8. Precautions

8-1. Ventilator

The surface temperature of fresh water cooled engines is higher than sea water cooled engines. Therefore, if the engine room is not well ventilated, engine room temperatures can rise to a point where they will adversely influence engine performance.

8-2. Cooling water

(1) Fresh water
Use clean soft water as cooling water. Hard water will cause calcium build-up, poor heat transmission and a drop in the cooling affect, resulting in overheating.

(2) Fresh water tank capacity

l (cu. in)

Model	Capacity
2GM20F	2.9 (177.0)
3GM30F	3.4 (207.5)
3HM35F	4.9 (299.0)

Remove the cap from the fresh water cooler, and check the water level. If the water level is below the top of the cooling pipe, add clean soft water up to the iron plate at the bottom of the filler.
If water is added up to the mouth of the fresh water tank, about 50cc of water will overflow from the filler immediately after the engine is started. This is normal, and is caused by the increase in the volume of the water as its temperature rises. If the water filler cap is removed after the engine has been stopped and allowed to cool, the water level will be 2—3cm from the top of the filler. This is also normal, and is caused by the overflow of the unnecessary water as the temperature of the water rises.

(3) Cooling water (fresh water) level check
Check the level of the cooling water (fresh water) before daily operation. A low cooling water level can cause insufficient pump discharge and the accumulation of scale in the heat exchanger.

(4) Cooling water leakage check during operation
Although checking for water and oil leakage during operation is generally necessary, check for fresh water leakage with special care.
Fresh water leakage is directly related to seizing of the engine.

(5) Fresh water replacement
Replace water every 500 hours. Always use an anti-rust agent.
To drain the water, open the cooling water drain cock and remove the water filler cap. If the filler cap is not removed, a vacuum will be created in the water jacket and not all the water will be drained.

(6) Removing the filler cap
Do not attempt to remove the water filler cap at the top of the fresh water tank while the engine is running, or while the engine is still hot after it has been stopped; steam will escape and may cause serious injury. If removal of the filler cap is unavoidable, place a piece of cloth over the cap and turn the cap slowly, making sure you are in a safe position even if steam escapes.

8-3. Antifreeze

(1) Use permanent type antifreeze in the winter. Freezing of the fresh water will damage the heat exchanger, cylinder head and water jacket.

(2) Antifreeze use
1) Before adding antifreeze, clean the cooling system and check for leaks.
2) Select mixing ratio according to the following table.

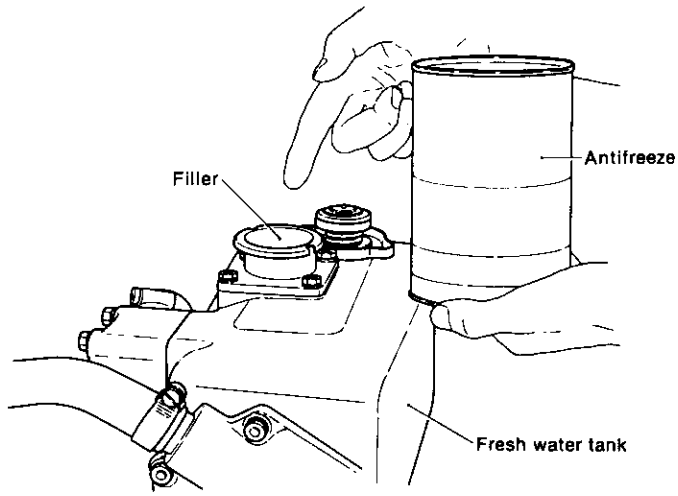
l (cu. in)

Temperature	−5°C	−10°C	−15°C	−20°C	−25°C	−30°C
Mixing ratio	12%	22%	29%	35%	40%	44%
2GM20F	0.35 21.40	0.64 39.10	0.84 51.30	1.02 62.20	1.16 70.80	1.28 78.10
3GM30F	0.41 25.00	0.75 45.80	0.99 60.40	1.19 72.60	1.36 83.00	1.50 91.50
3HM35F	0.59 36.00	1.08 65.90	1.42 86.70	1.72 105.00	1.96 119.60	2.21 129.40

NOTE: The temperature selected in the above table should be 5°C lower than the lowest expected temperature in the area.

NOTE: Check the mixing ratio carefully, especially when using premixed coolant.

3) Tighten the drain cock and fill the cooling system. Then, run the engine for approx. 5 to 30 minutes to make sure the solution is well mixed.



NOTE: Some antifreeze solutions will corrode aluminum. Check carefully before use.

NOTE: When antifreeze protection is no longer necessary, drain water, flush cooling system and refill with fresh water.

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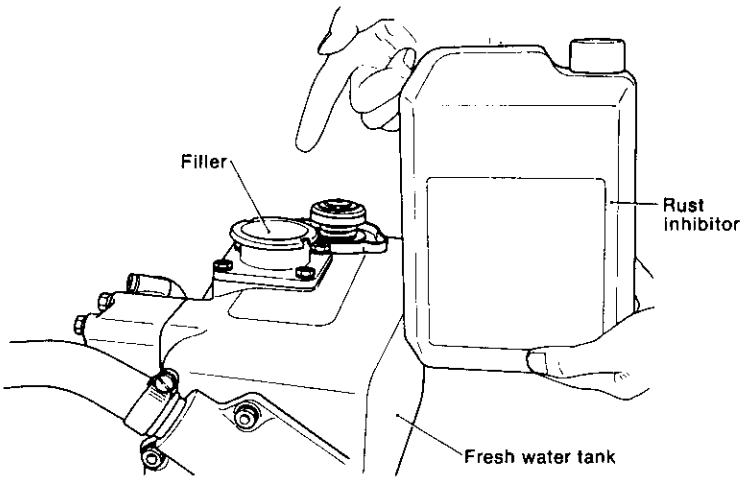
8-4. Rust inhibitor

When the fresh water is changed, a rust inhibitor must be added to the new water to prevent rusting.

Rust inhibitor : Fresh water = 1 : 10

Flush cooling system with fresh water, fill with proper rust inhibitor and then top-up cooling system with fresh water.



8-5. Idling the engine when stopping

Always idle the engine for ten minutes immediately after starting and prior to stopping. Be sure to idle the engine adequately, especially before stopping. Stop the engine only after its temperature has dropped sufficiently. If the engine is stopped while hot, the hot fresh water will cause the temperature of the water in the heat exchanger pipe to rise, causing a build-up of calcium deposits in the pipe and a drop in the cooling affect.

8-6. Cleaning the heat exchanger tube

If the heat exchanger tube through which the fresh water flows becomes extremely dirty, the cooling effect will deteriorate.

If the C.W. warning lamp lights periodically when the engine is run at the rated output, clean the tube in the fresh water tank with a cleaning agent and then flush the accumulated scale produced by cooling the fresh water from the tube.

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