

## EXCERPT FROM, MARINE ENGINE & PROPULSION SYSTEMS

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# 2.5 Rectifying injector faults

Any injector problem at sea can be rectified by replacing the injector with a spare. However the candidate is required to know how the following faults can be identified and rectified.

## Incorrect opening pressure

Too low an opening pressure will cause the valve to chatter on its seat. Fuel will be injected into the cylinder earlier. It is caused by insufficient compression on the spring.

Too high an opening pressure will cause the valve to hammer on its seat. Fuel will be injected into the cylinder later. It is caused by too much compression on the spring.

The spring adjusting screw has a lock nut which may have slackened off causing insufficient compression on the spring.

The spring may break. Replace the spring.

The correct opening pressure can only be obtained by placing the injector in a test rig and adjusting the tension on the spring until the correct opening pressure is obtained. Whilst on the test rig, the spray pattern of the fuel leaving the nozzle can also be checked.

## Distorted spray form

Spray nozzle orifices are partially clogged. Spray nozzles should be cleaned by first soaking them in either kerosene or clean fuel to soften the dirt. The spray holes or orifices can be cleaned with a pointed piece of wood. Do not use a piece of wire.

## Dripping injector

The valve is not sealing on its seat. Grind it in with the finest grade of grinding compound. Excessive grinding causes the valve to seat too deeply in its seat causing a lagging of the fuel admission which results in late combustion and therefore loss of power.

In addition, the valve stem may be bent and this will cause the valve not to seal on its seat and the valve stem will be tight in the nozzle body. The valve and nozzle body are lapped to form a mated assembly. Therefore the valve and nozzle body cannot be exchanged individually. Replace with a new valve and nozzle body. The opening pressure will then have to be adjusted.

## **Dirt between the valve and its seating**

Spray nozzles should be cleaned by first soaking them in either kerosene or clean fuel to soften the dirt. Do not use anything metallic or abrasive to clean them. Grind it in with the finest grade of grinding compound. Excessive grinding causes the valve to seat too deeply in its seat causing a lagging of the fuel admission which results in late combustion and therefore loss of power.

## **Injector valve sticking in the nozzle body**

The valve stem may be bent and this will cause the valve stem to be tight in the nozzle body and the valve not to seal on its seat. The valve and nozzle body are lapped to form a mated assembly. Therefore the valve and nozzle body cannot be exchanged individually. Replace with a new valve and nozzle body. The opening pressure will then have to be adjusted.

Alternately, there may be dirt between the valve stem and the nozzle body. It may be possible to clean the dirt away and reuse the assembly. If however, there has been grit passing through the fuel injector, it is most likely that there is pick up on the valve stem and body thereby scoring them. *Pick up is when metal from one part is transferred to its mating part and scores or grooves it.* Further operation in this condition could cause the valve stem to seize in the nozzle body. Any pick up on the valve stem and nozzle body will require the assembly to be replaced.

## **Too much fuel escaping at the leak off pipe**

Caused by excessive clearance between the valve stem and the nozzle body resulting from wear or pick up from dirty fuel or corrosion by water contaminated fuel. A fine clearance is required to maintain the fuel pressure and allow some fuel to pass by to lubricate. Replace the valve and nozzle assembly.

## 2.6 Exhaust emissions

Exhaust emissions can be related to the operation and condition of the engine.

### Black smoke

indicates a fuel or air problem. For efficient combustion, the ratio of fuel to air must be maintained otherwise incomplete combustion will take place resulting in black smoke.

- Blocked or partially blocked air cleaner
- Turbo charger not attaining sufficient speed
- Poor compression
- Incorrect fuel pump timing, Faulty fuel pump
- Incorrect valve timing
- Faulty fuel injectors - dirty nozzle, incorrect opening pressure, excessive leak off, valve not seating in body
- Engine overloaded

### Blue smoke

indicates that lubricating oil is being burnt. Caused by:

- Worn, broken or sticking piston rings and/or worn cylinder liner bores
- Worn valve guides
- Valve stem seals leaking
- Turbo charger seals leaking
- Oil bath type air cleaner overfull

### White smoke

or white exhaust vapour indicates water or moisture.

- Water in the fuel
- Moisture in the air
- Cold cylinder liner bores and combustion space when first starting engine
- Leaking cylinder head gasket between cylinder and cooling water passage.