



INDIAN RAILWAYS

TRACK MACHINES DIGEST

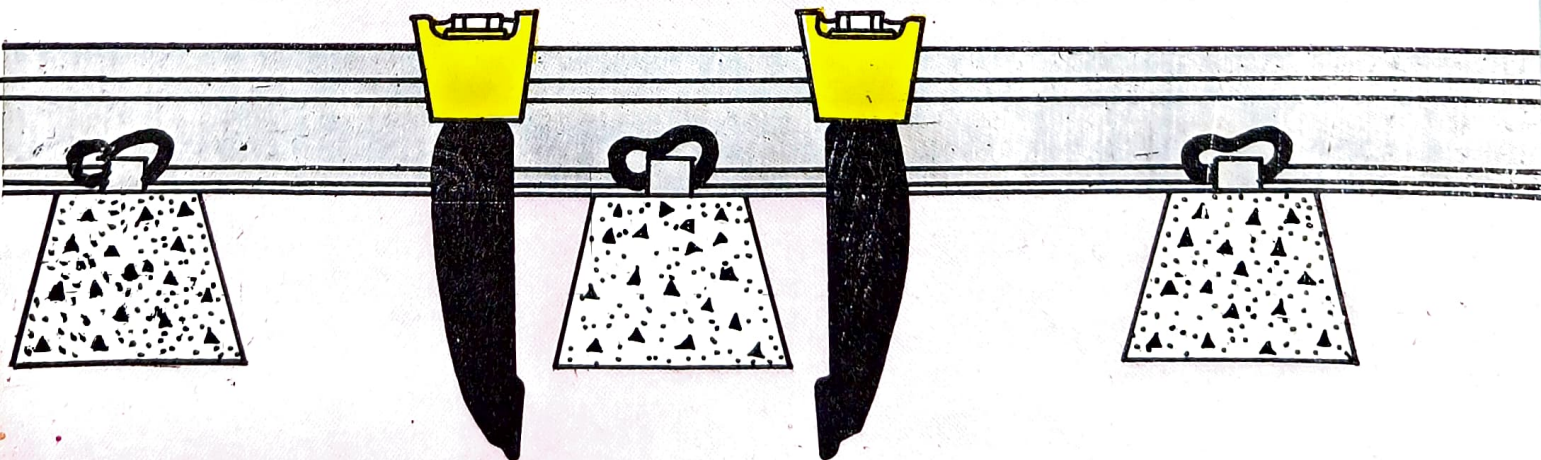
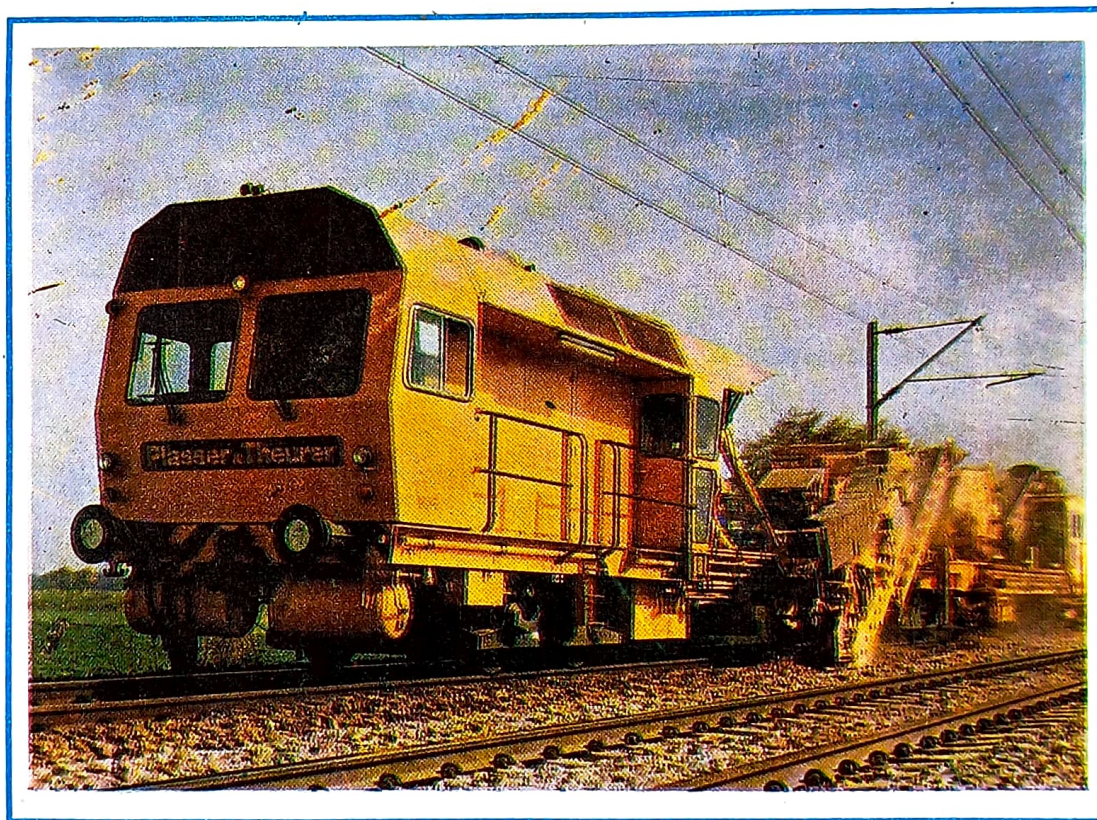
भारतीय रेल, रेलपथ मशीन डायजेस्ट

YEAR 2

ISSUE 7

QUARTERLY

APRIL 1980



DUST THE DEADLY DANGER FOR ENGINE PERFORMANCE

by

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For a good health, inhaling of pure & fresh air is a must. Polluted air leads to various air borne diseases-resulting in short span of life. When working in highly dusty conditions, the personnel working have to protect themselves from dust by wounding cloth around their mouth & nose in order to have entry of filtered air to be breathed in. Due to recent developments and awareness in the field of environment/Pollution control, various types of 'MASKS' are available to protect human being from the dust which is hazardous for life.

Like human body, performance of the heat engine also depends upon the pure air. Dusty air leads to quick wear of engine reducing its service life

Attack of dust on an engine and the degree of damage caused depends on the type of dust material.

WHAT IS THIS DUST:

In technical sense dust consists of finely divided solid particles measuring between one micron to 500 micron (0.001 to 0.5 mm) these can be of any shape, structure and density. The dust is made of mixture of hard & sharp particles such as quartz, granite, sand stone, etc. Higher wear rate is caused by harder particles.

EFFECT OF DUST ON THE ENGINE:

The amount of dust present in each case depends on, where and how the engine is used dust acts like emery in all precision engine parts and affect the engine performance in the following ways.

i) Dust in the combustion air leads to heavy wear on the piston rings, piston, cylinder liner, and on the valves. In the process, these particles get entry in to engine lub oil. The majority of these particles are extracted from the oil by filtration. However the very fine particles

remain in the lubricating oil where they are held in suspension during normal engine operation, these particles attack the engine all over causing early wear of all parts.

In extreme cases clogging can lead to filter back pressure reaching excessive levels, in these cases by pass valve opens and unfiltered oil returns to the engine lub oil system. This leads to heavy wear in all engine parts which are lubricated by engine oil such as pistons, bearings, cylinder-liners and lub. oil pump. Dust in fuel leads, above all to higher wear in the injection pump parts like plunger barrels and nozzle parts.

PROTECT ENGINE AGAINST DUST:

Filter systems are used to protect engine against dust and foreign impurities:

- 1) The air, that a diesel engine breathes in, for the combustion process is filtered.
- 2) The fuel that provides energy which is converted into mechanical energy by the engine during combustion is filtered.
- 3) The oil that is pumped around the engine to lubricate and cool the engine parts is filtered too.

Combustion air is the primary media but fuel and oil also transport dust into the engine where it can wreck the engine to down hill.

CHECK POINTS TO PROTECT ENGINE AGAINST DUST:

- 1) Careful filtering is essential.
- 2) Careful daily maintenance as recommended by the engine manufacturer i.e.

2.1 In case of oil bath type air cleaner, clean and refill with fresh oil.

2.2 In case of dry type air cleaner, clean the outer element, clean pre-cleaner bowl of dry type air cleaner, confirm that restriction indicator is fitted and functioning. If found broken please plug it. After replacing outer element three times, replace inner element, once only. Do not expose your engine to unnecessary levels of dust. If exposed to higher level of dust, contact area service manager for further study of application. Make sure that prescribed maintenance level is religiously maintained. Take care when carrying out maintenance and avoid mistakes such as-

2.3 Fitment of rubber gromet in centre bolt or mounting of outer element (dry type).

2.4 Missing of 'O' ring which is fitted alongwith the bowl, watch out for signs of dust deposit into the air in take system.

2.5 Remove air cleaner hose and check dust in-gress in the inlet.

2.6 Check condition of air inlet hose if cracked replace, clean your engine and radiator regularly to remove deposits of dust and prevent over heating

Watch out for leaks and repair them immediately. Wet patches on radiator fins or surfaces make it easier for dust to settle and hamper the essential heat exchange process. In case of extremely dusty atmospheric conditions dry type air cleaner in service with oil bath air cleaner can be used

Extreme operating conditions call for extreme care, your engine will repay you with reliable performance and render a long service life.

SHOULDER BALLAST CLEANING MACHINE (FRM-80)

by

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1.0 General:

1.1 Water is the enemy of the track. A track having poor drainage, can never have good maintainability. Formation of even local water pockets in the track, spoil the whole running quality.

1.2 Water accumulation in track occurs due to ballast clogging with muck and/or, improper cross slope of the drainage surface under the track (Including on shoulders) as well as due to improper cross slope on the cess. (In any case, maintaining the correct cess levels is a fundamental necessity for good drainage).

1.3 "Shallow screening" of track, commonly known as "Overhauling" is an age old concept. Shoulder ballast and limited quantity of crib ballast is taken out (Maintaining the desired cross slope of the drainage surface), screened and put back into the track.

1.4 With the introduction of concrete sleepers, LWRs and upgradation of track standards specially w.r.t. ballast cushion, there has been a substantial increase in the quantity of ballast to be handled during overhauling. Changing socio-economic conditions have further limited the quality and the progress of manual work on such jobs.

"Shoulder Ballast Cleaning Machine", model "FRM-80", is the answer to this problem. Indian Railways have got 4 such machines, manufactured by M/S Plasser India, Faridabad. Broad principle of working of this machine is to 'excavate' and pick up the shoulder ballast by two separate cutter chains, take it to a set of vibrating screens where the muck is screened away and deposit back the cleaned ballast on shoulders.

2.0 Salient Features of the Machine:

i) The depth of ballast excavation in the

shoulders can be adjusted upto 900mm below the rail top i.e. approximately upto 550mm below the bottom of sleepers on a PRC track. This adjustment is possible independently for both the shoulders.

(ii) The front of the cutter chains remains within adjustable flaps and the flaps can be so adjusted that the ballast can be excavated within a width of 500mm to 1300mm.

(iii) The cross slope on the excavated portion is adjustable upto 1 in 40 or steeper, independently on both the shoulders.

(iv) The quantity of the cleaned ballast to be deposited on the left shoulder or the right shoulder, can be adjusted, if required. Cleaned ballast can also be deposited in the tamping zone on either side of the rail.

(v) The machine is capable of carrying out screening at the rate of 500 cum. per effective chain-hour. However, if the shoulder ballast is caked up and the entire mass has become quite hard, the progress, becomes slower, (500 cum corresponds to approx 400 liner metres on LWR track with PRC sleepers).

(vi) The ballast screening is done by a set of 3 vibrating screens-75mm, 50mm, & 25mm.

(vii) For breaking of the mud pockets under the sleepers upto 100mm distance from the sleeper ends and upto 75mm below the sleeper bottom, the machine has got a special mechanism.

(viii) The machine is provided with a swivelling waste disposal conveyor in the rear portion which can throw away the screenings (muck) upto a distance of about 5m away from the centre of the track on either side of it.

(ix) As the machine approaches a signal post or an OHE mast, the waste conveyor can be drawn towards the track thereby preventing its hitting the post/mast and letting the muck fall near

the track. However, if the operator fails to withdraw the conveyor in time, a safety mechanism is provided on the machine (on the waste conveyor); as soon as this mechanism touches the post, the operator gets an audible warning and if the operator fails to withdraw the waste conveyor even then, the machine stops before the waste conveyor would touch the mast.

(x) The machine is also provided with another safety mechanism to ensure that the excavating mechanism, even if not retracted in time, does not hit a mast or its foundation.

(xi) The cleaned ballast deposited by the machine on the shoulders, can be profiled as required with the help of a set of ploughs. Also, the rail-sleeper fastenings and the sleeper shoulders can be cleaned of ballast with the help of a rotating broom mechanism.

(xii) Setting up and winding up time of the machine is quite less (less than 5 minutes each) due to which even short spells of block can be made use of. (In any case longer blocks are preferable.)

(xiii) Other features are:

(a) Travelling speed: The machine is capable of travelling at 90 KMPH, however, RDSO have permitted a speed of 40 KMPH on its own power & 30 KMPH when running in train formation.

(b) Engine: TBD.234-V12, MWM-DEUTZ Engine, H.P.=640, 470K.W. at 2100 RPM.

(c) D.T.E. Oil Tank Capacity: 1600 litres. (Servo system 68)

(d) Diesel Tank Capacity: 2000 lits.

(e) Axle Gear box oil: Servo System-68(4x40) = 160 lits.

(f) Air Compressor: Belt driven KNORRBREMSE (German)-L-P-4919/91130/1-76766.SN Type 91/30.

(g) Self Starter: 24Volt Bosch (German) Model 0001417058.

- (h) Conveyor Belts: (i) Excavation Conveyor belts 18800 x 500 x 10mm (required length = 20m) = two. Nos.
- (ii) Ballast Distribution Conveyor Belts, 11500 x 500 x 10mm (required length = 13m) = Two. nos.
- (iii) Main Conveyor Belt 35000x840x10mm (required length - 37m = One, no.
- (iv) Waste Conveyor Belt 13000x780x8mm (required length 14.5m) = one no.
- (I) Hyd. Filters:
 - (i) HyS-501-460-150 (Suction) 4nos.
 - (ii) HyS-501-360-150 (Suction) - 1no.
 - (iii) HyS-501-160-10ES
Suction Filters for Drive & Cutter chain: = 3nos.
 - (iv) Driving Axle Clutch, Filters 62.5-1000-113 = 4nos.
 - (v) Return Filter HyR-501-330-10A = 2nos.
 - (j) Air Cleaner Element: Outer Element
C-30-850-12=2nos.
Inner Element CF16-100=2nos
 - (k) Hydraulic Pumps
 - (i) Drive Pump HY 704x180xL/EL/A/380 Bar=2nos (Axial Piston)
 - (ii) Double Vane Pump for engine radiator fan drive, oil cooler & screen lubrication HY830x 17.06x0LI = 1no
 - (iii) Cutter Chain HY704x90R/EL/A 350 Bar Axial Piston Pump = 2nos.
 - (iv) Double Vane Pump for Clutch coupling HY830x06x 06Re=1no
 - (v) Discharge Belt Axial Piston Pump HY 709x28L/DFR/559 = 1no.
 - (vi) Cutter Chain Belt Pump Axial PistonHY 709x28L/DFR/559 = 1no.
 - (vii) Pump Double Axial Piston for main Conveyor + Cutter chain belt RH, HY-709x45L/DFR + HY 709x28L/DFR/559= 1no.
 - (viii) Screen Drive HY706x55R/HD = 1no. (Axial Piston Pump)
 - (ix) Pump Vane For Brush Box & General System HY830x17.06Li=1no.
 - (x) Feeder Belts Distribution HY709x28L/DFR/559=2no. (Axial Piston Pump)

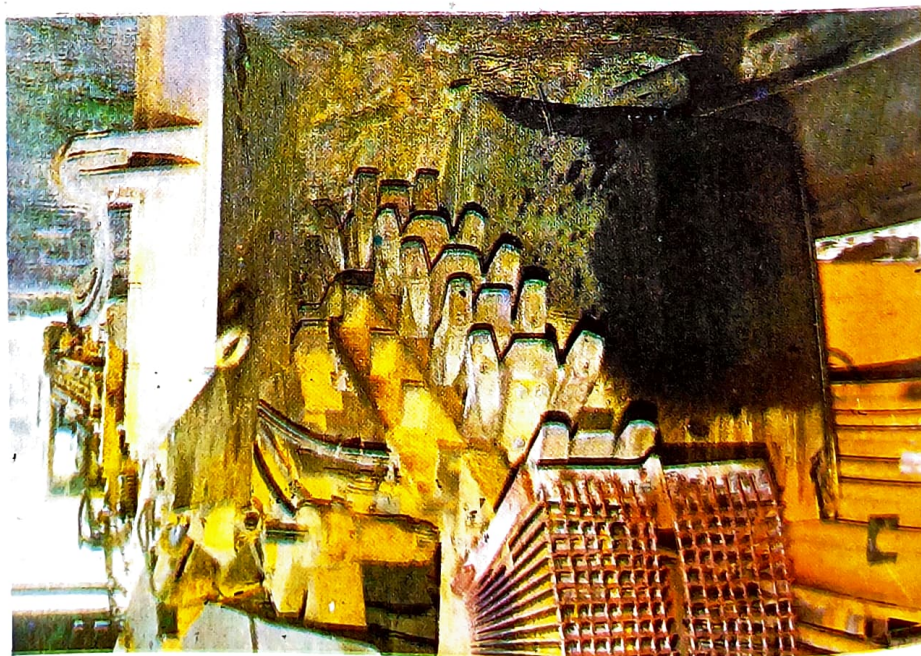
3.0 SOME HINTS FOR GOOD WORK

- (i) Advance survey of the excavation zones should be carried out and any obstructions such as embedded rail posts, tiebars, pipes, cables, junction boxes, traction bonds etc. must be removed ahead of machine either permanently or temporarily as deemed fit.
- (ii) Crib Ballast should be pulled by wire claws onto the shoulders, ahead of the machine, so that this also gets screened alongwith the shoulder ballast. While doing so, the drainage surface in the crib portion should be given the desired cross slope (towards cess side in case of double line, and towards both sides in case of single lines and towards drain side in case of multiple lines (FIG.I(b) & II(b).
- (iii) For ensuring good drainage, full depth of the haunches should be excavated in case of single line sections. FIG.I(c).
- (iv) In case of double line or multiple line sections, full depth of the haunch on the cess side should be excavated. However, between the tracks, only that much of depth of the haunch may be excavated which would pro-

vide continuity to the drainage surface of the cribs otherwise a continuous 'Water Channel' would get formed between the two tracks (Fig.II) This is specially important for tracks on bad formations.

- (v) Part of the cleaned ballast should be deposited near the rails towards the inside of the track. Cribs should then be filled by pulling & spreading this ballast in them with the help of wire-claws.
- (vi) For working on a track having other tracks on its either side (like in multiple line section or in station yards) or having some other feature where the muck can not be discharged (platform in case of station yards), for collecting the muck an empty wagon will have to be attached on the rear of the machine. As soon as this wagon becomes full of the muck, it will have to be taken away and another one attached to the machine. But this would warrant temporary stoppages of work every time. To overcome this a series of special muck wagons model MFS-40, can be attached to the machine. (These wagons have a special feature that with the help of the conveyors provided on them, one wagon can continuously transfer its contents into the next wagon).

Cutter Chain of FRM-80

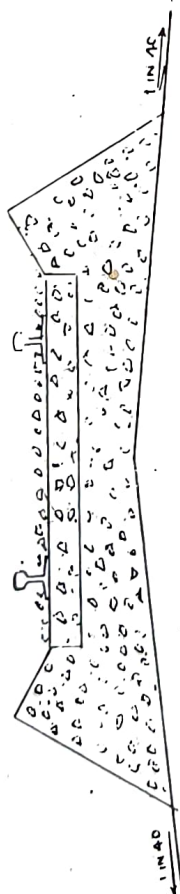


SHOULDER BALLAST OF THIS TRACK TO BE CLEARED

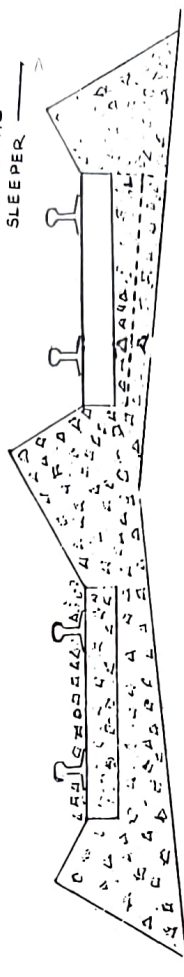


(a) ORIGINAL TRACK

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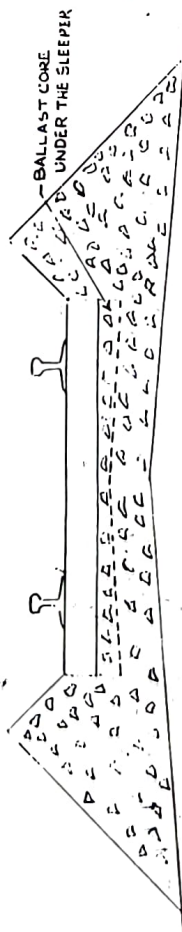


BALLAST CORE UNDER THE SLEEPER

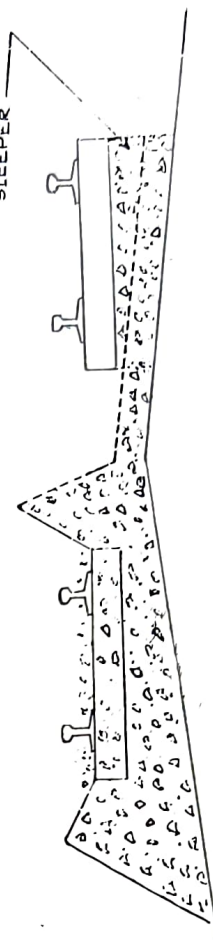


(b) TRACK AFTER PULLING THE CRIB ON TO THE SHOULDERS

(b) TRACK AFTER PULLING THE CRIB BALLAST ON TO THE SHOULDERS

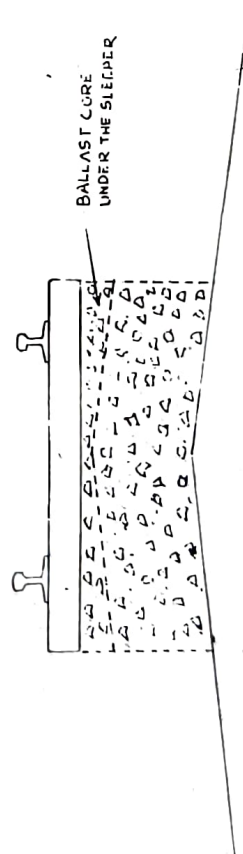


BALLAST CORE UNDER THE SLEEPER



(c) TRACK JUST AFTER BALLAST HAVING BEEN EXCAVATED BY FRM 80

(c) TRACK JUST AFTER BALLAST HAVING BEEN EXCAVATED BY FRM-80



DOUBLE LINE SECTION

SINGLE LINE SECTION

RELAYING TRACK WITH TRT

by

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Mechanised track relaying of B.G. on Indian Railways was introduced in the year 1972, Plasser Quick Relaying System popularly known as PQRS was adopted which is still in use on Indian Railways. More advanced system of track relaying has recently been introduced on Indian Railways, when two track-relaying trains have been imported from USA in the year 1990. One TRT on Northern Railway and another on Central Railway were deployed.

There are some advantages of TRT over PQRS but at the same time there are few special extra requirements of TRT. A brief description of TRT working is given below:

1. Base depot activities:

- Unloading and stacking of PRC sleepers.
- Loading of PRC sleepers on the special BFRs of TRT in a special manner with 3"x3" battens in between two layers.
- Unloading of released sleepers and stacking them after sorting out as US and SS separately.
- Re-cycling of battens
- Loading of released sleepers/fittings into wagons
- Maintenance of A.T.(3.7 metre gauge)
- Formation of rake.

2. Advance preparation:

- Unloading of long welded rail panels and pairing them so that all the panels are continuous without any gap and are upright at approximately 1.5m from centre of track.
- Survey and removal of obstructions- The track to be laid should be surveyed in advance and all the obstructions like creep posts, alignment posts

etc. should be removed. Infringment of any other structure like signal etc. should also be checked.

- Freeeness of fittings - All the fittings must be checked for their freeeness so that they do not cause problems in removal during block.
 - Reverse Jaw in CST-9 - Lips of all reverse jaw sleepers should be cut in advance or physically removed from track.
 - Broken sleepers/tie bars - All the broken S.T. sleepers/tie bars should be removed in advance otherwise they waste lot of time in removal.
 - Gauging - Gauging should be done in advance so that sleepers do not get lifted while old rails are lifted in the process of the work. Sled do not pass easily on lifted sleepers.
 - Destressing of track - If work is being done on LWR/CWR track during summer then destressing at higher temperature should be done otherwise rails may buckle ahead of TRT rake causing derailment of TRT rake.
- ## 3. Days Work:
- Removal of fittings partly before the

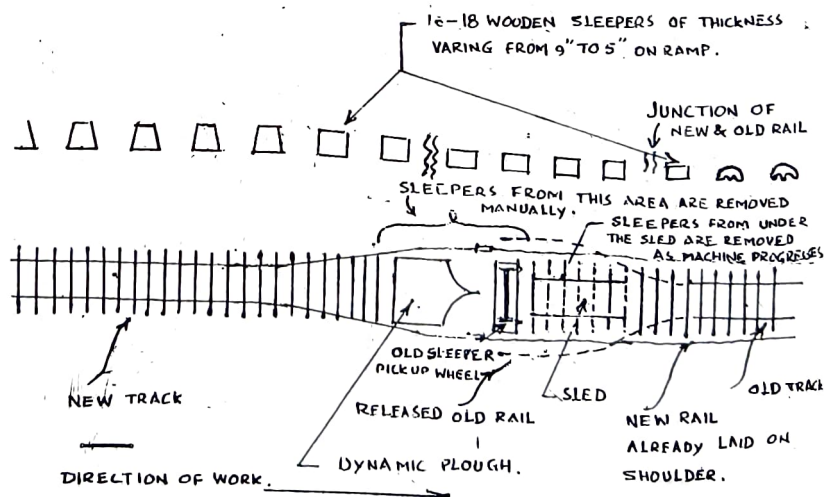
arrival of rake but after the traffic block starts.

- Opening of track or setting up of TRT.
- Removal of balance fittings after arrival of rake and removal of fittings ahead of rake.
- Removal of lifted/broken left over sleepers during working.
- Taking out of battens from layers and to place them between released sleeper layers.
- Dropping and fixing of fittings behind TRT and manual fixing of fittings left by clip applicator.
- Closing of work and making ramp after days work.

4. Setting up and winding up operations have been explained with the help of sketches as shown below :-

i. Setting up:

When TRT rake reaches the site, the fish plates of the junction of new and old tracks are opened and new rails are slewed out manually to drop the sled on sleepers. Wooden sleepers/ST sleepers from behind the sled are removed manually and dynamic



plough is lowered. The work is then started and wooden sleepers, on which the sled was initially laid, are either removed manually and shifted to closing point or lifted by TRT and then relayed at the closing point.

ii. Winding up operation:

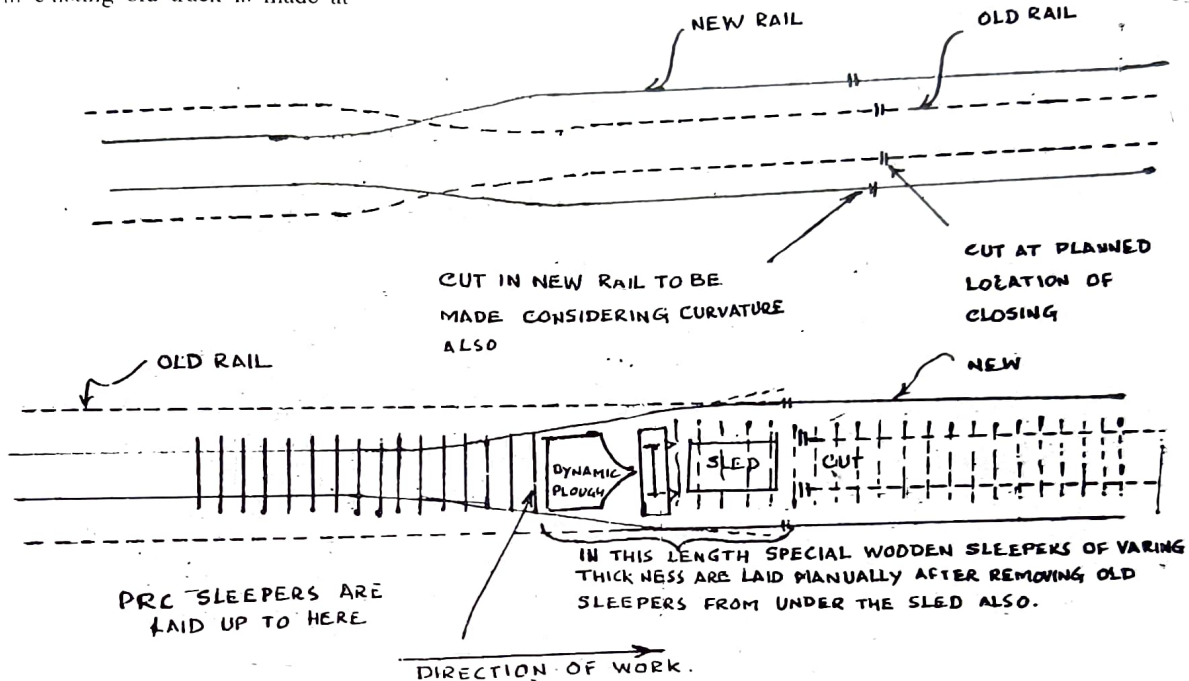
Cut in existing old track is made at

(ii) Level Crossing should be opened on the day of the block but before arrival of TRT and all muck should be thrown sufficiently away, so that it does not interfere in the working.

(iii) Level Crossing PRC sleepers should be brought on the day of block distinctly marked and kept in the top

Sometimes there are very small patches of PRC sleepers in CST-9/ST sleeper track in track circuited locations. TRT as it is, can not pick up PRC sleepers and therefore special care has to be taken- as described below:

Replace the PRC sleepers with



planned closing location and corresponding to it, cuts in new rails on either side are also made. The curvature of new rail is to be considered while making cut in it. Sled is taken upto the cut and TRT is moved ahead after unlocking the sled and lifting the dynamic plough. Sled is then picked up by TRT and existing old sleepers from under the sled are removed manually. Wooden sleepers of varying thicknesses are then provided between newly laid PRC sleepers and old sleepers so that a good ramp is made on which 40 KMPH speed is permitted. About 16-18 wooden sleepers are required.

5. SPECIAL PROBLEMS:

A. Re-Laying on level Crossing:

(i) Level Crossing should be checked in advance and longer sleepers if any must be cut before the block.

layer on one of the BFRs.

(iv) A mark on existing rail at a distance of 30 sleepers spacing from the level crossing should be made and when sleepers are laid upto that mark, the no. of sleepers in the laying unit and NT conveyors are counted. Extra sleepers should then be lifted by gantry and taken back and leaving only 30 sleepers or laying before the level crossing and if sleepers in the laying unit are less than 30 then only balance no. should be brought by the gantry. In this way ordinary sleepers will be just sufficient for laying upto the level crossing. In the next trip 14-16 level crossing PRC sleepers (depending upon the width of level crossing) should be brought after which normal work will start.

(v) Check rail can be fixed subsequently.

B. PRC sleeper in track:

wooden, well in advance in stretches where TRT is to work. The replacement should be done at least one month in advance.

If due to any reason the replacement could not be done in advance, then following methods be adopted.

(i) When relaying is being done with same sleepers as existing PRC:

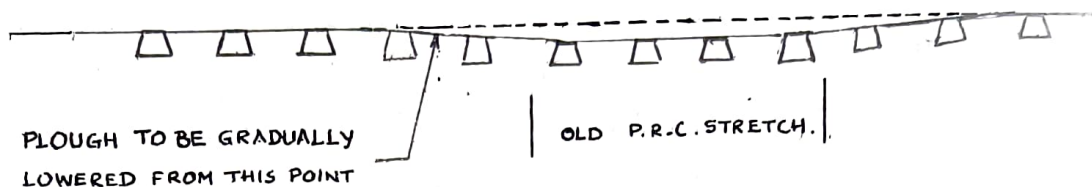
In this case, the sled should be passed over PRC sleepers by keeping M.S. plate on rail seats and plough be passed in lifted position in TRR mode. Care has to be taken for keeping proper longitudinal level because laid track is normally 150mm higher than the existing rail level whereas on old PRC sleepers, the rail level will remain un-altered. For this, plough should be gradually lowered before the PRC patch so that rail level of relaid track gradually comes down

and there is no sudden change in longitudinal level.

- (ii) When renewal is being done by 60 Kg. while 52kg. PRC Sleepers exist in the track.

sleepers also. On investigation it was found that newly laid sleepers were not having proper support conditions and the sleepers having end support condition were breaking. Post tensioned sleepers were breaking

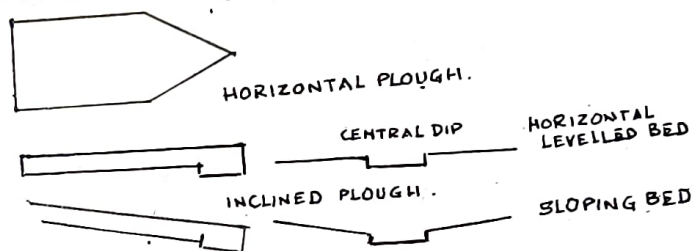
When the plough is horizontal it, makes a horizontal bed with central drain due to downward projection in the middle but if the plough is moved with its front nose down with respect to rear then it will give a ballast bed with central drain but both



- (a) If we are doing only TSR then the above method may be followed.

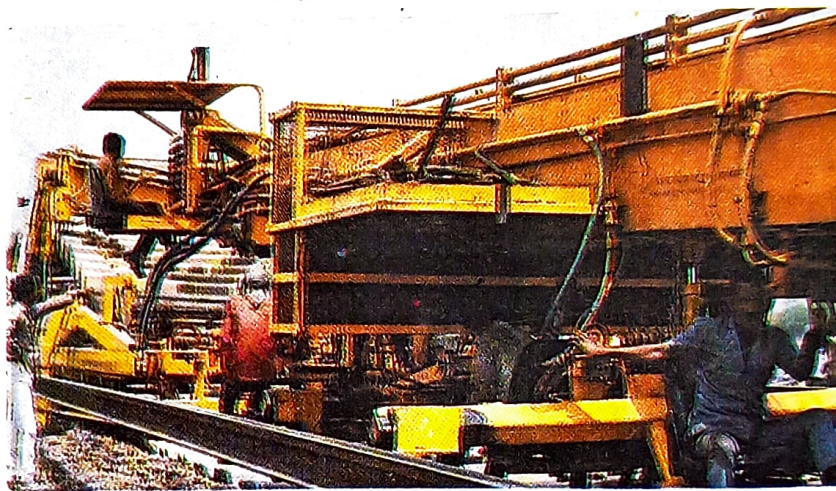
- (b) If CTR is being done, then sled is passed on PRC sleepers and the PRC sleepers are manually pulled out one by one just behind the sled. In this process the help of lifting hydraulic cylinder may also be taken. New 60 kg PRC are laid as usual. Manually pulling out takes extra time and on an average 25-30 seconds per sleeper are taken extra. Thus replacement of existing PRC with wooden sleepers should be done as far as possible, in advance.

because their design load is less than pretensioned. The reason of end support condition was the shape of the plough which makes the bed. This is explained in the following figure.



- (iii) Breakage of PRC sleepers:

On Allahabad Division about 6-7 percent newly laid PRC sleepers were breaking and most of them on the day of laying itself. It was also observed that this breakage was of post tensioned sleepers only. However cracks were observed in pretensioned



TRT LAYING CONCRETE SLEEPERS

Editorial: 7th issue of IRTM Digest is in your hand. It should have come up as January issue but as no articles were available it could be brought out as July issue, hope you would like to help us to continue our effort of bringing out IRTM digest by sending your valued articles regularly.

K.P.Mathur

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Printer	: Chief Printing & Stationery Supdt., N.Rly., Sakurbasti/NDLS at Public Printing(Delhi) Service, C-80, Okhla Industrial Area, Phase-I, New Delhi. Tel.: 6811935, 6811431.