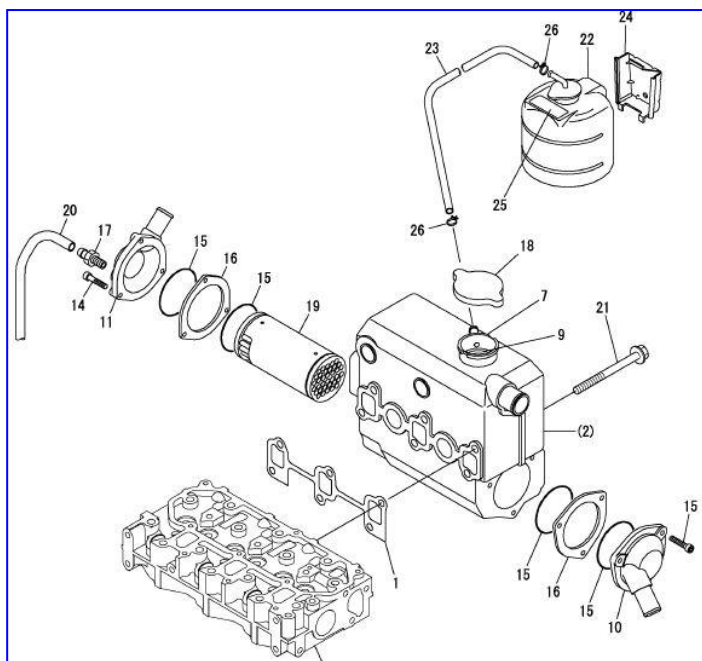


## Replacing the fresh water cooling pump on a 2008 Yanmar 3YM30

**Chasing down coolant leaks.** This engine has shown coolant leaks since we purchased the boat, a 2008 Hunter 36, in 2015. The first clue was the consistent loss of coolant from the overflow tank (#22). About 6 oz over a season. I used “diapers” of paper towel to wrap suspect coolant connections when the engine was cooling down. The pink Yanmar coolant contrasts well against white paper towel. Even a fraction of a drop shows up well.

The first leak was in the rear O-rings (#15/16) on the heat exchanger (#2) in the figure (right). The heat exchanger assembly was removed, rebuilt, and tested by a radiator shop. A new steel gasket (#1) was used when replacing the heat exchanger. A torque wrench and medium thread locker were used on the six bolts (#21) during reassembly.

The coolant loss persisted after the heat exchanger rebuild, but at a lesser rate. Diapers were also used to find the leaking fresh water pump shaft behind the V-Pulley, and a leak from the filler neck. The engine only had 770 hours. It is unknown if the alternator belt had been overtightened at some earlier point and rapidly wore out the shaft bearing/bushing seal. The shaft felt snug with no end play.



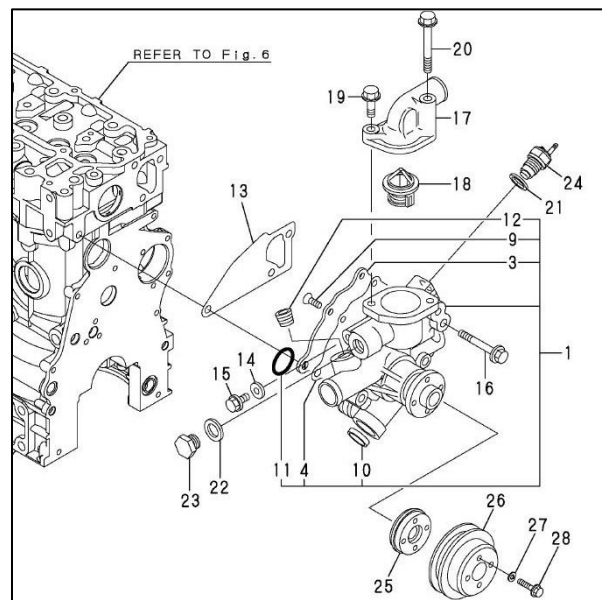
A new radiator cap did not stop the leak around the filler neck. Upon removing the heat exchanger again to replace the filler neck, a crack was discovered on the upper sealing surface (photo at right). There was very little residual antifreeze on the tank around the filler neck because it evaporates off so quickly. The crack is obvious in the photo at right, but was probably there before we bought the boat.



The crack was accidentally found during pressure testing as shown at right. A stream of small bubbles developing at the crack area when bubbles were expected at the seal between the neck and tank. The crack may just have been a lucky find because the bubbles leak out from the cap when the pressure is too great for both seals to hold (a little above 15 psi) in this test configuration. This is a cool test because leaks around the 4 bundle O-rings would show up as either exterior leaks or as bubbles rising from the raw water ports. This test is in the shop manual. The yard pressed in a new filler neck – leak fixed.

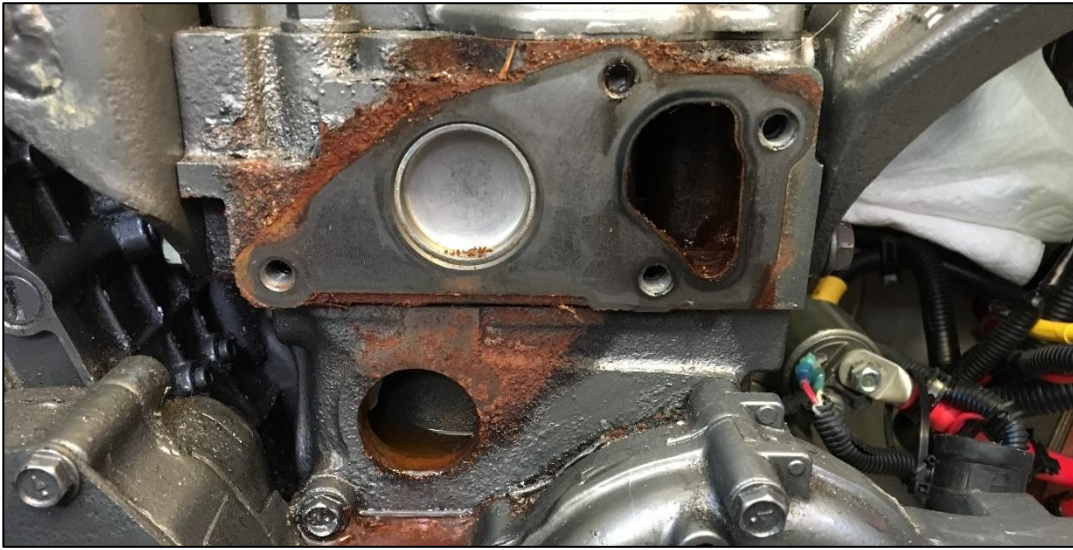


**Finally – Replacing the pump.** The alternator was already off to remove the heat exchanger and coolant was already drained. The raw water pump was loosened from the mounting bracket and the fresh water hoses removed from the fresh water pump. The raw water pump was moved so there would be room to work and clean/paint the front of the engine. Impeller replacement was easier too. The photo below shows the hot water heater hoses removed and plugged (kept the hoses full of coolant). The lower radiator hose was removed followed by the three bolts (#16) that hold the water pump to the engine. A word of caution when “prying” the pump away from the engine. The gasket (#13) and O-ring (#11) held the pump to the engine after the bolts were removed. The gasket (#13) freed by just shaking the pump. A small wooden wedge was useful to pull the pump straight away from the engine because the O-ring (11) was tight in the engine block. Do not



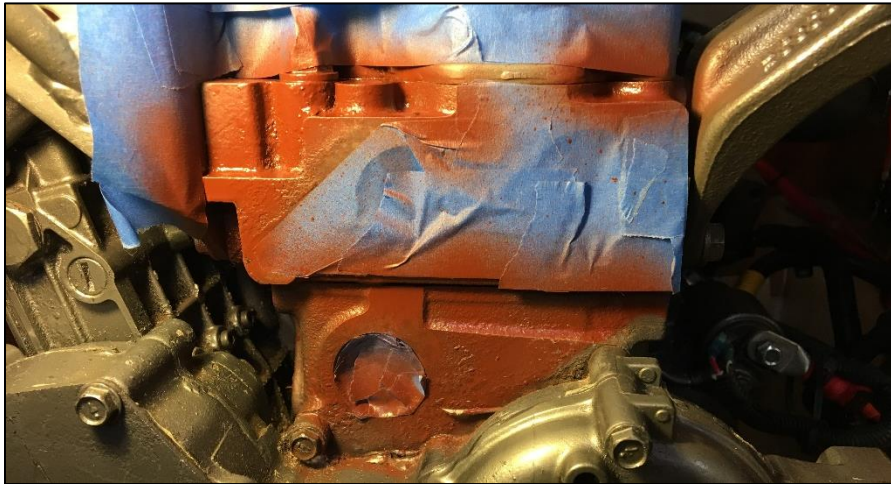
pull off angle or the O-ring sealing surface in the block could be scratched, although the pump is aluminum so the scratch risk is probably low. All the items marked #1 come with the pump assembly.

The front of the engine and pump are shown below.





Cleaned the gasket and O-ring mating surfaces on the head and block with a stainless steel wire brush and 1000 and 1500 grit wet sand paper.



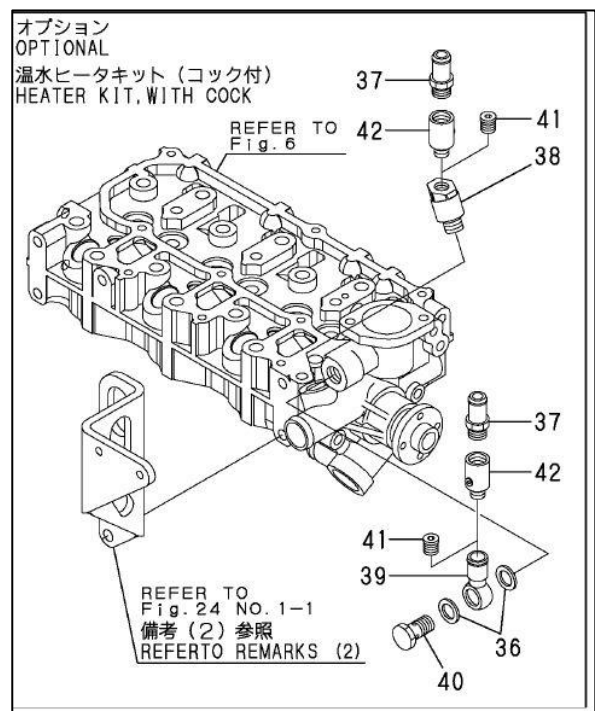
Primed the bare and lightly rusted spots with rust inhibiting primer.



Wiped down the surrounding areas with a degreaser and sprayed \$12/can with Yanmar gray. It must be a special marine enamel...



The new pump, like many Yanmar parts, comes unpainted. The pump was degreased, taped, primed and painted. I tried not to paint the gasket surface on the rear side of the pump. Shown above the pump at upper left is the water temperature sensor and copper gasket. The other items are the "Optional Heater Kit, With Cock" to supply the hot water heater. The parts were cleaned with a brass wire wheel and a light coat of clear lacquer was applied on the exposed surfaces to keep them looking nice. In the lower photo the gasket (#13) and O-ring (#11) are not shown, but come with the new water pump assembly (#1). Refer to pg 2. The short bolt (#15) is reused from the old pump. The five copper gaskets shown should be replaced to prevent new leaks.





Engine paint dry and ready for reassembly. Note the raw water pump is free from the bracket and not yet mounted. Anytime I remove a part from the engine for whatever reason, it gets a fresh coat of paint (silver, black, or gray).



The raw water pump was reinstalled then the fresh water pump. Per the shop manual, both sides of the triangular gasket were heavily coated with an adhesive to hold it in place during assembly. Per the local Yanmar parts guy, I used a 3M spray adhesive. The O-ring was coated with a PTFE-based lube made for O-rings in order to make insertion of the O-ring into the block

easier. Medium thread locker was applied to the three bolts (#16) and were tightened in a round-robin manner (no pattern given in the manual) and torqued per the values in the manual. Getting the hot water heater fittings clocked into the correct orientation is difficult because of limited wrench space. If you can reassemble the fittings and tighten them on the pump ahead of time, that might be the way to go



Before reattaching the heat exchanger and alternator, a sharp razorblade was used to scrape the old exhaust manifold gasket from the manifold. Removing the elbow from the exhaust hose and raw water hose is difficult. There was no reason to remove them in this case since the manifold, connector and mixing elbow were replaced about a year prior because of coking. During separation of the elbow, the stainless steel connector broke off in the manifold side. More boat bucks. A few coats of high temperature silver paint on the manifold and elbow back then may prevent them from rusting like they seem to do, but this is inconsequential surface rust.



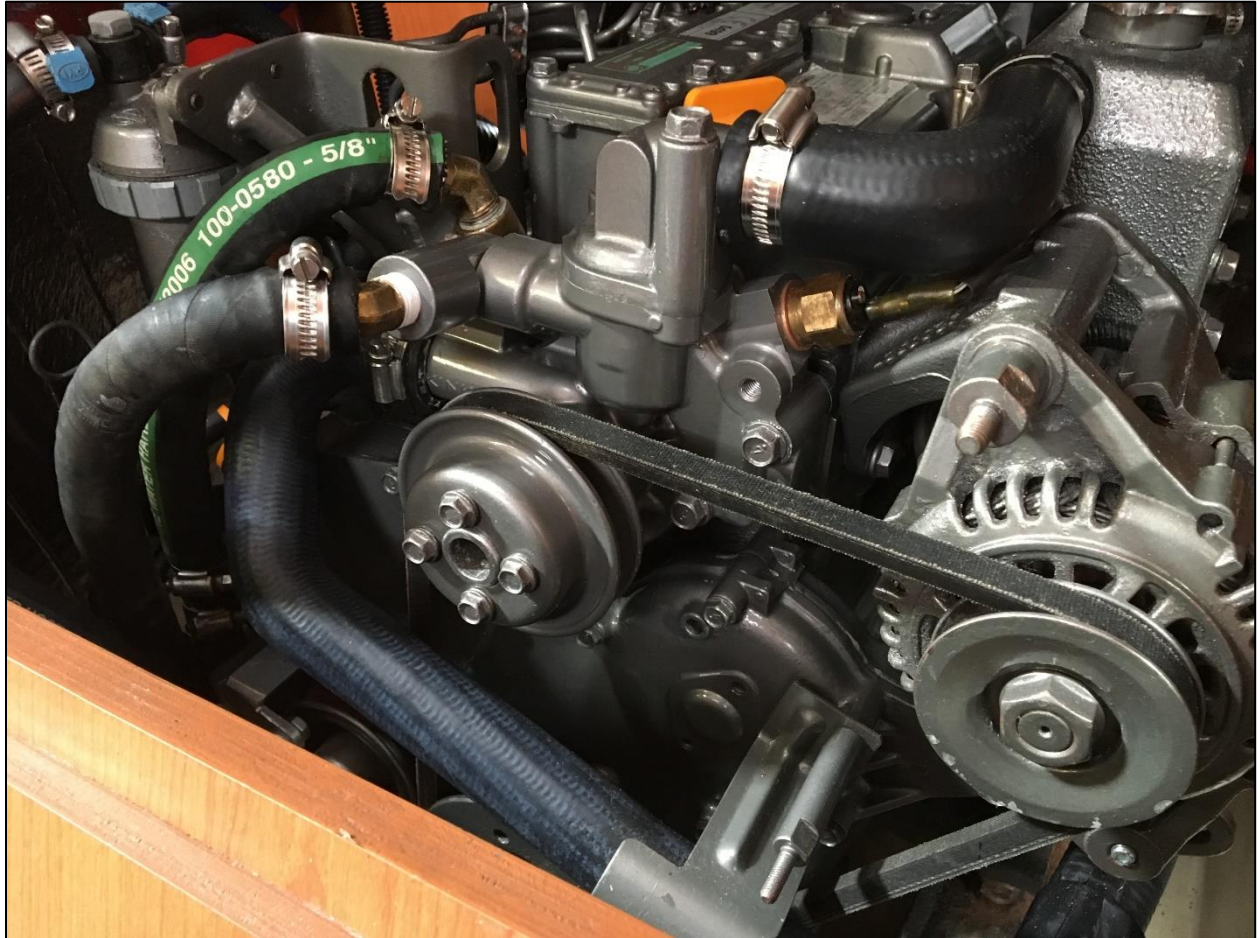
All of the parts are reassembled with the exception of the water heater hoses and the gooseneck/hose. Coolant was slowly poured into the thermostat opening to fill the block and pump. This seems to work well at eliminating much of the trapped air. The engine rake makes the thermostat and water heater hoses the highest part of the cooling system. Coolant was added until the block was full up to the sealing surface of the thermostat. Getting air out is important.



The thermostat was replaced along with the gooseneck and radiator hose. I use medium thread locker on all engine bolts.

The corks were removed from the heater hoses (middle photo above) and coolant added to top off the lines. The coolant was not replaced since it was only a year old. Coolant was then added through the top heater elbow

fitting on the pump until coolant appeared in the lower elbow fitting. The lower hot water heater hose was reattached and a few more ounces of coolant were added to the higher elbow, then that hose was replaced. Finally, the filler neck was topped off and radiator cap replaced. The thermostat has a small,  $\sim 1/16$ -in hole, which appears to allow a small amount of coolant (or air) to pass through the thermostat when it is closed (cold). My guess is that it could be there to help remove air from the system.



The coolant overflow tank was refilled in anticipation that the system will draw in some additional coolant after a few operational cycles as the air bubbles out (hopefully).

After about 3 1-hour motoring sessions, the coolant level dropped about  $3/8$ -inch in the tank. My fingers are crossed that the level becomes stable. Otherwise the engine may also have a head gasket issue...☹.

To complete this note, the photo on the next page shows a small amount of what looked like sand in the exhaust manifold opening. There were also small amounts in each of the exhaust ports on the engine block. I am hoping that is NOT what burnt Yanmar coolant looks like. It was loose, so it may be something that condensed over the layup period because I would think it would be blown out of the exhaust system otherwise.



**Disclaimer** – I am a reasonably competent DIY type (within my limits), but not a diesel mechanic. Don't try this at home. You have been warned or disclaimed or whatever the correct term is...☺