Marine Diesel Engine
Maintenance and Repair

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We’ll Cover

1. Engine & Propeller Systems
2. Valve Adjustment
3. Belts
4. Engine Oil & Filters
5. Fuel Filters
6. Engine Alignment
7. Essential Spares
8. Reference Information
9. Technical Support
ENGINE & PROPELLER SYSTEMS
1. Engine & Propeller Systems
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- The propeller must allow the engine to reach the manufacturer’s Fuel Stop RPM (Intermittent Power RPM) + 3% at full throttle/top speed with normal load and sea conditions.

- Do not prop to Continuous RPM!

- Note: Electronically governed diesels may be limited to throttle stop RPM by the Electronic Control Unit (ECU).

- Propeller maximum diameter is the largest that will fit with correct minimum tip clearance:
  - i.e. 10% of diameter for V bottom hulls & 15% of diameter for flat bottom hulls. Smaller for planing hulls, tunnel hulls, etc.
1. Engine & Propeller Systems

Fuel Stop Power

kW: 232 / 3800 min⁻¹
is metric for

311 BHP @ 3,800 RPM
1. Engine & Propeller Systems

- Fuel Stop Power: 311 HP @ 3,800 RPM
- Prop to 3,800 RPM + 3% (114 RPM) = 3914 RPM -> 3,900 RPM
- HP = Torque (lb. ft.) x RPM / 5,252... therefore at 5,252 RPM, HP = Torque
- Rated Horsepower is ONLY obtained at Fuel Stop RPM
1. Engine & Propeller Systems

- A boat is **over-propped** if it cannot reach Fuel Stop RPM at full throttle/top speed.

- It also cannot ever produce rated horsepower in an emergency and is lugging throughout the RPM range from idle to full throttle.

- Over-propping causes early engine wear, head gasket failure, overheating, poor fuel economy, vibration & black-smoking
1. Engine & Propeller Systems

- The **reverse gear (transmission) ratio** is selected based on propeller diameter & engine power to produce the lowest propeller RPM and most efficient propeller pitch.

- The higher the propeller RPM the more cavitation and slippage and lower the efficiency... 2,000 rpm is a rough limit for displacement hull boats!

- When repowering, the correct propeller diameter, engine power & gear ratio required must be calculated **BEFORE** ordering the new engine & gear.

- The engine dealer will measure the boat & calculate that for you... if he doesn’t know how to do it - **choose another dealer!**
2. Valve Adjustment
2. Valve Adjustment

- Most automobile engines have automatic valve adjustment and the valves **do not** have to be serviced regularly.

- Most diesel marine engines have mechanical valve adjustment and the valves **must** be adjusted at regular intervals.

- Misadjusted valves can cause engine noise, rough running, low power, & engine damage
2. Valve Adjustment

- See your service manual Preventive Maintenance schedule for valve adjustment intervals.

- Serious engine damage can be caused by incorrect valve adjustment!
BELTS
3. Belts
3. Belts

• V-Belts & Flat Belts
• Double Belts
• Tensioning Tools
• Tensioning Procedures
• Belt Dressing
• Sheaves
• Pulley Alignment
OIL & FILTERS
4. Oil & Filters
4. Oil & Filters

- Diesel oil is designated “C”... for **Compression** ignition
- Gasoline engine oil is designated “S”... for **Spark** ignition
- The latest API diesel standard is “K”, i.e. **CK-4... CJ-4** is also common
- The latest API gasoline standard is “N”, i.e. **SN**
4. Oil & Filters

- Most diesel engines use **SAE 15 - 40 Multi-grade or SAE 30 Straight-grade**

- Low viscosity multi-grade synthetic oils (SAE 5 - 40) are *not* recommended for older diesels that were designed to use non-synthetic heavy-viscosity oils (SAE 30, 40, or 15-40)

- Engine oils rated higher than “SG” have friction enhancer additives & should not be used in reverse gears which have clutch plates
FUEL FILTERS
5. Fuel Filters

Algae & water in bowl!
5. Fuel Filters

Algae lives in the water & eats the fuel

No water...

No algae!
5. Fuel Filters

Water in the fuel tanks is caused by:

- condensation of moisture laden air entering via the tank vent
- rain water leakage past poorly sealed deck fill ports
- refueling at remote marinas with poorly maintained fuel tanks
- sea water entering the tank through poorly designed hull vent fittings
5. Fuel Filters

- Algae!
- Dirt
- Microns
- Mud Filters
- Primary Filters
- Water Separators
- Bowl fire guards
- Secondary Filters
- Water Alarms
- Vacuum Gauges
- Biocide Additives & additives
- Pre-filling filters
- Squeeze bulb primers
- Bleeding Filters
ENGINE ALIGNMENT
6. Engine Alignment
6. Engine Alignment

- The propeller pushes the shaft...
- The shaft pushes the engine...
- The engine pushes the mounts...
- The mounts push the boat!
6. Engine Alignment

- Engine Isolators (Mounts)
- Failsafe Mounts
- Basic & Advanced Alignment
- Couplers & Flanges
- Coupler Fasteners
- Stern Tubes
- Cutlass Bearings
6. Engine Alignment
ESSENTIAL SPARES
7. Essential Spares
7. Essential Spares/Tools

- Fuel Filters!
- Belts
- Hoses
- Gaskets
- Water pump impellors
- Raw-Water Pump
- Alternators & Starters
- Fuses
- Sealants
- Service & Parts Manuals
- Hand tools in bag
- Multi-tester
- Wire
- Electrical tape
- Duct tape
- Battery booster cables
8. Reference Information

Books

▪ Propeller Handbook
  by: Dave Gerr

▪ Boat Mechanical Systems Handbook
  by: Dave Gerr

▪ Marine engines
  by: Nigel Calder

▪ Troubleshooting marine diesels
  by: Peter Compton

▪ ABYC Marine Systems
  by: Ed Sherman

Websites

▪ www.boatdiesel.com
▪ www.marinepartssupply.com
▪ www.abyc.com
▪ www.tc.gc.ca/marine
Please stop by booth 54 to 56 on the Upper Concourse Level

Technical Support
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