Fuel oil System

STC / SBC
Fuel oil System -- Purpose

Pressurizing of Fuel oil to required level by FPM

Ensure continuous supply of fuel to all Fuel Injection Pumps

Supply of Fuel to Injectors by Fuel Injection Pump at a higher pressure

Supply of required quantity of fuel at required pressure to combustion chamber
Components in Fuel oil System
Fuel oil tank
Fuel trap
Primary Filter & Secondary Filter
Fuel booster pump
Relief Valve
Regulating valve
Fuel main header (Right & Left)
Fuel injection pumps (8 + 8)
Fuel injectors (8 + 8)
High pressure pipeline (8 + 8)
Crossover pipe (@ power takeoff end)
Fuel Tank Capacity & Minimum Fuel Oil Balance:

6000 litres in WDG 3A and WDM 3D.
(Fabricated Bogie Locos)

5000 litres in WDM 2 and WDM 3A
(Tri Mount Bogie Locos)

1000 litres + Trip ration for working the train + 10% of the Trip ration [or as per Stencil in Loco]
FUEL OIL TANK

Steel fabricated tank located between the two trucks

Provision of fuel oil filling on both side with caps & strainers, to prevent foreign particles entering into the tank.

Glow rod gauge & scale are provided on both sides

Vent pipe is provided to
Maintain air pressure on the top surface of oil
Enable air to escape out during filling
**Fuel trap**
Provided on the right side of the engine block between fuel tank and fuel primary filter. Traps heavy particles in fuel such as paper, cloth etc.

**Primary & Secondary filters**
Primary filter located at Engine right Side free End (WDM 2, WDM 3A), Engine room or Compressor Room(WDG3A).
Secondary filter is located at Engine right side free end.
Filters minute particles.
**Fuel booster pump**

Electrical Motor driven pump is located at the Compressor room.

When the pump starts working a partial vacuum is created in the pump and the fuel oil is sucked from the tank.
Fuel oil pressure Relief & Regulating valves

Relief valve is located near Secondary filter at engine right side free end & set at 5.5 Kg/sq. cm².

Relief valve is provided to protect the pump and motor from over load whenever the secondary filter is choked or due to any blockage in the system.

Regulating valve is located at engine left side free end & set at 4.4 kg/cm².
Regulating valve maintains constant pressure in the fuel main headers.
The excess pressure returns to the tank.
**Fuel main headers**

The header runs from free end to the power take off end on both sides.

These headers have fuel oil always stored at certain pressure.

Cross over pipe connects both side fuel oil main headers at power take off end

Fuel reaches the FIP’s through fuel jumper pipe/ Banjo pipe
High pressure pipe line

It is connected between FIPs & Injectors

The pressure of fuel oil flowing will be very high (approx 7000 PSI to 9000 PSI).
Fuel injection pumps - FIPs
FIPs are operated by centre cams of the camshaft.

FIPs supply Fuel at very high pressure to the injectors.

FIPs are provided with fuel rack to allow required quantity of fuel.

Fuel injectors
Finely drilled spray holes at the tip of the injector sprays fuel in atomized form so as to distribute the oil throughout the combustion chamber.

The pressure during fuel injection is around 3600 PSI to 4050 PSI.
# Fuel pump motor or pump not working

<table>
<thead>
<tr>
<th>Reason</th>
<th>Remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak Battery</td>
<td>Contact PRC</td>
</tr>
<tr>
<td>BS not closed</td>
<td>Close</td>
</tr>
<tr>
<td>MB1 / MB2 - OFF / tripped</td>
<td>Switch ON / reset</td>
</tr>
<tr>
<td>MFPB1 / MFPB2 - OFF / tripped</td>
<td>Switch ON / reset</td>
</tr>
<tr>
<td>FPC not picking up</td>
<td>Connect them</td>
</tr>
<tr>
<td>▪ Terminals disconnected / Slack</td>
<td>▪ Remove wire No. 13 &amp; insulate it. Pack FPC</td>
</tr>
<tr>
<td>▪ Coil short circuited or burnt</td>
<td>▪ Pack FPC in energized condition.</td>
</tr>
<tr>
<td>▪ Any mechanical binding</td>
<td>▪ Remove the binding</td>
</tr>
<tr>
<td>FPB OFF / tripped</td>
<td>Switch ON / reset</td>
</tr>
<tr>
<td>Fuel Pump Motor</td>
<td>Connect terminals</td>
</tr>
<tr>
<td>▪ Terminals disconnected</td>
<td>▪ Clean the commutator</td>
</tr>
<tr>
<td>▪ Commutator dirty (DC Motor)</td>
<td>▪ Check spring tension and adjust</td>
</tr>
<tr>
<td>▪ Carbon brushes not making contact</td>
<td></td>
</tr>
<tr>
<td>Fuel Pump</td>
<td>Check and tighten the allen screw</td>
</tr>
<tr>
<td>▪ Lovejoy coupling given up</td>
<td>▪ Contact PRC</td>
</tr>
<tr>
<td>▪ Mechanical binding</td>
<td></td>
</tr>
</tbody>
</table>
FPM not working
FPC not picking up

- Terminals disconnected / Slack
- Connect them & try

- Coil short circuited or burnt
- Remove wire No. 13 & insulate it. Pack FPC in energized condition.

- Any mechanical binding
- Remove the binding

**Location:**
Back panel or Control Compartment

**Note:** FPR is provided in GE mcp loco and energizes when EST kept to Prime
DC FPM
Check Carbon Brushes & clean Commutator

Check Terminal Box connections
Provision of Inverter changeover switch for AC FPM
Modifications

3 phase AC Fuel Pump Motor with Inverter

Check 3 phase AC and DC terminals

Vertical Type FPM with inbuilt FPM, Pump & Inverter
Modifications

Inverter changeover Switch

In LPs Cab

In Compressor Room
Trouble Shooting for AC Fuel Pump Motor

If FPM not working due to Inverter problem:

1. Switch OFF FPB & DEB
2. Change the Inverter Changeover Switch position
3. Switch ON FPB & DEB
4. Ensure FPM Working
5. If FPM is not working, Contact PRC

Note: DEM(Engine) will not work in this position
Fuel oil pressure not building up even though FPM working
Lovejoy coupling uncoupled
If air lock, slacken delivery side joint & release air.
Fuel Relief Valve
Location Engine Free End Right Side

Gently tap & try

Return pipe to Tank

Setting - 5.5 kg/cm²
Fuel Regulating Valve
Location Engine Free End Left Side

Gauge / Sensor Connection

Setting – 4.4 kg/cm²
Leakage in Crossover pipeline / joints
Try to arrest leakage
Contact PRC
**Location**: Engine Power take off end both sides
If High Pressure Pipeline leaking or Unusual sound from FIP

Can lock one FIP on either side

Lock FIP Fuel Rack
Leakage at Banjo joint or FIP damage

Can try Banjo joint Dummying
If Fuel leakage noticed after this COC / APU

Close AESS / APU Fuel Oil pipeline COC
(Connection from near Relief or Regulating Valve)
AESS / APU Fuel Oil pipeline COC
(Connection from near Relief or Regulating Valve)
**Additional FPM (PLPM) Modifications**

PLPM is fitted with Fuel Booster Pump
COCs provided in Fuel pipeline – For Changeover
During FPM failure / AFPB tripping repeatedly
Close FPM COC and Open PLPM COC
• FPB to be kept always ON.
• Addl. FPB to be kept ON for FPM working.
• During FPM failure / Addl. FPB tripping repeatedly - Switch ON Bypass FPB
Additional Fuel Pump Breaker

Fuel Pump By Pass Breaker
WDM2/WDM3A Loco
Primary & Secondary Filter

- Primary Filter
- Secondary Filter
- Relief Valve
Primary Filter In WDG 3A Loco in Compressor Room and size is bigger
Primary Filter provided on right side of Engine Block in WDM3D Loco
Crossover pipe
From Left Header at Engine Free End

Regulating Valve 4.4 KG/CM²

Connection To Fop Gauge In Lp’s Cab
Governor Linkage connected to Fuel control Shaft

Banjo Joint
Fuel control Shaft

Fuel Injection Pump
Operated By Cam Shaft
Center cam

Fuel Rack Locking
---- Only One On each side
Duties related to Fuelling point & others
**En route examination**

- Fuel balance and no leakage from tank.

- Ensure no fuel falls on engine block. Arrest leakage immediately. If not possible shutdown loco.

- For High Pressure Pipeline Leakages, FIP Locking can be done. (Only one FIP on each side).

- Glow Rod gauge leakages can be arrested by dummying it.

- Check fuel tank leakages after cattle run over / while checking under gear examination