule, but all boats are at some risk. Surveys suggest that about one boat in four develops blisters.

### **Repair materials**

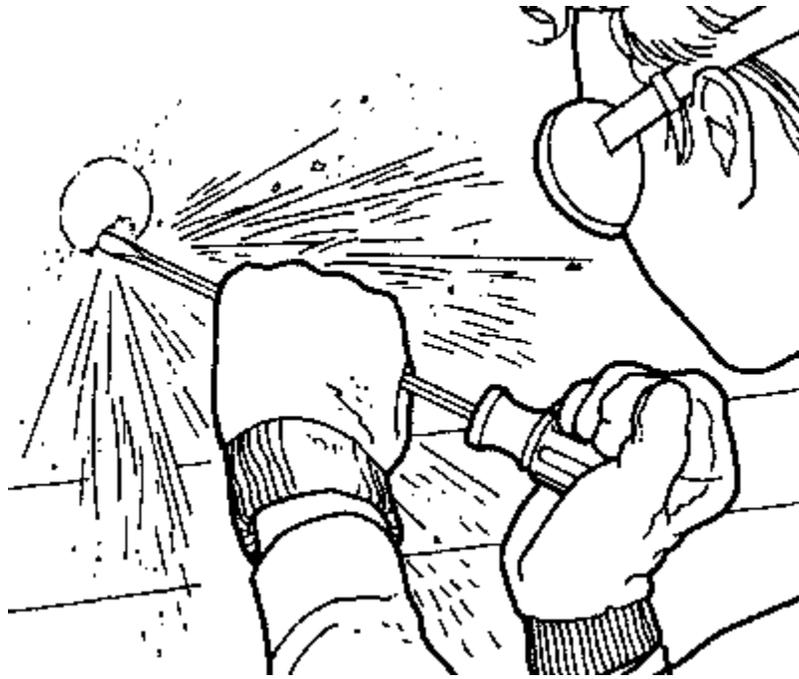
Effecting the repair of a few hull blisters requires an appropriate quantity of epoxy resin and hardener. Do not use polyester resin for blister repairs; you need the stronger adhesion and better water impermeability epoxy provides.

You also need a filler to thicken the epoxy into a putty. Select colloidal silica. Never use microballoons or any other hollow or absorbent (talc, for example) fairing compound to fill blisters.

A quart of acetone, a box of TSP (trisodium phosphate), a few acid brushes, and a 36-grit sanding disk completes your supply list. If the blisters penetrate the laminate, you may also need a yard of 6 to 10 ounce fiberglass cloth.

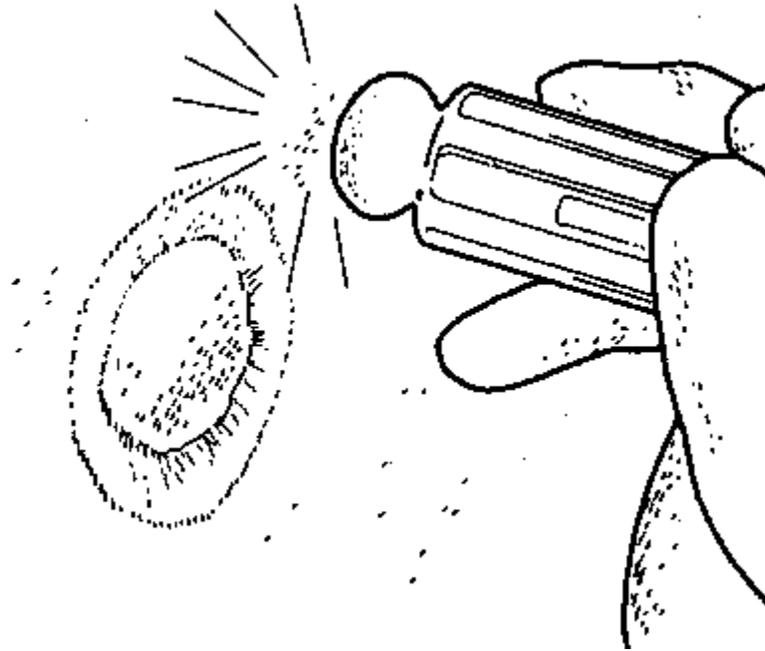
### **Minor Blistering**

The first step in minor-blisters repair is opening the blister to let it drain. Pop the dome with a chisel, screwdriver, or rotary tool. Be sure you are wearing eye protection; pressure inside a hull blister can be double that of a bottle of champagne, and the fluid that blasts out when you pop it is acid



Load a disk grinder with your 36-grit disk and grind the open blister into a shallow depression. The rule of thumb is that the depression should be 20 times as wide as it is deep, and it should only be as deep as required to remove any damaged laminate beneath the gelcoat.

Use a plastic mallet or the handle of a screwdriver to tap the hull all around the blister. Sound laminate will give a sharp report. A dull or flat sound anywhere indicates additional delamination, meaning that the blister is larger than you thought. Increase the circumference (not the depth) of the depression until the laminate all around it is sound.

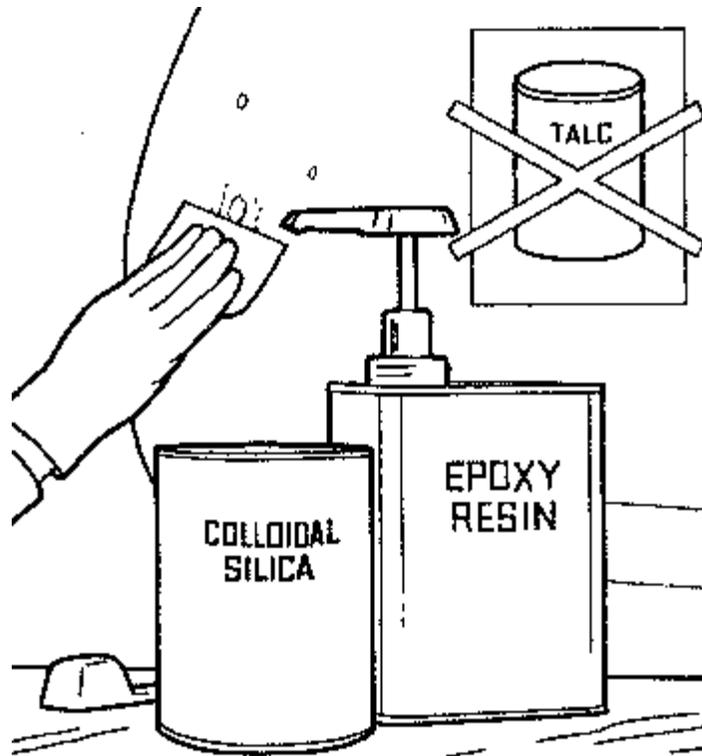


Flush the open blister with water, then scrub it squeaky clean with a solution of hot water (if available) and TSP-about a quarter cup of TSP to a gallon of water. Rinse thoroughly, then allow the blister to dry for at least 48 hours, longer if practical. If you dry-store your boat for the winter, grind and scrub blisters at haulout but don't fill them until launch time.

### **Filling**

Just before filling, scrub each depression briskly with a clean rag dampened with acetone.

Mix a small quantity of epoxy (one pump) and paint this unthickened resin into the cavity. Wet out the entire surface of the depression. Use an acid brush to apply the epoxy and give this application 20 or 30 minutes to begin to kick. For shallow blisters, prepare a small amount of fresh epoxy (one or two pumps) and thicken it to peanut butter consistency with colloidal silica. Fill the depression completely with this mix, using a squeegee to compress and fair the filler. Silica-thickened epoxy is difficult to sand, so take extra time to fair the epoxy as well as possible while it is wet.



Deep blisters require the replacement of the damaged glass fabric. Cut a disk of fiberglass cloth the size of the bottom of the depression, then cut several more, each a little larger than the last. Use only cloth; never use fiberglass mat with epoxy resin.

Wet the bottom of the cavity with epoxy and lay in the smallest disk of cloth. Wet out the cloth with resin until it is transparent, then lay in the next, slightly larger disk. Wet this one out, using the end of the brush to tamp the disks and compress them together. Continue adding disks and saturating them with resin until the repair is even with the surrounding surface.

Whether you have filled the cavity with glass disks or epoxy putty, allow the filler to kick. When the epoxy is no longer fluid, but still tacky, paint the repair and an inch or so beyond with at least two coats of unthickened epoxy, letting each coat kick before applying the next.

Let the repair cure for 24 hours, then scrub it with water and an abrasive pad (like Scotchbrite) to remove the waxy film on the surface of the epoxy. Fair the repair with a sanding block and you are finished.

Gelcoat should never be applied over epoxy. Since the repair will be covered with bottom paint, there is no need for a gelcoat surface anyway. Don't use gelcoat in blister repair.

**Boat Pox**

Boat pox is a much more serious condition, related to the occasional blister like acne to the occasional pimple. If the bottom of your boat is covered with blisters, filling them won't cure the problem. Pox is a systemic condition indicating that the hull is saturated. The actions necessary to remedy boat pox require specialized equipment and expertise.

For more information about hull-damage repair, consult *Sailboat Hull & Deck Repair* by Don Casey.