



INDIAN RAILWAYS

TRACK MACHINES DIGEST

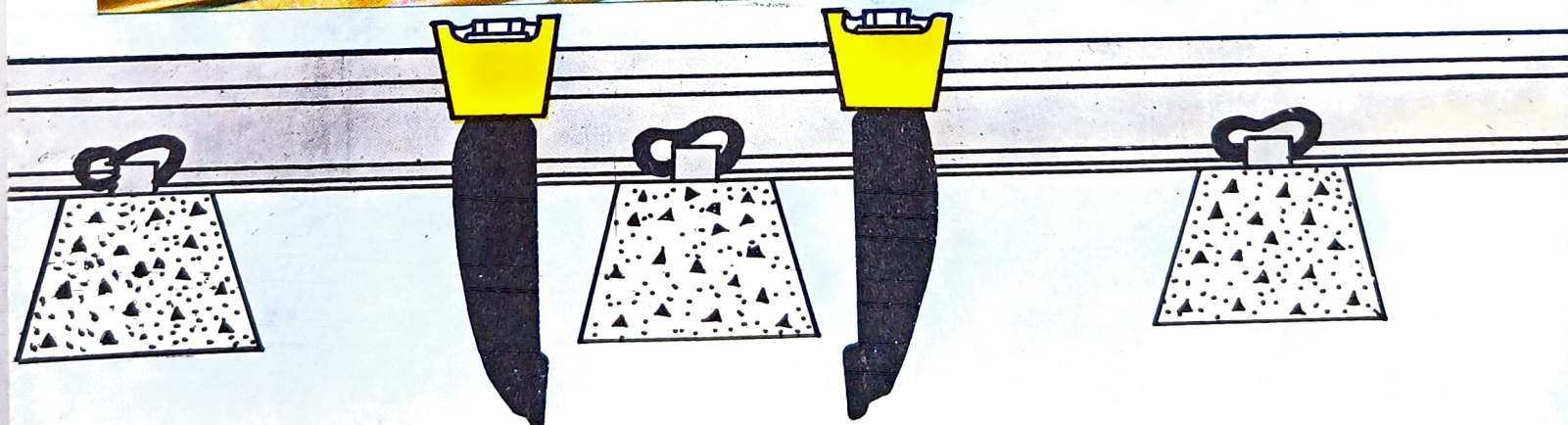
भारतीय रेल, रेलपथ मशीन डायजेस्ट

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UTILISATION OF TRACK MACHINES

The following table gives the comparative output, utilisation and block position railway wise (Source-Railway Board)

Rly.	Machine Type	Output		Utilisation as % of			Block (March 94)		Actual given
		93-94	92-93	stipulated performance			Stipulated	Demanded	
				in 4/5 hrs block					
				93-94	92-93	Best Ever	Hrs.	Hrs.	Hrs
C	TTM Kms	6191	5079	43	39	43	1500	1336	726
	PQRS Kms	124	116	30	28	30	188	108	72
	BCM Kms	25	16	17	10	34	100	76	18
	Pts & xing Nos.	1505	1540	42	64	64	300	256	169
	BRM Kms	671	849	56	70	70	100	48	34
E	TTM Kms	4990	4818	37	34	37	2120	1790	759
	PQRS Kms	134	150	15	17	26	210	104	6
	BCM Kms	11.0	37	8	25	31	155	110	28
	Pts. & Xing Nos.	1693	1151	47	48	48	465	385	122
	BRM Kms	857	725	71	66	71	155	115	48
N	TTM Kms	6601	5231	40	32	40	2200	1751	1004
	PQRS Kms	108	145	30	24	30	155	80	58
	BCM Kms	33	30	23	20	37	124	80	44
	Pts. & Xing Nos.	1513	1505	42	41	48	233	170	95
	BRM Kms	1237	676	103	56	103			
NE	TTM Kms	493	300	13	13	13	496	244	110
	PQRS Kms	74	48	27	17	27	62	32	7
NF	TTM Kms	138	104	18	13	18	248	248	65
S	TTM Kms	5068	3560	43	51	51	1300	1436	751
	PQRS Kms	272	264	30	29	30	937	220	195
	BCM Kms	37	29	26	20	37	100	124	52
	Pts & xing Nos.	1031	438	29	36	37	300	316	220
	BRM Kms	806	644	72	54	72	100	120	129
SC	TTM Kms	4807	3343	36	43	53	1488	1248	607
	PQRS Kms	227	215	38	34	38	387	252	216
	BCM Kms	33	24	23	16	40	124	104	23
	Pts. & Xing Nos.	658	219	27	24	27	248	208	99
	BRM Kms	1130	190	94	16	94	124		
SE	TTM Kms	5256	3741	40	31	51	1488	1160	639
	PQRS Kms	88	98	8	9	11	186	81	54
	BCM Kms	18	28	13	19	35	124	64	44
	Pts. & Xing Nos.	1040	894	29	25	29	372	290	146
	BRM Kms	347	203	29	17	33	124	108	72
W	TTM Kms	4153	3137	34	28	51	1430	1310	507
	PQRS Kms	86	58	18	12	15	560	284	213
	BCM Kms	57	24	39	16	39	72	58	47
	Pts. & Xing Nos.	472	303	33	25	33	324	300	146
	BRM Kms	797	739	66	61	66	120	120	59
Note	TTM	-	Track Tampers						
	PQRS	-	Plasser Quick Relaying System						
	BCM	-	Ballast Cleaning Machine						
	Pts & Xing	-	Points & Crossing Tamper						
	BRM	-	Ballast Regulating Machine.						

Besides the above, other important machines, which are not on all zones, have the average performance as under:

i) Shoulder Ballast Cleaners (SBC)

Indented in '92-93 end, during '93-94, the utilisation and the output is an under:

Rly.	Output (kms)	Utilisation % stipulated in 4Hrs Block
C	116	38
E	141	47
N	133	44
SE	98	33

ii) Track Renewal Train :

Rly	Output (kms)	Utilisation as % of stipulated 4Hrs Block
C (for 8 Months)	61	51
SE (Balance 4 months)	24	39
N One Year	93	51

Causes for low utilisation:

a) For Tampers, BCM & SBC (Hrs)

1. Average block per day (hrs) during '93-94 has reduced:

	'93-94	'92-93
TTM	2.16	2.48
BCM	2.30	2.47

2. Average duration of each block spell/ day has reduced:

	'93-94 Hrs	'92-93 Hrs
TTM	1.39	2.07
BCM	2.18	2.09 (Marginal increase)

b) For PQRS & TRT :

- i) Non-availability of dedicated powers for yard and main line working.
- ii) Contractual labour not being available.
- iii) Rails, Ballast and sleepers not moving on time.

FAMILIARIZATION WITH UNIMAT- 2S & 3S

by Shri C.G. Panse, AEN/TT/JHS

Mechanised maintenance of track has been introduced on Indian Railways since past three decades. During this period frequency of trains, their speeds and loads have increased requiring high standard of maintenance to closer tolerances but block margins are progressively declining, therefore sophisticated high output tamping machines were introduced to meet the needs. These machines were capable of maintaining only plain track. The need for maintaining turnouts also, by machines was a long pending

necessity. Concrete sleepers on turnouts are being progressively introduced on Indian Railways. These heavier concrete sleeper turnouts essentially need maintenance by machine for obvious reasons.

In view of the above, Railway Board have procured 12 Nos. Unimat Points-Crossing tamping machines model 08-275-2S from M/S Plasser India against Contract.

No. 87/WSC/TK4 of 15.7.88, which were not sufficient.

In order to overcome this problem

8 No Unimats, model 08-275-3S were procured against contract No 90/Track-III/23 of 13.12.91.

By both These types of machines, the level and alignment of main line portion is corrected while the turnout portion is only tamped without levelling and alignment because this will disturb the main line

Two Unimat machines against each contract were allotted to Central Railway.

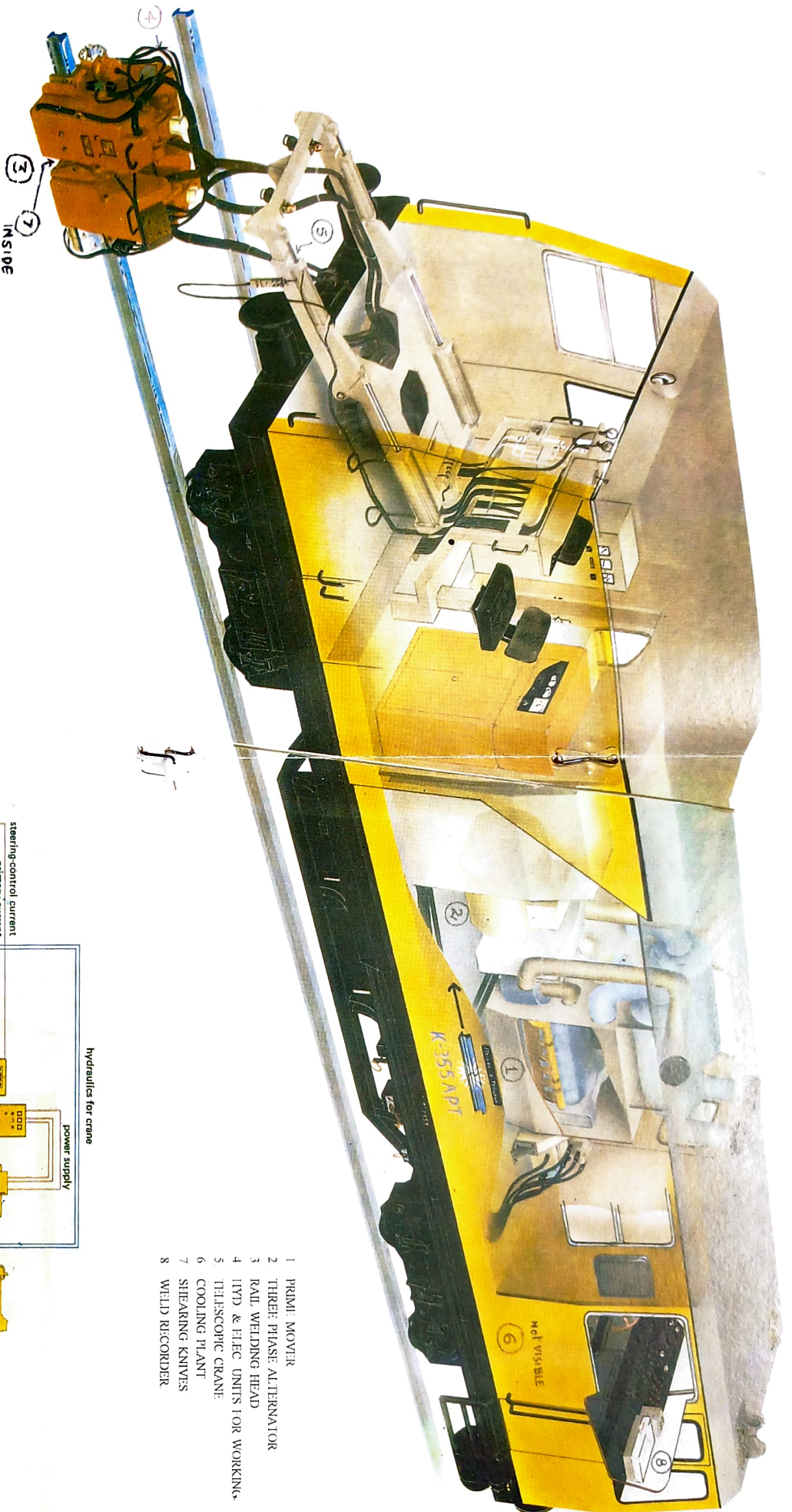
The differences between Unimat 08-275/2-S and 08-275-3S are listed below :



The new Unimat in 1987.

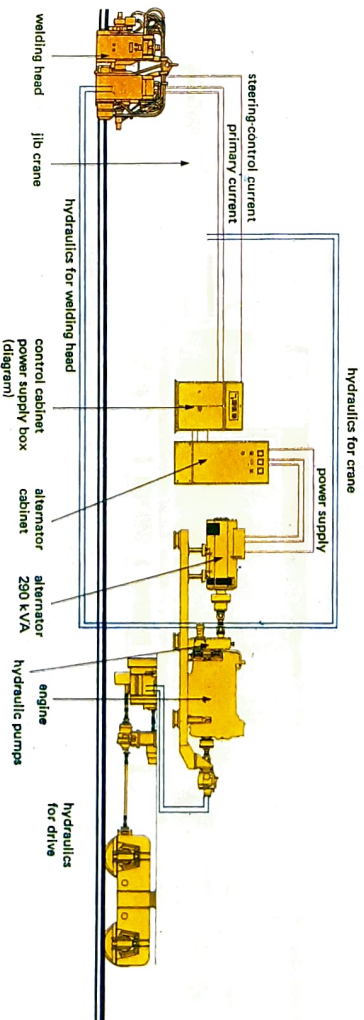


The new Unimat 08-275 /3S



- 1 PRIME MOVER
- 2 THREE PHASE ALTERNATOR
- 3 RAIL WELDING HEAD
- 4 HYD & ELEC UNITS FOR WORKING
- 5 TELESCOPIC CRANE
- 6 COOLING PLANT
- 7 SHEARING KNIVES
- 8 WELD RECORDER

The main source of power is cummins KT11.50L. water cooled, six cylinder engine with an output of 455HP (330-KW) The engine directly operates a regulating pump for drive and a distributor gear for two hyd pumps for the work functions of the welding head, & the crane Also it runs three phase alternator



1.0 PRIME MOVER :

- 1.1 The prime mover is a Cummins engine water cooled, in line, vertical, model NTA 855 L six cyl. with 320 HP at 2000 RPM
- 1.2 The air compressor is an accessory of the engine and directly mounted on the engine, capacity of the air compressor is 500 lit/min.
- 1.3 The engine is fitted with one Turbocharger.
- 1.4 The cooling circuit of the engine is having one radiator and one water pump.

2.0 ELECTRICAL SYSTEM :

- 2.1 Two batteries of 12 V/180 ampere hours are provided.

- 2.2 Inter communication system is not provided in the driving cabin
- 2.3 Automatic adjustment of lining cord to avoid infringement with tamping tool while working in sharp curves is done through electric motor arrangement

3.0 HYDRAULIC SYSTEM:

- 3.1 One Hydraulic motor is provided in rear bogie for working drive in gradients to be operated specifically when required.
- 3.2 Two separate valves are used each for slow & fast movement of lifting and lining operations.
- 3.3 Hydraulic pumps of 38/22 GPM, 20/22 GPM and 20/17 GPM are provided with 3 no. separate suction filters for various (working pressures) hydraulic circuits.
Pump 38-22 : Used for system at 135-140 bar.
Pump 20-22 : 20 GPM pump is used for vibration at 150 bar for T/unit, 22 GPM is used for high pressure system of 150 bar for tamping circuit.
Pump 20-17 : 20 GPM pump is used for vibration of other unit at 150 bar. 17 GPM is used for cooling circuit in series. Vibration motors are of 17 GPM capacity
- 3.4 There are two return filters. One pressure filter is provided for T.U. UP & Down proportional valves.

4.0 GENERAL:

- 4.1 Tamping units can only be moved laterally. This restricts tamping of skew sleepers on trunouts.
- 4.2 Lining trolley is mounted on flexible frame and complete unit is moved for fixing datum
- 4.3 Fail safe brake arrangement is not provided
- 4.4 No emergency back-up system is provided for locking tamping unit, lifting unit etc. in case of shutdown or hydraulic pump failure.
- 4.5 Recorder is provided to record track parameters.
- 4.6 There are three electrical pendulums one each on front tower, working cabin & recorder.
- 4.7 The distance between bogie pivot centres is 11.5 M.
- 4.8 Lining unit frame work is in one piece.
- 4.9 Cannot lift third line, jacking has to be done with kutchha packing for its lifting.
- 4.9.1 All the three hydraulic pumps are on power take offs of ZF gear box
- 4.9.2 Draining of water from pneumatic tank is done manually
- 4.9.3 Diesel & Hyd. tank capacities are 1500 lit. each.

The prime mover is a MWM engine water cooled V Shaped, model TBD 232. V-12 with 473 HP at 2000 RPM

The compressor is ELGI make and mounted separately. It is left hand drive and got a capacity of 700 Lit/min at 690 RPM

The engine is fitted with two turbochargers.

The cooling system is provided with two radiators and two water pumps.

Two batteries of 12 V/220 AH are provided. In addition 2 Nos. 12 V 20 AH batteries are provided for the programme circuits.

Inter communication system is provided in all the three cabins.

Automatic adjustment of the lining cord is done by rod less penumatic cylinder with electropneumatic valves

Two hydraulic motors are provided in rear bogie for working in steep gradients to be operated specifically when required

Servo valves are used for lifting and lining operations

Hyd. pumps of 38/17 GPM, 25/25 GPM, 20/14 GPM are provided for various (working pressures) and one axial piston pump is used for high pressure tamping circuit with 4 No. separate suction filters

Pump 38-17: used for system at 135-140 bar.

Pump 25-25: for vibration motors LH & RH at 150 bar.

Vibration motors are of 22 GPM capacity.

Pump 20-14 for drive of cooler and engine radiator fans

There are two return filters. Three pressure filters are provided for T.U. up & down proportional valves and two for lifting and lining servovalves.

The tamping units can be rotated through an angle of 8.5° on both the sides. This enables positioning of the T/unit properly above the sleeper where it is inclined to achieve better packing

Lining trolley is fixed on rigid frame and the datum can be achieved by activating the bogie on rollers.

Fail safe brakes are provided.

Back up system is provided.

Recorder is not provided.

Only two pendulums have been provided.

The distance between bogie centres is 14 M.

Lining unit frame work is in two pieces.

Can lift third line synchronous with main line but cannot tamp. manual kutchha packing has to be done.

3 pumps have been provided on power take offs of ZF gear box and 20-14 pump is provided in the front of engine with small carden shaft.

Draining of water is automatic through special valve.

Diesel and Hyd. tank capacities are 1500 lit each.

MOBILE FLASH BUTT WELDING PLANT

By K P. Mathur Principal IRTMTC Allahabad

Flash butt welding has been used for years in many fields of production proving to be absolutely reliable and economical. No foreign matter is used in this welding process. The two ends to be welded are heated to around 1200°C and pressed against each other.

Due to high strength of this joint over others this is being extensively used to weld rails on Indian Railways

Two Types of plants are available.

- 1 Stationary Flash butt welding Plants: Can weld rails in factory
- 2 a) Mobile Flash Butt Welding Plant: Can weld rails in factory as well as in situ and sidings.
- b) In situ it can weld rails in the centre of track, on the shoulder, cess and the track on which it is standing.

In this article we will discuss mobile Flash Butt Welding Plant.

It is basically a construction machine and can weld in 8Hrs. shift around 30-40 joints. If worked in block section to convert 10/20 rail panels in to LWR of 1Km. or so, it can weld 4 to 5 joints in 2 to 2½ Hrs block

DIMENSIONS AND WEIGHT OF THE MACHINE :

Gauge	-1676 mm
Length over buffers	-16305 mm
Overall width	-2990 mm
Overall height	-3695 mm
Distance between bogie pivots	-10000 mm
Wheel dia	-710mm
Total weight	-42000kg.
Wt on powered bogie	-24000kg.
Wt on idle bogie	-18000 kg.
Speed potential	-80 KMPH
Speed permitted by RDSO	-60 KMPH
Wheel base on bogies	-1500 mm

The machine can be broadly divided in to 8 major assemblies.

- 1 Primemover.
- 2 Three phase alternator
- 3 Rail welding head
- 4 Hyd and electric units for working
- 5 Telescopic crane
- 6 Cooling plant

7. Shearing knives
8. Weld recorder.

1. PRIME MOVER :

The machine has been provided with cummins engine KT 1150L turbo charged, 6 cyl, developing 450 HP (330 KW). This engine is utilised to operate hyd. pumps (for working & driving) & alternator

2. THREE PHASE ALTERNATOR:

It is manufactured by Austrain firm named Allen. The capacity of alternator is 290 KVA. it produces 400/231V (3 phase 400 V, single phase 231V) at frequency 50 Hz and RPM 1500.

3. RAIL WELDING HEAD :

It is Russian built unit responsible for welding of rails from their normal temp. in gradual voltage regulation according to pre set programme.

This welding head can weld rails having cross sectional area from 6400mm² to 10000mm² in field conditions and can be operated from AC Mains also. The unit is water cooled, if the ambient temperature is below 5° C water in coolant circuit, to be changed by low freezing liquid.

Specifications for Welding Head:

-Supply Voltage	380V from A.C. mains, 400V from Gen. Set	Fed to primary transformer provided on machine in the control panel
- Frequency	50 Hzs	
- Power rating	150 KVA	for head only.
- Duty factor for current	50%.	
- Primary rated current.	395 A	
- Welding ratated current	20000 A	
- Welding voltage (secondary voltage)	7V (out put of secondary transformer provided in side welding head).	

- Max. cross section of rail can be welded	10000 mm²
- Time for welding	130 to 180 Secs
- Pressure for Hyd System	100 bar.
- Max. clamping force	125 Tonnes
- Max. up set force	45 Tonnes
- Up set rate	20 mm/Sec
- Flashing rate	0.25 to 1.00/mm/Sec
- Machine full stroke	70 mm with 15 mm up set
- Cooling water at pressure	1.5kg/cm²
- flowrate	3-Lit/mm.
- weight	2250 kg.

4. HYD. AND ELECTRIC UNITS FOR WORKING :

Hydraulic system of welding head consists of two cylinders for clamping and two cylinders situated in the right half positioned longitudinally to the rails, this end remains fixed other end in left half moves according to work programme, initially a gap of 3 to 5mm is kept for sparkings to take place.

In the initial stages the clamping force is 40 tonnes and rises to 125 tonnes by high pressure to cause butting pressure of 45 tonnes.

In the initial stages when the rails are cold some times current density exceeds 2A/mm² causing over loading on engine, the circuit is such that the control motor for hydraulic follower system gets throttled or even reversed to keep rails at proper gap

During welding process, the flash burn speed is 0.25mm/sec which progressively rises to 1.00 mm/sec. During above period progressive warming up of the two rail ends takes place and temperature rises to around 1200°C, and they are pressed with a force of about 45 tonnes to form the joint

5. TELESCOPIC CRANE:

It is a twin jib hyd. crane, welding

head is hung from this crane. With the help of this crane the welding head is loaded on the machine and unloaded for work. During work the crane can swing left & right by 16°. On the machine, with sliding cabin it can swing 90° to a maximum radius of 3.25 meters

6. COOLING PLANT :

High temperatures of the order of 1000° to 1200° C occur in the welding dies and secondary transformer, need cooling. Compact type of water cooler from M/s Voltas has been provided. Cooled water at a pressure of 1.5 Kg/cm² is circulated in side these to maintain the temperature at 30° C. It is controlled thermostatically. If this system fails a yellow light is switched on for warning, the plant must be stopped and defect should be rectified otherwise dies & transformer will be spoiled.

7. SHEARING KNIVES:

When weld is made by pressing two hot rails at a pressure of around 45 tonnes, up set metal is formed around the joint. To remove this, shearing knives are provided. These are made of special steel, made in 3 pieces and joined by pins. The knife envelopes the rail around with a margin of 1 to 1.5mm. For its working, the pressure in front jaw is released and this moves back by a distance equal to butting stroke after this the clamping force is again raised, now the clamping force in the rear jaw is reduced and moves forward until the shearing stroke completes and the weld seam is removed.

8. WELD RECORDER :

To ensure quality of weld and to keep permanent record of the weld a three channel recorder has been provided channel one records welding current in three phases (a) warning up (b) flash burning (c)

compression brief high amperage. Channel 2: records force of butting and that of shearing 1mm of graph = 2 tonnes.

Channel 3: records the material consumption which is 32 to 35mm/Joint. From this record we can directly evaluate the quality of joint. Its reaction time is 0.25 sec and precision is .05%.

Working Sequence:

1. After arrival of machine at site, fittings of both the rails in front are removed, fittings of the rail on which machine is standing are also removed upto 1st set of wheels (not required in stationary application)
2. Rail web and face are kept grinded for proper conductivity up 45 cm from ends.
3. Two sleepers are removed before the arrival of plant for housing welding head (not needed in stationary application)
4. Front rail is made free on rollers and aligned top and gauge face and made in the same plane with rail on which the machine is standing.
5. Welding head is fixed in position and after clamping, the rails are checked with a special tool for top alignment. Initially a gap of 3mm is maintained.
6. Welding operation switched on, joint is welded as per programme provided on the machine after shearing of heaped up metal the head is declamped.
7. Fittings on every 4th sleeper are provided, the new joint is temporarily supported and machine moved to next joint.
8. In the rear removed sleepers are provided and fittings

completed

9. Due to flashing and butting rails are shortened by 32 to 35mm as such rails have to be pulled from front for further welding. The machine has pulling arrangement

NOTE :

1. For welding different types of rails the welding dies have to be changed and programme for that rail has to be switched on.
2. Marking on rails that are likely to come under the dies have to be grinded flat.
3. Rails of different sections should not be clamped as the head will get damaged.
4. Variation in web thickness should not be more than 1mm

Small Equipments Needed:

1. Web grinders & gen set
2. Profile grinder.
3. Rail base grinder.
4. Rail cutting machine
5. Rollers.
6. Jacks
7. Jig for jacking rail.
8. Wooden blocks for supporting joint

Quality Control:

As per welding code for flash butt welding

EDITORIAL

Dear reader, 8th issue of IRTM Digest is in your hand, your valuable comments will further help in improving quality of the digest

This is the last IRTM Digest I am bringing out as I am retiring on 31.1.95, I thank you all for the cooperation and affection shown by you.

Thanking once again

(K.P. Mathur)
Principal/IRTMTC/ALD.

Note : IRTMTC accepts no responsibility for the views expressed by the authors.

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