

How to unstick a frozen piston

by Bill Hancock

Recently, I had the self-inflicted opportunity to repair a frozen piston in my own boat engine. So how did I get there? As it turns out, quite innocently enough.

After washing and cleaning up the hull following a prolonged run in salt water, I decided to flush the engine and cooling system before storing the boat. I backed the boat on the trailer into my driveway which is gently sloped downward toward the street. I removed the top of the intake water strainer and stuck the garden hose in and started the engine. The engine ran and drew water from the open strainer well. This method was used to avoid over pressuring the engine cooling system as we have covered before. After running for 15 minutes or so, I shut the engine off and reassembled the strainer, drained the bilge and vacuumed the remaining water from the bilge and

put the boat away.

Little did I know that by parking on a slight incline which allowed the bow to dip slightly below the stern, it allowed water to backflow past the exhaust risers and into the rear-most pair of cylinders. As fate would have it, the exhaust valve on the starboard side was open which allowed a small amount of water to get trapped on top of the piston and remain there for 6 months until I

used the boat again. When I tried to start the boat prior to leaving for the next event, the engine was locked up solid. I removed the spark plugs and found the rear plug caked with rusty debris. Right away I knew that I would have to remove the engine and make a major repair.

One question that came to mind was “Why, after all these years of successfully running the boat with no problems, does water



The plate, showing the pressure gauge and grease gun attached to the zerk fitting in the plate.

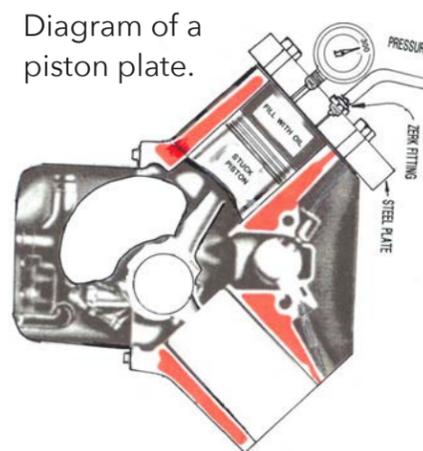
suddenly get into the engine.” The answer; after a Cabernet Sauvignon moment, became clear; I had never flushed the engine with the bow lower than the stern. When I used the boat in fresh water, I never flushed the engine, I simply pulled the boat out of the water on the typical steeply inclined ramp and the engine cooling water then drained completely before the boat ever reached my driveway.

Once I removed the engine with the help of my good friend and neighbor, Gerald Dake and his son Rick using their front end loader, we carefully removed the cylinder heads and found the rear most piston frozen in the bore. I removed the accumulated rusty debris and soaked the piston with penetrating oil to no avail. I needed a way to gently apply force to the top of the piston without risking any more damage to the engine. The accepted method among backyard mechanics and professionals in a hurry (AKA dealership flat-rate mechanics) is to find a block of wood and use a big hammer to literally beat the top of the piston until it breaks loose from the cylinder bore. While this method works, it is crude and to avoid the risk of being tagged as a Mechanical Neanderthal, I devised a kinder-gentler way of approaching the problem. I was looking for potentially a lot of force but I did not want to leave any marks or create any localized stress. My immediate solution was to use air pressure to move the piston.

I started by digging in my scrap box and found a 1” thick piece of steel plate which was approximately



Zerk fittings and grease gun



6” square. I cut one end off the old head gasket and used it as a template to center punch the locations of the head bolt holes. I drilled these holes out and also drilled two more holes in the center of the plate which I tapped for an air hose fitting and a pressure gauge.

I squirted some liquid penetrant into the bore around the piston, and using the old section of head gasket, I mounted the plate to the block using some bolts which had adequate thread engagement in the block. I torqued the plate down and then proceeded to hook up an air line, using an air pressure regulator so I could control the amount of air pressure in the cylinder. I gradually

increased the pressure until I had 100 psi in the cylinder, but the piston did not move. Time to regroup and make a new plan. Why not use hydraulic power? I filled the cylinder with used engine oil before attaching a 2000 psi pressure gauge.

Next, I got out my trusty grease gun and installed a Zerk grease fitting and started pumping grease into the cylinder. Soon, the pressure inside the cylinder began to slowly rise. It went past 100 and on to 200. When it got to 300, it stopped creeping up with every stroke of the grease gun. I looked down and realized that the crank was now slowly turning perhaps a degree with each stroke of the grease gun.

EUREKA!!

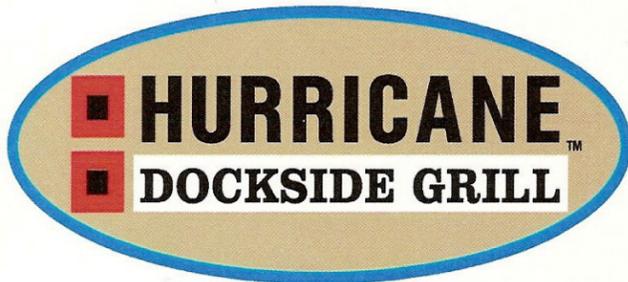
I had managed to free up the piston without heating, beating, scratching, cracking, scaring, mangling or otherwise inflicting a host of other mechanical travesties. From there, I simply continued pumping until the piston reached the bottom of its travel, which I realized when the crank stopped rotating and the pressure rose abruptly. With the piston at the bottom of the travel, I relieved the pressure and removed the plate, and drained the oil and grease. The initial frozen area of the cylinder wall was now exposed, which allowed me to carefully remove the scale, rust and debris and smooth out the surface so the piston could now easily pass the damaged area and return to the top of the bore. With the engine able to freely rotate, I could now proceed with the disassembly and inspection.



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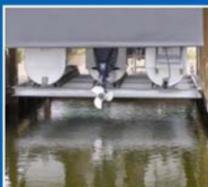


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Hopefully you never have a piston seize up in the bore, but before you rush out and use this method, there are some cautions.

- 1** NEVER USE COMPRESSED AIR OR GAS - you will create a bomb. People have been known to blow the side out of the block by applying too much air pressure. By using grease, which is virtually incompressible, when and if a structural failure occurs, a small amount of grease will squirt out and the pressure will be instantly relieved.
- 2** If you have time, apply some penetrating oil and let it soak in for several days before trying anything, sometimes this alone will solve the problem.
- 3** Prior to using this hydraulic method, determine whether the affected piston is either at the top or bottom of its stroke. If it is at either extreme, applying pressure will not work, other than to inflict severe damage. The piston must be in a position where it can travel.
- 4** Limit the cylinder pressure to 500 PSI to avoid over stressing the cylinder bores. It is OK to leave the cylinder pressurized for a period of time, during which, the grease and penetrating oil can work its way all through the affected area.
- 5** And last but not least-If you decide to flush your engine cooling system, always make sure the bow is higher than the stern. ♦

Happy Boating



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