

Today's Topics:

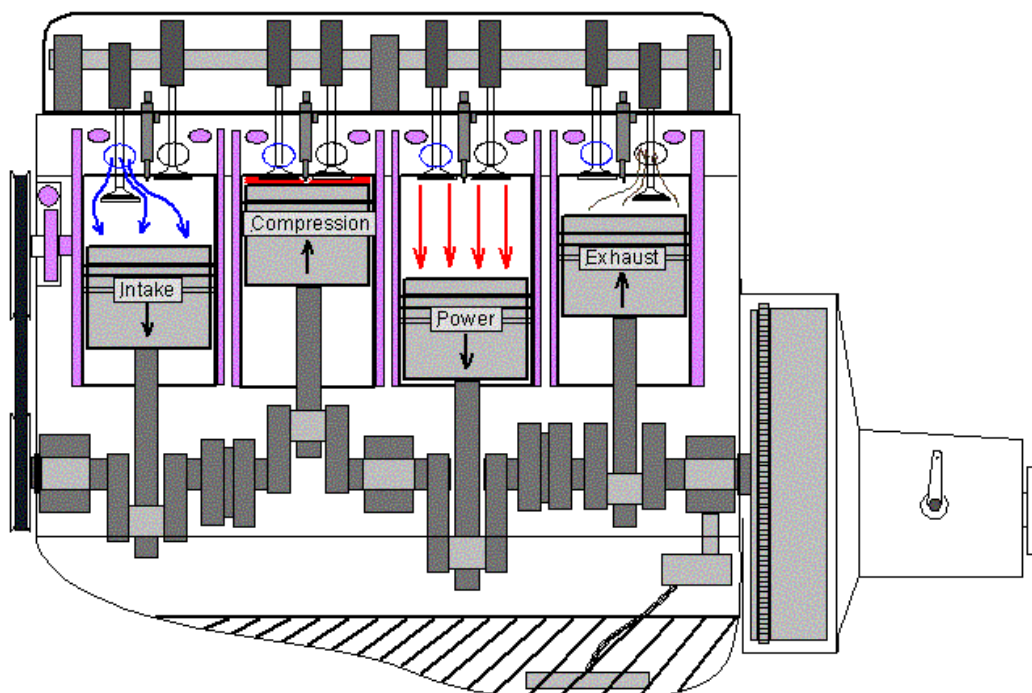
- 1) The Marine Diesel Engine Concept
- 2) Safety & Reliability Features
- 3) Marine Diesel Engine Systems
- 4) Scheduled Maintenance
- 5) Questions & Answers

1) The Marine Diesel Engine Concept, What makes it tick?

Spontaneous Combustion:

- The air / fuel mixture is compressed to an extremely high pressure
- This high combustion chamber pressure creates very high heat
- The heat created causes the air / fuel mixture to ignite spontaneously
- This rapid burning and release of energy drives the pistons downward, delivering the power through the driveline
- "Four Stroke" Engine: Intake – Compression – Power - Exhaust
- Natural Aspiration
- Turbo Charging
- Inter-cooling

Four Stroke Internal Combustion Diesel Engine



2) Safety & Reliability Features

- Diesel fuel is much less volatile than gasoline
 - Diesel engines are more heavily built
 - Longer life expectancy
 - Fewer spare parts to carry on board
 - Better fuel economy
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3) Marine Diesel Engine Systems

A.) CONTROLS

Controls should NEVER be positioned so that access is easiest through the wheel.

I. **Throttle**- readily accessible to the helmsman, moves freely, stays where set

II. **Shifter**

- Enough resistance so no accidental shifting
 - Definitive gear shift, if not fully engaged there could be serious damage
 - Always insure engine is at idle speed before shifting into or out of gear
 - Levers installed correctly
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III. Kill- 2 Types

- a. Manual Cable- Most push/pull cables simply shut off the flow of fuel
System remains “charged” with fuel, insuring that the engine will start quickly the next time
- b. Electric Stop- An electro-magnetic solenoid switch that pulls stop lever shutting off flow of fuel to the fuel injection pump.
Internal corrosion can make these problematic

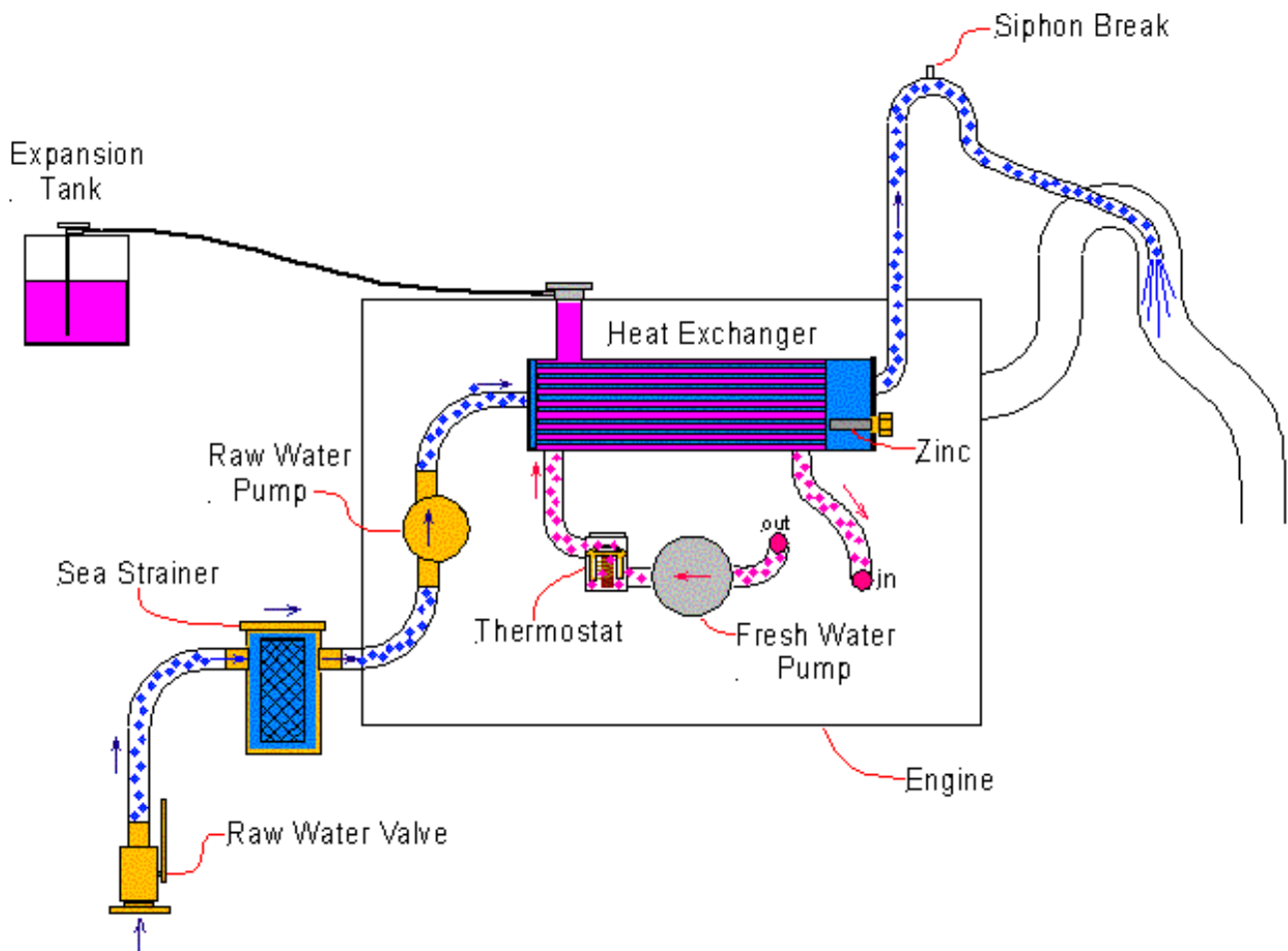
When killing the engine, make sure it comes to a complete stop, then push the kill cable back in fully to be sure the engine has adequate fuel the next time you attempt to start it.

B.) COOLING SYSTEM

Two Types: Fresh Water and Raw Water (Raw Water: salt water)

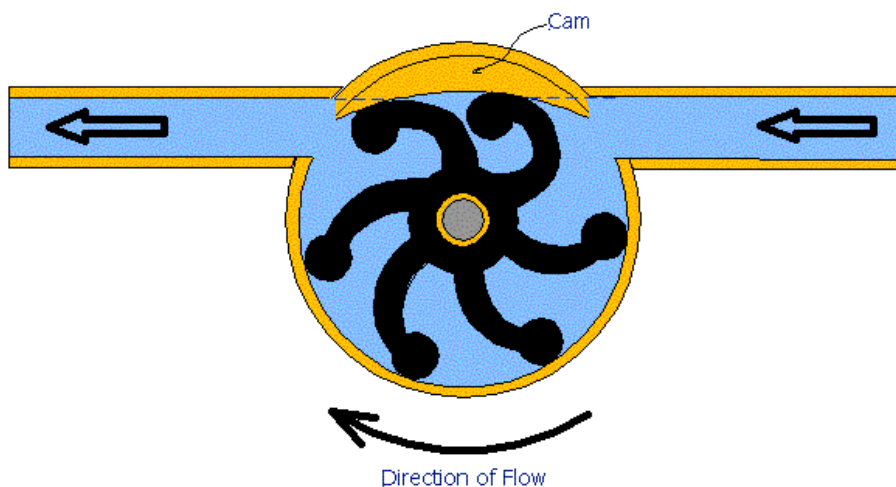
- Fresh Water Cooling:
 - 50/50 mix of coolant and distilled water
 - Circulates via the fresh water pump in a “Closed Loop” system within the cooling passages of the engine
 - Heat from the engine is absorbed by the coolant mixture, which, in turn, exchanges the heat into the raw water inside the heat exchanger

Fresh Water Cooling System



- Heat Exchanger Maintenance- Zinc Replacement
 - Some higher quality engines, such as Yanmar do not have zincs in heat exchanger
- Surge or Overflow Tank- Check level occasionally
- Coolant Types: Green and Pink
 - Pink contains no silicates or phosphates
- Two Year Coolant Change Interval
- Raw (salt) Water Pump- Impeller inspection, spare impeller and a factory cover plate gasket
- When replacing the impeller, if ANY of the vanes or pieces of the vanes are missing, take the time to locate them!
 - Reassemble the pieces of the puzzle
- Importance of the Sea Strainer- Check often
 - Especially when going through a kelp or grass area or when jellyfish are seen
- Raw Water pump weep holes are a visual indicator of seal failure
(Fresh water pump is usually a centrifugal type pump- no maintenance required. Failures are rare)

Raw Water Pump



C.) LUBRICATION SYSTEM

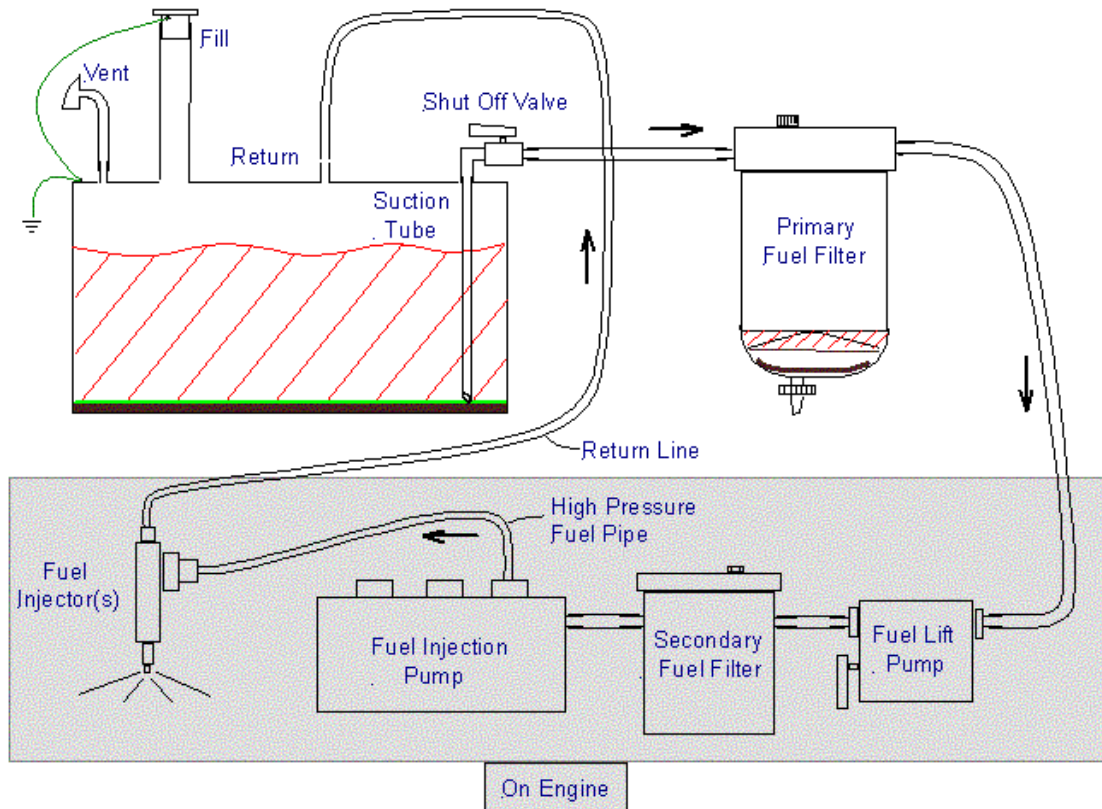
- Check engine oil level every time the engine is started
 - Follow the manufacturer's recommendations regarding type and viscosity.
Diesel engine rated oil usually has a "CC" or a "CD" rating- can be found on the container
 - Change oil every 50 hrs or every 6 months
 - Changing often is more about removing moisture from the engine accumulated from condensation, than dirty oil
 - Change the oil filter EVERY time you change the oil
 - Be aware of any increase in oil level
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D.) FUEL SYSTEM

Keeping your fuel system CLEAN is what will keep you and your diesel engine happy for years to come

- Keep your fuel tank(s) FULL at all times if at all possible
- Multiple tank systems- Return line must go to tank chosen for pick-up
- Be sure all valves are clearly and correctly marked
- Insure fuel tank vent is clear and runs uphill all the way from the tank to the overboard fitting (no Traps)

Fuel System



Primary and Secondary Fuel Filters

- Primary is a “Dual Stage” water separator and particle filter. Secondary is a finer particle element only
 - “Dual Primary” filter system
 - Micron sizing – 30 for primary, 2 for secondary
 - Biocides and additives
 - Bleeding air from fuel System
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REMEMBER: NO AIR, NO CONTAMINATION, NO PROBLEM!

E.) ELECTRICAL SYSTEM

- Starter, Alternator, Panel, Wiring, Harness, Alarm System, Gauges, and Senders
 - Must be kept in good order
 - Clean and dry!!
 - Never turn battery switch to another position with engine running
 - Always “kill” the engine before turning off the ignition
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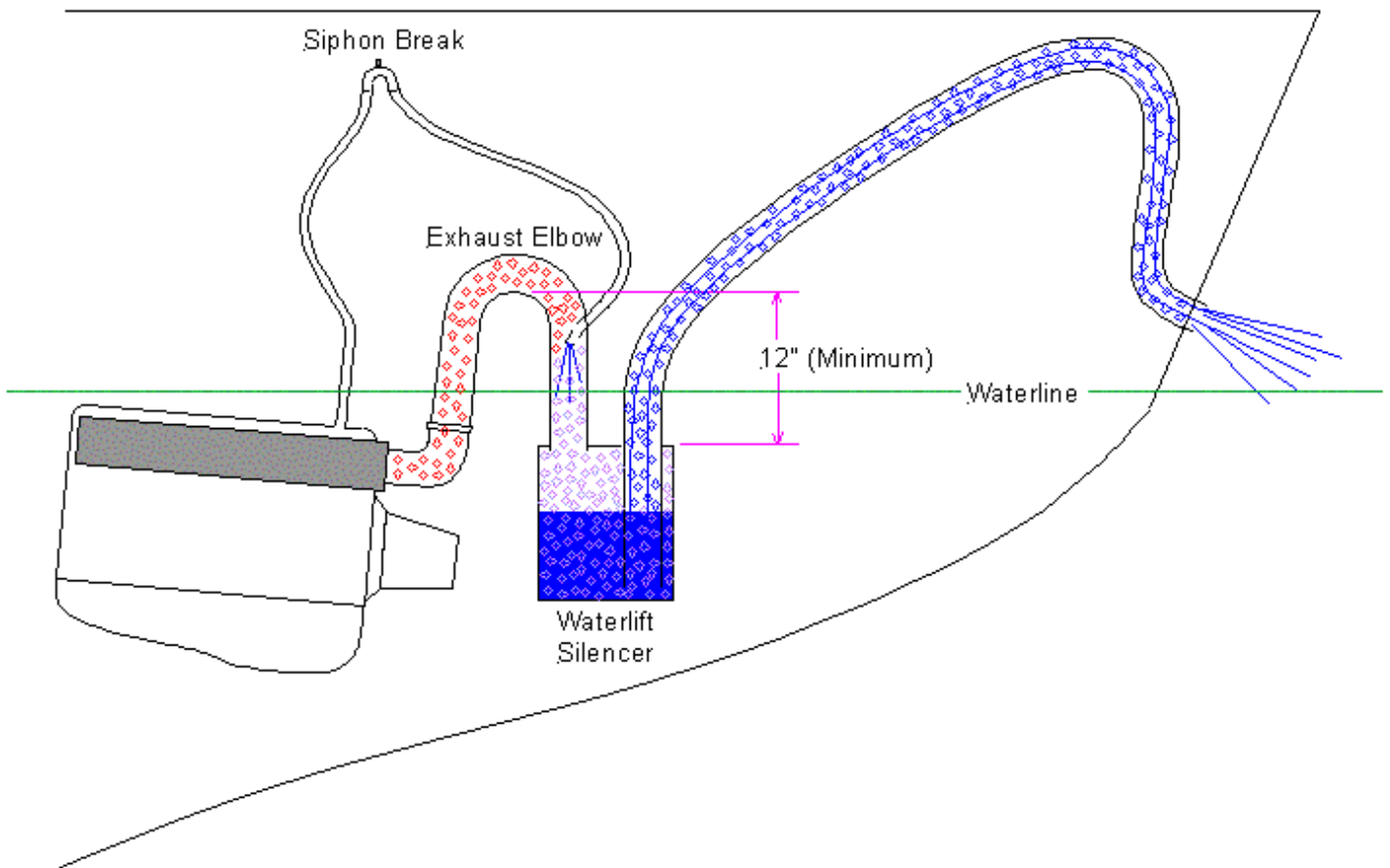
F.) INTAKE SYSTEM

- Ventilation
 - Intake Filter or Screen - Keep it clean and replace at regular intervals
 - Air Intake Horn - Be sure its pointed down keeping any water from running into the intake
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G.) EXHAUST SYSTEM

- “Water-lock” type of system
- Over Cranking an engine that won't start can ruin the engine
- Siphon Break/ Air Valve
- Mixing Elbow

Waterlift (Wet) Exhaust System



H.) TRANSMISSION

- Transmission fluid should be checked every few weeks, depending on use
- Use same oil as used in the engine or ATF (Automatic Transmission Fluid) as called for by the manufacturer
- Fluid should be replaced every other year
- Check Transmission oil cooler zinc, if fitted

I.) POWER TAKE OFF

J.) KEEP YOUR ENGINES CLEAN AND PAINTED

4) Scheduled Maintenance

A.) Daily Check List

- Check Oil Level
 - Check Primary Fuel Filter Bowl
 - Check Coolant Level
 - Inspect Belts & Hoses
 - Check Sea Strainer
 - Visual Inspection
 - Listen
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B.) Maintenance: 6 month or 50 hour

- Change oil & replace oil filter
 - Replace primary fuel filter
 - (replace secondary every other service)
 - Check transmission fluid
 - Thorough visual inspection
 - Clean engine & touch up paint
 - Check zincs (where applicable)
 - Inspect exhaust system
 - Refer to owner's manual for additional requirements
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C.) Maintenance 2 year or 200 hour

- All 6 month / 50 Hour Checks
- Change Transmission Fluid
- Drain, Flush & Refill Coolant
- Inspect / Replace Raw Water Pump impeller
- Inspect / Replace Air Intake Element
- Check Engine Alignment

D.) Extended Maintenance (600 Hours)

- Rebuild or replace raw water pump
- Replace all belts & hoses
- Check / adjust valve clearances
- Check head torque - (see manufacturer's specifications)

The Marine Diesel Engine's Plea

“Please: Run me in gear, as often as you can. I’m not happy sitting for long periods of time.”

“Keep me clean and painted– I will live longer”

*“Always keep **clean fuel** feeding me – I won’t quit on you.”*

“Never crank me for more than 30 seconds, if I won’t start – I do not like being filled with salt water”

“All I ask is a little TLC from time to time. In return, I will always be there for you when you ask, and I will bring you safely home.”

5) Questions & Answers
