



INDIAN RAILWAYS

TRACK MACHINES DIGEST

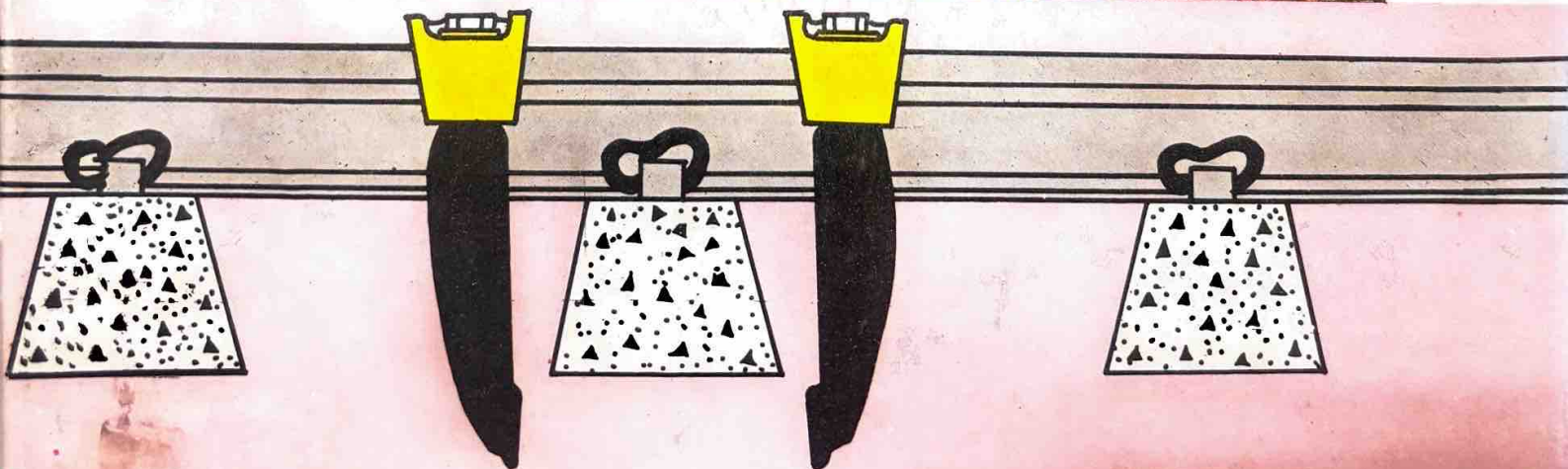
भारतीय रेल, रेलपथ मशीन डायजेस्ट

YEAR 3

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OUT PUT OF TRACK MACHINE DURING 1994-95 & FIRST QUARTER OF 1995-96

Rly.	MACHINE DETAILS				Total No. Machine	Ideal Target (KM)	Desirable Target 60%	Potential On Rly.	OUT PUT IN Kms	
	UT	UNO	DUO	CSM					94-95	1st Quarters 1995-96
CR	8	-	1	8	17	1216	608	7000	6230	1593
ER	3	2	3	6	14	1019	533	5800	4622	1089
NR	1	2	5	7	15	1305	652	7200	7242	1702
NER	-	2	1	1	4	310	155	1500	1025	305
			MG							
NFR	2	-	1	-	3	250	125	800	489	87
SR	5	-	2BG	5	13	969	485	5400	5222	1239
			1MG							
SCR	1	-	4	5	10	1026	513	5940	4458	1233
SER	2	1	3	7	13	1152	576	7500	5158	1331
WR	4	1	1MG	6	12	1016	508	6000	4631	1157
TOTAL	26	8	22	45	101	8261	4155	47140	39177	9736

UT = 31 KM PER MACHINE
 UNO = 56 KM PER MACHINE
 DUO = 88 KM PER MACHINE
 CSM = 100 KM PER MACHINE

OUT PUT OF POINT & CROSSING TAMPER 03-275 IN T.O. DURING 94-95 & FIRST QUARTER OF 1995-96

Rly.	Total No. Machine	Ideal Target (KM)	Desirable Target 80%	Potential On Rly.	OUT PUT IN NO. OF T.O.	
					94-95	1st Quarters 1995-96
CR	4	400	320	3000	2581	1093
ER	3	300	240	2160	1712	431
NR	4	350	320	3000	2244	595
SR	3	300	240	2160	1449	340
SCR	3	300	240	2160	1383	556
SER	3	300	240	2160	1217	269
WR	3	300	240	2160	1137	370
TOTAL	23	2250	1840	16800	11723	3654

TARGET 1 M/C = 100 T.O./MONTH

OUT PUT OF BALLAST CLEANING MACHINE RM-80 IN KM DURING 1994-95 & FIRST QUARTER OF 1995-96

Rly.	Total No. Machine	Ideal Target (KM)	Desirable Target 80%	Potential On Rly.	OUT PUT IN NO. OF KM	
					94-95	1st Quarters 1995-96
CR	2	24	19.2	180	33.2	29.6
ER	2	24	9.6	180	10.4	12.9
NR	2	24	19.2	180	87.7	13.5
SR	1	12	9.6	90	40.1	8.9
SCR	1	12	9.6	90	57.9	8.9
SER	2	24	19.2	180	47.3	13.2
WR	2	24	19.2	180	28.1	19.1
TOTAL	12	144	105.6	1080	304.7	106.1

TARGET 1 M/C = 12 KM/MONTH

**OUT PUR OF BCM RM-76 FOR POINTS & CROSSING IN KM DURING 1994-95
& FIRST QUARTER OF 1995-96**

Rly.	TOTAL NO. MACHINE	Ideal Target	Desirable Target	Potential On Rly.	OUT PUT IN Kms.	
					94-95	1st Quarters 1995-96
CR	1	7 Km.	6 Km.	72 Km.	27.8	9.3
NR	1	7 Km.	6 Km.	72 Km.	42.3	10.5
TOTAL	2	14 Km.	12 Km.	144 Km.	70.1	19.8

TARGET 1 M/C = 7 KM OR 12 T.O/MONTH

**OUT PUT OF FRM-80 FOR SHOULDER BALLAST CLEARER IN KM. DURING
1994-95 & FIRST QUARTER OF 1995-96**

Rly.	TOTAL NO. MACHINE	Ideal Target	Desirable Target	Potential On Rly.	OUT PUT IN Kms.	
					94-95	1st Quarter 1995-96
CR		25	16.6	200	106.6	17.5
ER	1	25	16.6	200	74.8	21.6
NR	1	25	16.6	200	51.6	25.5
SER	1	25	16.6	200	117.0	24.7
TOTAL	3	100	66.4	800	350.0	89.3

TARGET 1 M/C = 25 KM/MONTH

OUT PUT OF TRACK RELAYING TRAIN IN KM DURING 1994-95 & FIRST QUARTER OF 1995-96

Rly.	TOTAL NO. MACHINE	Ideal Target	Desirable Target	Potential On Rly.	OUT PUT IN Kms.	
					94-95	1st Quarters 1995-96
CR	1	-	-	-	-	-
NR	1	15	12	90	75.8	31.8
SCR	1	15	12	100	-	6.5
SER	1	15	12	110	50.2	13.8
TOTAL	4	45	36	300	126	52.1

TARGET 1 M/C - 15 KM/MONTH

RELAYING OF TRACK BY PQRS IN KM DURING 1994-95 & FIRST QUARTER OF 1995-96

Rly.	No. of Portals		Total No.	Ideal Target	Desirable Target 30%	Potential on Rly.	OUT PUT IN KM	
	5 T	9T					94-95	1st Quarters 1995-96
CR	-	8	8	40	12	150	110	25.7
ER	-	12	12	50	18	145	117.5	15.5
NR	-	4	4	20	9	90	83.6	17.3
NER	3	3	6	22.5	6.7	63	19.0	1.5
SR	-	15	15	75	22.5	120	210.7	31.2
SCR	4	8	12	50	15	122	197.7	41.0
SER	-	16	16	80	24	150	80.3	26.9
WR	-	8	8	55	17	110	92.1	4.9
Total	7	74	81	392.5	124.2	950	910.9	164.0

TARGET

5 TONNE CAPACITY = 2.5 KM/MONTH/MACHINE

9 TONNE CAPACITY = 5.0 KM/MONTH/MACHINE

OUT PUT OF BALLAST REGULATOR IN KM. DURING 1994-95 & FIRST QUARTER OF 95-96

Rly.	TOTAL NO. OF MACHINE	Ideal Target	Desirable Target	Potential On Rly.	OUT PUT IN KM	
					94-95	Ist Quarters 1995-96
CR	4	400	320	3600	1198	694
ER	3	300	240	1800	1323	431
NR	4	400	320	3600	1418	371
SR	2	200	160	1800	622	217
SCR	3	300	240	2700	1356	719
SER	3	300	240	2700	522	198
WR	3	300	240	2700	515	442
TOTAL	22	2200	1760	18900	6954	3072

TOTAL 1 M/C = 100 KM/MONTH

OUT PUT OF DYNAMIC TRACK STABILISER IN KM DURING 1994-95 & FIRST QUARTER OF 95-96

Rly.	TOTAL NO. OF MACHINE	Ideal Target	Desirable Target	Potential On Rly.	OUT PUT IN KM	
					94-95	Ist Quarters 1995-96
CR	1	110	55	600	-	22.50
ER	1	110	55	600	-	34.00
NR	1	110	55	600	7.7	189.1
SR	1	110	55	600	-	-
SCR	1	110	55	600	-	43.6
SER	1	110	55	600	-	-
WR	1	110	55	600	-	22.0
TOTAL	7	770	385	4200	7.7	311.2

TARGET 1 M/C = 110 KM/MONTH

OUT PUT OF T-28 DURING 1994-95 & FIRST QUARTER OF 1995-96

Rly.	TOTAL NO. OF MACHINE	Ideal Target	Desirable Target	Potential On Rly.	OUT PUT IN KM	
					94-95	Ist Quarters 1995-96
CR	1	12	10	120	37	8
ER	1	12	10	120	19	8
NR	1	12	10	120	38	14
SR	1	12	10	120	76	11
SCR	2	24	10	240	153	48
SER	1	12	10	120	31	15
WR	1	12	10	120	2	-
Total	8	96	70	960	356	104

TARGET 1 M/C = MONTH 12 T.O.

METHODS AND MACHINES TO ASSURE UNIFORMITY AND QUALITY OF CONCRETE SLEEPER TRACKS

1. DEFINITION OF TRACK QUALITY :

On any real-life track, lateral forces will cause the lateral position to be altered and vertical forces will cause irregular settlements and attrition of the ballast. The rail will have surface faults and be subjected to gradual wear. The permanent way materials used have limited lifetimes and have to be replaced once the service life of the material has expired. For reasons of safety and travelling comfort, the track will require regular maintenance.

The loss of track quality can be compared to the deviations of the wheel/rail contact line from the target geometry. These deviations occur in the alignment and longitudinal level and where there is inadmissible twist. In order to quantify the track quality in figures, the deviation of the actual geometrical position of the track from the target position can be used. Very often, the standard deviation of the longitudinal level fault over a certain length of track (e.g. 500m) is taken. Weighted track quality indices are also formed from various geometrical fault parameters.

The trend of the track quality over time also develops in a very similar way. Figure 1 shows the typical trend of the track quality figures dependent upon the traffic load after maintenance work (tamping). Following the maintenance carried out, the track quality is improved dramatically. Subsequent traffic loading up to around 1 million gross tons will lead to an exponential drop in the track quality. In this phase the ballast stones rearrange themselves, settle together densely, in some cases the points break off under the traffic load, until a stabilisation of the settlements has occurred. This phase is followed by the phase of linear deterioration of the track quality. Whereby only irregular settlements contribute towards a deterioration of the track quality.

A uniform sequence of settlement does not lead to any deterioration. It is interesting to study the influence of the gradient of deterioration straight lines and the initial quality. If, for example by using a modern high capacity tamping machine, a starting quality improved by $\Delta Q_0 = 0.5\text{mm}$ can be achieved, then there will be an approximately parallel displacement of the curves (drawn in dotted lines). This displacement leads to an extension of the maintenance cycle by approx. 20-25%.

The good working performance of the maintenance machines is therefore a guarantee for high initial quality and also for the economic success. The linear trend of the settlements is composed of the friction of the ballast stones and possible yielding of the subsoil. Local irregularities of the ballast bed lead to the observed drop in quality. The **exponential drop** in track quality can in part be **anticipated** by the **dynamic track stabilizer(DTS)**. The DTS achieves a **uniform, force-free, spatial consolidation** of the ballast bed.

Through the application of the DTS, substantial extensions of the cycle periods between the necessary maintenance operations can be expected.

The gradient of the linear drop in quality is determined mainly by the following influencing parameters as ballast quality, heavier rails, large bearing surfaces of concrete sleepers, formation or frost protection layers and the homogeneity of the ballast bed.

The afore-mentioned measures result in flat, linear, quality deterioration curves. A track designed in this way can suffice with maintenance cycles in excess of five years with a high volume of traffic.

Figure 2 shows the behaviour of the vertical track quality for tracks with different inherent track quality. Above shown is an inherently poor track. As can be seen by this figure the achievable initial quality is quite poor. Also the tangent of the linear deterioration curve is very steep. Such a trend is typical for a dirty ballast bed. Due to the loss of friction between the ballast stones, tamping has nearly no effect. The maintenance cycles of such a track are short and the maintenance is therefore costly. The curve underneath shows the behaviour of an inherently good track. The achievable initial quality using tamping machines is very high, the tangent of the linear deterioration curve is flat, the maintenance cycles are therefore long and the costs of maintaining this track are lower.

2. THE IMPORTANCE OF UNIFORMITY OF METHODS AND MACHINES FOR CONCRETE SLEEPER TRACKS

A very important factor for a high track quality is uniformity. From this point of view the uniformity of the track construction (from subsoil to ballast bed and further on to the rail) as well as the uniformity of the working methods of the maintenance machines is of high importance. This can be seen as a fundamental law of nature. Rapid changes of mechanical design for example cause high stresses in the materials. Consider the behaviour of an abrupt change in vertical stiffness of the track as it is often the case on transition from bridges or tunnels to tracks with a normal ballast bed. The rolling wheel over these discontinuities causes high forces.

The effect is damage of the ballast stones, stresses in rail, sleepers and fastenings. These locations have to be maintained frequently using tamping machines, but only removal of the primary source of damage will help. The abrupt step in vertical stiffness has to be replaced by a smoothed transition, for example by using ballast mats or by using elastic pads under the rail.

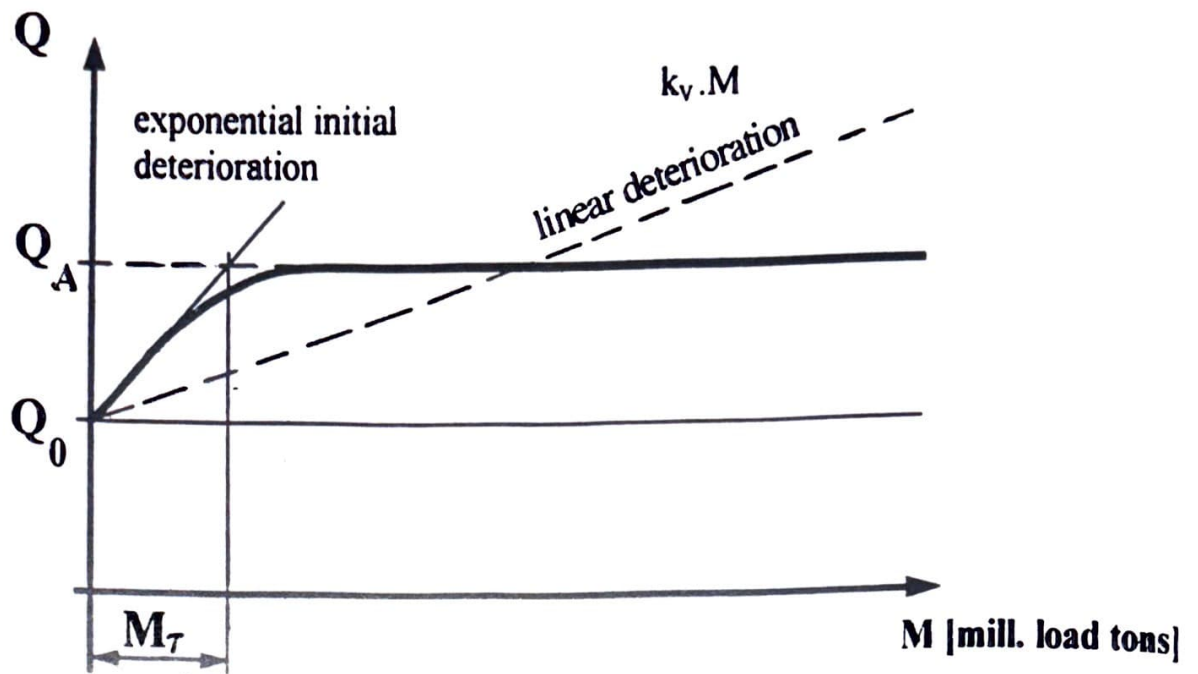


Figure 1a Exponential and linear proportion of quality loss

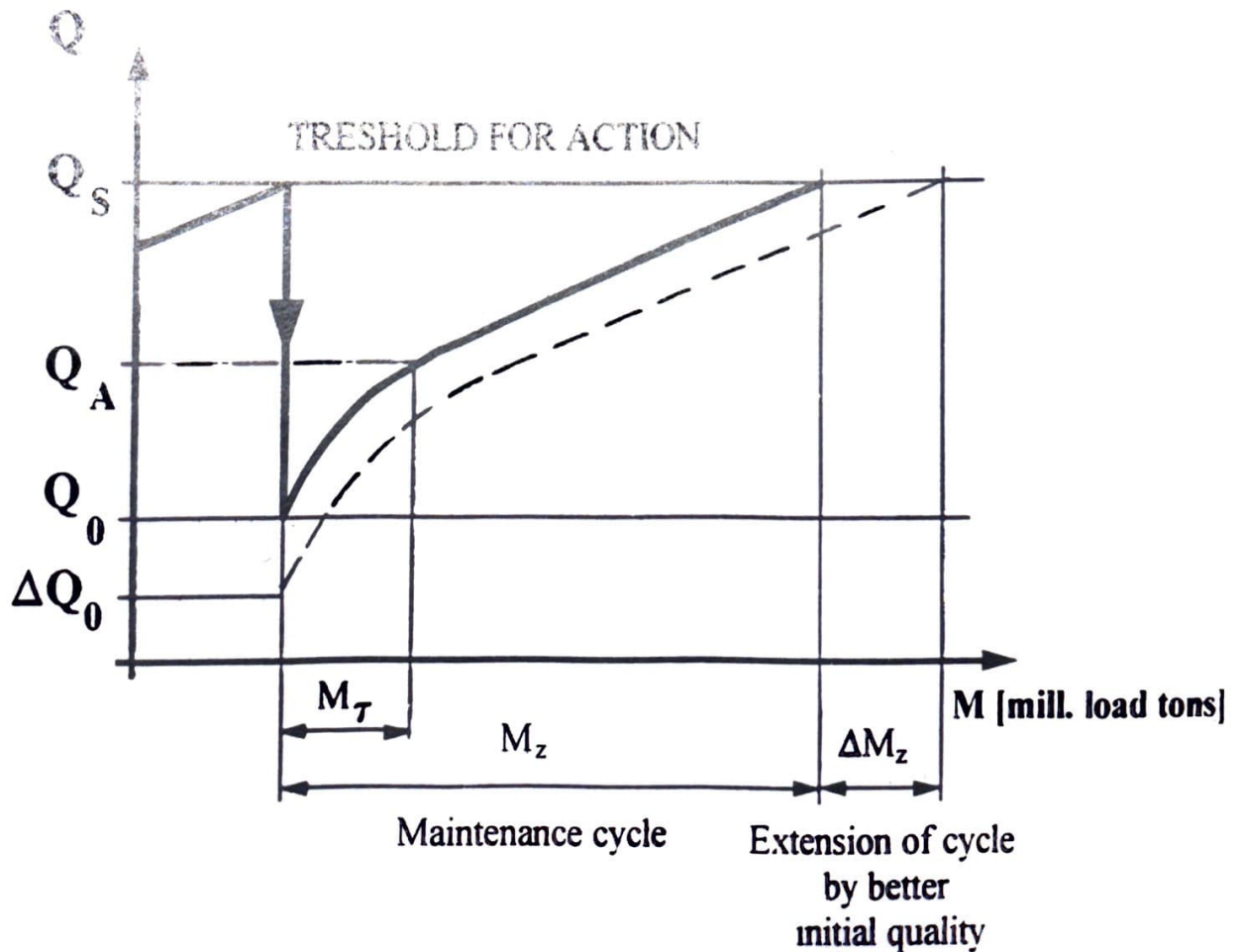


Figure 1b Trend of the track quality in relation of the traffic loading

**VERTICAL QUALITY -
STANDARD DEVIATION
[mm]**

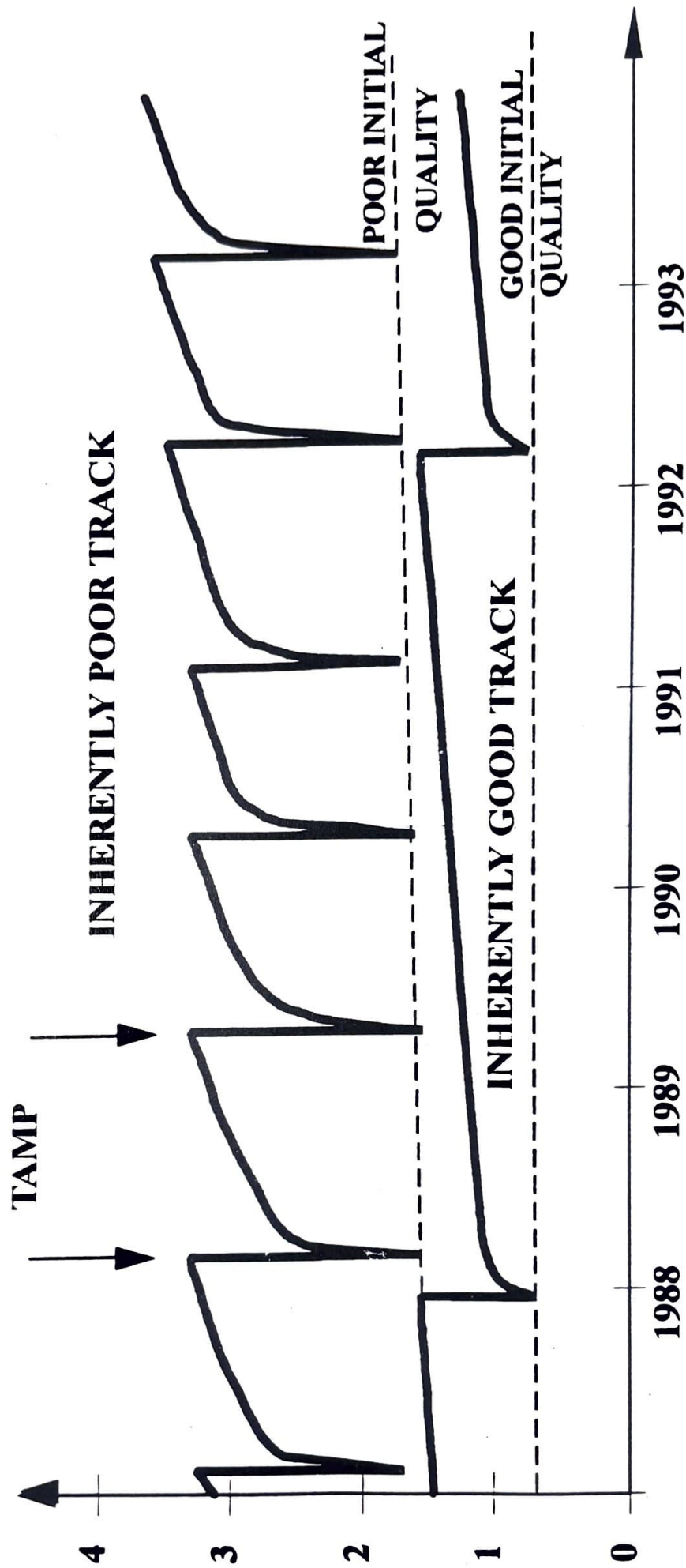


FIG. 2 Schematic behavior of a track with inherent poor track quality and a track with inherently good track quality

It is judicious that continuous working methods of track maintenance machines show similar advantages. The machine as well as the worked track will be less stressed through continuous acting forces as it will be through discontinuous and abrupt changes in forces.

3. THE TRACK SYSTEM AND ITS QUALITY :

Taking into consideration the significance of initial quality and the desire for the smallest possible rate of quality deterioration, each individual component of the track system as a whole is placed under scrutiny. This raises the questions:

- How can the highest possible initial quality be obtained ?
- How does the quality of each individual track material influence the track system as a whole ?

Figure 3 shows the track system as a whole in diagram form. The train wheel transmits vertical and horizontal forces onto the track. In addition, the continuous welded railway track is subjected to longitudinal forces due to fluctuations of temperature. The loading is transmitted through the rail onto the sleepers and from these to the ballast bed. The ballast bed conducts the forces further into the subsoil.

As already described, the static and dynamic tractive forces cause an irregular change in track geometry. An objective assessment of the state of the track and a selective planning of the necessary work requires monitoring by suitable electronic recording cars and subsequent computer-assisted analysis of the recording data as a basis for decision-making.

3.1 QUALITY OF THE BALLAST BED

3.1.1 BALLAST CLEANING:

The main sources of pollution originate from fine particles during installation, deposits from the air and transport, rising fines from the subsoil, remains of vegetation, fines produced by attrition of the ballast under traffic load and abrasion of the ballast stones during maintenance operations.

The ballast stones themselves become round due to attrition and breaking, the cavities are filled. This then causes retention of rainwater, the fine particles are washed downwards by the rain; the subgrade remains damp and its bearing capacity sinks. If the ballast bed of a highly polluted track is not cleaned and the track merely tamped,

then it soon resumes its poor geometry. The gradient of the quality drop curve (see Figure 2) becomes steeper, the maintenance cycles become shorter.

A ballast cleaning machine with a straight cutter bar ensures a high inherent quality of the subgrade formation. This avoids later formation of water traps and frost heaves. An unevenly cut subgrade in longitudinal direction is the source of never-ending maintenance work during the future life cycle of the track. The cutter bar can be guided by an all-round-laser.

In the case of the subgrade, the initial quality achieved is of decisive significance as to whether the track will forever need little maintenance or require constant treatment.

3.1.1.1 HIGH PERFORMANCE BALLAST CLEANING MACHINE FOR PLAIN TRACK-RM-80 :

Ballast Cleaning Machine RM-80 with a pentagon-shaped excavating chain takes the ballast material directly onto the screening unit. The chain speed is variable between 1.8 and 3.5 m/s. The chain crossbeam has a standard width of four metres and can be extended to the left by 500mm and the right by 500mm or 1.000mm. The screening unit consists of a three level screen with a surface of 30m². This guarantees a high output. The cleaned ballast is guided directly onto the distributor conveyor belts and spread over the entire ballast bed. A grading bar or optionally two grading chains, adjustable in height, drive the surplus ballast to the outside and produce a good formation.

For the Swedish State Railways a ballast cleaning machine RM-80 was fitted with units to be able to insert heat-insulating slabs in the course of ballast cleaning. The idea was conceived to prevent expensive frost damage to tracks and thus reduce maintenance costs.

3.1.1.2 BALLAST CLEANING MACHINE FOR SWITCHES, CROSSINGS AND PLAIN TRACK RM - 76 UHR :

The ballast cleaning machine RM 76 UHR for switches, crossings and plain track shown on cover is a fully hydraulic, high capacity machine for cleaning the ballast bed without removing the track skeleton. The equipment permits railbound cleaning of switches and crossings. The excavating width is extended to 7.7 metres by inserting intermediate sections and additional chain links. As soon as the position is reached, where the distance between the sleeper-ends permits conventional cleaning, the excavation width is reduced again to the width of the track.

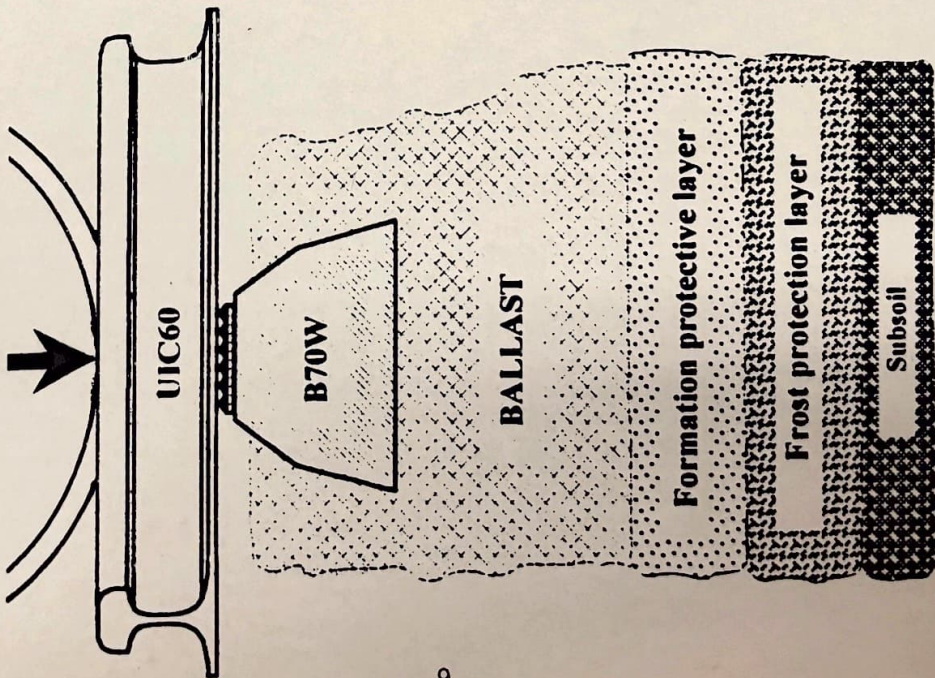
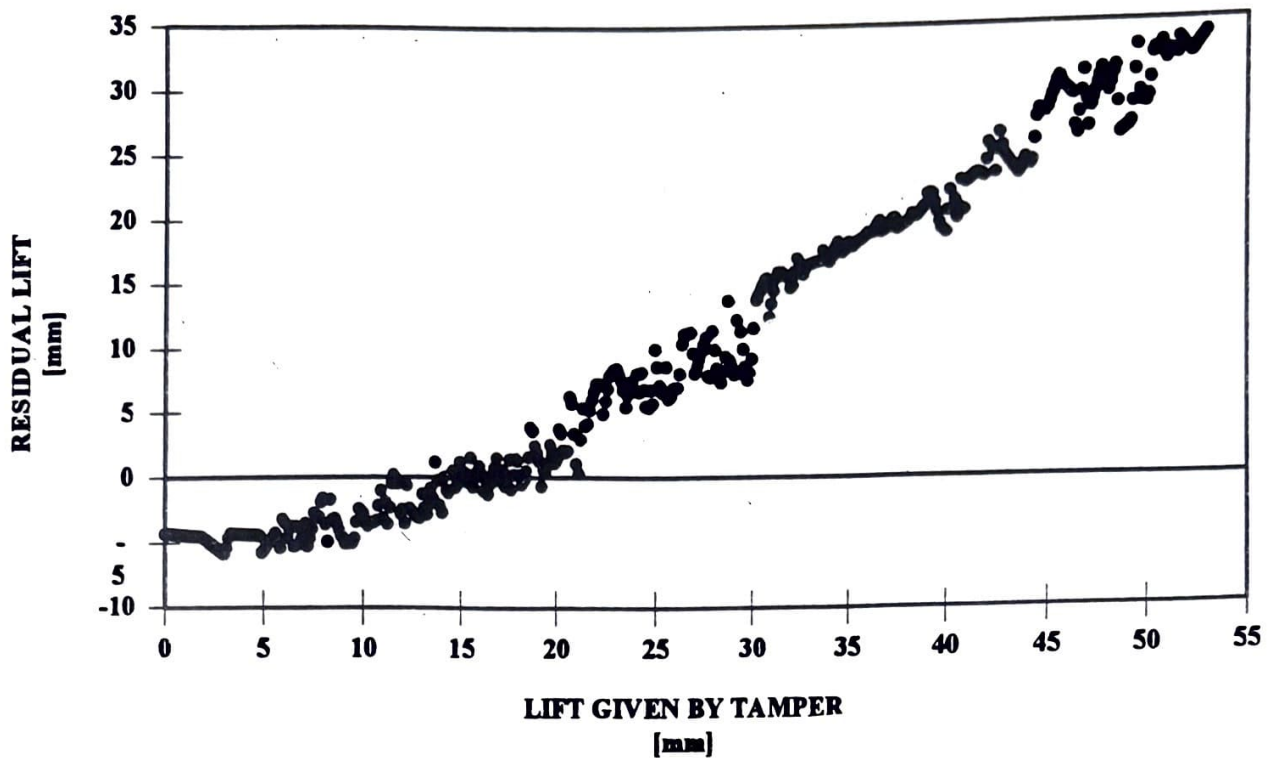
TRACK QUALITY LOSS		MAINTENANCE MEASURES		MAINTENANCE MACHINES		SERIES	
WHEEL LOAD F_Q		Track geometry faults	Recording Tamping, lifting, lining	Electron. track rec. car Tamping machines	EM 08, 09		
	Rail wear	Grinding	Grinding machine	SSM			
	Surface faults	Planing	Planing machine	SBM			
	Welded joints	Joint alignment Flash-butt welding	Joint Bending machine Mobile Flash-butt Welding machine	STRAIT K355			
Rail fastening		Renew shims Correct gauge					
Sleeper		Exchange Tamp	Relaying Trains	HUZ			
Ballast fouling Weed growth Ballast attrition Irregular settlement	Cleaning	Cleaning machine	RM				
	Destruction	Thermal infra-red control	TIK				
	Renewal	Total excavation	RM				
	Tamping Stabilisation	Tamping machines Stabilizer	08, 09 DTS				
Rising fines		Insertion of protective layers	Material conveyor and hopper unit	MFS			
Frost damage Mud spots		Insertion of protective layers	Cleaning machine Formation rehabilitation machine	RM PM			
Low bearing capacity		Drainage Examine subsoil	Subsoil probing machine	UUM			

Figure 3 The Track System and its Maintenance



Residual sleeper lift as a function of tamping lift

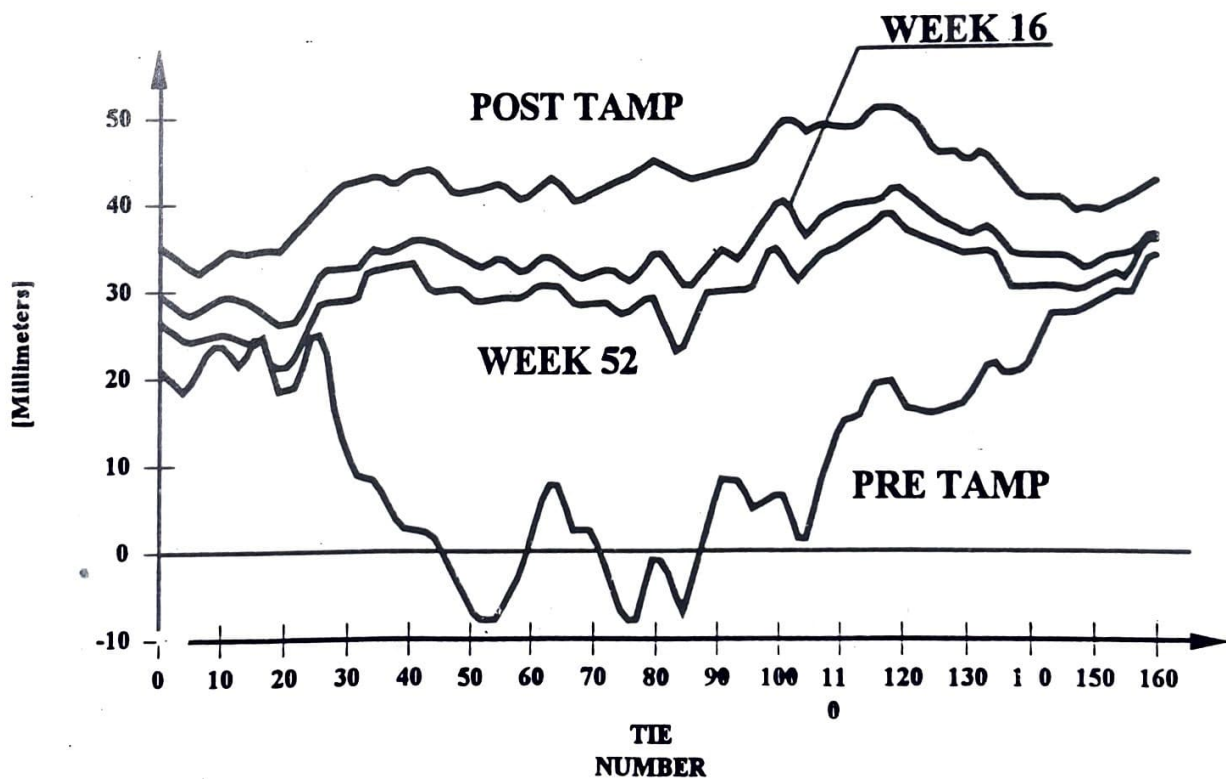


Fig. 4 Effect of design tamping on track geometry

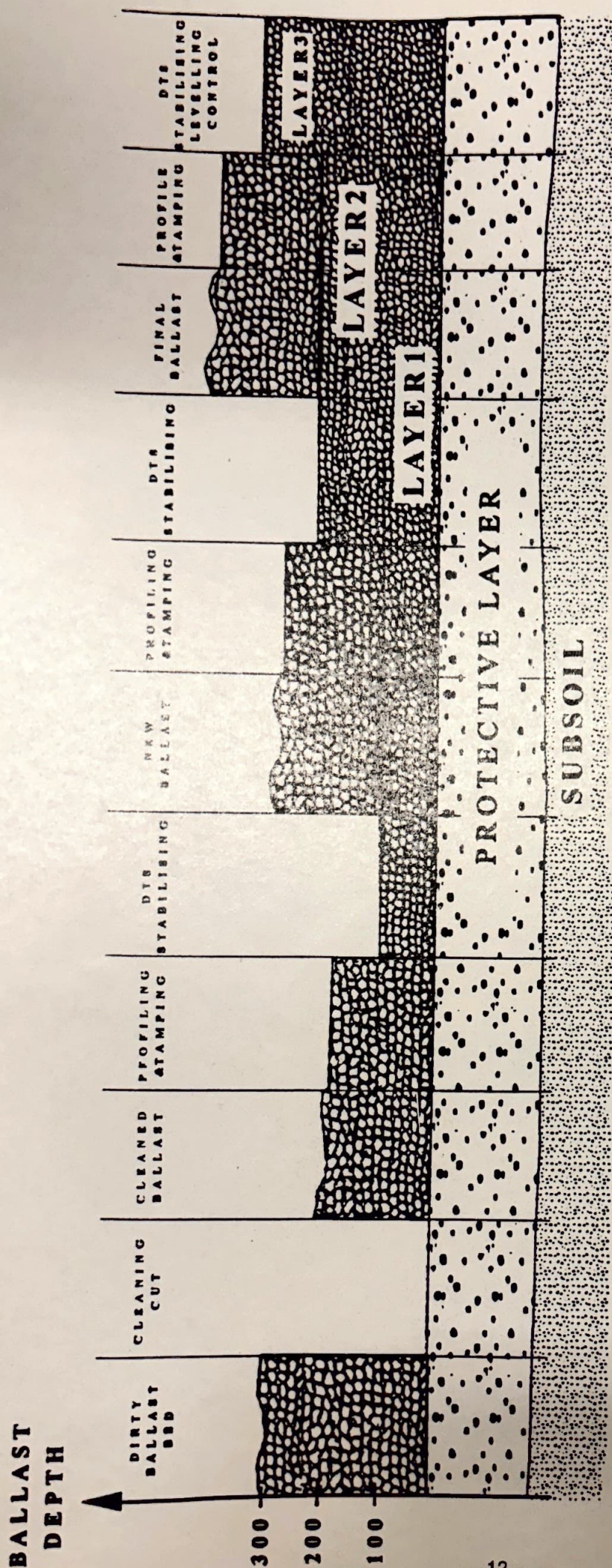


**Fig. 5 Illustration of construction sequence
after ballast cleaning or relaying with
Dynamic Track Stabilizer (DTS)**

3.1.3 QUALITY BY STABILISATION OF THE TRACK :

The **uniformity of consolidation and the homogeneity of the ballast** are of great importance because they have a **considerable influence on the uniformity of the remaining settlements** and thus the durability of the longitudinal level. A uniform and strong consolidation can however only be achieved when the ballast, including that between the sleepers and around the sleeper ends, is consolidated in the lower layers too.

The latest standard of technology, which helps to achieve a **spatial force-free consolidation** while regaining the resistance to lateral displacement, is dynamic stabilisation of the track after tamping and sleeper-end consolidation using the Dynamic Track Stabilizer (DTS). As shown before, the anticipation of the initial traffic loading by the DTS leads to a reduction of the initial exponential loss in quality following tamping. The result is a considerable extension of the maintenance cycle and constitute, for this reason alone, an economically sound measure.

3.1.3.1 APPLICATION OF THE DTS ON UNCONSOLIDATED BALLAST :

Granular material is best consolidated in layers. For the purposes of illustration, a ballast renewal operation will be considered. However, similar principles apply both to the construction of new track and to ballast cleaning.

The key to success of the method adopted is that the ballast is placed in layers (see, figure 5). Each layer is

compacted by the Dynamic Track Stabiliser, geometric faults associated with differential compaction being buried by the subsequently placed ballast layer. Geometric faults associated with compaction by the DTS of the final ballast layer are removed by the tamping machine which will still be on site. The final pass of the DTS imparts a measure of lateral stability to the track. Geometric faults associated with this pass cannot be removed since they are the last operation prior to reopening the track to traffic at final speed. For this reason, the compaction control system of the DTS is activated, and the loss of track geometry associated with this last pass is removed.

On British Rail, the use of these techniques has allowed the old track to be removed, the ballast to be cleaned, new track to be replaced and reopened to traffic at the full line speed of 200 kph.

To achieve a high track quality the track must be regarded as a complex system as a whole. The higher the initial quality of a track, the lower will be the later maintenance costs. A well-maintained track provides the most economic solution for the permanent way. The track quality can be assured by careful treatment of the track materials by the application of the principle of uniformity. The highest quality track maintenance machines are essential for efficient and economical railway operation.

By Courtesy M/S Plasser India.

KNOW IMPORTANT FACTS ABOUT YOUR SEAL MATERIALS

This is the concluding part of earlier published article in last issue.

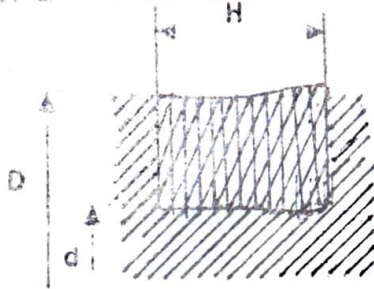
Piston Seal

	Standard	Operating conditions			applications		
		Temperature °C	Pressure bar	Surface Speed m/sec	Oil Hydr	Oil/H ₂ O Hydraulic	Pneumatic
1	Ecopur (PU)	-30- +110	400	0.5	+	up to 60°C	+
1	H Ecopur (H PU)	-20- +110	400	0.5	+	up to 90°C	+
1	T-Ecopur (T-PU)	-50- +110	400	0.5	+	up to 60°C	+
2	Ecorubber 1 (NBR)	-30- +100	160	0.5	+	+	+
3	Ecorubber 2 (Viton)	-20- +200	150	0.5	+	+	+
4	Ecorubber 3 (EPDM)	-50- +130	160	0.5	not resistant to mineral oil		+
5	Ecosil (Silicone)	-60- +200	160	-	+	+	+
6	Ecoflon 1 (PTFE)	-200- +260	160	4	+	+	+
7	Ecoflon 2 (filled PTFE)	-200- +260	400	4	+	+	+
8	Ecotal (POM)	-50- +110	-	-	+	+	+
8	Ecornid (PA)	-20- +120	-	-	+	+	+

The stated operating conditions are general indications. Those values may be exceeded in some cases. +=resistant
Should you require further information, please do not hesitate to contact Seal Jet.

The dimensions shown in the diagrams are required when placing an order.

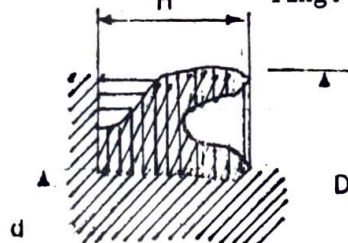
K 1 Piston Seal



recommended materials

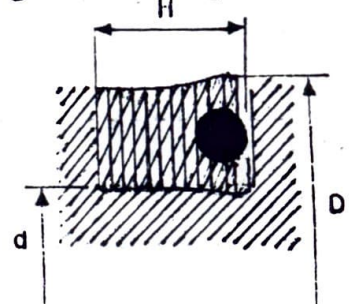
1 2 3 4

K 2 Piston seal with support ring.



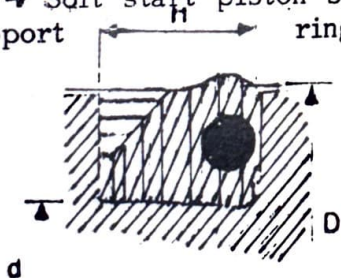
1+3 2+3 3+3 4+3 5+3

K 3 Soft start piston seal



1+2 3+3 4+3

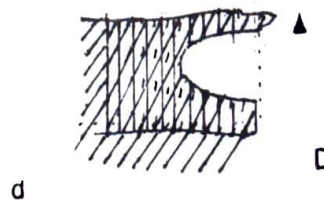
K 4 Soft start piston seal support ring



recommended materials

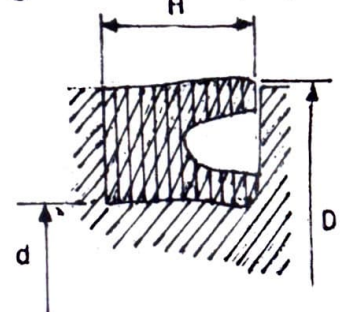
1+3+2

K 5 Piston seal pneumatic



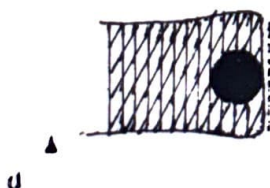
1 2 3

K 6 Piston rod U-cupseal



1 2 3 4

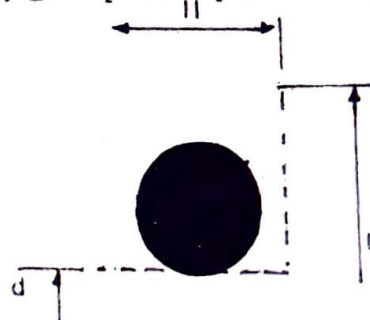
K 7 Energised piston/rod seal



recommended materials

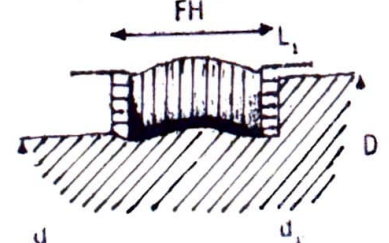
1+2 6+3 7+3

K 8 Composite piston seal



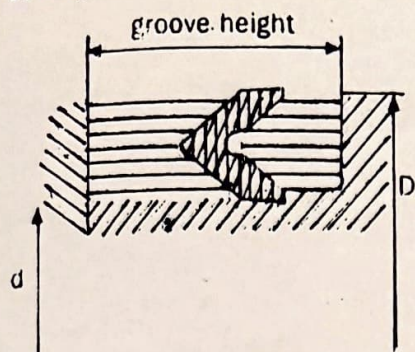
6+2 7+2 6+3 7+3 6+4 7+4 1+2 6+5 7+5

K 9 Double-acting compact piston seal



1+2+3

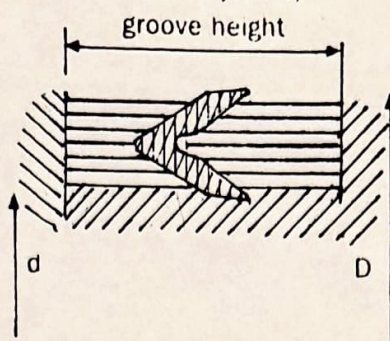
K 10-12 Piston chevron packing 90°



recommended materials

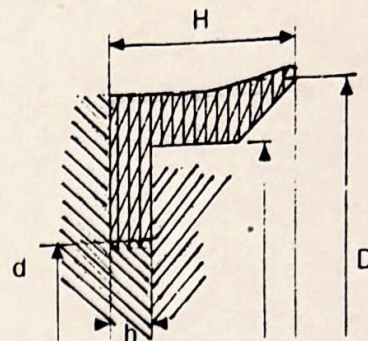
1+8 2+8 3+7 4+8

K 13-15 Piston chevron packing 60° (water hydraulic)



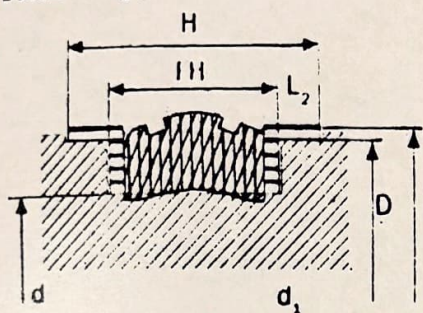
1+8 2+8 3+7 4+8

K 16 Cup seal



1 2 3 4

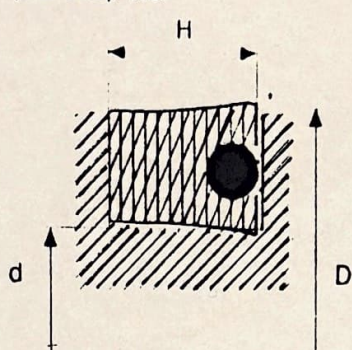
K 17 Double acting piston seal



recommended materials

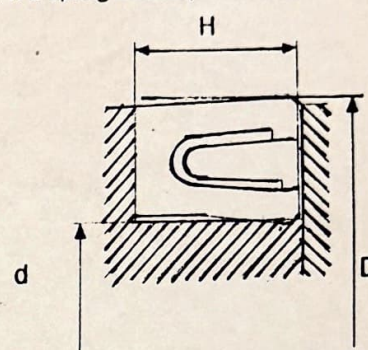
2+8 1+8 3+7

K 18 American Standard Compact U cup seal



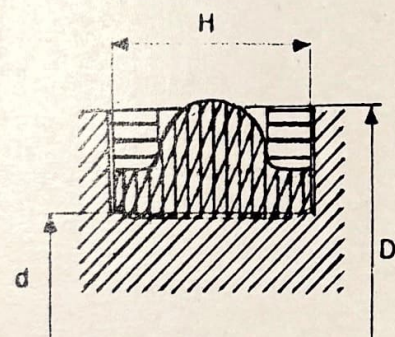
1+2

K 19 PTFE spring loaded piston seal



6+metal 7+metal

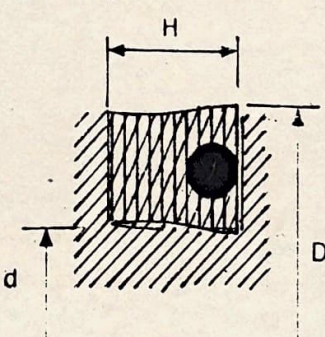
K 20 T-seal (O-ring substitute)



recommended materials

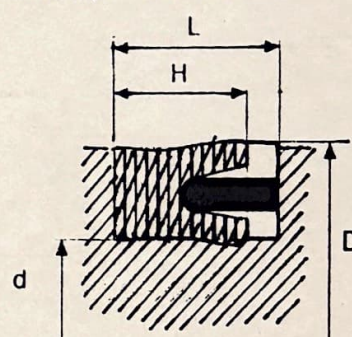
2+8 3+6 3+7 1+8

K 21 American Standard Compact U cup seal



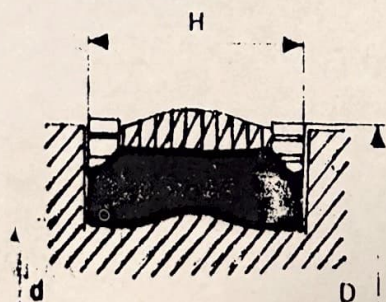
1+2

K 22 Piston U cup seal with retainer



1+8 2+8 3+8 1+8

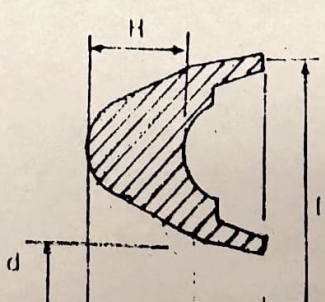
K 23 Double acting compact piston seal



recommended materials

1+2+8

K 24 Piston seal for press manufacture



1 2 3 4

American Standard = standard design used in USA

Rotary Seals

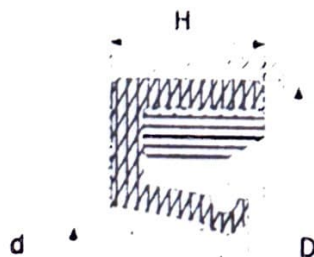
Material +=resistant	R1	R2	R3	R4	R5	R6	R7	R8	RO/13 static applications	Hydraulic
Ecopur(PU) Speed m/s pressure bar temperature °C	5 0.5 110	5 0.5 110	0.2 400 110	0.2 250 110	0.2 250 110				600 110	+
H-Ecopur(H-PU) Speed m/s pressure bar temperature °C	5 0.5 110	5 0.5 110	0.2 400 110	0.2 250 110	0.2 250 110	- 110	- 110	- 110	600 110	+
T-Ecopur(T-PU) speed m/s pressure bar temperature °C	5 0.5 110	5 0.5 110	0.2 400 110	0.2 250 110	0.2 250 110				600 110	+
Ecorubber 1(NBR) Speed m/s pressure bar temperature °C	10 0.5 100	10 0.5 100	0.2 0.5 100	0.2 250 100	0.2 160 100	160 100	- 100	- 100	160 100	+
Ecorubber 2(Viton) Speed m/s pressure bar temperature °C	10 0.5 200	10 0.5 200	0.2 250 200	0.2 160 200	0.2 160 200	0.2 200	- 200	- 200	160 200	+
Ecosil (Silicone) Speed m/s pressure bar temperature °C	5 0.2 200	5 0.2 200	- - -	- - -	- - -	- 200	- 200	- 200	160 200	

Material code

1...Ecopur, H-Ecopur, T-Ecopur 4...Ecorubber 3 7...Ecotton 2
2...Ecorubber 1 5...Ecosil 8...Ecotal, Ecomid
3...Ecorubber 2 6...Ecoflon 1

The dimensions shown in the diagrams are required when placing an order.

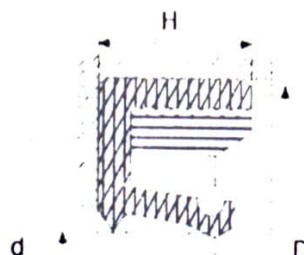
R 1 Shaft seal



recommended
material:

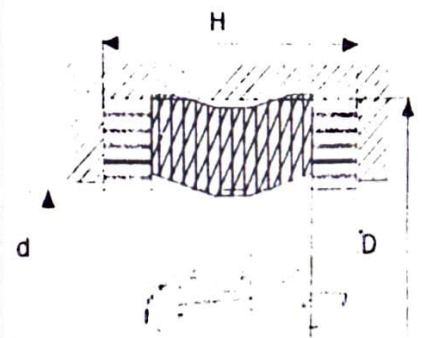
1+8+spring 2+8+spring
4+8+spring 5+7+spring

R 2 Shaft seal with dust lip



3+7+spring 1+8+spring
2+8+spring 4+8+spring

R 3 Seal for rotary application



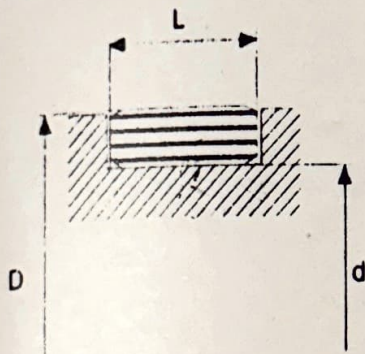
1+8 2+8 3+7

if required match material combination with application

Guide Rings

Material +=resistant	Operating conditions			Applications		
	Temperature "C"	Maximum bearing load N/MM	Surface speed m/sec	Oil Hyd.	Oil/H ₂ O Hydraulic	Pneumatic
6. Ecoflon 1 (PTFE)	200	2	4	+	+	+
7. Ecoflon 2 (filled PTFE)	200	3	4	+	+	+
8. Ecotal (POM)	110	25	4	+	+	+
9. Ecomid (PA)	120	25	4	+	+	+

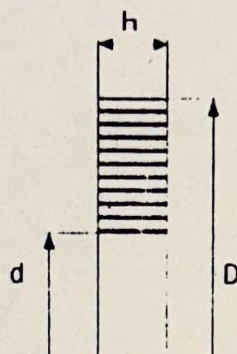
F 1 Guide ring (rod or piston)



recommended
materials

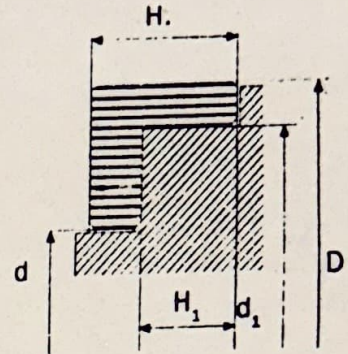
8 6 7

F 2 Guide ring



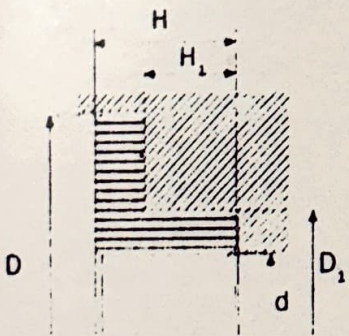
8 6 7

F 3 L-shaped guide ring piston



8 6 7

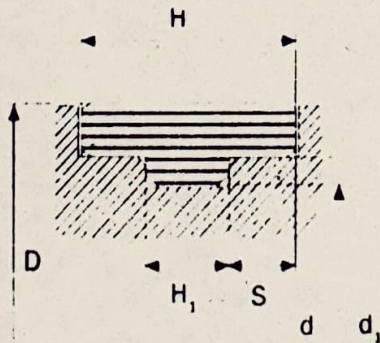
F 4 L-shaped guide ring rod



recommended
materials

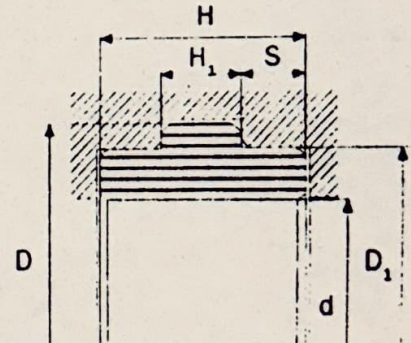
8 6 7

F 5 Piston guide ring



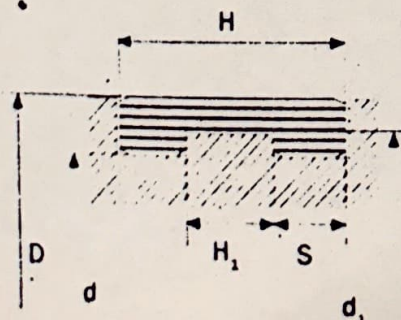
8 6 7

F 6 Rod guide ring



8 6 7

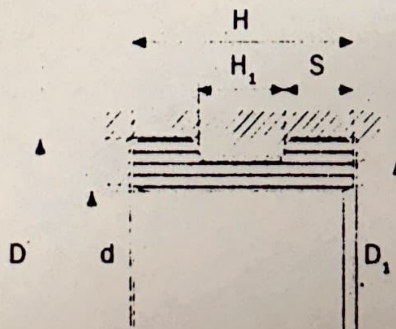
F 7 Piston guide ring



recommended
materials

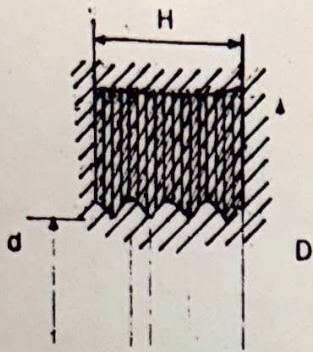
8 6 7

F 8 Rod guide ring



8 6 7

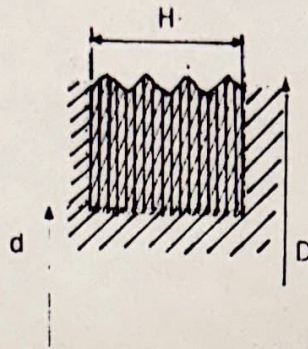
R 4 Seal for rotary transmission



recommended materials

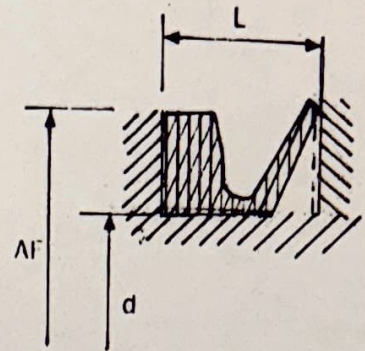
1 2 3 4

R 5 Seal for rotary application



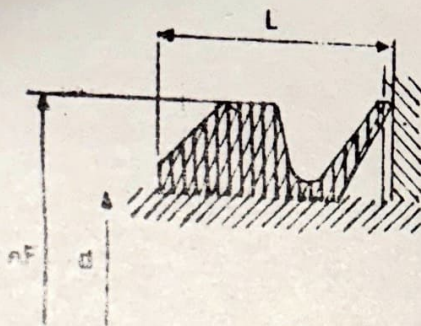
1 2 3 4

R 6 V ring A shape



1 2 3 4

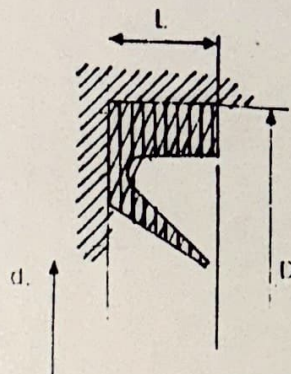
R 7 V-ring S shape



recommended materials

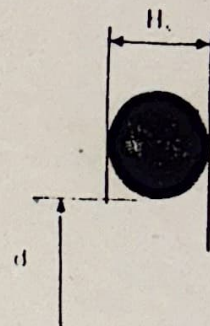
1 2 3 4

R 8 Springless rotary seal



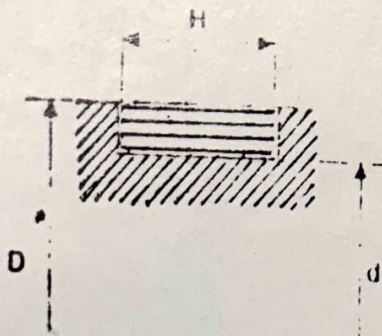
1 2 3 4

R 0 O ring



1 2 3 4 5 6

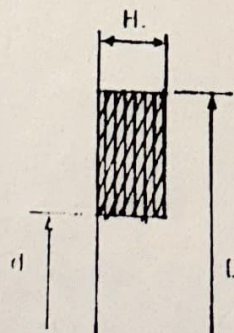
R 14 Gasket



recommended materials

1 2 3 4 5

R 15 Washer

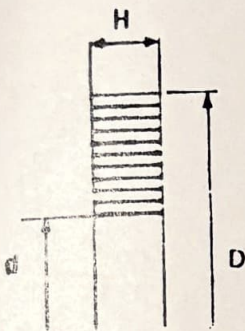


1 2 3 4 5

Back-up Rings

Material +=resistant	Operating conditions	applications		
	Temperature "C"	Oil Hydraulic	Oil/H ₂ O Hydraulic	Pneumatic
1 Ecopur (PU)	110	+	up to 60°C	+
1 H-Ecopur (H-PU)	110	+	up to 90°C	+
1 T-Ecopur (T-PU)	110	+	up to 60°C	+
3 Ecorubber 2(Viton)	200	+	+	+
6 Ecoflon 1(PTFE)	260	+	+	+
7 Ecoflon 2(Filled PTFE)	260	+	+	+
8 Ecotal (POM)	110	+	+	+
8 Ecomid (PA)	120	+	+	+

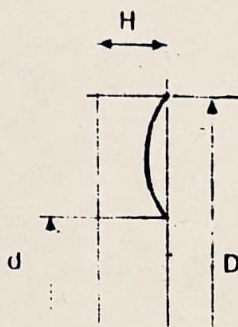
ST 8 Back up ring



recommended
materials

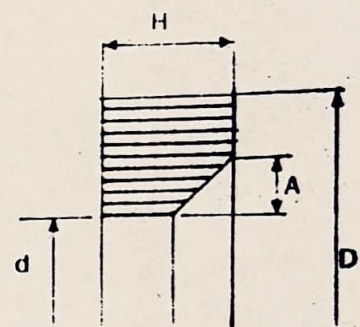
6 1 7

ST 9 Contoured back up ring



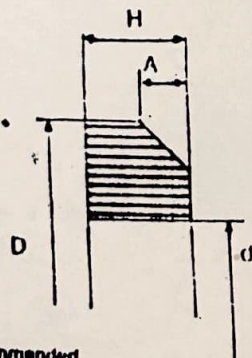
1 6

ST 10 Angled back up ring (outer)



8 6 7

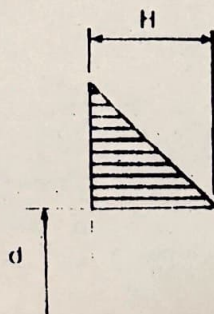
ST 11 Angled back up ring (inner)



recommended
materials

6 6 7

ST 12 Triangular back up ring, inner



6 6 7

ST 13 Triangular back up ring, outer

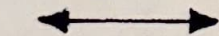


8 6 7

**Dimensions of the
Installation Space for O-rings
(Static applications)
permissible tolerances to DIN 3771**

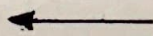
Cross Section d (mm)	Groove Depth t (mm) +0,05 -0,05	Without back up ring b(mm)	One back up ring b ₁ (mm)	Two back up rings b ₂ (mm)	Recommended back up ring width (mm)
1,5 1,78 2	1,2 1,4 1,7	1,8 2 2,4	3,3 3,5 3,9	4,8 5 5,4	1,5 1,5 1,5
2,5 2,62 3	2,1 2,2 2,5	3 3,1 3,6	4,5 4,6 5,1	6 6,1 6,6	1,5 1,5 1,5
3,5 3,53 4	3 3 3,4	4,2 4,2 4,8	5,7 5,7 6,3	7,2 7,2 7,8	1,5 1,5 1,5
5 5,33 5,7	4,3 4,5 4,8	6 6,2 6,5	7,5 8,2 8,5	9 10,2 10,5	1,5 2 2
6 6,99 7	5 6 6	7,2 8,4 8,4	9,2 10,4 10,4	11,2 12,4 12,4	2 2 2
8 10	7 8,7	9,6 12			

direction of pressure



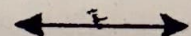
D

direction of pressure



L₁

direction of pressure



b₂

FAILURE OF CSM 907

Derailing of Satellite Axle and Overheating of Engine

By Hitesh Khanna
Dy.CE/TT/NR/ALD

- 1.0 CSM 907, working on ROK-BTI section of DLI division of N. Rly. had its satellite axle derailed on 26.6.95 and again on 27.6.95 with LHS wheel jumping off the rail on both the occasions.

The machine was put off the main line to study the failure and take corrective action.

- 2.0 **MECHANISM:** With a substantial production in axle load of the satellite axle, during the tamping cycle, when the tamping tools penetrate the ballast the upward reaction offered by ballast resistance tends to uplift the satellite axle.

- 2.1 To counter this uplifting tendency, a satellite support cylinder is provided on the satellite frame, with a roller at the top. This cylinder is charged before putting the machine in working drive which butts the roller against the main frame, getting a reaction from the complete weight of the CSM countering the uplift created by ballast resistance.

- 2.2 If the distance between the top of satellite frame and bottom of the main frame, 'A' while working, is more than what it should be, even with full stroke of satellite support cylinder, the satellite support roller may not develop full reaction.

- 2.3 In normal running mode, the machine is supported on two helical springs on either side of each bogie. While putting the machine in working mode the tension cylinder of the bogie tying down the main machine frame to the bogie frame, is actuated compressing the springs and eliminating the flexibility of springs by butting the main machine frame against bogie frame. In the process, the distance between the satellite frame and main frame also reduces, helping in better reaction by satellite support cylinder.

3.0 SOURCES OF PROBLEM :

With above mechanism, the following can be the likely causes for uplifting of satellite axles :-

- 3.1 Increase in the distance between satellite frame and the main machine frame due to wheel dia differential between the bogie wheels and satellite wheels. Originally the dia is 730mm and the wheels

can be reprofiled upto the mark provided on the tyre. However, during unit exchange, there is a likelihood that a bogie with brand new wheels with dia 730mm is provided with satellite wheel sufficiently worn, increasing the distance between the frames by half the dia.

- 3.2 Leakage of hydraulic oil from tension cylinders, causing incomplete compression of main helical springs.

- 3.3 Leakage of hydraulic oil from satellite axle support cylinders, causing inadequate reaction force to satellite frame.

- 3.4 Defective 4 way valve HY 6RSX resulting in non charging of the cylinders or loss of pressure during tamping cycle.

- 3.5 Any obstruction between the bogie pivot and main frame pin or between machine frame and bogie frame increasing the distance between satellite frame and main frame.

4.0 ACTION TAKEN FOR CSM 907 :

The observations on CSM907 showed that there was leakage from tension cylinder UD-50-1950 and also from satellite support cylinder UD-50-100. The 4 way valve HY 6RSK was also defective.

- 4.1 The main frame to satellite frame distances, with tension cylinder fully charged were observed on various N. Rly. machines and the observations are as below :

Machine No.	Distance A		Stroke
	Tension Cyl. charged	Tension Cyl. Released	
901	355mm	330mm	25mm
907	375mm	340mm	35mm
912	350mm	325mm	25mm
917	375mm	365mm	10mm
922	350mm	330mm	20mm
926	350mm	325mm	25mm
942	350mm	318mm	32mm
948 Under commissioning	355mm	Not taken	

It can be seen that untensioned distances 'A' is much higher in CSM907 and 917. This is likely to have been generated during O.H. due to difference in wheel dia or any other obstruction during bogie fitment. However, for machine to function properly, it should be in the range 350-355mm.

- 4.2 Once the distance 'A' gets increased, with charging of the tension cylinder against the bogie spring, the requisite gap may not be available. Due to this wheel off loading was occurring in CSM 907 and tendency was observed in CSM-917 as well. To counter this, the satellite support cylinder was raised by giving a packing plate of 25mm/10mm respectively, compensating for the increased stroke requirement.

With the above action taken, the problem was finally overcome on 4.7.95.

- 5.0 After the rectification of satellite derailing problem, the engine of CSM-907 was found to be overheating. Newly overhauled engine had been put on CSM 907 by M/s. Greaves and since then, had worked only for 130 hrs.

- 5.1 To ascertain the cause of failures, the following checks were made :-

- i) Checking of cooling system.
- ii) Closing of thermostat operated by pass system.
- iii) Leakage of any water from cooling line.
- iv) Dismantling and checking of water pump.
- v) Checking of blow by.
- vi) Checking of lubrication circuit including oil filters

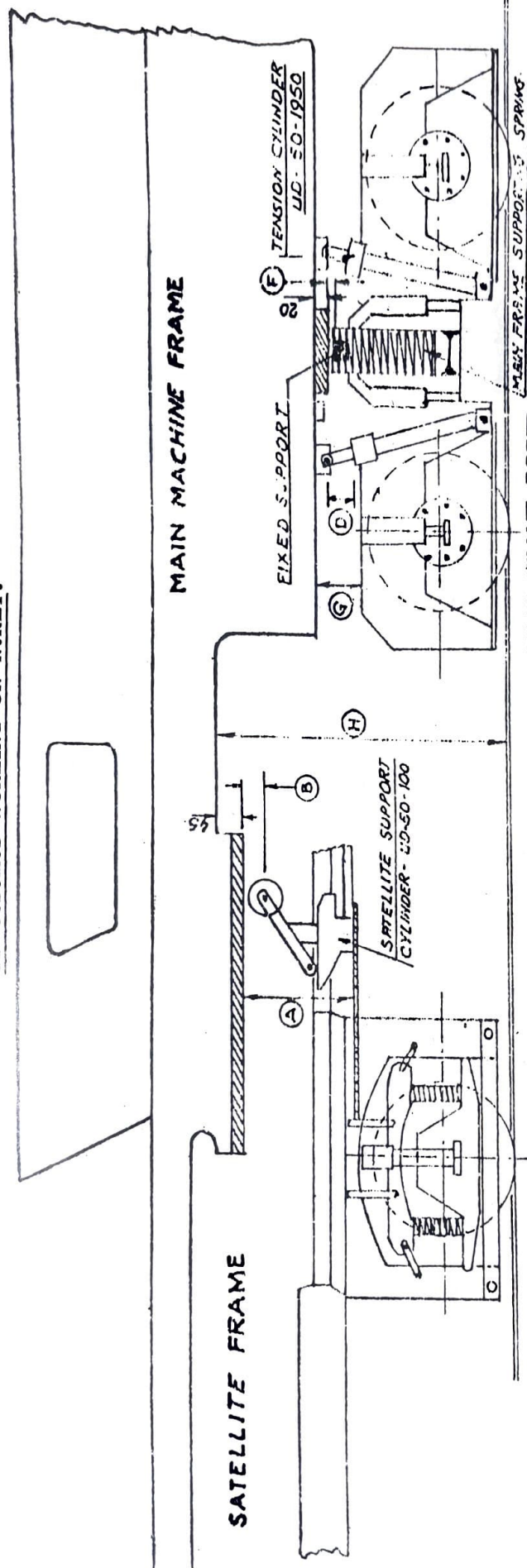
- vii) All injectors were checked and found to be O.K.
- viii) One head of the engine was found to be cracked and the same was replaced after calibration by a released one but that did not solve the problem.
- ix) Oil cooler, Air filter was checked and found to be O.K.
- x) Flow of water from radiator was checked and found to be O.K.
- xi) Two more heads were opened out, checked at DLI and found to be O.K.
- xii) All the injectors were taken out, recalibrated. The water pump was changed with a new one.
- xiii) In the mean while, 2 nos. injector sleeves 'o' rings and piston ring sets were requisitioned by the service engineers at site, planning to change these in two of the cylinders.

- 5.2 After the problem of overheating of engine continued w.e.f. 5.7.95 till 23.7.95 and the problem investigated by 4 different service engineers of M/ S Greaves, the fifth service engineer discovered that the hose from thermostat to radiator is damaged from inside, with threads block by the water flow. The hose was replaced and the problem of overheating was eliminated.

- 5.3 The hose was provided by OEMs service engineer during the commissioning of the engine on the machine, but subsequently the hose was declared to be not the original one.

- 6.0 The above incidence can be taken as a guidance for area of attention while facing similar problem any where else in future.

DETAILS OF CRITICAL DIMENSIONS RELATING SATELLITE FRAME TO MAIN FRAME
OF C.S.M.s WORKING ON N.R.LY.



MACHINE NO.	SATELLITE AXLE							MAIN FRAME BOGIE						
	DISTANCE WITHOUT AXLE SUPPORT				DISTANCE WITH AXLE SUPPORT									
	A	B	D	E	F	G	H	A	B	D	E	F	G	H
901	355	128	175	-	25	170	1150	330	55	150	-	0.0	145	1145
907	375	145	185	-	40	180	1245	340	52	135	-	0.0	130	1190
912	350	113	175	-	30	170	1225	325	53	140	-	0.0	142	1200
917	375	125	180	-	10	170	1255	365	60	165	-	0.0	160	1250
922	350	105	175	-	35	165	1205	330	55	145	-	0.0	135	1175
926	350	135	175	-	35	170	1245	395	55	145	-	0.0	140	1225
942	350	170	160	-	27	170	1215	318	53	145	-	0.0	146	1190
948	355	135	185	-	35	155	1260							

EDITORIAL

Dear Reader, 10th issue of IRTM digest is in your hand the delay caused in publishing 9th issue of digest is regretted. In this 10th issue apart from other articles, an useful article on maintaining uniformity and quality of concrete sleeper track has been brought out by courtesy M/S Plasser India. Your valuable comments alongwith fresh articles on your innovations, experience and suggestions of effective working of track machines may kindly be sent to IRTMTC at an early date.

Thanks

M.M. Banerjee
PRINCIPAL

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