

Servicing Your Stuffing Box

by Don Casey

If your boat has inboard power, odds are it is fitted with a stuffing box to provide a watertight seal for the propeller shaft. Stuffing boxes are also used to seal rudder stocks that penetrate the hull below the waterline.

In principle a stuffing box is identical to the packing nut on a common faucet. Its primary components are a threaded sleeve and a hollow nut through which the shaft passes. The sleeve - or sometimes the nut - is filled with rings of braided square flax rope that has been heavily impregnated with wax and lubricants. Tightening the nut compresses this packing against the shaft, forming a watertight seal while still allowing the shaft to turn.

Adjusting

Water is required to lubricate conventional packing, so a properly adjusted stuffing box can be watertight when the shaft is stopped, but it must drip when the shaft is turning. Two or three drops per minute are adequate. It is not uncommon to see stuffing boxes leak at a much higher rate. This doesn't harm the shaft or the stuffing box, but the spinning shaft will sling this excess flow all over the engine compartment, leading to rampant corrosion of the shaft coupling, the transmission housing, and everything else getting sprayed. Even more disastrous, it puts an unattended boat at risk of sinking. If your stuffing box leaks more than 8 or 10 drops a minute, it needs servicing. Tightening the stuffing box nut a half turn is all that is required to reduce the leak, but the location of the stuffing box can render this job far more difficult than it should be. Access can be especially challenging in boats with V-drives and in sailboats.

The first step in stuffing box adjustment, then, is to figure out how to get two wrenches on the box--one for the lock nut and one for the adjusting nut--and how to position yourself so that you can pull on one while pushing on the other, and vice versa. You can use pipe wrenches to turn the nuts, but adjustable packing nut wrenches tend to be easier to handle in confined spaces. If the stuffing box is above a deep bilge, tie a retaining line to the wrenches before you start. With your wrenches on both nuts, hold the adjusting nut and turn the locknut clockwise to release it. Back this nut off a couple of turns. Now turn the adjusting nut clockwise until the dripping just stops.

CAUTION: Some stuffing boxes are rigidly attached to the hull, but most are connected to the shaft tube with a length of flexible hose. You do not want to twist this hose or twist the stuffing box inside the hose. If the adjusting nut does not turn easily, use a pipe wrench on the stuffing box flange--located just forward of the hose--to keep the box from turning with the nut. If the box is corroded, back off the adjusting nut several turns and wire brush the box threads bright before making the adjustment. Give threads and nuts a heavy coat of Boeshield T-9 (or some other corrosion blocker) to avoid this problem in the future.

After you make this initial adjustment, you are going to need to check the drip rate with the shaft turning. You can do this either with the boat underway or with the transmission engaged in forward and the boat securely tied in the slip. With the help of a flashlight--and a mirror if you need one--count the drops per minute. If it is more than two, tighten the adjusting nut slightly. If you cannot make this adjustment without putting body parts or clothing in dangerous proximity to the spinning shaft, stop the engine, make the adjustment, then restart it to check the drips. When the drip rate is one or two drops per minute, stop the engine. Hold the adjusting nut securely so that you do not alter the setting, then tighten the locknut against it. Before you extract yourself from your access position, carefully check the strap clamps that attach the hose to the stuffing box and to the stern tube. These inevitably corrode at the bottom, so you may need a mirror to check them. Better yet, release each one and rotate it to view all sides before retightening. Do this one clamp at a time.

Repacking

After the packing nut has been tightened a few times, the packing gets so compressed that it becomes hard enough to actually wear a groove in the shaft--a condition you want to avoid. In a powerboat used regularly, the shaft packing should be replaced at least every other year. Sailboats may not need to have

the packing replaced for five years or more, but when the stuffing box starts requiring frequent adjustment or if it begins to feel warm, it's time.

Repacking is straightforward. Hold the packing nut while you release the lock nut, then unscrew the adjusting nut completely to open the box. You must dig out ALL of the old packing. The easiest way to do this is with a corkscrew-like pick designed specifically for this task, but a sharpened piece of stiff wire bent 90 degrees at the end will also do the job. Take care not to scratch the shaft with either tool.

If the old packing comes out relatively intact, use it to determine what size packing you need. If it comes out as shapeless wads of fluff, then measure the space between the shaft and the inside of the packing nut to determine the correct flax size. Multiply the diameter of your shaft by 14 to get the approximate number of inches you need for 4 layers of new packing--usually sufficient.

A common mistake is winding the new packing around the shaft as a continuous piece. Packing installed this way will not seal properly. It must instead be installed as a series of stacked rings. This requires cutting the packing into lengths that just encircle the shaft with ends touching. The easy way to do this is to wrap the packing around the shaft in some accessible location and cut across the overlap with a razor knife. Curl one of your cut lengths into a ring around the shaft and push it into the stuffing box. Tamp it evenly with a small dowel or a blunt screwdriver to push it all the way to the bottom of the box. Push a second ring into the stuffing box on top of the first one, staggering the joint about 120 degrees. Add a third layer, then a fourth, each time staggering the joint. If you don't seem to have room for the fourth layer, hand tighten the adjusting nut to force the other rings deeper, then remove it again to see if this made room for an additional ring of flax. When the box is full--but not so full that the adjusting nut doesn't thread on easily--adjust it to drip two or three times per minute, as previously outlined. You will need to check this setting after the first couple of hours of use; some tightening is usually required.

Because you remove the old packing before installing new, and it is the packing that is keeping the ocean out of your boat, it should be out of the water when you do this job. If you must do it with the boat afloat, have the new packing ready to install as soon as the old is out, and drape a towel over the stuffing box to deflect the incoming flood into the bilge, where your bilge pump should handle it without difficulty. You can make the task less frantic by sealing the shaft from the outside with plumbers putty, but you will have to go into the water twice to do this, once to put the putty around the shaft, and a second time to remove it. Do not turn the shaft while the putty is in place or you will break its seal, and make sure you clean out ALL the putty when you are finished since both the stern bearing and the shaft seal depend on water flow for lubrication.

Drip-Less Packing

An alternative to conventional braided packing is Drip-Less moldable packing. The advantage of this type of packing is that it is self lubricating, which eliminates the necessity of letting the stuffing box drip. Drip-Less packing requires two retainer rings of conventional packing. You install a ring of conventional packing, then push Dripless Packing into the box until it is about three-quarters full. A second ring of conventional packing completes the job. Tighten the nut just enough to stop the box from dripping. This type of packing runs hotter than water-lubricated flax, and over tightening will generate excessive heat. The stuffing box should not be too hot to touch. Low-friction packing is six to ten times more expensive than flax, but because it rarely needs adjustment, it can be a good choice for a stuffing box that is particularly difficult to service.

For more information about boat maintenance, consult *This Old Boat* by Don Casey.