TRANS ATLANTIC DIESELS, Inc.

MARINE ENGINE OVERHEATING

SOME CAUSES & SUGGESTIED REMEDIES

This section applies to heat exchanger cooled marine engines and lists some possible causes & remedies for overheating conditions. The suggestions to remedy issues are not guaranteed but are based on our many years of experience within the marine industry. This document is intended for the operators help in emergency situations where a qualified technician is not available. Do not go beyond your level of expertise, it could compound the problem and make final troubleshooting more difficult.

IMPORTANT NOTES:

1. PRIOR TO WORKING ON ANY RAW WATER COOLING COMPONENTS THE SEACOCK MUST BE TURNED OFF.

2. WHEN WORK IS COMPLETED TURN ON THE SEACOCK AND CHECK CAREFULLY FOR LEAKS, BOTH PRIOR TO RUNNING THE ENGINE AND AFTER, ESPECIALLY IF LEAVING THE BOAT UN-ATTENDED.

    a. Is the hull of the boat and prop clean?
    Growth on either can be a factor. Inspect and clean if necessary.

    b. Is the water strainer grid on the underside of the hull clean and unobstructed?
    Inspect and clean if necessary.

    c. Is the Sea Strainer filter clean?
    TURN OFF THE MAIN SEACOCK before dismantling and cleaning the sea strainer.

    d. Raw Water Pump?
    Are you seeing a good flow of raw water being discharged overboard? If not, the problem could be in the Raw Water Pump. TURN OFF THE MAIN SEACOCK. Firstly check the condition of the pump's rubber impeller. (It is recommended that the rubber impeller be replaced each season or earlier if necessary.) When removing the impeller, check to see if any of the blades or pieces of them have become detached from the impeller. If so, you should follow the path of the raw water plumbing exiting the pump and see where the pieces may have become trapped, possibly causing a restriction. It's

usually the entrance to the main heat exchanger tube bundle or oil cooler where the debris ends up. While changing or checking the impeller, it's a good time to inspect the condition of other critical components of the pump. The cam is often overlooked. This is a wear item and will reduce the performance of the pump exponentially as it wears. A half worn cam will pump approximately half the amount of cooling water. Some pumps have a wear plate on the back inside wall of the pump. This should be checked as well as the condition of the inside surface of the pump's end cover. Wear in any of these components can affect the pumps performance. In the case of a belt driven raw water pump, check for correct belt tension. If your vessel is operating in shallow sandy bottom waters or you have run aground and disturbed the sand, the abrasive matter being sucked in by the pump can cause premature wear/damage to the pump.

To familiarize you with the appearance of some of these pumps and other cooling components, there are some sample pictures at the bottom of the page.

e. Is your temperature gauge reading accurately?

If your high water temp. alarm sounded and you observed a high gauge reading of 200°F + then the gauge is probably working ok. If the alarm did not sound, and your gauge indicated above 200/210°F + then it is suggested that you confirm the accuracy of the gauge. An electric gauge is not as reliable as a mechanical gauge. You can either confirm the accuracy with a hand held infra-red thermometer by concentrating the beam in the area where the temp gauge sender is located, or if your temp gauge is electrically operated, temporarily fit a mechanical gauge and compare readings. If they differ, and your mechanical gauge indicates a normal temperature, then the electric gauge and appropriately matched sender should be replaced. A mismatched gauge and sender from different manufacturers can give an inaccurate reading. Not all senders are the same resistance value. The infra-red thermometer is also useful in detecting hot spots throughout the engine's cooling system. Often the area of the restriction will show hotter than other areas as water flow may be interrupted.

f. Restriction in the interior of the rubber exhaust hose?

Older hoses can de-laminate on the inside. This can cause a restriction in the exhaust and the water discharge. To check this, a gauge must be fitted to the exhaust discharge system to measure the pressure. This works best if carried out by a qualified technician, as special test equipment is required.

g. Restriction or Blockage in Exhaust Mixing Elbow/Riser?
Check that the passage way where the raw water is injected into the elbow is free of corrosion or restriction. These elbows are usually made of aluminum, cast iron or stainless steel. The aluminum and cast iron types are more prone to corrosion.

h. Raw water pump Supply Hose being sucked close?
The hose between the sea strainer and the raw water pump should be reinforced to avoid the hose being sucked closed. If you have to replace the hose, TURN OFF THE MAIN SEACOCK before commencing.

i. Thermostat problem?
Most thermostats start to open around 160°F. and are fully open at around 180/190°F. The most common time for a thermostat to fail and remain closed is after a prolonged layup. It may require more heat than normal to open it, after which it may continue to operate normally. If not, it should be checked and/or replaced. To check the opening temp. and test it, heat the thermostat in a saucepan of water on the stove top using a thermometer of known accuracy. Do not allow the thermostat to touch the bottom of the pan. It should be suspended by wire or similar. It should commence opening at approx.160°F. and be fully open at approximately 180/190°F. Different engine manufacturer's thermostat temps. may vary slightly. When re-installing the thermostat, follow the manual's instructions. It will not function if fitted incorrectly. i.e. upside down or improperly seated. It is advisable to carry a spare.

j. Head Gasket Failure?
This section applies to an engine that has been severely overheated. The most common cause of a head gasket failure is overheating. If the head gasket has been damaged, this can allow exhaust gasses to enter the water jacketed cooling system and build pressure. The purpose of the radiator cap is to release above normal pressure. This will also lead to a loss of coolant, further compounding the overheating problem. The presence of exhaust gasses can cause abnormally high pressure within the engine and the cooling reservoir.
TO AVOID BURNING, NEVER REMOVE THE COOLANT FILLER CAP UNTILL ENGINE HAS COMPLETELY COOLED.
A qualified technician should be contacted to determine the condition of the head gasket, and any other damage that might have occurred, such as

cylinder wall scoring and or cylinder head damage. The engine should not be operated if damaged. If an attempt is made to start the engine after coolant has leaked into the cylinder/s, this could hydro-lock and result in bending one or more connecting rods doing further damage. Repairs should be carried out before the coolant deteriorates the cylinder walls, pistons and rings.

k. Heat Exchanger and Oil Coolers corroded, and /or restricted?
Before working on these items TURN OFF THE MAIN SEACOCK. Beyond checking the heat exchanger and oil coolers for a restriction in the raw water tube bundles, there is not much more that can be done without special equipment. To clean the interior between the tubes, it is best to take it to a radiator shop that has a tube cleaning tank. Sometimes this process is successful, if not the heat exchanger must be replaced. The rate of success is often based on the age of the cooler.

For those that wish to clean their own coolers and system, we do offer a product called Hammerhead Descaler. View on our website >

l. Fresh Water Circulating Pump?
The Fresh water circulating pump is seldom the cause of overheating because it usually has a cast iron impeller that will not normally wear or corrode unless in direct contact with salt water. Most pumps have a weep hole on the underside for alerting the operator that the seal on the pump is leaking. This of course will lead to low coolant level and eventual overheating if not replaced. Check that the belt tension is correct to avoid slippage.

The sample images shown below are from a Perkins 4.108. They are intended as a guide to familiarize you with some items associated with engine cooling that have been referenced in this document. Your particular items will vary by engine and vessel.

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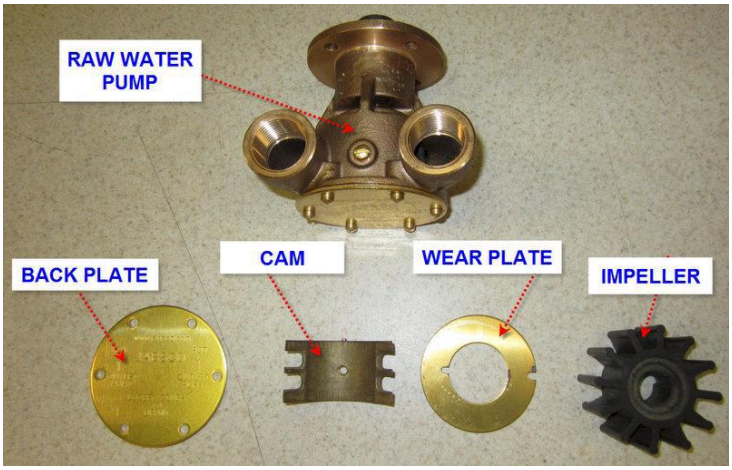

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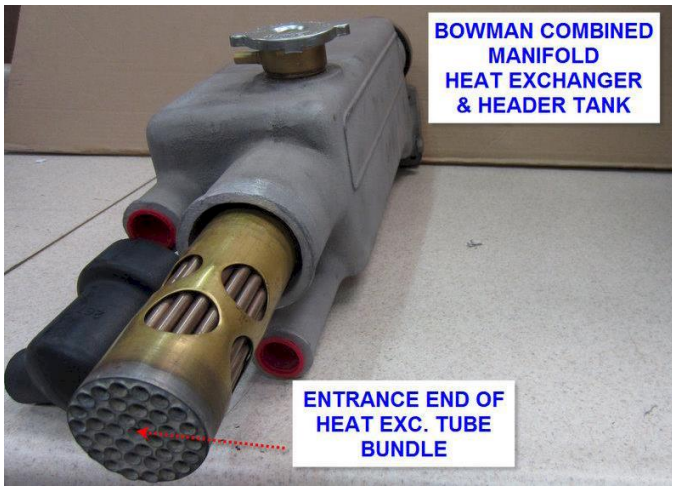

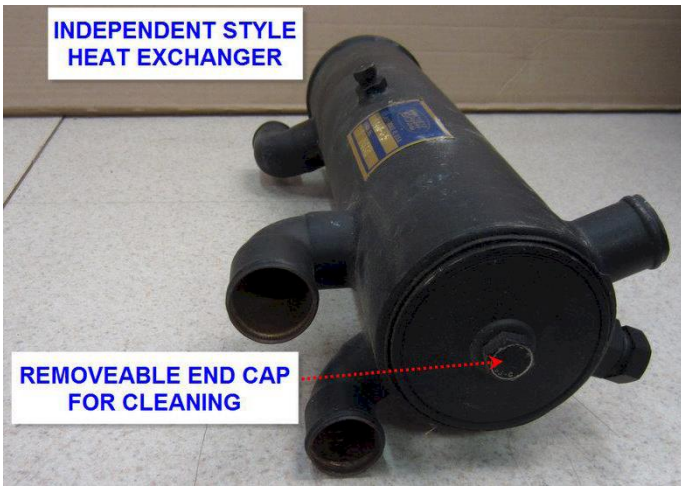

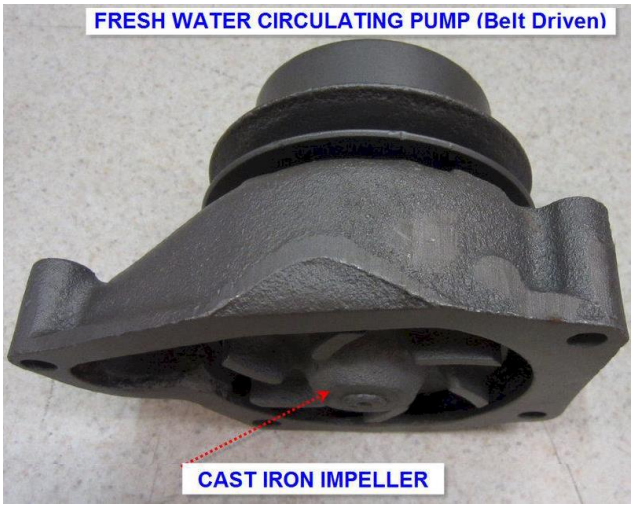

Hopefully this document was of assistance is resolving your overheating issue. If you cure your problem by discovering something we have not covered, we would like to hear from you in order to benefit others. Please email us at tadinc@earthlink.net