TRACK MACHINE DIGEST
रेल पथ मशीन पत्रिका

Digitalisation of Track Machines Monitoring and Management

Indian Railways Track Machine Training Centre

North Central Railway, Prayagraj, Uttar Pradesh

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The views expressed by the authors of technical papers in this digest are not necessarily the views of IRTMTC or North Central Railway.

Editor's Message

Dear Readers,

It is a matter of great pleasure that current Edison of Track Machine Digest is focused on three important issues i.e. TMMS, UDM and SRGM, which are being inducted in Track Machine organization. Topic is relevant and it is expected that digest will reach out the expectations and will lead to fulfill the objective of knowledge dissemination to readers.

The Government of India launched the Digital India campaign to ensure that the services of the Government are made available electronically to all citizens. In a world that's constantly changing, digitalization has been that much-needed anchor that has helped every sphere and builds resilience amidst disruption. In the age of increasing population, our need and necessities are also increasing day by day. Digitalization supported Railway system in all corners right from ticketing to asset management for better customer insights and tracking any anomaly in real time basis. Digitization is the need of time and demand of hour for keeping pace with global advancement in streamlining the complex and huge data management system. It saves our fuel, time, money and makes us very efficient. Let us understand exactly what is digitization, we take one example: Suppose that you want to pay your elect bill, then you had to take long time in manual system. You would have to follow the many rules and stand in long queue till hours. But, today with the use of digitization, we complete our work in minutes and saves huge time and energy. Software enables the improvement in efficiency and quality control by tracking information about machines for identifying the areas of attention at right stage and at right location to improve efficiency and quality. Additionally, a machine monitoring platform can generate a machine's performance history. This data history can later help in diagnosing the root cause of problems with assets and to predict future issues of reoccurrence. User Depot Module has already proved its utility in effective inventory control and now creation of e-ledger for material at site available on Track machine. This will lead to improvement in reduction of idling time on account of emergency spares arrangement. This digitalization will be only effective and useful when user will accept the change. Improvement is the continuous process and we should accept the changes are happening in our day-to-day life. A famous quote of Winston Churchill

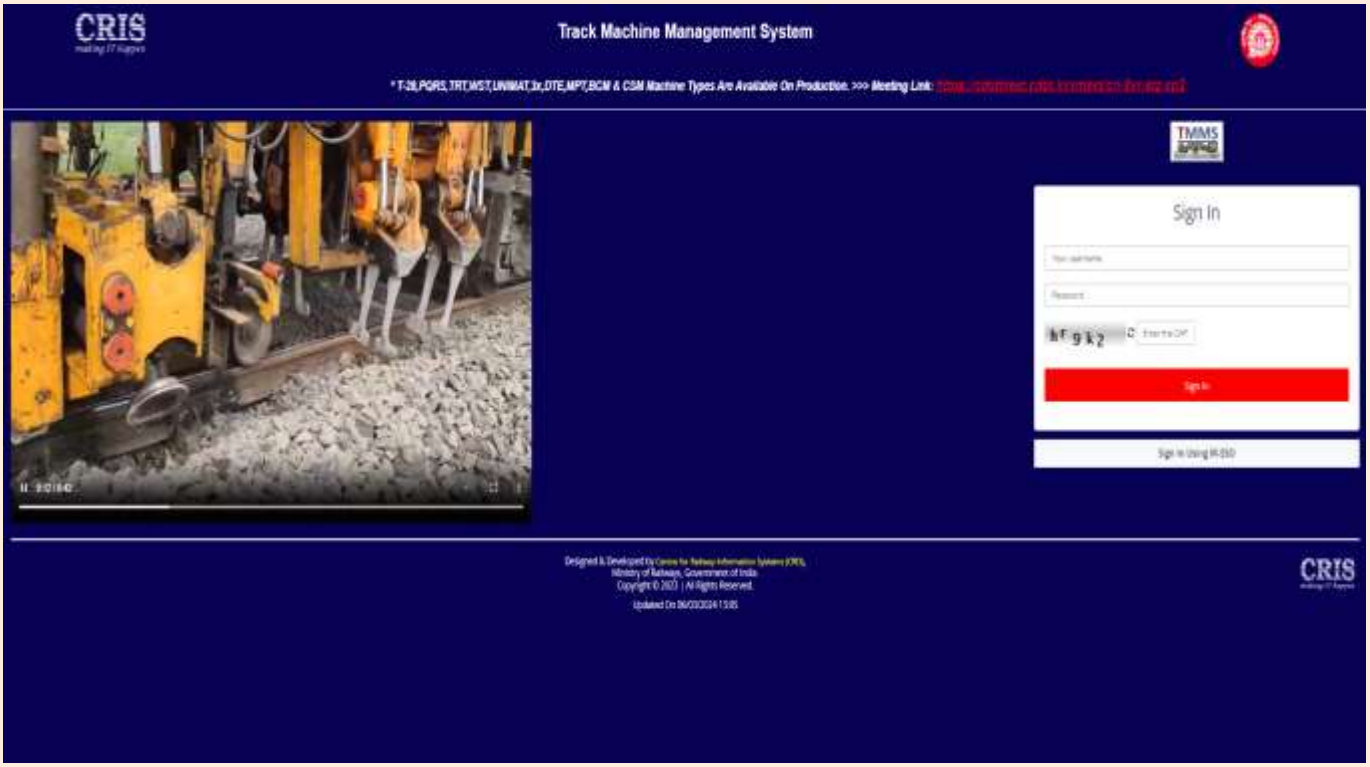
"To improve is to change; to be perfect is to change often."

Finally, I extend my sincere thanks to respected PCE/NCR and CE/TMC/NCR for their valuable direction and support in selection of appropriate topic and guiding in write ups for this current and important topic of digitalization in Track machine management. My sincere thanks to all content writers of this digest also.

With Best Wishes from Principal, IRTMTC

Track Machine Management System: A step towards digitalization of Machine monitoring and managements.

- Sanjay Asthana (Principal, IRTMTC)



1. General

Indian Railways is one of the largest rail networks in the world with about 70 thousand route km. Manual record keeping of such huge number of assets has its inherent shortcomings. Collection of data, arriving at meaningful information is cumbersome, time consuming and inaccuracies are bound to creep into the analysis. Numbers of Track machines are continuously on increasing manifold. Therefore, in order to bring efficiency and transparency in various management practices, implementation of Track machine management system is extremely essential, important and useful. Since Track machines has become indispensable tool for Track maintenance and increasing growth of IR level machines, effective monitoring and optimum utilization of machine is impossible without real time digital data platform. It is sure that TMMS will become essential system of monitoring o machine and will lead to future need of Track machine organization.

2. Digitalization is the need of time

With the significant changes the world has undergone in the last decade, more so after the COVID-19 pandemic, the term 'digitalization' has become more pervasive. It has redefined how system operate in every sphere, from recruitment, operation, maintenance, HR management for transparency and related with strategies to the various objective and vision of Railways like modernization and passenger satisfaction.

Digitalization is more than the integration of technology into different facets of business. True digitalization completely changes the way of any organization functions including its processes, systems, and culture. In an era where everything, from the way we work to the way we shop, has been recalibrated, digitalization has been at the center of this change. Digitization is beneficial in terms of saving your time, efforts and fuel which means it saves your money. Nowadays there are certain mobile applications that can be linked to your household electrical appliances and even if you forget something to

turn off digital data storage is the only and perfect solution. Advantages of digitization and data capture are undeniable. With the help of a professional service provider like CRIS, various functioning unit of Railway like ticketing, asset management, huge HR management (HRMS), salary and contractual bill payment system (AIMS), Track management (TMS) has become integral and safe tool to manage the day-to-day work of the system. Track Machine Management System (TMMS) is a Web Application for Planning, Operation, Maintenance, and Monitoring & Inspections of all types of Track Machines in IR.

3. Team involved in development

Integrating the huge data of spare parts, their functionality, performance parameter of spares, acceptable makes, expected service life, schedule maintenance; health monitoring data for machine, Inspection check lists and performance parameters of machine including classifications of failures for analysis was extremely technical and complex work. This will lead to uniformity among users for entire Indian Railways. A committee of Track machine expert officers was framed to conceive the requirements of various modules and need of data compilation for monitoring of various machines in use over Indian Railways. Following officers have contributed in data compilation for TMMS as a member of expert committee. On date more than 90 types of Track Machine are in service. Work was initiated nearly 6-7 years back i.e. probably from 2018-19. But actually, it has started taking shape when CPD/NR Sh. Achal Jain taken work in his hand after May 2022.

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4. Various modules in the system

TMMS application is equipped with various modules for effective management of machines

1. Master Data Module is used to capture various attributes related to Track Machine.
2. Track Machine User Management Module for functionality to Create/Manage Users.
3. Track Machine User HR Module for e HR Details of Track Machine users
4. Digital Log books and all registers as per IRTMM.
5. Track Machine Inspection Module is provided for functionalities to enter the Inspection details for particular machines on periodical basis.
6. Track Machine Failure Reporting Module.
7. Track Machine Schedule Maintenance module.
8. Track Machine material at site management module.
9. Machine health monitoring.
10. Machine performance parameters monitoring is essential for monitoring of effective and quality outcome of machine.
11. Massage center for any issue/query/doubt related to Application.
12. Report module is provided for machine wise, time wise and railway wise data for Failure analysis, Breakdown, Maintenance, Inspection overdue, Health Monitoring status, Performance parameter status, progress and consumable reports
13. User depot module for expenditure and inventory control

5. Increasing fleet of Track Machine

In the process of Track mechanization, fleet of Track machines are continuously increasing day by day.

It is extremely difficult to adopt uniform policy for monitoring the performance, failure analysis, inspection, maintenance monitoring and human resource management of huge fleet of Track machine officials to operate the Track machines of Indian Railways.

SUMMARY OF TRACK MACHINES ON ZONAL RAILWAYS AS ON 01.05.24

MC Type	CR	ECOR	ECR	ER	NCR	NER	NFR	NR	NWR	SCR	SECR	SER	SR	SWR	WCR	WR	Kol. Met	TOTAL
HOT-S-3X	4	3	5	4	5	4	5	8	4	7	3	4	6	4	4	8		78
HOT-3X	2	1	1	1	1		1	2	1	2	1	1	1		2	1		18
CSM	7	2	4	3	6	2	3	6	4	8	3	5	6	4	3	5		71
WST	12	7	9	9	8	5	9	12	8	12	7	9	10	8	9	10		144
UNI	12	7	7	9	10	6	8	13	5	12	6	8	9	6	8	12		138
MPT	16	12	12	13	14	9	17	21	13	19	10	14	18	9	12	15		224
BCM	14	8	12	10	13	7	10	17	11	15	6	11	12	7	11	13		177
HOBCM		1								1			1			1		4
SBCM	7	5	5	5	6	4	4	9	5	9	3	4	7	4	4	7		88
PQRS set	1	5	3	6	5	2	5	3	3	9	4	5	3	4	1	4		63
T 28	2	2	2	1	2	2	1	3	2	4	2	4	3	2	2	2		36
TRT	3	1	2	0				4		1	1	1	2		1	2		18
DTS	8	5	7	7	10	4	4	12	6	12	6	7	8	4	9	9		118
BRM	7	5	4	6	7	2	4	6	3	9	4	6	7	5	5	8		88
UTV	18	8	15	11	14	6	12	17	10	19	10	9	15	11	11	18		204
RGM	1	1	1		1			1		1		1		1	1	1		10
SRGM		1	1		1			1		1				1	1			7
RIV			1															1
RBMV	4		2	1	6						3			1	1	4		22
RTH	1		1		1			1		1								5
MDU	10	5	10	10	10	10	10	15	5	10	5	5	8	5	10	10		138
MBIU							1									1		2
RMV														11				11
RMM		1																1
8 Stone RGM																	1	1
Total	129	80	104	96	120	63	94	151	80	152	74	94	116	87	95	131	1	1667

6. Usefulness of TMMS

a. Better decision-making in machine management.
b. Effective Maintenance will result in efficient utilization optimum productivity of Track Machines.
c. Home page shows pending work of users.
d. Digitalization of data will be extremely useful for analyzing the performance.
e. Uniformity in system over Indian railway.
f. Huge quantity of Material at site will be useful to meet out the emergency.
g. Comparison of performance, fuel consumption and failures will improve the system.
h. Attendance and consumable consumption will be marked in real time basis.
i. Overdue LR, PME, ZTI and competency can be monitored easily.
j. There are so many other benefits for the root level of machine users.

7. Machines type and versions

Various Machines type are available over Indian Railways as tabulated below

S.N.	VSN	Machine Code	New Machine Series	Manufacturer	Version
1	1	CSM	CSM: 901-947	Plasser	Version-1
2	2	CSM	CSM: 948-954	Plasser	Version-2
3	3	CSM	CSM: 955-967	Plasser	Version-3
4	4	CSM	CSM: 968-984	Plasser	Version-4
5	5	WST (Duomatic)	WST: 8037-8059	Plasser	Version-1
6	6	WST (Duomatic)	WST: 8060-8064	Plasser	Version-2
7	7	WST (Duomatic)	WST: 8065-8072	Plasser	Version-3
8	8	WST (Duomatic)	WST: VPR17-VPR18	Kaluga	Version-4
9	9	WST (Duomatic)	WST: 8073-8082	Plasser	Version-5
10		WST (Duomatic)	WST: 8083-8094	Plasser	Version-5
11	10	WST (Duomatic)	WST: 3313-3325	Plasser	Version-6
12	11	WST (Duomatic)	WST: 8096-8119	Plasser	Version-7
13		WST (Duomatic)	WST: 8120-8127	Plasser	Version-7
14	12	WST (Duomatic)	WST: VPR48-VPR61	Kaluga	Version-8
15	13	WST (Duomatic)	WST: 8128-8140	Plasser	Version-9
16		WST (Duomatic)	WST: 8141-8155	Plasser	Version-9
17	14	WST (Duomatic)	WST: (8156-56599)-(8163-56700)	Plasser	Version-10
18		WST (Duomatic)	WST: SAN 001	SAN	Version-10
19	15	HOT-3X (Tamping Ex)	TE: 3954-3963	Plasser	Version-1
20	16	HOT-3X (Tamping Ex)	TE: 3964-3965	Plasser	Version-2
21	17	HOT-3X (Tamping Ex)	TE: 3966-3971	Plasser	Version-3
22	18	DTE	DTE: 9001-9007	Plasser	Version-1
23	19	DTE	DTE: (9008-56737)-(9029-56758)	Plasser	Version-2
24	20	DTE	DTE: (9030-56842)-(9056-57085)	Plasser	Version-3
25		DTE	DTE: (9057-57050)-(9077-57148) & 9078-57087	Plasser	Version-3
26	21	DTS	DTS: 334-362	Plasser	Version-1
27		DTS	DTS: 363-382	Plasser	Version-1
28	22	DTS	DTS: 122-123	BHEL	Version-2
29	23	DTS	DTS: 383-398	Plasser	Version-3
30	24	DTS	DTS: M95-M96	Metex	Version-4
31	25	DTS	DTS: 399-447	Plasser	Version-5
32	26	UNIMAT2S	UNI: 8249-8260(UNI-2S)	Plasser	Version-1
33	27	UNIMAT3S	UNI: 8261-8271(UNI3S)	Plasser	Version-2
34		UNIMAT3S	UNI: 8272-8281(UNI3S)	Plasser	Version-2
35	28	UNIMAT3S	UNI: 8282-8291(UNI3S)	Plasser	Version-3
36	29	UNIMAT3S	UNI: 8292-8312(UNI3S)	Plasser	Version-4
37	30	UNIMAT4S	UNI: 8401-8411(UNI4S)	Plasser	Version-5
38		UNIMAT4S	UNI: 8413-8418(UNI4S)	Plasser	Version-5
39		UNIMAT4S	UNI: 8419-8429(UNI4S)	Plasser	Version-5
40	31	UNIMAT4S	UNI: 8430-8437	Plasser	Version-6
41	32	UNIMAT4S	UNI: Gemac 8253 - Gemac 8254(UNI4S)	Gemac	Version-7
42	33	UNIMAT4S	UNI: 19A11001-20A11020 (UNI 4S)	CRCC	Version-8
43		UNIMAT4S	UNI: 20A11021-21A11040 (UNI 4S)	CRCC	Version-8
44	34	UNIMAT4S	UNI:(8437-57132)-(8439-57134)(UNI4S)	Plasser	Version-9
45	35	MPT	MPT: 2000-2002	Plasser	Version-1
46	36	MPT	MPT: 2003-2008	Plasser	Version-2
47	37	MPT	MPT: 2009-2017	Plasser	Version-3
48	38	MPT	MPT: (2018-56564)-(2155-57251)	Plasser	Version-4
49		MPT	MPT: (2156-57252)-(2157-57253)	Plasser	Version-4
50		MPT	MPT:(2158-57254)-(2191-57287)	Plasser	Version-4
51		MPT	MPT:(2204-57300)-(2227-57327)	Plasser	Version-4
52	39	MPT	MPT: 19A12001-19A12002	CRCC	Version-5
53	40	BCM	BCM: 289-290	Plasser	Version-1
54	41	BCM	BCM: 318-329	Plasser	Version-2
55	42	BCM	BCM: 330-338	Plasser	Version-3
56		BCM	BCM: 339-342	Plasser	Version-3
57	43	BCM	BCM: 343-364	Plasser	Version-4
58	44	BCM	BCM: 365-372	Plasser	Version-5
59	45	BCM	BCM: 373-384	Plasser	Version-6
60	46	BCM	BCM: 386-396	Plasser	Version-7
61	47	BCM	BCM: 397-403	Plasser	Version-8
62	48	BCM	BCM: 700-728 and 729-56610 to741-56831	Plasser	Version-9
63	49	BCM	BCM: (742-56759)-(761-56778)	Plasser	Version-10
64	50	BCM	BCM 762-57088-to 779-57105	Plasser	Version-11
65		BCM	BCM: (780-57165)-(790-57175)	Plasser	Version-11
66	51	HOBCM	HOBCM: (1-6840)-(4-56551)	Plasser	Version-1
67	51	SBCM	SBCM: 1866	Plasser	Version-1
68	51	SBCM	SBCM: 1870-1872	Plasser	Version-1
69	52	SBCM	SBCM: 1873-1878	Plasser	Version-2
70		SBCM	SBCM: 1879-1882	Plasser	Version-2

Various Machines type are available over Indian Railways as tabulated below					
S.N.	VSN	Machine Code	New Machine Series	Manufacturer	Version
71		SBCM	SBCM: 1883-1886	Plasser	Version-2
72	53	SBCM	SBCM: 1887-1891	Plasser	Version-3
73		SBCM	SBCM: 1892-1896	Plasser	Version-3
74		SBCM	SBCM: 1897-1899	Plasser	Version-3
75	54	SBCM	SBCM: (1900-56403)-(1911-56414)	Plasser	Version-4
76	55	SBCM	SBCM: (19A10001)-(20A10003)	CRCC	Version-5
77	56	SBCM	SBCM: (1925-57066)- (1936-57075)	Plasser	Version-6
78	57	SBCM	SBCM: (1937-57149)-(1956-57334)	Plasser	Version-7
79		SBCM	SBCM: (1912-56794)-(1924-56806)	Plasser	Version-7
80	58	MDU	MDU: 701-802	OEPL	Version-1
81	59	MDU	MDU: 1201-1208(56445-56452)	Plasser	Version-2
82	60	MDU	MDU: 57001-57048	Plasser	Version-3
83		MDU	MDU: 57176-57249	Plasser	Version-3
84	61	BRM	BRM: 103-106	Kershaw	Version-1
85		BRM	BRM: 107-121	Kershaw	Version-1
86	62	BRM	BRM: (122,117D)-(121D)	Kershaw	Version-2
87	63	BRM	BRM: (PBR-03)-(PBR-14)	Plasser	Version-3
88	64	BRM	BRM: (RPB-002)-(RPB-003)	Kaluga	Version-4
89	65	BRM	BRM: (PBR-15)-(PBR-20)	Plasser	Version-5
90		BRM	BRM: (PBR-21)-(PBR-28)	Plasser	Version-5
91	66	BRM	BRM: (SPZ-210 K-1)-(SPZ-210 K-2)	GEMAC	Version-6
92	67	BRM	BRM: (PBR-29)-(PBR-40)	Plasser	Version-7
93	68	BRM	BRM: (USP01-56658)-(USP27-56684)	Plasser	Version-8
94	69	BRM	BRM: (USP R01H)-(USP R02H)	Plasser	Version-9
95	70	BRM	SG 0255	SRIDA	Version-10
96	71	UTV	UTV: 200110001	Phooltass	Version-1
97		UTV	UTV: (2003 02 002)-(2003 05 005)	Phooltass	Version-1
98		UTV	UTV: (2003 12 006)-(2004 08 010)	Phooltass	Version-1
99		UTV	UTV: (2004 03 009)-(2005 01 016)	Phooltass	Version-1
100		UTV	UTV: 200507018-200703030	Phooltass	Version-1
101		UTV	UTV: (2005 10 019)-(2006 03 023)	Phooltass	Version-1
102		UTV	UTV: 200606025-200801040	Phooltass	Version-1
103		UTV	UTV: 200701028-200801035	Phooltass	Version-1
104		UTV	UTV: 200801002-200812010	Phooltass	Version-1
105		UTV	UTV: 200903011-200906020	Phooltass	Version-1
106		UTV	UTV: 201109024H-201205039H	Phooltass	Version-1
107	72	UTV	UTV BHEL-1	BHEL	Version-2
108	73	UTV	UTV: OVIS 222	OVIS	Version-3
109		UTV	UTV:OVIS-747,750 ,757	OVS	Version-3
110		UTV	UTV:OVIS-682,688 ,689	OVS	Version-3
111		UTV	UTV:OVIS-723,724 ,744	OVS	Version-3
112	74	UTV	UTV: 201302041H-201401059H	Phooltass	Version-5
113		UTV	UTV: 201404064H-201407069H	Phooltass	Version-5
114		UTV	UTV: 201712050P-201910057P	Phooltass	Version-5
115		UTV	UTV: 201802093H-201909103H	Phooltass	Version-5
116	75	UTV	UTV: SAN001-SAN004	SAN	Version-6
117	76	UTV	UTV: 201608001-20200001	Trident	Version-7
118	77	UTV	UTV: 202000106H-202303070-P	Phooltass	Version-8
119	78	PCCM	PCCM: (9305,9306)-(9410,9412)	Ameca	Version-1
120	79	PCCM	PCCM: (9903-9904)-(9917-9918)	Ameca	Version-2
121		PCCM	PCCM: (0401-0402)-(0519-0520)	Ameca	Version-2
122		PCCM	PCCM: (0014-0015)	Ameca	Version-2
123	80	PCCM	PCCM: 901A,B-913A,B	Ameca/ Colmar	Version-3
124	81	PQRS	PQRS: 01-12	Plasser	Version-1
125	82	SQRS	PQRS: (05001,05002)-(07023,07024)	Simplex	Version-2
126		SQRS	PQRS: (14025,14026)-(15037, 15038)	Simplex	Version-2
127	83	SQRS	PQRS: (17039,17040)-(18067, 18068)	Simplex	Version-3
128		SQRS	PQRS: (19069, 19070)-(19087, 19088)	Simplex	Version-3
129		SQRS	PQRS: (20089, 20090)-(22117-22118)	Simplex	Version-3
130	84	TRT	TRT: 6190020-6190050	Tamper corporation	Version-1
131		TRT	TRT: 6100731	Harsco	Version-1
132	85	TRT	TRT: 6100984-6101015	Harsco	Version-2
133	86	TRT	TRT: 6111443-6111453	Harsco	Version-3
134		TRT	TRT: 6112139-6112159	Harsco	Version-3
135	87	TRT	TRT: 6122392-6122442		Version-4
136	88	RGM	RGM: (RGI-5)-(RGI-6)	Loram	Version-1
137	89	RGM	RGM:(RGI-96-1) -(RGI-96-8)	Loram	Version-2
138	90	RBMVM	RBMVM: 201406001-202108020	Phooltass	Version-1
139	91	SRGM	(IR20-1)-(IR20-6)	Loram	Version-1

As evident in above table there are 91 versions are available in existing 15 types of machines in use over Indian railways.

8. Concluding note

Imagine having a crystal ball that lets you know when machine will fail before it even happens. It sounds like science fiction. We can predict equipment failures and prevent costly downtime. With induction of TMMS for machine monitoring software each and every aspect of machine will be available on digital platform to produce high-quality machine maintenance at a lower cost and shorter time frame. To meet these goals, User can rely on various modules of the system to execute various tasks in the maintenance and inspection process. However, machines are subject to wear and tear and can break down unexpectedly, leading to requirement of maintenance input at desired stage of failure initiation.

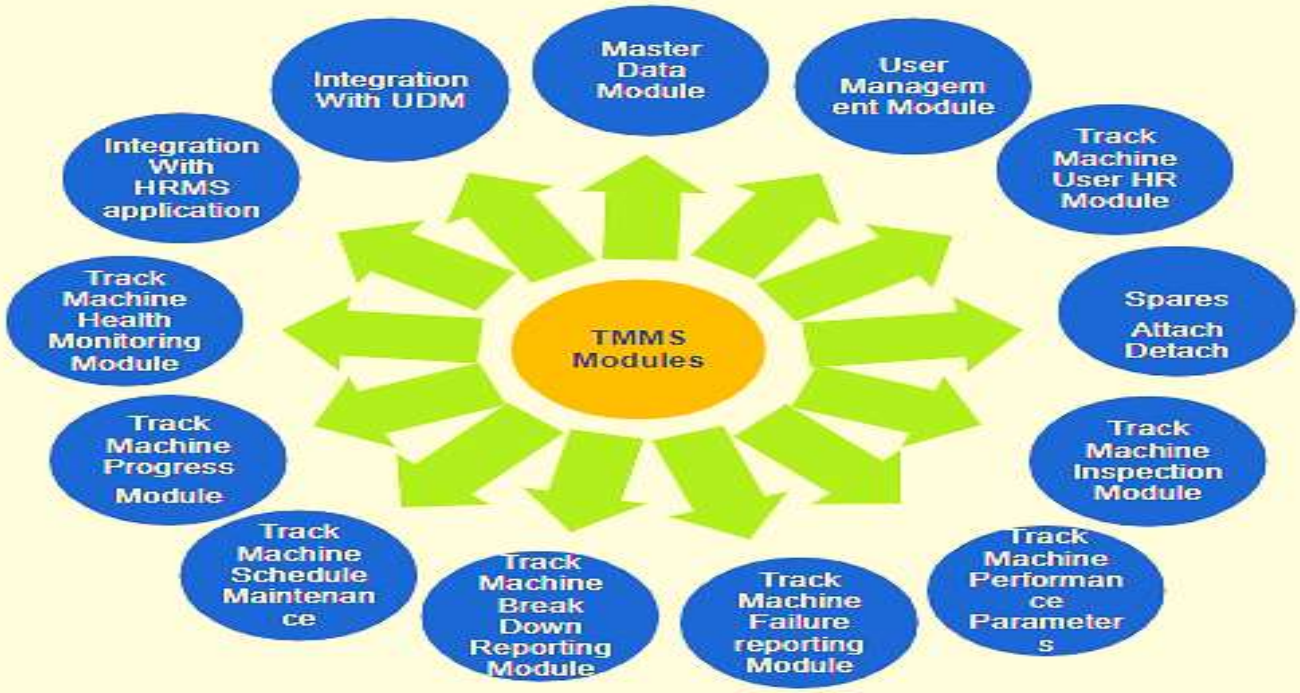
To avoid any adverse effect in maintenance due to manual error in data logging, machine monitoring systems to track the performance of machines is extremely useful and essential. Data of machine can be analyzed to specify trends and potential issues. Which in turn lead to optimize in reducing downtime and increasing efficiency. Uniformity in monitoring will keep all machine at equal platform. Any system is useful when it is being used extensively and user friendly. Keeping in view monitoring of huge track machine fleet it is expected that TMMS system will fulfill all expectations and will lead to improve the functioning of Track machine organization.

Track Machine Management System-A brief Introduction

- Seema Khare (Senior Project Engineer, CRIS)

General

- Track Machine Management System (TMMS) is a Web Application for Planning, Operation, Maintenance, Monitoring & Inspections of all types of Track Machines in IR.
- It will replace all the Paper Based Record Keeping of Daily Log Book, Schedule Maintenance, Failure Reporting, Breakdown Reporting, Inspection Reporting, Capturing Performance Parameters, Capturing Health Monitoring, Track Machine Employee details etc.



- TMMS is enriched with various useful reports based on the data captured in above mentioned functionalities which will provide analytical base for better decision making.
- Better decision-making management, maintenance & productivity of Track Machines will result in their better and efficient utilization for Track maintenance which in turn will help IR to manage its traffic more efficiently.
- TMMS application has various modules like Master Data Module, Track Machine User Management Module Track Machine User HR Module, Track Machine Inspection Module, Track Machine Failure Reporting Module, Track Machine Schedule Maintenance etc.
- TMMS home page shows users their pending work, new feature of the webpage and also has a bell icon on the top right corner where user will get their notifications regarding their work Maintenance due, Inspection due and so on.

1. User Management

- This module provides functionality to Create/Manage Users.
- CRIS will create Dy.CE / Track Machine Users and all Users above Dy.CE (PCE, CE).
- Dy CE/ Track Machine will be Admin User in his/her respective Railway. Admin user will create all rest of the technical users of Track Machine below Dy. CE (XEN, AEN, SSE, JE),i.e., up to JE.
- Technician, Helper & Contractor employees can be created through Add

Employee Functionality: Marking attendance.

- Login Credential will be shared on mail as and when User is assigned to a particular post.
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- User can edit their phone number, email ID and can change the password as well under User Management Section.
- Dy.CE (Admin) can vacate and reassign the post in cases like transfer, promotion or others and can delete the post as well if it is no longer needed.

This Module contains 6 functionalities

- Create Post
- Assign/Reassign Employee
- Edit Profile
- Change Password
- Vacate Post
- Delete Post

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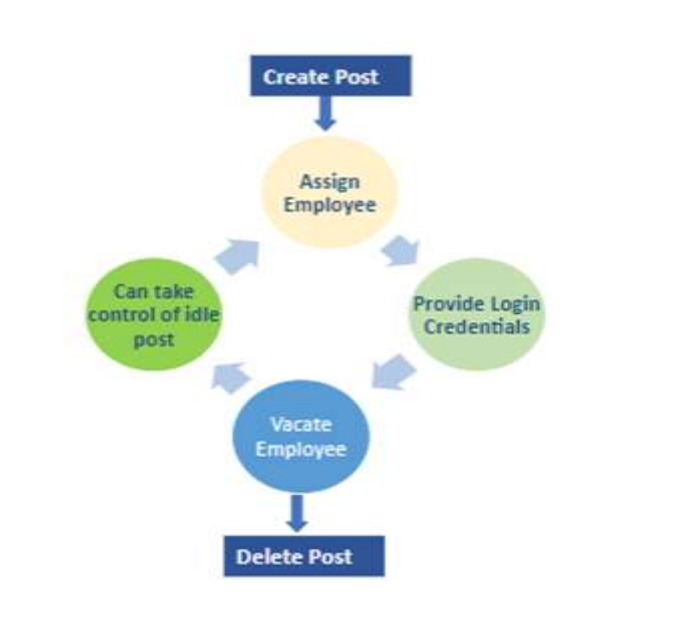
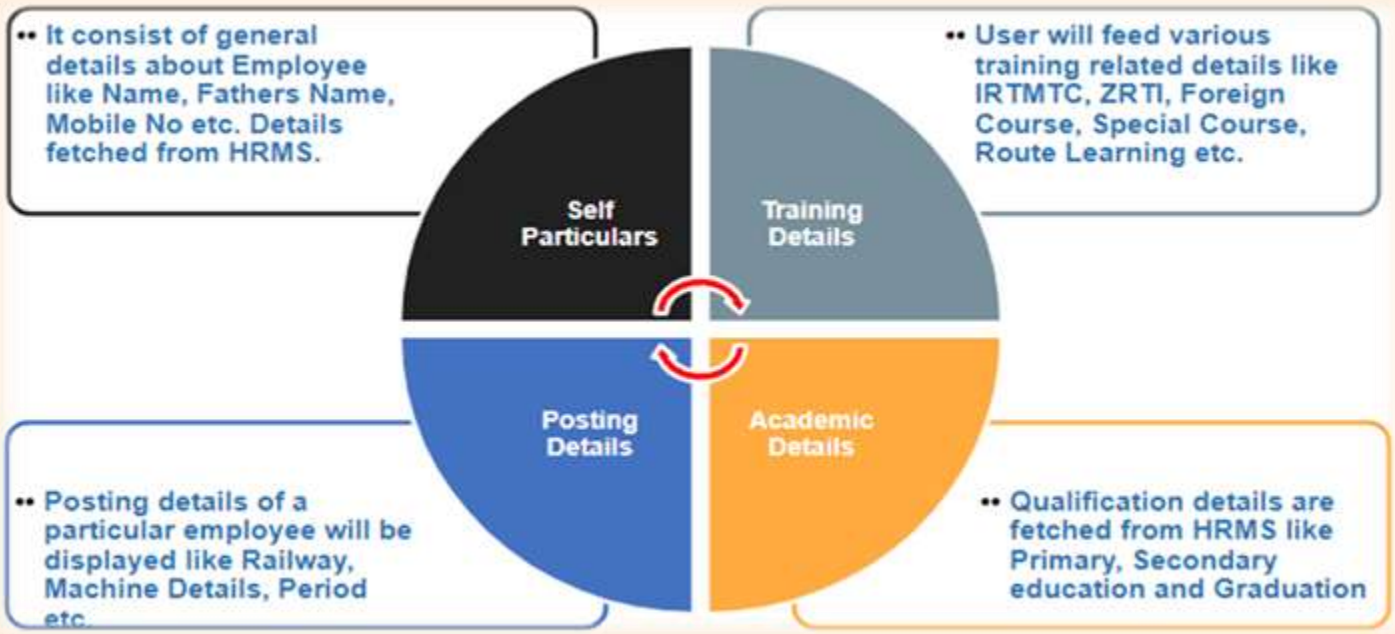


2. HR Module

2.1 Add Employee Details

- This module provides functionality to Store HR Details of Track Machine users: Self Particulars, Academic, Training and Posting Details.
- Generate alerts to the users regarding their Upcoming Trainings and Periodical Medical Exams.



- Most details of Self Particulars, Academic, Awards and Punishment of User are fetching automatically from the HRMS.
- Posting Details of User is updated Automatically through USER MANAGEMENT During Assigning and Vacating Post.

2.2 Add/Delete Machine Staff

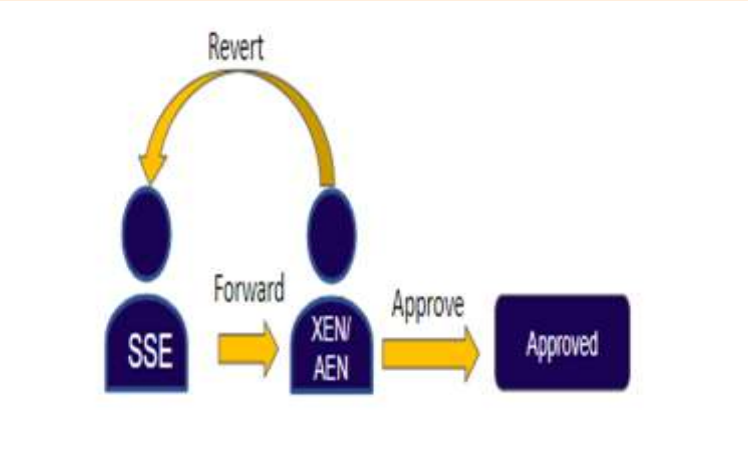
- This module provides the feature to Add/Delete employees under specific machine.
- The user can add two types of employees which can be added to machine: (1) Railway Employee (2) Contractor Employee.
- In case of Railway Employee, HRMS ID is required and for Contractor Employee Aadhar Number and its soft copy is required.
- When an employee is transferred, terminated, or otherwise no longer working with the machine, users can promptly remove them from the system.
- Who Will Fill the Details?
    - It is done by SSE for their respective machines.

2.3 Employee Attendance

- This module provides the functionality to register the attendance of Employees posted on that particular machine on the daily basis.
- Who Will Fill the Details?
    - SSEs can mark the attendance of Employees for the respective machine assigned to them.

3. Master Details

3.1 Machine Master Module



- This functionality is used to capture various attributes related to Track Machine Like - Machine Model Number, Machine Type, Max Axle Load, Max Speed Train Formation, Commissioning Date etc.
- These machines are already available in Track Management System (TMS).
- All static attributes like (Max Axle Load, Max Speed Train Formation etc.) of the Track Machine have been filled through Add Speed & Dimension Details functionality and used for all the Machines of same type. Only few attributes like Model No, Cost, Commissioning Date, Railway Board Contract No need to be fill by User.
- This module contains following functionalities.

- Capture Machine Master Details.
- Capture Approval/Revert on Machine Master Details.
- In case of Revert, correct Machine Master Details.
- After Correction again sent for Approval.
- Approval on Machine Master Details

- Machine Master details will be filled by SSE.
- XEN/AEN will approve Machine Master details.

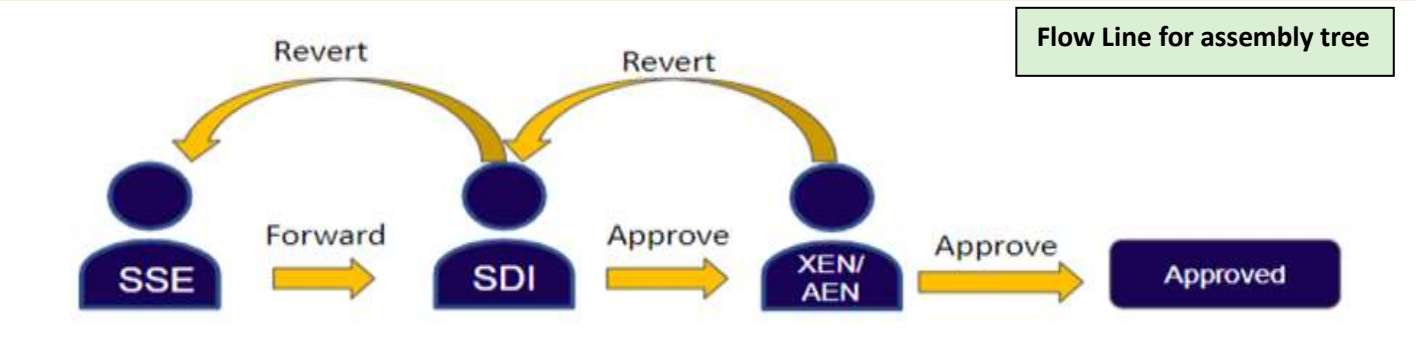
3.2 Assembly Type Tree

- This functionality is already completed by CRIS. In this section Assembly structure created for a particular type of machine, which is applicable for all machines belonging to same type and same version.
- Along with creation of assembly type structure this functionality also captures various attributes of the assemblies like SPN, Assembly Name, Approximate Life, Quantity, Location,

Manufacturer, Assembly Property, Change Frequency and Function.

3.3 Assembly Tree, Details & Approval

- Through this functionalities user shall prepare Machine Tree.
- Machine Tree will be prepared on the basis of Machine Assembly Type Structure decided by Track Machine experts.
- The machine in-charge of machine will create the tree by ticking the parts available on machine and unticking the extra ones from Machine Assembly Type Structure.
- After Tree Creation the machine in-charge will fill the engine and other component details and forward it to the SDI who can edit the details filled and forward it to XEN/AXEN for further approval or revert it to machine in charge for correction.
- XEN/AXEN's approval is the final step in the process of tree creation no change after that can be made, XEN/AXEN's can also edit or revert the details if needed.



4. Spare Entry

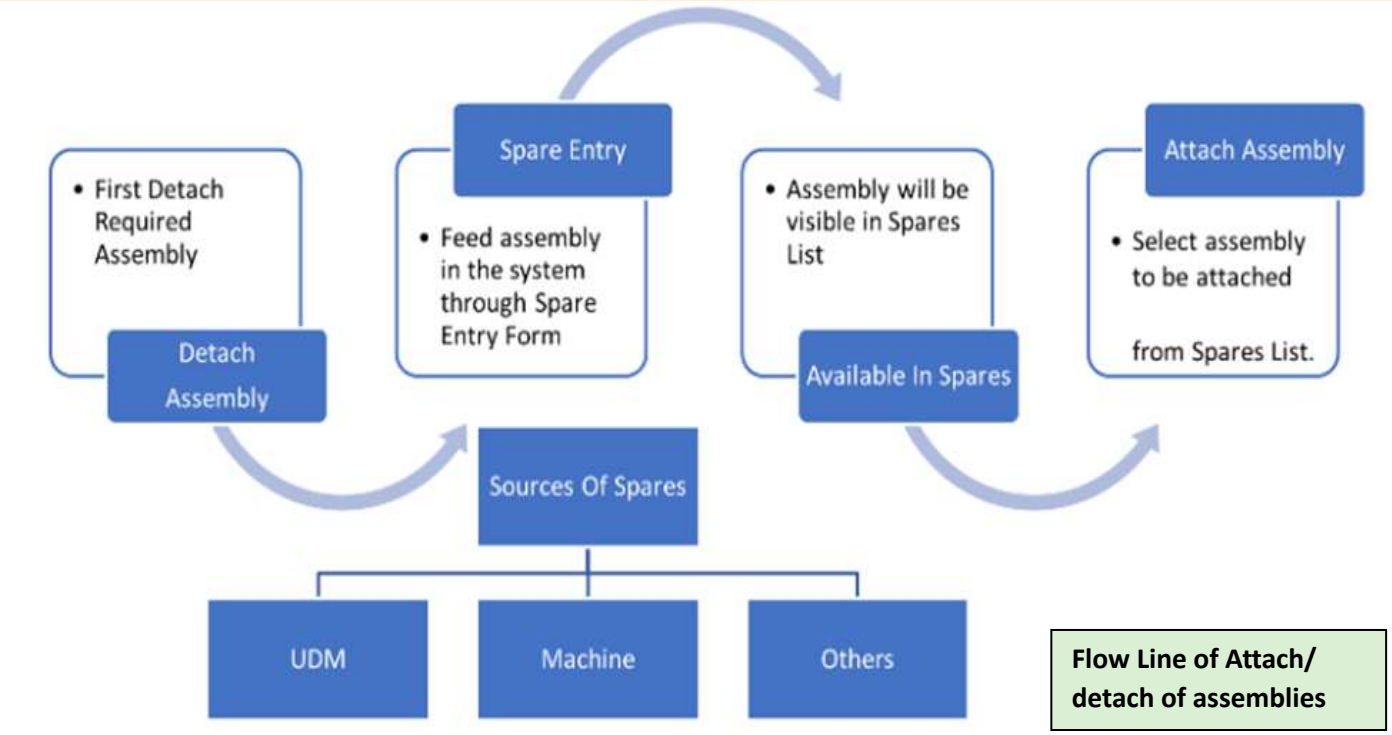
- With this functionality user can add spare component with machine assembly details tree. This functionality will be visible to authorized user. This user is authorized to amend the spare component details or add new spare component as required.

5. Detach/Attach Assembly

- This Module provides the functionality to attach assembly to a particular Track Machine and detach particular assembly from a Track Machine.
- In detachment user can detach any component from the assembly tree which is present on machine.
- In Attachment the user can choose from the list of detached items and attach the spare on the machine.
- For performing Attachment there must be spare present of that component on machine.
- Who Will Fill the Details?
  - SSE/JE will perform the task of attaching or detaching component from the machine
- There can be three sources of spare:
  - From UDM
  - With Machine
  - Others
- Who Will Fill the Details?
  - SSE Track Machine will fill all the spare assembly available into respective machine.

6. Attach/Detach Miscellaneous Assembly

- This Module provides the functionality to attach assembly to a particular Track Machine and detach particular assembly from a Track Machine which is not present in the tree.
- There can be three sources of spare:
  - From UDM
  - With Machine
  - Others



Flow Line of Attach/ detach of assemblies

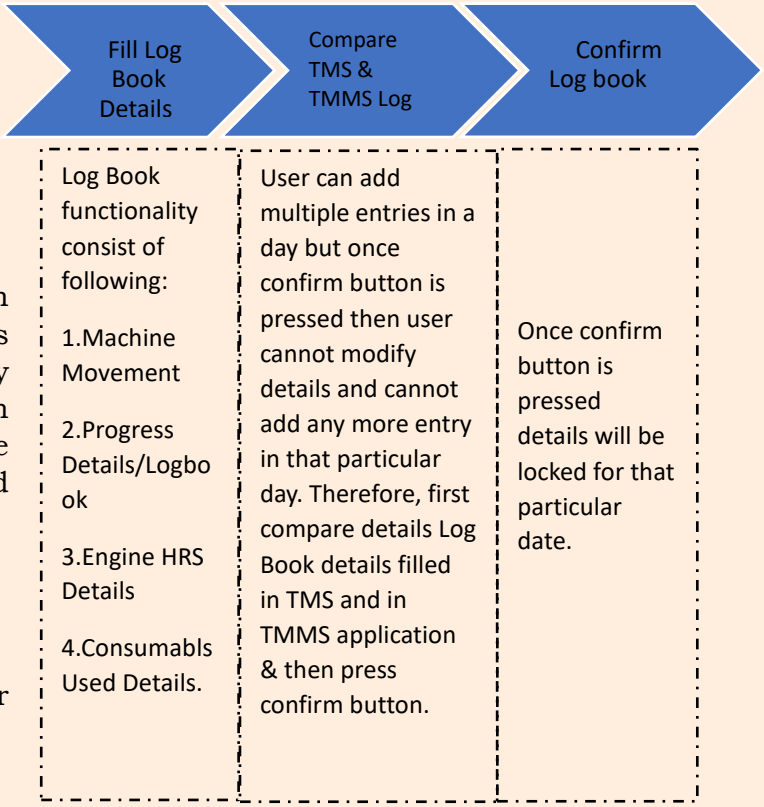
- Who Will Fill the Details?
  - SSE/JE will perform the task of attaching or detaching miscellaneous component from the machine.

7. Log Book

- User can view progress details filled in TMS and can modify progress details available in TMS if required else may continue with same values along with filling extra information like Machine Movement details, Engine Details and Consumable Details in TMMS.

- Who Will Fill the Details?
  - SSE/JE will fill the logbook for their respective machines.

- This Module provides the functionality to capture various activities associated with a Track Machine like Machine Movement details, Block Details, Time Loss details, Engine Details and Consumable Details.



8. Schedule Maintenance

- This Module provides the functionality to capture all information related to all Scheduled Maintenance done for a particular Track Machine.
- This module has two functionalities:
  1. Fill Schedule Details: In Fill Schedule Details the User (SSE) can create answer the due schedule's check points.

2. Schedule Due Check Points: Through Check Points Due user (SDI) can answer the pending check points.

- Who Will Fill the Details?
  - SSE Track Machine will fill all the check points for a particular schedule.
  - If SSE feed pending into status for a particular check point, then these check point will further feed by SDI.
  - SSE do not have access to feed data again once he completes (Save) the feeding of check point for respective schedule.
  - SDI will have re-work into same check point whose status is pending.

9. Track Machine Inspection

- Who this module provides the functionalities to enter the Inspection details for particular machines on periodical basis.
- There are 3 types of inspection done by SDI, XEN/AXEN and Dy. CE.
- These Inspections will get due on the First day of month, quarter and year or that respective Inspection period. After that the user can fill the inspection details.
- User will have to fill Date of Inspection, Division, Location of Machine (optional) and Name of Supervisor on Machine.
- In General section user can view some information about the machine-like Machine's Manufacturer, Commissioning Date, Total No. of POH etc. and can enter some historical details about machine in history section.
- In all the other sections there is a list of checkpoints groupwise following which the user will do the inspection and give their response for particular checkpoint in condition dropdown and give remark if needed and mark its status. The user can also give groupwise remark.

At the time of saving the inspection if all the checkpoints are marked as complete then Inspection process is complete otherwise if any checkpoint is marked as pending the compliance for those pending questions will be required.

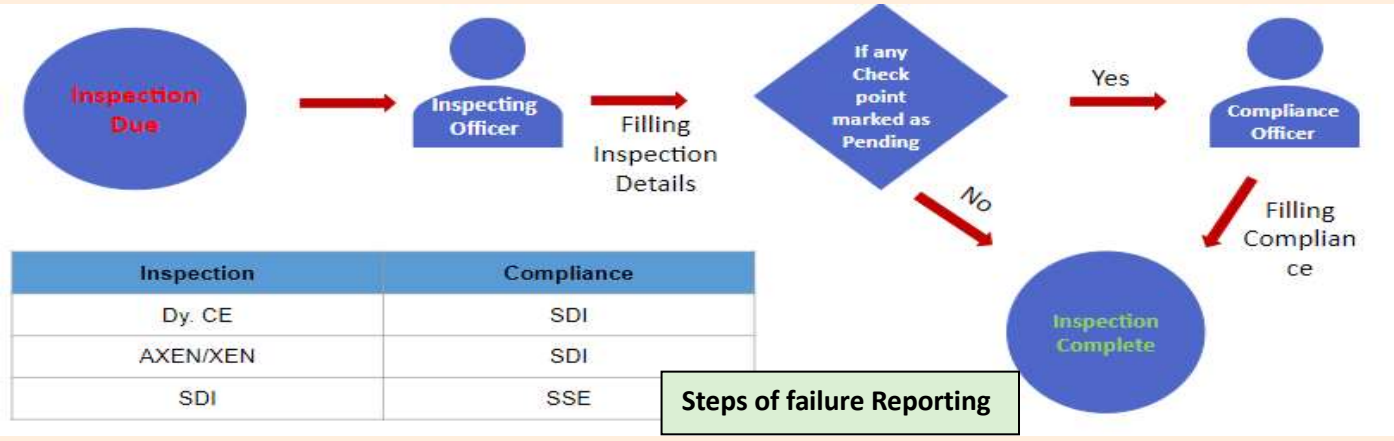
- Who Will Fill the Details?
  - For the Inspections performed by XEN/AXEN and Dy. CE the compliance will be given by SDI and for Inspection performed by SDI the compliance will be given by SSE/JE.

10. Non-Schedule Inspection

- This module provides the functionality to register the Inspections other than scheduled inspections.
- Who Will Fill the Details?
  - This can be filled by Dy. CE, XEN, AXEN, SDI, SSE/JE.

11. Machine Failure Register

- This module provides functionality to register failure associated with group of or individual components of particular Track Machine.



- Component failure is for reporting failure which is not due to functional aspect such as Overheating, Starting Problem, Internal Sound, Low Pressure etc.
- Failures corresponding to Group of Components can also be registered by clicking on Group.
- Failure of miscellaneous component that are added through '**Add Misc Component**' form can be reported.
- Who Will Fill the Details?
    - SSE/JE will fill the logbook for their respective machines.

13. Performance Parameter Register

- This module provides functionality to fill the monthly inspection related to Performance Parameters of a particular machine.
- Once details saved of particular month it cannot be edited.
- Who Will Fill the Details?
    - This module is only available for SDI to fill.

12. Machine Breakdown Module

- This module provides functionality to report Breakdown of a machine.
- Breakdown Module is to report failure of whole Machine, thus capturing information relevant to Track Machine.
- Who Will Fill the Details?
    - SSE/JE will fill Breakdown form of assigned Machine.
    - This form will be forwarded to respective SDI for remarks.
    - After SDI this form will be forwarded to XEN/AXEN for filling further details.
    - Once it is saved by XEN/AXEN, Dy. CE can approve or revert this form with Remarks.

14.Machine Health Monitoring

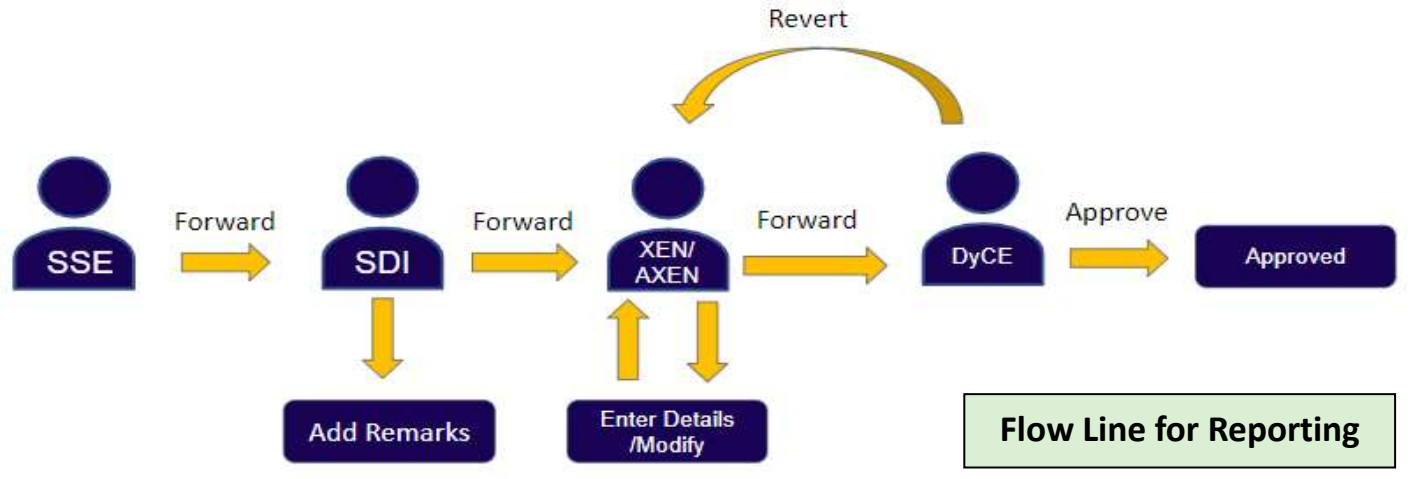
- This module provides the functionality to enter the monthly status of various components of machine.
- Who Will Fill the Details?
    - This module is only available for SDI to fill.

15. Add Tools & Safety Items

- This module is use to capture various tools and safety items available in the machine.
- Who Will Fill the Details?
    - SSE/JE will perform the task of adding tools and safety items on the machine.

16. Reports

- TMMS is enriched with useful reports which will not only facilitate Track Machine user's day to day work but will also provide strong base for decision making.



- TMMS contains various type of reports for modules like Failure, Breakdown, Maintenance, Inspection, Health Monitoring, Performance parameter, Log Book (machine progress) and many more which will help in maintaining and analyzing machines efficiency and will make decision making much easier.

- TMMS also has reports which can show Zone wise or Machine Type wise status of ongoing work like how many Machines Master have been created, how many have been approved for various modules, these reports give picture about the overall progress

17. Tutorial

- This module contains module wise detailed tutorial videos of each and every functionality present in TMMS which user can refer in case he faces any difficulty or issue while working.

For any issue/query/doubt related to Application user can message us using Message Center.

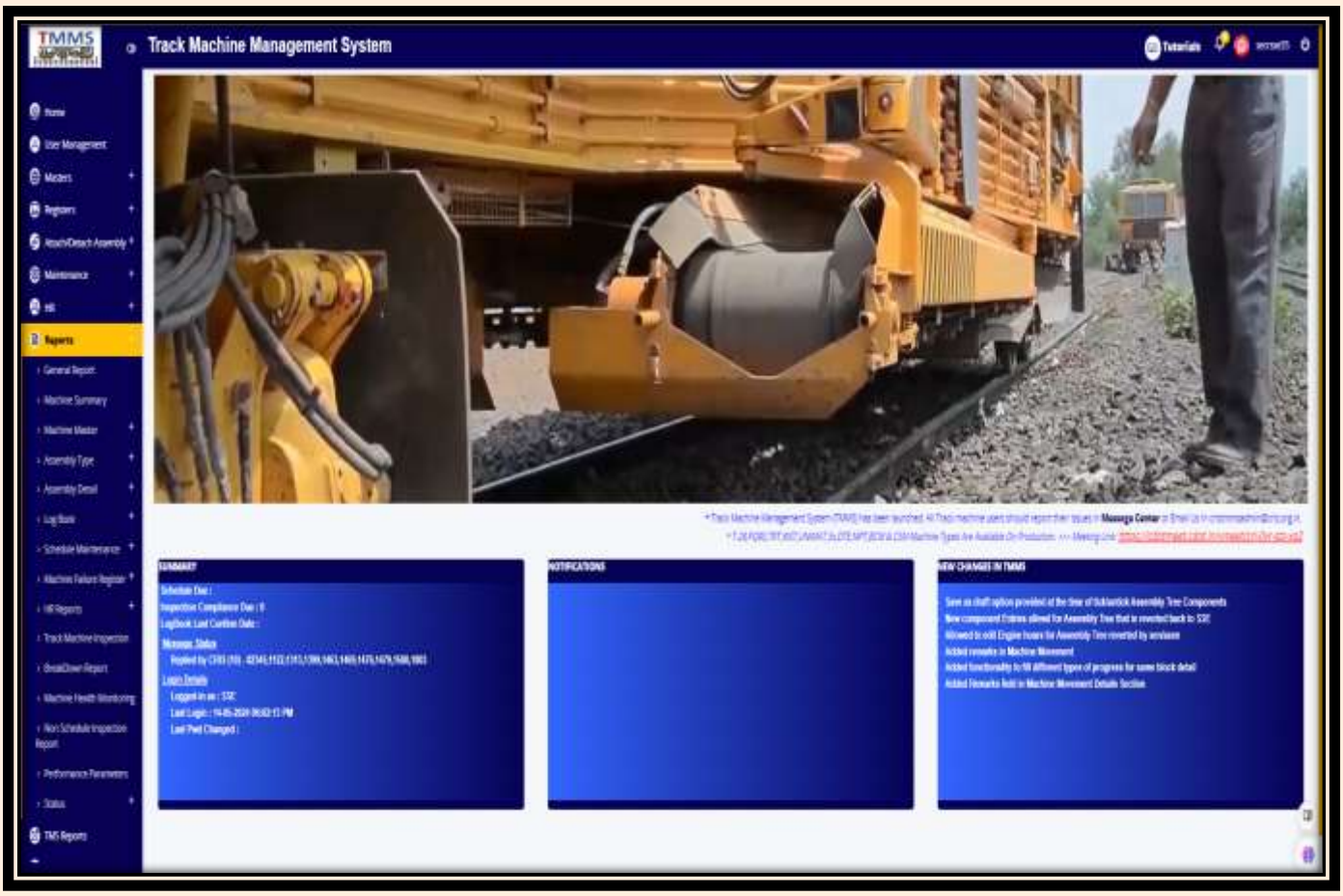
- Users can track the status & response of their queries in View message section.

- Users can view queries of other users as well in view message.

18. Message Center & View Message

- The users can not only view these tutorial videos but can download them also.

- Users can also download user manual from this module.



User Depot Module

- Rohit Kesawarni (Chief Instructor, IRTMTC)

GENESIS& INTRODUCTION

- UDM was developed by CRIS as per mandate from Railway Board. Intends to computerize Material Management at Consignee's end (All Departments).

- **UDM stands for → User Depot Module**
- Supply chain of Materials Management Department is never complete without Digitalization of Depots by not implementing UDM.

- UDM has led to optimization and traceability of materials usage resulting in improved Asset Maintenance and transformational changes from manual working to digital working environment.

- By implementing this module, an expenditure and inventory control is achieved.

What can be done in UDM

- This "User Depot Module" (UDM) intends to computerize various material management activities at the end of User Depots i.e. Consignees. This will enable authorized user for:

- Creation of Computerized Ledgers & DMTRs (Daily Material Transaction Reports) for recording receipt & issue transactions by authorized Users.

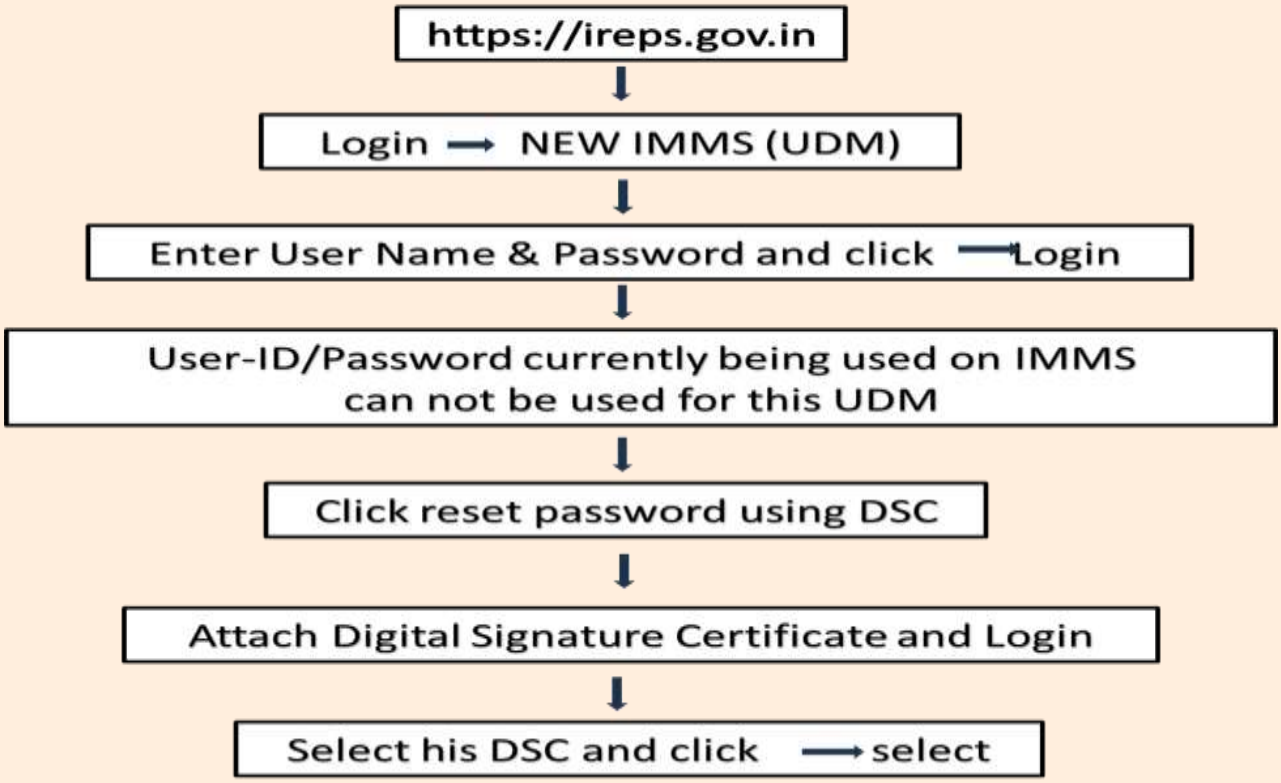
- Receipt of Stores by User Depots/Consignees against Purchase Orders/GeM Orders/Contracts wherein material to be delivered directly to Consignees, against Cash Purchase/Imprest, from Shops, from Other User Depots/Consignees on Loan/Assistance basis, from other Field Units, against Book Transfer within same User Depot, from Stores Depots against S-1313 (Combined Requisition-cum-Issue Note) / S-1830 (Imprest Issues) / Non-Stock R-Notes/ Sale Issue Notes.

- Issue of material to End User, to other User Depots/Consignees on Assistance/Loan basis, to Contractors, on Book Transfer within same User Depot, to Stores Depots on Advice Note, to Purchasers for Scrap Deliveries etc.
- Placing Requisitions on Stores Depots for Non stock & Stock Items (S-1313 as well as imprest Demands).
- Facility for processing of Non-Stock Demands in UDM.
- Placing Demands on User Depots/Consignees, Issue Note, Gate Pass, Adjustment Memo etc.
- Transacting with Non-Computerized User Depots/Consignees w.r.t. receipt & issue of material.
- SMS alert to Stock Holder if Stock falls below Threshold Limit defined by user.
- Integration of payment activities on IPAS with digitally signed Consignee Receipt Note (CRN) / Consignee Receipt Certificate (CRC) being generated in UDM, once it is decided to do so.
- Rejection Handling - both Initial Rejection as well as Warranty Rejection
- Stock Verification (Accounts / Departmental) & Stock Sheet Management.
- Real time information exchange among various stake-holders leading to enhanced operational efficiency, economy and transparency.
- Generation of computerized Gate Pass for the material issued.

Requirements at User end:

- PC / Laptop / Printer
- Internet Connectivity
- Minimum Class-2 Digital Signature Certificate (DSC) [Same DSC being used for iMMS / IREPS / e-Office / SPARROW /e-filing of IT Return can be used for UDM also]
- Basic knowledge of Computer
- Consignee Code of User
- Email ID of User (@gov.in or any domain)
- Mobile No. of User

FLOW CHART



Now, User is ready to use "User Depot Module" (UDM) and Homepage will appear for the Transaction Users who have Consignee Codes mapped against their login.

DMTR (Daily Material Transaction Report):

DMTR:
It is a summary of all the finalized transactions on a particular day. On clicking DMTR Tab on Left side Panel and select period of transaction, we can see transaction report.

Ledger:
Any finalized transaction of Receipt / Issue of material is entered into the concerned Ledger. A Ledger comprises of various Folio and a Folio comprises of various items like as a physical ledger. This will show Summary of Ledgers Maintained by a Consignee i.e. a Main Depot User and his all-associated Sub-Depot Users.

- For creating a New Ledger, click the link Create New Ledger, and enter the Ledger's Name in the field Please Fill Out this Field and click Save Button.
- For creating new Folio (group of similar items) in a Ledger, click icon (Create Ledger Folio) and fill all particulars and save.
- For creating a new Folio Item in a Ledger Folio, user can either click icon (Create Ledger Folio Item) available under Action Header of Summary of Ledger Folio Maintained Tab on the Screen) and fill all particulars and save.
- Name of Ledger, folio & item can be updated any time by clicking the icon (Edit Ledger Name, folio name & item name respectively).

Receipt:
On clicking Receipt Tab on Left side Panel.

To initiate any transaction of receipt of material from Trade, User has to select Fresh Receipt from drop-down options available under Receipt from Trade and click Search PO/Contract/LOA Tab when following Screen will open on which User is required to select PO Type as (i) Stores PO (Local Purchase), (ii) Stores PO (Other than Local Purchase), (iii) GeM PO, (iv) Imprest/Cash Purchase, (v) Supplies against Contracts and (vi) Others.

It is clarified that only the Consignment supplied has been registered and it is yet to be accepted / rejected & accounted for in Ledgers. Material against such registered Consignment is to be accepted/accounted for into Ledgers using Acceptance tab as per Para 6 of User Manual.

Consignment Receipt Certificate (CRC):

User can click View / Print Voucher Tab on above Screen to generate as under which can be printed, signed & given to Supplier as a Receipt of material.

After getting it signed by Gazetted Officer, it can be given to supplier as a Receipted Challan for the supplied material.

Consignment Receipt Certificate (CRC) & Consignment Receipt Note (CRN):

Provision for creating digitally signed CRC (Consignment Receipt Certificate) for the accepted material (Receipt from Trade) has been provided for which CRN Tab on Left side Panel is to be clicked, when Screen will open On the Screen, Select Receipt Voucher Tab will be selected in default condition and all the vouchers against which digitally signed CRN has not been processed will be automatically loaded on Screen.

To process generation of digitally signed CRN, click on (View Consignment Receipt Detail) against the selected voucher.

User has to enter Forwarded Bill Amount (Rs.) and Remarks and select the Officer's name to whom he wants to forward this CRN for approval from the dropdown.

Then the Button Process for Sign & Forward is to be clicked.

The official who has prepared & forwarded this digitally signed CRN to his officer for approval can see list of his forwarded CRNs under the Tab "My Forwarded".

He can see his digitally signed forwarded CRN by clicking Icon (View Consignment Receipt Detail) against selected voucher. It also indicates the name of the officer to whom a CRN has been forwarded for approval.

Till a forwarded CRN has been approved by the concerned officer, the official who has prepared

& forwarded it can drop it by entering reason against the selected CRN from the Screen above and clicking Drop button shown below.

Such dropped cases will appear in the Tabs My Finalized Cases as well as "Finalized by Me".

The official can re-process digitally signed CRNs against such dropped CRNs.

Requisition:

This option is to be utilized for placement of Demand/Requisition on Other User Depots using User Depot Module.

- On the Screen, ***online (User Depot)*** Tab will be selected in default condition. Before placing indent for stock item user has to select respective tab and then search the with PL no. or with name of item after selection of concerning store.
- User can also select ***Type of Requisition*** as Normal or Loan basis by clicking on tab.
- User can view/Print Draft S-1313 Demand by clicking ***View Demand*** button on the above Screen. Alternatively, user can directly send the S-1313 Demand to the selected Officer by clicking ***Sign & Forward Button***; using his Digital Signature Certificate (DSC).
- Signed & Forwarded S-1313 Demand (Requisition) from the User will be visible to concerned officer under ***Awaiting My Approval*** Tab and ***S-1313 Stores Reqn. With Awaiting My Approval.***
- The Officer may make changes in the quantity demanded etc. and then click ***Approve & Forward button*** on the above Screen to forward the S-1313 Demand to Stores Depot using his own DSC.

Officer can see S-1313 Demands approved by him for sending to Stores Depot by clicking ***S-1313 Stores Reqn.*** & ***Finalized by Me.***

Issue:

By clicking ***Issue*** Tab on Left side Panel user can issue item to end user of same consignee, book transfer, user depot. After filling of all requirement user can issue item to related end user, book transfer & user depot.

- Transferring material from one Ledger to another Ledger within the same Consignee has been named as ***Book Transfer***.

Advice Note (DS-8):

Provision for returning material to Stores Depot on Advice Note (DS-8) has been made available in User Depot Module

for which *Advice Note (DS-8)* Tab on Left side Panel is to be clicked, with default selection of *Select Item* Tab wherein user has to select the item to be returned to Stores Depot on *Advice Note (DS-8)*. User can select the item to be returned to Stores Depot on *Advice Note (DS-8)* by clicking *Return* Button under ***Action*** header.

- After putting all details finalized list of item has to be send for approval, for that click on "forward for approval tab".
- The Advice Note (DS-8) will appear to the Officer to whom it has been sent under ***Awaiting My Approval Tab*** & under ***Awaiting My Approval*** Tab of ***Advice Note (DS-8)*** Tab on Left Side Panel. Such forwarded Advice Notes will appear in ***My Forwarded Cases*** Tab of the user.

Gate Pass:

Provision for creating Gate Pass against various Issue transactions has been made available in User Depot Module for which ***Gate Pass*** Tab on Left side Panel is to be clicked. User is required to select Radio Button against ***Contractor*** or ***User Depot/Consignee*** or ***Stores Depot*** to generate Gate Pass against the corresponding Issue Notes. By default, all Gate Passes generated in last 10 days will be displayed and this period can be changed by user based upon his requirement. To view or get print-out or digitally-signed print of a Gate Pass, user may click ***Print*** button available under ***Action*** header.

- To generate Gate Pass against advice Notes (DS-8) made in favour of Stores Depots, user is required to select Radio Button against ***Stores Depot*** appearing on the Screen.

Adjustment Memo & Pink Slip:
When material is issued by one User Depot working on User Depot Module to another User Depot (both Online as well as Offline), which is not on returnable Loan basis, the User Depot which has issued the material to other Depot required to raise a Debit on the User Depot who has received the material (duly involving Associate Finance) through a document, which is known as ***Adjustment Memo***. To generate Adjustment Memo, user is required to click ***Adj. Memo& Pink Slip*** Tab on Left side Panel.

Pink Slip:

When material is issued by User Depot to any Contractor, the User Depot is required to raise a Debit on the Contractor who has received the material (duly involving Associate Finance) through a document, which is known as ***Pink Slip***. To generate Pink Slip, user is required to click ***Adj. Memo & Pink Slip*** Tab on Left side Panel.

Stock Verification (Accounts / Departmental) & Stock Sheet Management:

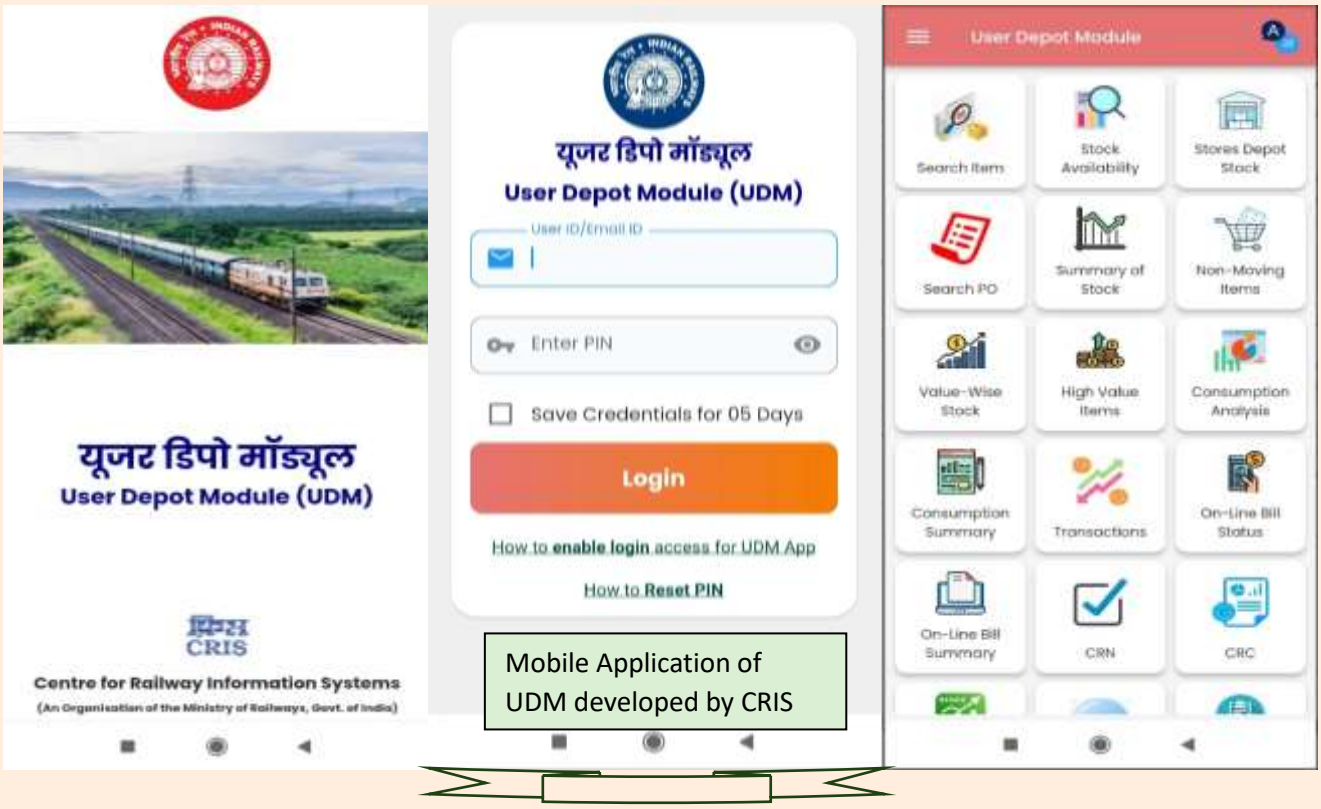
In Railways' working, there is provision for periodic physical verification of Stock held with any Stock Holder by Stock Verifiers (SVs) / Inspector of Stores Accounts (ISAs) of Accounts Department which is called ***Accounts Stock Verification***. Also, when there is requirement, Executives may get Stock Verification done departmentally, which is called ***Departmental Stock Verification.***

- When difference between Ledger (Book) Balance & Physical (Ground) Balance [Excess (+) / Deficiency (–)] of any item held by Stock Holder is noticed, a document called ***Stock Sheet*** is generated.
- This "User Depot Module" has provision for dealing with Accounts & Departmental Stock Verification and corresponding Stock Sheet Management.

Reports:

On clicking ***Reports*** Tab on Left side Panel, Screen will get opened with ***Summary of Stock Held*** Tab selected in default, which shows List of items in a User Depot.

- Item having Stock less than Threshold Limit will be shown in red color.
- User can click ***Stock Availability*** Tab on the Screen get List of items in a User Depot.
- Similarly, User can click ***Value-wise Stock Availability*** Tab on the Screen to see List of Items in a User Depot.



Mobile Application of UDM developed by CRIS

Switch Rail Grinding Machine (SRGM)

- Ajay Kumar Yadav (Chief Instructor, IRTMTC)

1. Rail grinding

Rail Grinding is done to re-profile the railhead taking into consideration the profile of the wheel for optimization of the rail wheel contact band and thereby making rail wheel interaction favorable. This is expected to increase the life of the rail and the wheel, apart from reducing the rate of generation of defects in the rails. Indian Railway is using 20 stone grinders of RGI-IR Series of Loram, USA make grinding machine as gap grinder.

1.1 Purpose

- Rail grinding reduces the contact stresses and maintains favorable steering of the wheels. This will result in reduction in wear & tear and damage to the rail and wheel surfaces.
- Rail grinding shifts the contact of majority of the wheels from the area with surface defects on the rail, thus, avoiding further growth of defects.
- Rail grinding avoids the contact of tread of wheel on misaligned welds, thus resulting in reduction in hunting on straight track and avoiding consequent damage.
- Rail grinding helps to control the damage due to rolling contact fatigue and removes the cracks in the initial stages of their development, thus avoiding their further growth deeper in the rail; thereby reducing rail/weld failures. The cracks will not be allowed to reach the stage of high growth and will be ground in initial stages when their growth is slow.
- Rail grinding removes the corrugations and other irregularities from the rail top resulting in better riding quality.

- Wheel radius is flatter than the rail radius of new rails. With the passage of traffic, the rail radius tends target flattened increasing the width of the contact band, which is not desirable. This causes hunting and damage to the rail surface. Rail grinding will restore the rail crown radius, thus reducing this damage.
- Rail grinding removes the white martensitic layer on rail top, which is the cause for development of cracks due to its brittle nature.
- Due to difference in hardness of rail and heat affected zone (HAZ) near welds, dip formation starts in the vicinity of the weld due to differential wear. This weld dip also promotes rolling contact fatigue (RCF) in various forms and also causes squat formation. This dip formation will be avoided by regular rail grinding.
- Rail grinding helps in reduction of wear due to reduced contact stresses by adoption of engineered rail profiles.
- Where other surface defects such as wheel burns, scabs, low or high welds etc. exist on rail, rail grinding helps to taper down the defects after each grinding pass so as to reduce the damage due to these defects.

1.2 Advantages

The advantages that will accrue by rail grinding can be summarized as given below:

- **Increased life of rail and wheel:** There is appreciable increase in life of the rails after rail grinding. The life of the wheels is also reported to increase by grinding of rails.
- **Improved reliability of assets:** The defect generation rate of rails is reported to reduce to one-fourth on some of the railway systems. Reduction in failures will lead to increased safety and reliability of train operations.
- **Less tractive resistance:** due to lesser impact & therefore be saving in fuel consumption.
- **Improved reliability of USFD testing:** Due to smooth and cleaner rail surface, the reliability of USFD testing will improve.
- **Reduced track geometry deterioration:** The track geometry will retain for longer period and the requirement of tamping of the track should come down.
- **Reduced degradation of ballast:** Due to lesser impact, the degradation rate of ballast will come down. This should result in reduction in the frequency of deep screening of track.
- **Less noise:** The noise level goes down after rail grinding.
- **Reduced derailment proneness:** The overall improvement in rail wheel interaction will result in better safety performance.

2. Switch Rail Grinding Machine (SRGM) salient features and functions:

SRGM is capable of Rail Grinding Operations: -

- Plain tracks and Curves
- Tracks in tunnels
- Track on bridges with or without guard rails (without removing guard rails)
- Track on platform lines
- Switches, Crossings / Diamond crossings (with or without check rail/guard rails)
- Level crossings (with or without removing check rails)
- Curves (with or without removing check rails)

2.1 Machine Description:

(SRGM) rail grinder is a machine designed to re-profile the rail cross section and to remove or reduce rail corrugations, corrosion, joint mismatches, and other railhead surface irregularities. It consists of a Grind Car (GC) and a Camp Car. The Grind Car has two 10-stone full-flex buggies. The grind modules in the buggies can be used to grind tangent or curved track.

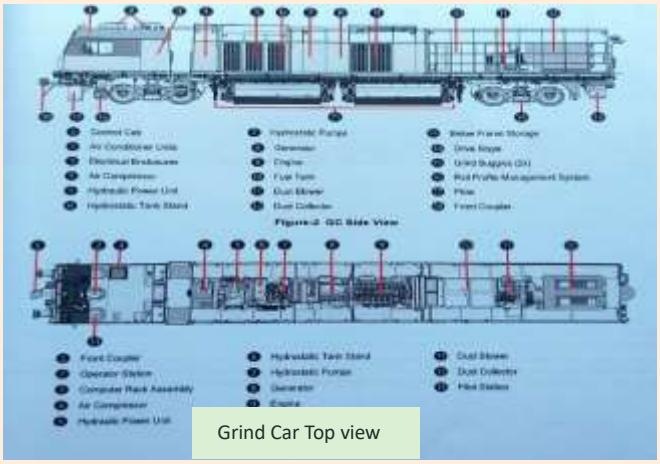
Each Car has key features and functions associated with it:

- Grind Car - Rail grinding equipment, dust collection, operator controls, power generation, hydraulics, hydrostatic traction, tie and ditch sprays, rail Inspection
- Camp Car – Operator controls, water pump and storage, rail Inspection, Convenience room

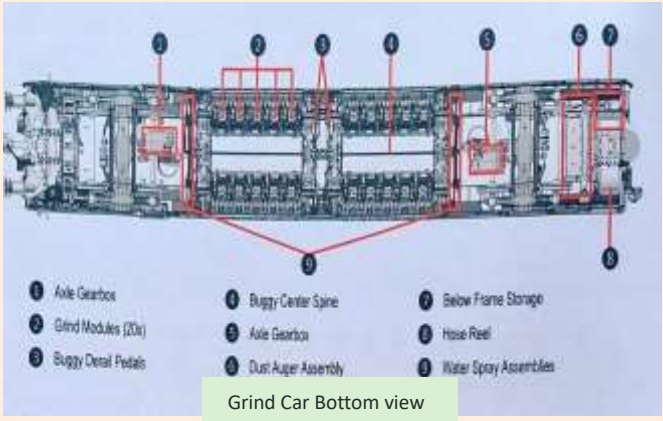
2.1.1 Grind Car:

The operator controls and rail grinding components are located on the grind car (GC). The grind car has buggies, a hydraulic system that supplies fluid power to the grind buggies and grind modules, and a dust collection system. The grind car also contains:

- The Operator Control Cab
- A Genset and Fuel tank
- A Hydrostatic Traction System
- An Air Compressor
- Rail Inspection Equipment
- A Water spray Assembly



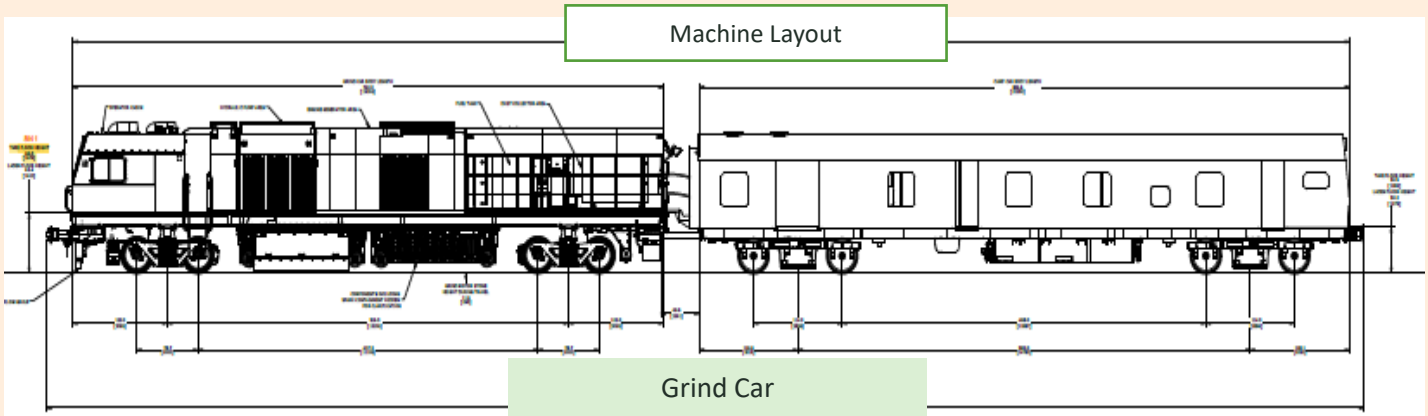
Grind Car Top view



Grind Car Bottom view

Camp Car:

Machine Layout

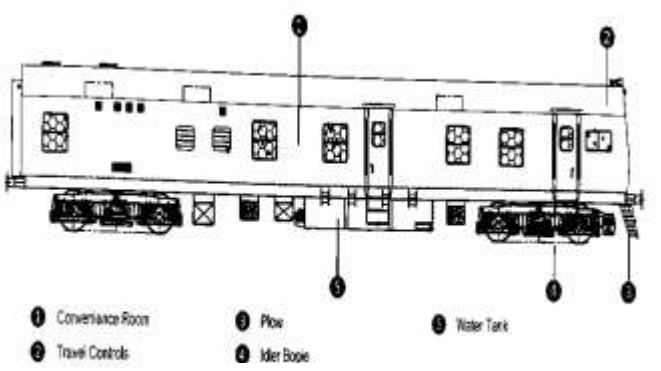


Grind Car

2.1.2 Camp Car:

Travel controls are located on the camp car. The camp car also contains.

1. A water tank and pump
2. A convenience room
3. Rail inspection equipment



Camp Car

3. Grinding Strategy:

Strategy – The metal removal during the process of grinding and the frequency of grinding is decided with a purpose to control Rolling Contact Fatigue.

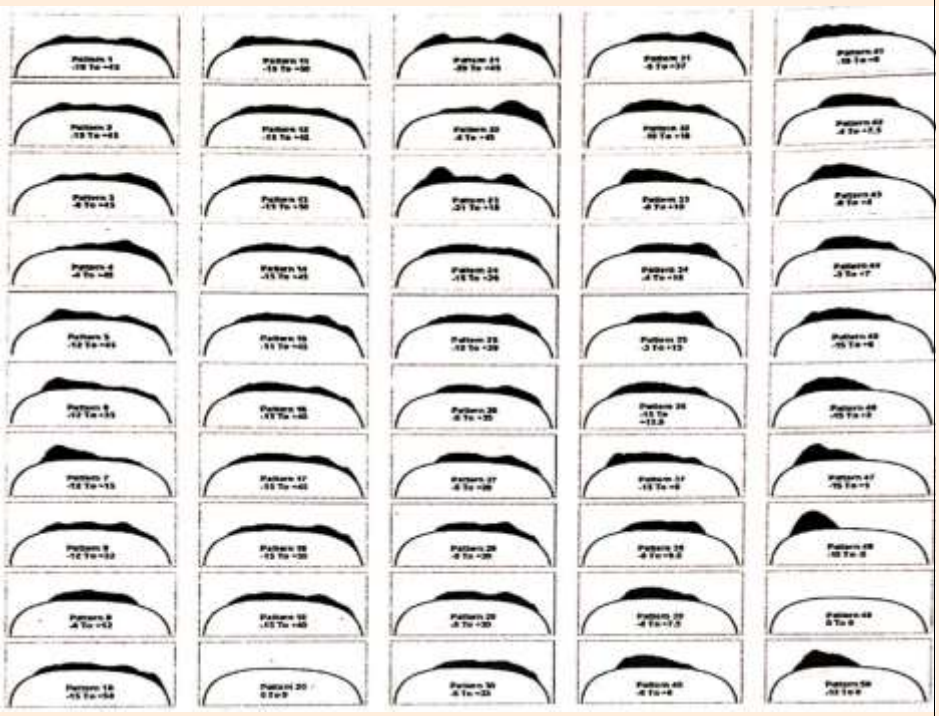
Corrective Grinding – Grinding done for complete removal of corrugations and surface defects in one cycle (with required number of passes in same or continuous blocks) to achieve the engineered rail profile is called corrective grinding.

Preventive Grinding – Grinding done in the initial stages of defect generation is called preventive grinding. In preventive grinding, the grinding is done more frequently but the amount of metal removed during each cycle is much less as compared to corrective grinding. Preventive grinding is considered to be a better approach since the grinding can be done in a single pass at higher speed and the head hardened layer on the rail top is not removed. To be done at 40-50 GMT.

Preventive-Gradual Grinding – On Indian railway the surface defects, in the sections identified for rail grinding have passed the stage of preventive grinding. Corrective grinding on IR is not desirable on account of issue of blocks and likelihood of removal of head hardened layer. Thus, the strategy of Preventive-gradual grinding has been adopted wherein metal removal to be done is more than that required in case of preventive grinding but less than that required for corrective grinding.The stage of preventive grinding is expected to be achieved on IR, after 3 to 4 cycles of grinding within periodicity of 8 to 25 GMT.

Target Rail Profiles – Target rail profiles are the rail profiles to be achieved after rail grinding and are designed to produce minimum contact stresses during rail wheel interaction. Nature of Rail Wheel interaction is different on straight track as compared to curved track. It is different on mild curves and on sharp curves, for high rail and for low rail of a curve. The target rail profiles to be achieved by grinding are therefore different for each of these locations and are designed to produce least stresses during rail wheel interaction.

Patterns – Grinding stones are positioned across the railhead to achieve a particular pattern for removal of metal. The position of a stone is characterized by the angle of the rotation axis of the stone from the vertical. Thus, depending upon the angle, the location of the grinding by each of the stone on the railhead will vary. Power of grinding motor can also be controlled.
A pattern will be defined by angle and power of each of the motors working on the railhead.



For grinding at different locations, it is required to select one of the designed grinding patterns to achieve the target rail profile in one or more passes. Different patterns may be used for left and right rail of the same track. Metal removal from the railhead will depend upon the following factors:

a) The number of grinding stones working on a rail
b) The power of the motors
c) Speed of grinding
d) Number of passes
e) Hardness of the rail
f) Characteristics of grinding stones (depending on specifications of the manufacturer)
g) Position of the grinding stones (angle of axis of rotation of the stone)

7. **Grind Quality Index (GQI) –** The post grinding profile achieved is compared with the target rail profile by GDMS and an index known as GQI (Grind Quality Index) is displayed during the run. GQI gives an idea about variation from the target rail profile. GQI value of 100 means that we have achieved the target profile within the specified tolerances. A lower value indicates the deviation. GQI value of 80 or above can be considered acceptable.

8. Block Working and Safety Rules for SRGM working

8.1 Block working

- Marking of Sequence Up and Sequence Down points to be marked with paint and should be made visible to the operator,
- Before block, Rail profile to be measured with mini prof instrument and carryout DPT test of test sites.
- Arrange Pilot for machine working.
- Check the angles of motors and their proper functioning before block.
- Check the proper functioning of buggies.
- Perform spin test of all modules.
- Check dust system.
- Brake test is to be done every day before movement of machine.
- Track recording to be done prior grinding.
- Synchronize the chainage of track and the machine before starting of work.
- Note down the patterns to be adapted for grinding before start of work.
- Ensure proper block authorities are received for attending 3 Grind passes (to grind complete railhead)
- Always grind at the specified grinding speeds.
- Change the patterns/modes promptly.
- Alert upcoming pattern swaps and obstructions to main operator.
- Always keep a watch on Alarms

8.2 Safety Rules

- Staff working with SRGM should wear protective gear such as Helmets, goggles, reflective jackets, shoes etc.,
- Ensure communication between grind car, camp car and staff on ground
- Counsel the staff and gateman to keep everyone away from machine during working to avoid injury from flying sparks and iron dust.
- Ensure proper functioning of water pumps, water cannons, ditch sprays and tie sprays for extinguishing any Fire hazard.
- Ensure all fire blankets are intact.
- Inform Section Controller not to permit any inflammable trains on the adjacent line where grinding work is being carried out.
- Keep the climbing steps free from Grease, oil, fuel and dirt.
- Don't cross underneath the machine during operation or working. it is strictly prohibited.

9.0 Equipment required for Grinding:

- Optical Rail Profile Measuring Instrument (Miniprof)

- Star Gauge
- Bar Gauge
- Surface hardness testing instrument
- Surface roughness inspection instrument
- Digital inclinometer
- Dye penetration test kit
- Other equipment:

Good quality digital camera, 1m straight edge, a taper gauge, one steel scale & feeler gauge,

10. Fuel Consumption:

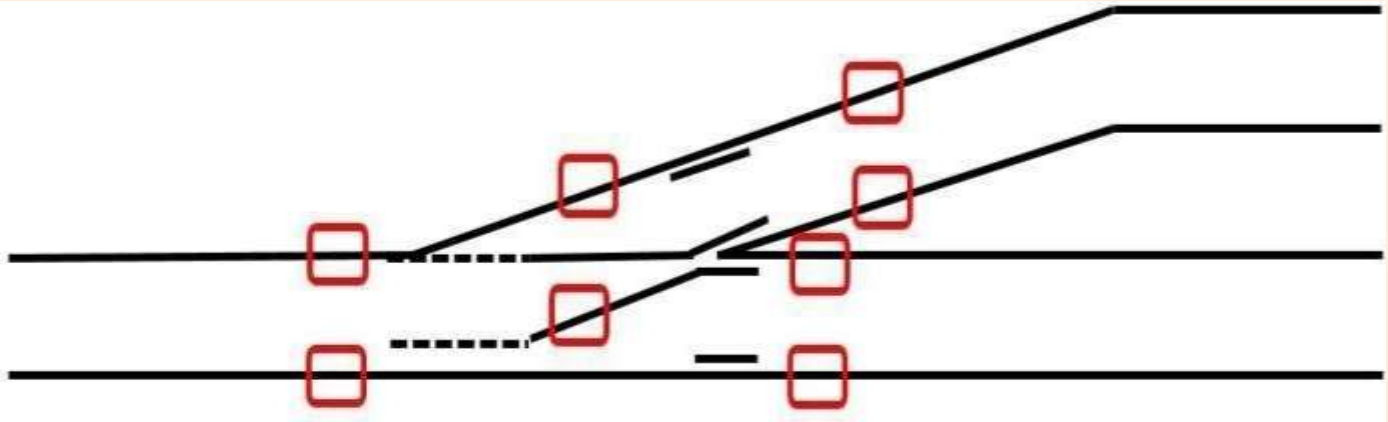
The machine has a fuel tank of 5000 liters (1320 gallons). Daily usage would be around 800 to 1200 liters based on the amount of grinding done.

11. Water:

The machine has a capacity to hold 6000 liters (1585 gallons) of water. This would be needed for grinding operations. Based on the actual usage of the machine between 3000-6000 liters of water would be used daily.

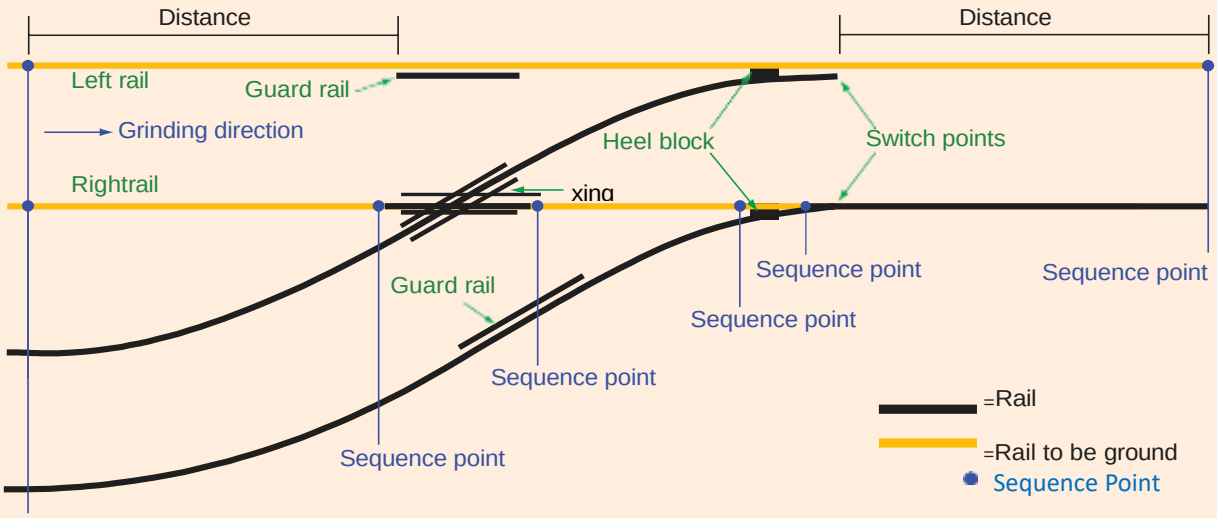
12. Identification and management of Test Sites:

- Select 12 representative turnouts (4 each of the following sizes) 1:8.5, 1:12, 1:16.
  - While selecting the turnout the following precautions should be taken:
    - Turnouts should be a mix of both new and old in a reasonable state of repair and should not be near the end of their service life.
    - Turnout should be in normal running line. At least 1 turnout per size should be from railway lines of maximum annual tonnage/ year
    - At the time these 12 test sites are established the following information should be collected.
- **Optical Rail Profile Measuring Instrument (MiniProf) Data:**
  - Establish a location on the rail between two sleepers and at least 3meters from a joint or weld.
  - Clearly label the exact location on the rail to perform measurement each grind cycle. Ensure rail is free of grease and debris
  - Ensure MiniProf is placed squarely on the rail using rod and perpendicular device.
  - Record detailed location parameters for each MiniProf file either in the file itself or on a data collection sheet.
  - Clear well-lit and labeled photographs of the rail surface looking from above.¬
  - Perform a dye penetrant or magnetic particle test directly adjacent to the location the MiniProf was taken.
  - Clear, well-lit and labeled photographs of the rail after dye penetrant /magnetic particle test (pre-grind only).
  - Example test site locations (below red boxes)



It is imperative that all test sites are identified in a timely manner, well in advance of the arrival of the 20 Stone Specialty Rail Grinding Machines

13.Switch Grinding Procedures

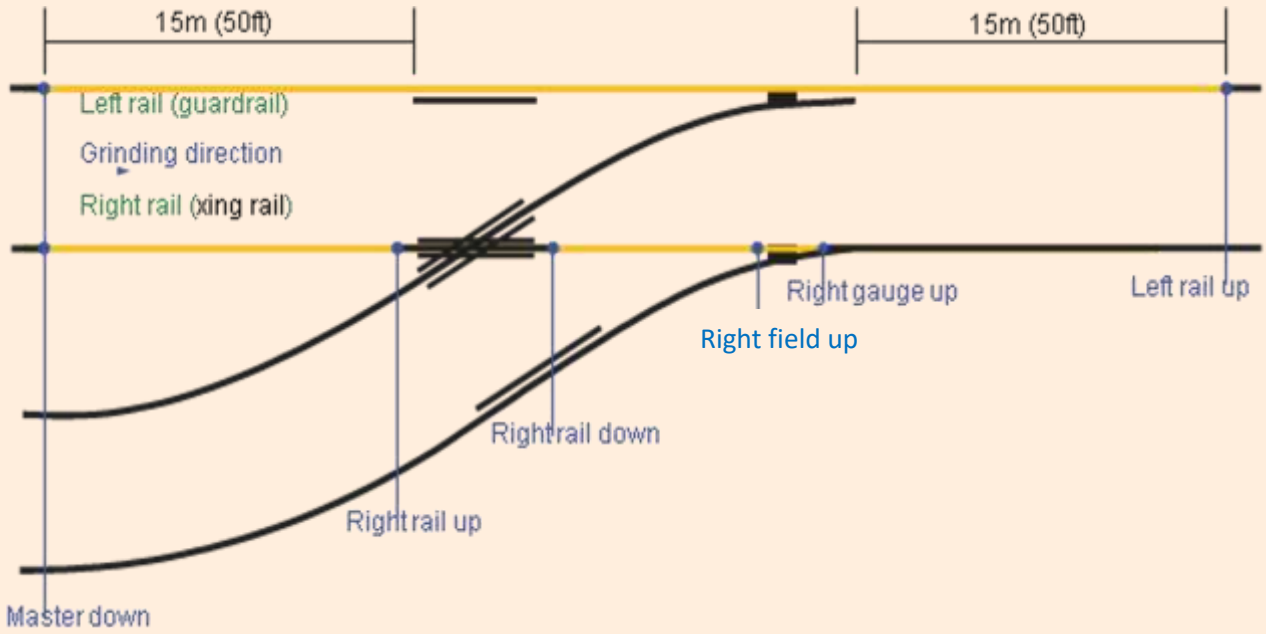


The following table provides estimates of curve grinding sequence set down and pick up point drift per pass.

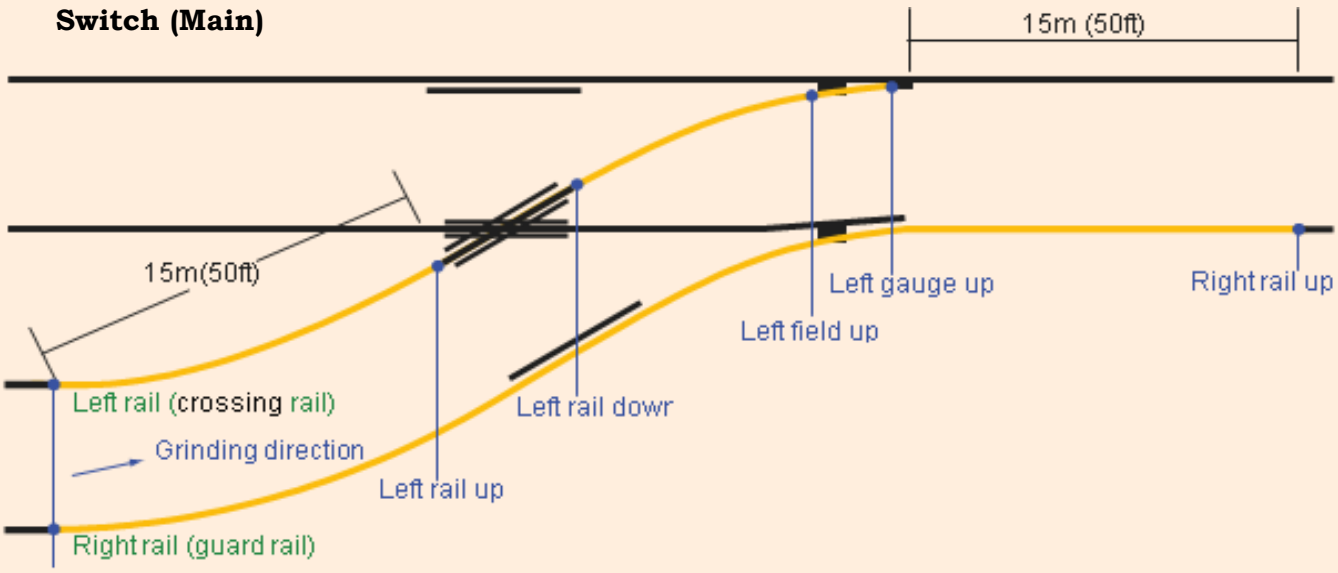
Set Down Point Drift Per Pass on a 305m (1000 ft) Curve.

Travel Distance	Estimated Drift
152 m (500 ft)	50 mm (2 in.)
305 m (1000 ft)	100 mm (4 in.)
610 m (2000 ft)	200 mm (8 in.)

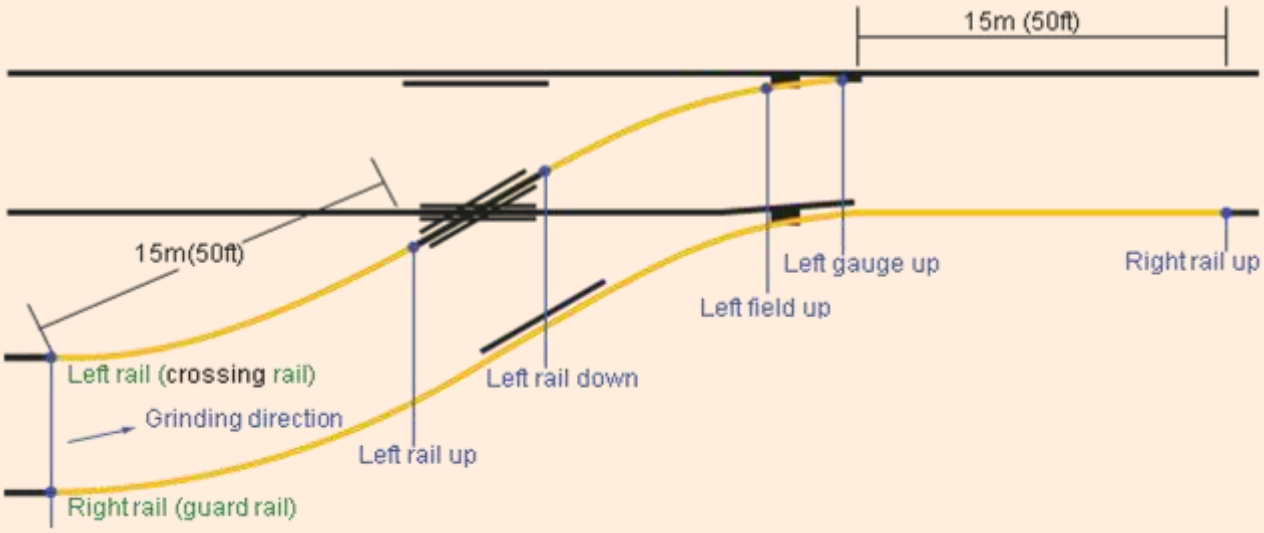
a. Trailing Point Movement: Complete Switch (Turn Out)



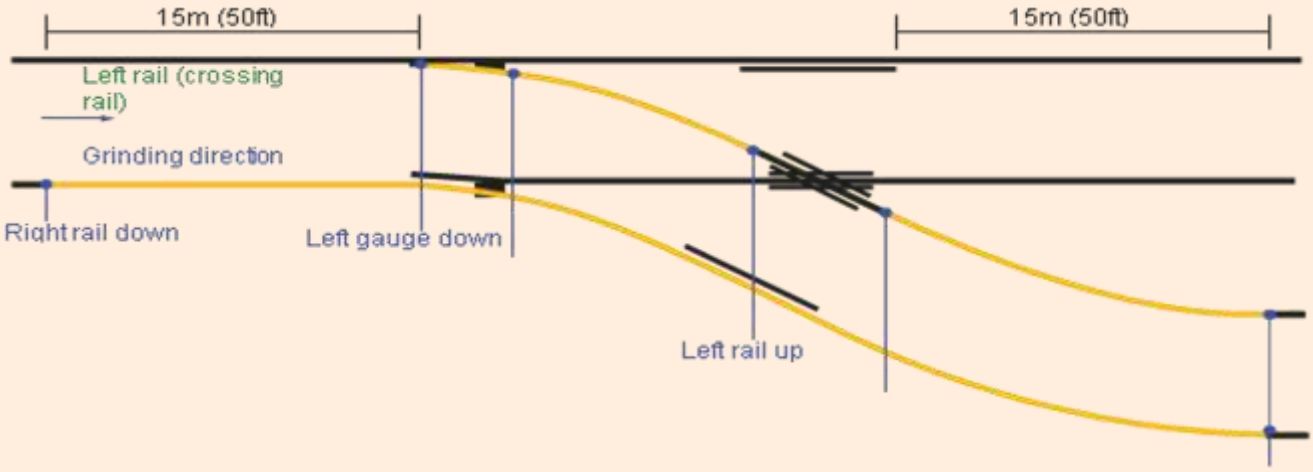
b. Facing Point Movement: Complete Switch (Main)



c. Facing Point Movement: Complete Switch (Turn Out)

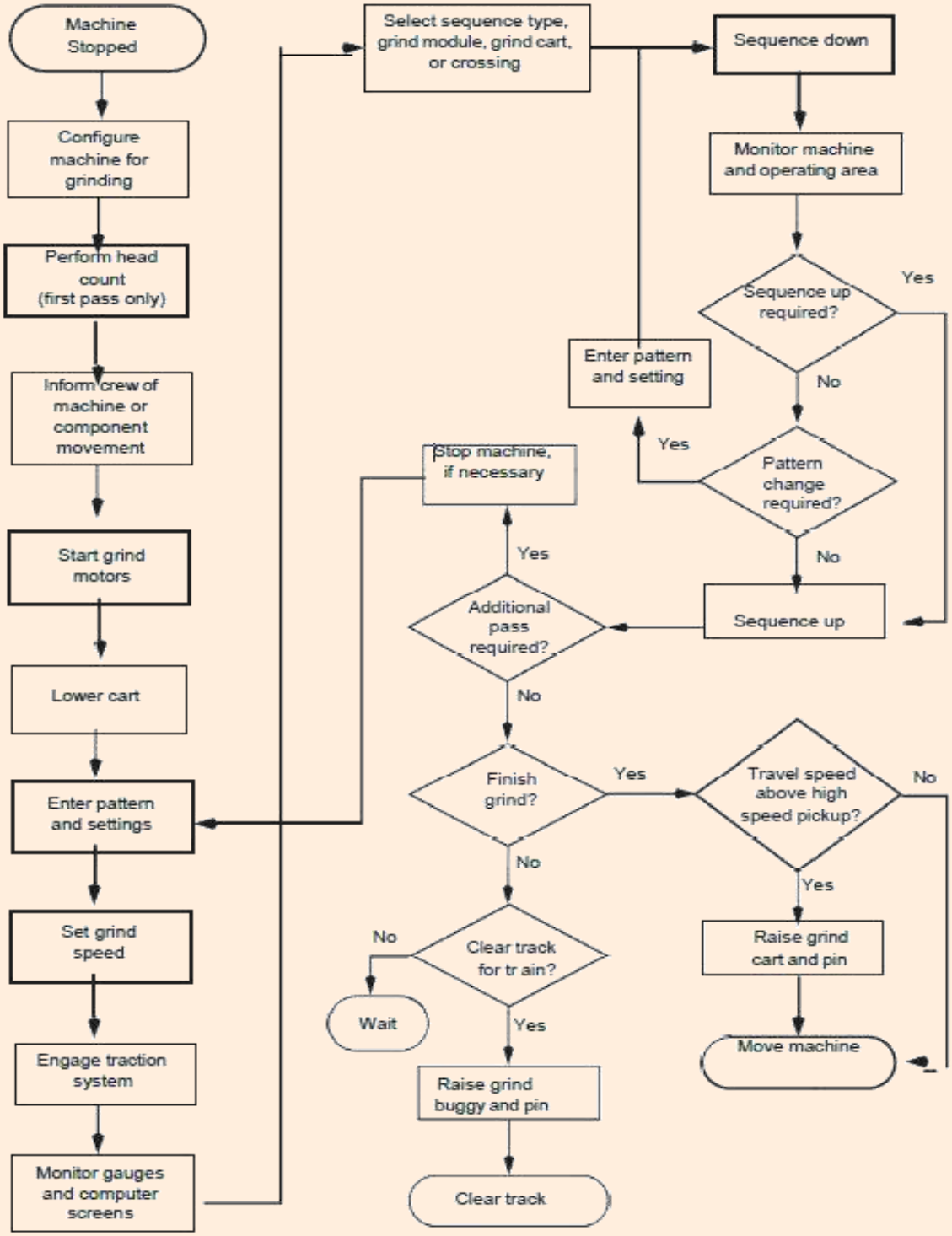


d. Trailing Point Movement: Complete Switch (Main)



Flow Chart of Grinding Sequence

The flowchart provides an overview of the grinding process



Recent events at IRTMTC

Vindication of Track Machine Magazine (24th Edition) by Sh. S. C. Jain (Principal Chief Engineer, NCR) on 27.09.2023

Inspection of IRTMTC by Sh. S. C. Jain (Principal Chief Engineer, NCR) on 27.09.2023

Plantation at IRTMTC by Sh. Gaurav Verma (Chief Engineer/TM, NCR)

Plantation at IRTMTC in presence of Sh. Sanjay Asthana (Principal, IRTMTC)

Sports awards given to the winners by Principal, IRTMTC

Trainees competing in Cricket and Volleyball game at IRTMTC

Motivation to participants on annual sports day by Principal, IRTMTC

Winnings team posing for winner's photoshoot

Morning Yoga Session at IRTMTC

Saraswati Puja at IRTMTC

BCM tour of Initial JEs

Diwali Diya lighting at IRTMTC

Volleyball Winning team receiving award from Sh. Sanjay Asthana (Principal, IRTMTC)

Overall, Winner in Sports Event at IRTMTC

Best Performers at IRTMTC

1 2 3

Initial JE, CE-26, From 04.09.23 - 02.03.24

Hemanti Mukherjee, ER

Ambar Mukherjee, ER

Vipin Kumar, ER

Initial JE, CE-26, From 14.08.23 – 10.02.24

Abhishek Mukherjee, ER

Ashu Smit Anand, ER

Manish Kumar, ER

Initial JE, CE-26, From 03.07.23 – 30.12.23

Priya Upadhaya, NFR

Janhvi Priya, ECR

Ashwariya Jain, NFR

Old Administrative Building

New Administrative Building

AI enabled IP cameras Surveillance in campus

Smart classrooms with Digital Boards

Modern Computer lab facility

Inhouse Simulator of Track Machine

Modern Simulator room at IRTMTC

Over 1500 Books in Libarary to feed the apetite of your brain.

Yoga Sessions to keep you healthy, wealthy and wise.

Gym and Sports facilities to make you flexible and stronger.

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"We at IRTMTC, Prayagraj impart best technical training to the Railway Professionals which helps them to keep the track machines operational and maintain over 68000 route kms of Indian Railway tracks giving you safe and comfortable ride."

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