



**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

**MAINTENANCE SCHEDULES  
FOR  
SHOULDER BALLAST CLEANING MACHINE  
(FRM - 80)**

**REPORT NO. TM-79**

**FEBRUARY- 2005**

**RESEARCH DESIGNS & STANDARDS ORGANISATION  
LUCKNOW-226011**

## **PREFACE**

Maintenance of On-Track Machine is a challenging task. Presently, about 345 On Track Machines are working over different zonal railways. Maintenance of these machines is being done by zonal railways with the assistance of local trade available, zonal track machine workshops, CPOH / Allahabad and RDSO/ Lucknow. With experience over the years, the railway engineers have developed adequate expertise in the maintenance of these machines. However, in absence of approved maintenance instructions, different maintenance practices have come into vogue. Therefore, it has become imperative to have a uniform maintenance standard throughout the Indian Railways. Provisional maintenance schedule manuals for Points and Crossing Tamping Machine (UNIMAT), Dynamic Track Stabilizer (DGS-62N), Ballast Regulating Machine (BRM), Points and Crossings Changing Machine (T-28), Plasser Quick Relaying System (PQRS), Multipurpose Tamping Machine (MP), Duomatic machine (DUO), Unomatic machine (UNO), Track relaying train (P811S), and final maintenance schedule manuals of Continuous Tamping Machine (CSM 09-32) and Ballast Cleaning Machine (RM-80) have been issued by RDSO. Provisional maintenance schedule manual for Shoulder Ballast Cleaning Machine (FRM-80) was issued previously as report no. TM-25 vide letter no. TM/HM/15 dated 10-09-98. Present manual have been prepared after necessary amendment in provisional manual on the basis of experience and suggestions received from railways.

It is hoped that this manual will be quite useful for the staff maintaining the machines in field.

While every care has been taken to make the maintenance schedules quite exhaustive, there is always scope for further improvement. Suggestions from the railways in this regard will be welcome and may be sent to the undersigned.

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## EXPLANATORY NOTES

While preparing text of schedules for maintenance of Shoulder Ballast Cleaning Machine (FRM-80), the terms used and their meanings are explained below:

- CHECK - Ensure a specific condition does or does not exist.
- INSPECT - Look for damage and defects including breakage, distortion, cracks, corrosion and wear, Check for leaks, security and that all items are completed.
- CHANGE - Fit new or overhauled or reconditioned part in place of old parts and missing parts.
- OVERHAUL - Dismantle, examine, recondition or renew parts as necessary against given specifications, reassemble, inspect and test.

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**Schedule -- I**  
**To be done daily**  
**(Duration – One and half hrs)**

**1. ENGINE**

1. Check the level of coolant in radiator and top up, if required.
2. Check level of the lube oil and top up, if required.
3. Check fuel level and top up, if required.
4. Check for any fuel leakage from the fuel pump, injectors, fuel supply, and return pipes.
5. Check engine oil pressure after warming up-
  - (a) at idle speed ( min. 1.5 kg/sq.cm )
  - (b) on rated speed ( min. 2.5 kg/sq.cm ).
6. Check & correct the tension of alternator V-belt.
7. Check the vacuum indicators for dry type air filter.
8. Record the maximum engine temperature of the day.
9. Clean engine and its premises.
10. Check battery charging system.
11. Drain water from air reservoir and drip cup after day's work.
12. Check leakage of lube oil, if any.
13. Check and prevent water leakage, if any.
14. Check all indicative gauges for proper functioning.

**2. MACHINE GENERAL:**

1. Check the oil level and top up both main gear boxes, if required.
2. Check hydraulic oil level in tank and top up if required
3. Check oil level of axle gear boxes and top up, if required.
4. Check oil level in vibration screen drum.
5. Check proper locking of all units.
6. Check the function and condition of conveyor belt, belt tension, scrapers of conveyors and look out for damages.
7. Check anti collision devise of waste conveyor and cutting unit..
8. Screening mesh should be checked in order to have proper sizes of ballast.
9. Check for any unusual sound from machine.
10. Check air brake pressure.
11. Check for any air leakage.
12. Check leakage in hydraulic circuit and do needful.
13. Check tightness of cardon shaft bolts.
14. Record the max. hydraulic oil temperature of the day.
15. Check for proper axle clutch pressure.
16. Lubricate the cutting chain and excavating conveyor bearing.
17. Check for any rubbing of hoses and loose clamping etc.
18. Check and top up bottle for lubricating conveyor chain and ensure that lubrication system is working properly.
19. Check the safety items, emergency tools and spares.
20. Check the filter indicators of axle gear box clutch.
21. Check the filter indicator of suction filters.

**Schedule II**  
**To be done after 50 engine hours**  
**(Duration – Two hrs.)**

**1. ENGINE**

1. Clean air cleaner element (outer) with air pressure.
2. Clean the fins of engine radiator and hydraulic oil cooler with air pressure.
3. Clean battery plug connections and apply petroleum jelly.
4. Check electrolyte level in batteries and specific gravity  
[ minimum specific gravity = 1.24 ].

**2. MACHINE GENERAL:**

1. Check brake linkage and lubricate the pivots and gear teeth of hand brake with grease.
2. Check guide rollers of conveyor belts.
3. Check the condition of the cutter chain and replace worn-out parts
4. Lubricate axle gear box flange cover of driving bogie with grease.
5. Lubricate screen guide plates with grease.
6. Lubricate all carbon shafts with grease.
7. Lubricate bearings for main and distributing conveyor with grease.
8. Clean complete machine.
9. Check wear on ballast distribution chutes.
10. Inspect wear plates of chain trough.
11. Top up the bottle for lubrication of king pin pivot.
12. Clean excavating conveyor sliding frame.
13. Check the tension of excavating conveyor chain and adjust if required.
14. Grease guide columns, plow pivots broom units and sliding planes of cutter unit.
15. Check rubber bearing fitted under screen meshes and change if broken.
16. Check all working lights and do needful.
17. Check brake shoe clearance and adjust if required.

**Schedule III**  
**To be done after 100 engine hours**  
**(Duration – one day)**

**1. ENGINE**

1. Check bolt tightness of fuel pump coupling.
2. Check engine foundation bolts.
3. Check all hooks and clamps and replace if required.
4. Inspect cooling coil for leakage.

**2. MACHINE GENERAL**

1. Check all the idler rollers of conveyor for free rotation.
2. Check guide rollers and bushes of cutter chain.
3. Check bushes, pressure separating rings and grooves of axle clutch shaft.
4. Check the functioning of back up system.

**Schedule IV**  
**To be done after 200 engine hours**  
**(Duration --Two days)**

**1. ENGINE**

1. Change engine oil.
2. Change lube oil filters.
3. Change fuel filter.
4. Lubricate the accelerating mechanism with lube oil.
5. Check proper concentration of additive of radiator water.
6. Check the tension pulley of compressor and water pump for free movement and any damage.
7. Clean alternator and check connections.
8. Change air cleaner elements.

**Note:--** I) Item no. 1,2 and 3 will be done after 300 engine hrs.

**2. MACHINE GENERAL**

1. Check function of all limits switches.
2. Check up rubber element of torque plate suspension and do needful.
3. Check the excavation chain sprocket and change if required.
4. Clean breather filter of hydraulic oil tank.
5. Change the filters of axle gear box clutch.
6. Repair ballast screens.
7. Replace scraper shovel and intermediate links, if required.
8. Lubricate hand brake gear with grease.
9. Change oil in the axle gear boxes and replace clutch filter.
10. Change oil in the main gear boxes.
11. Change oil in waste conveyor gear box.
12. Check the clutch pressure and adjust if required.
13. Clean the hydraulic oil with the help of hydac pump for about one hour.
14. Change hydraulic suction and return filters.

**Note:--** I) Item no. 10,11 will be done after 250 engine hrs.

II) Item no. 3,5,14,15 will be done after 500 engine hrs.

**Schedule V**  
**To be done after 1000,3000,5000 engine hours.**  
**( Duration - 7 days)**

**1. ENGINE**

- 1 Clean the cooling coil and check its fitment.
- 2 Check high pressure fuel pipe and clamps.
- 3 Clean the diesel tanks.
- 4 Change dry type air filter element.
- 5 Test engine temperature safety device.
- 6 Change batteries, if required.
- 7 Check engine compression.
- 8 Clean turbo charger and check for end and radial play.
- 9 Calibrate the fuel injectors.
- 10 Check the exhaust manifolds and silencers.
- 11 Calibrate the fuel injection pump.

**2. MACHINE GENERAL**

1. Check meggi spring and change oil required.
2. Lubricate the axle bearings of the bogies with grease.
3. Clean and lubricate sliding surfaces and bolts of torque supports with oil.
4. Change oil in screen drive drum and replace filter element.
5. Change hydraulic oil on condition basis through lab test.
6. Change the chute wear plates.
7. Check shock absorber for proper functioning and do needful.
8. Check universal joints for play and replace if required.
9. Replace all conveyor belts on condition basis and overhaul the driving stations.
10. Overhaul the complete plow.
11. Replace the worn out broom sticks, if required.
12. Repair the missing and defective hand tools.
13. Clean water separator.
14. Check tappet clearances and adjust if required.
15. Check the cover plate bolts of all hydraulic cylinders.

16. Lubricate the turn table with grease.
17. Check foundation bolts of brake cylinders.
18. Check all pressure settings.
19. Check wear of brake shoes.
20. Check condition of trough plates and replace if required.
21. Change the chute wear plates.
22. Check condition of hydraulic and pneumatic hoses and replace as required.
23. Check the functioning of pressure switch of axle clutch and adjust if required.
24. Check wheel and axle cracks by magnifying glass.
25. Replace the defective lights.
26. Paint the screen area and chain trough.
27. Replace excavating belts, supports pipes and chains of excavating units & acrylic strip.
28. Replace distributing conveyors and waste conveyor.
29. Replace main conveyor, support pipes and chains. And replace acrylic strip.

**Schedule VI**  
**(To be done after 2000, 4000 engine hours)**  
**(45 days)**

**1. ENGINE**

1. Engine is to be top overhauled.
2. Check engine timing and do needful.
3. Check the air compressor. Overhaul if necessary.
4. Replace V-belts on condition basis.
5. Overhaul the alternator and starter.
6. Clean turbocharger and do needful.
7. Check anti vibration mountings of the engine and change, if required.

**2. MACHINE GENERAL**

1. Check wheel tyre defects and do needful.

**Schedule VII**  
**To be done after 6000 engine hours**  
**(Duration-90 Days)**

**1. ENGINE**

1. Overhaul/Replace the engine.
2. Check crank shaft and cam shaft end play.
3. Overhaul the air compressor.
4. Change air inlet hoses.
5. Change all the high pressure fuel pipes, pipe clamp, flexible fuel hoses and rubber hoses.
6. Overhaul turbo charger.
7. Change shaft seals and bearings of the clutch drive shaft assembly.
8. Check the exhaust manifold for any defect and clean the same.
9. Change shut down valve on condition basis.
10. Replace cooling coil on condition basis.
11. Change anti-vibration mountings of the engine.
12. Rewire the engine wiring with temperature proof wires.
13. Change engine safety system components.

**2. MACHINE GENERAL**

1. Check hydraulic pumps, valves, motors in the test bench for rated output and replace if necessary.
2. Clean the hydraulic oil tank. Paint the surface of tank with approved quality of paint and fill new oil.
3. Change scraper rubber plates of excavating unit.
4. Change the rear frame, chute box and wing frame.
5. Overhaul the gear boxes.
6. Check the bogie pivot for wear and attend as necessary.
7. Change the scraper pads and skirt rubbers of all conveyors.
8. Check all the direct acting and pilot operated direction valves and change if necessary
9. Check all the pressure control valves and change if necessary.
10. Check all the stop cocks and flow control valves and change if required.
11. Check shock absorber and replace / repair as necessary.
12. Replace defective switches and potentiometers.
13. Repair/replace screen frame.
14. Overhaul screen vibration drum and replace bearings.
15. Replace bearing of cutting chain drive gear box.
16. Replace bearing of excavating unit.
17. Check the wheel tyre profile.
18. Check the brake system.
19. Replace pneumatic cylinder seals or cylinders as required.
20. Replace all the hydraulic hoses along-with clamps.
21. Check all hydraulic cylinders, change if necessary.

22. Clean hydraulic oil cooler.
23. Replace air unloader.
24. Test air tank.
25. Check all pneumatic valves and change if necessary.
26. Check all the pneumatic cylinders and do needful.
27. Change all the brake shoes.
28. Check the axle bearing and grease them. Change if required.
29. Change mounting pad of all gear boxes.
30. Overhaul the bogies.
31. Check the calibration of all the indicative instruments and replace the defective ones.
32. Replace all the limits switches on condition basis.
33. Check the LED of all solenoids.
34. Overhaul all the panel boxes.
35. Arrange insulation test of main cables and replace the defective ones.
36. Provide missing thimbles.
37. Replace the defective PCBs.
38. Strengthen the machine frame where cracks have developed.
39. Flush the complete system.
40. Fill new oil after replacing return line and suction filters.
41. Check the function of all assemblies.
42. Test the machine for one week before it is put for actual working in section on regular basis.
43. Overhaul the cutting unit.
44. Replace excavating belts, supports pipes and chains of excavating units & acrylic strip.
45. Replace distributing conveyors and waste conveyor.
46. Replace main conveyor, support pipes and chains. And replace acrylic strip.

## LIST OF SPARES TO BE KEPT ON FRM-80

S. No	Items	Part No.	Qty.Reqd.
<b>I.</b>	<b>ENGINE</b>		
1.	Fuel filter 5 lit. capacity paper type	3166555	2 Nos.
2.	Lube oil filter	3166554	3 Nos.
3.	Set of fuel injection pipes		1 Set
4.	Set of water radiator hoses		1 Set
5.	Set of fuel hoses		One set
6.	Filter element lube oil super by pass	3873576	1 No.
7.	Compressor belt	C-3040384	2 Nos.
8.	Alternator belts	A-33	2 Nos.
9.	Air cleaner filter (outer)	3237962	2 Nos.
10.	Air cleaner filter (Inner)	3237498	2 Nos.
11.	Set of copper washers		1 Set
12.	Banjo bolts		4 Nos.
13.	Fuel filter 'O', Ring for 5 Litre capacity filter	151881	2 no.
14.	Self starter		1 No.
15.	Gasket for lube oil filter	3167229	4 Nos.
16.	Gasket for water separator	3232923	1 no.
<b>II.</b>	<b>HYDRAULIC</b>		
1.	Hyd. Suction filter	HYS.501.360.150ES	1 No.
2.	Hyd. Suction filter	HYS.501.160.P19ES	3 Nos.
3.	Hyd. Suction filter	HYS.501.460.150ES	4 Nos.
4.	Hyd. return filter	HYR.501.330.10ES	2 Nos.
5.	Clutch filter	62.05.1000.113	4 Nos.
6.	Clutch filter	62.05.1000.424	4 Nos.
7.	Piston ring for clutch shaft	52 dia,2.4 mm	6 Nos.
8.	Modified piston ring for clutch shaft (if modified).	52dia, 3.6 mm	6 Nos.
9.	Bush for clutch shaft	64.02.2107.00	2 Nos.
10.	Seal set for hyd. cylinders (for each cylinder)		1 set
11.	Hyd. hoses with end connection (length 5 mtrs each)	No. 4,6,8,10,16,20	1 No.
12.	Hyd. return hoses with end connection (5 metre length) dia 24 mm		1 No.

<b>S. No</b>	<b>Items</b>	<b>Part No.</b>	<b>Qty.Reqcd</b>
<b>III</b>	<b>PNEUMATIC</b>		
1.	Pneumatic Hose 1/4" dia		10 Mts
2.	Pneumatic Hose 1/2" dia		10 Mts.
3.	Pneumatic Hose clamp 1/4" & 1/2" dia		6 each
4.	Brake cylinder seal	12"	1 No.
5.	Hose connection (compressor to cooling coil)	90291	1 No.
6.	Brake shoe		4 Nos.
<b>IV.</b>	<b>ELECTRICAL / ELECTRONICS</b>		
1.	Head light bulbs		6 Nos.
2.	Working light bulbs		12 Nos.
3.	Tail lamp bulbs		4 Nos.
4.	Micro fuse 4 Amps		6 Nos.
5.	Limit switch complete		2 Nos.
7.	Battery terminals		4 Nos.
8.	Thimbles off sizes ( To be checked )		10 Nos.
9.	Power supply card	EK.813 SV002	1 No.
10.	4 Way toggle switch for waste conveyor and cutter unit operation		1 No.
<b>V.</b>	<b>MECHANICAL AND GENERAL</b>		
1.	Hex bolt with nylon nut 12 x 65 mm		50 Nos.
2.	Rivets with washer		50 Nos.
3.	Cutter chain shovels		4 Nos.
4.	Bolt (Pin)	656 080 1050	4 Nos.
5.	Roller	SU 127.21.4.1.6B	4 Nos.
6.	Bush	SU 127.21.4.1.5	10 Nos.
7.	Clamping bushing	656.080.1040	4 Nos.
8.	Cap	9/064538	20 Nos.
9.	Fuse	9/062380	20 Nos.
10.	Hardener	5251067	1 pkt
11.	Cement	5252602	1pkt
<b>VI.</b>	<b>TOOLS</b>		
1.	Standard Tools provided on the machine		1 set
2.	Mechanical jacks 20 t. cap. and 5 t cap.		2each
3.	Drilling machine - small size		1 No.
4.	Riveting machine		1 No.
5.	Chain hoisting device		1 No.

### List of Safety Equipments

S.No.	Description	Quantity
1.	Detonators	1 box
2.	H.S. flag red	2 nos.
3.	H.S. flag green	1 nos.
4.	H.S. Tri colour lamps	2 nos.
5.	Chain & Pad lock	1 set
6.	25 t jack with traverser	1 no.
7.	Crow bars	4 nos.
8.	Beaters	4 nos.
9.	Wooden blocks off sizes	8 nos.
10.	Rail thermometer ( dial type)	1 no.
11.	Banner flag	2 nos.
12.	Portable Control Phone	1 no
13.	First Aid Box	1 no
14.	Skid	4 nos.
15.	Walkie-Talkie set	1 no.

### **Important Items For Working of Shoulder Ballast Cleaner (FRM-80)**

1. Longer blocks should be stressed for effective working.
2. Track should be surveyed thoroughly for broken rail pieces etc., which may obstruct the working.
3. Signal cables and rods passing under the track must be removed by S&T official at site.
4. Muck wagon to be arranged on through ballasted bridges and cuttings, where disposal is not possible on sides.
5. Ballast should be arranged in advance, If required.
6. Frequent shifting of FRM - 80 from one location to another should be avoided to achieve good work and adequate progress.
7. Normally, FRM - 80 should be deployed on concrete sleepers.
8. Ensure that there must not be any obstruction in a width of 4100 mm i.e. 2050 mm on either side of the centre of track, to avoid infringement to the cutter chain.
9. Adequate stock of cutter chain wear plates and other fast wearing parts should be procured in advance.
10. A set of gas cutting machine should be readily available with the machine.
11. Set excavating unit to desired working position.
12. Select machine working speed according to site conditions.
13. Set scrapers depth as required.

### **Precautions To Be Observed During Movement Of The Machine**

1. All parts which are not connected to the machine must be secured against tilting and shifting.
2. Waste conveyor belt should be secured in central position against tilting.
3. Upper part of waste conveyor should be secured in lowered position.
4. Both chain troughs are to be completely lifted, retracted and secured with chain.
5. Chain tensioning cylinder should not be extended by more than 25 cm.
6. Excavation chain must be secured against sliding down the chain troughs.
7. Retract ballast distributing conveyor and secure by safety chains.

## **General Safety Notes**

1. The machine has to be operated to existing Indian Railways rules and regulations.
2. The safety of yourself and other people is most important consideration in the operation and maintenance of the machine.
3. Remember the machine is a working unit, carrying delicate instruments. Therefore the machine should not be driven at excessive speed over bad track or turnouts.
4. Always keep your eyes open for other men working close to the machine.
5. Do not forget to look out for signals, switches and track obstructions.
6. Remember to make sure that all protection equipments and safety devices are in place on the machine and in working order especially when it is being driven from site-to-site.
7. Always, keep the machine clean. Excessive oil or grease on the machine can cause you to slip and fall and is also a potential for fire hazard.
8. Always lock the machine before you leave. Make sure that the machine is protected in accordance with railways regulations.
9. Do not permit un-authorized persons to operate the machine.
10. It is prohibited to use exposed light or fire on or near the machine.
11. Do not tow the machine if the final drive is engaged.

### Consumables To Be Used

S.N.	Section	Lubricant	Grade	Frequency
1.	Engine Crank Case	Lube oil	APICF4-15W40	300 Hrs
2.	Axle gear boxes	Hydraulic oil	HLP-68	500Hrs
3.	Main gear boxes	Hydraulic oil	15W40	250Hrs
4.	Waste conveyor gear box	Gear oil	C-90	250Hrs
5.	Screen drive drum	Hydraulic oil	Omola-150	1000,3000,5000 Hrs
6	Working system	Hydraulic oil	HLP-68	6000Hrs
7.	Axle bearing and greasing points.	Grease	MP2 or RR3	As per schedules
8.	Cutting chain gear box	Gear oil	C-90	250 hrs
9.	Chains of excavating and main conveyor	Hydraulic oil	HLP-68	Daily
10.	Excavating belt sliding frame	Powder lubricant	Graphite lubricant	200hrs
11.	King pin pivots	Lube oil	15W40	-----
12.	Radiator	Coolant	Premixed coolant or prepared coolant additive concentrate	Daily

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### Railway

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