Indigenization of Track Tamping Machines for Indian Railway

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Abstract: This paper gives a diagram of significance and advancement of automation of Indian railroad track support and different kinds of packing machines with their particular capacities which are utilized by Indian rail route for track upkeep. Railroad, being more secure and conservative, has been a favored mode for transportation of travelers and products. For long, the support of tracks were done physically, which was man power riched and tedious as well as had other specialist impediments of trouble in dealing with heavier track structure, constrained work window because of higher recurrence of trains, wellbeing of track upkeep faculty, and unpredictable nature of yield among others. Toward the beginning of automation Indian railroad imported the rail packing machine from plasser and theurer which is an Austrian organization. It is the main organization on the planet that gives a scope of packing machines for support of railroad tracks. At first the attention was solely on machines for track laying, track upkeep and estimating work. During the 1990s the range was reached out to incorporate machines for the establishment and support of overhead lines. From most recent couple of years Indian railroad is chipping away at indigenization of packing machines. For making indigenous machines railroad utilize figuring out system based on sort of the rail line track (straight track, Curved track and point and intersection track) the packing machine is fabricated.

Keywords: Mechanization, Tamping Machine, Overhead lines, Installation, Indigenization, Reverse Engineering.

I. INTRODUCTION

The track of railway which is also called permanent way consists of rails fasteners sleepers and ballast plus under laying sub grade. The main functions of permanent way and track foundation is to direct the flanged wheel and transfer of loads from rail wheels to the bed capable of sustaining cyclic loading. A Tamping machine is outfitted with in any event two Tamping unit with it. The pressing In incredible condition if loading loads from rail wheels to the bed capable of sustaining cyclic track foundation is to direct the flanged wheel and transfer of loads from rail wheels to the bed capable of sustaining cyclic loading. A Tamping machine is outfitted with in any event two Tamping unit with it. The pressing In incredible condition if loading loads from rail wheels to the bed capable of sustaining cyclic track foundation is to direct the flanged wheel and transfer of loads from rail wheels to the bed capable of sustaining cyclic loading. 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D. Manual maintenance is not needed now a day because of the heavy weight of the concrete sleeper and heavy welded rails.

E. Manual maintenance of railway track takes too much time which causes restriction of speed for long period of time till the track is renewed after maintenance.

F. Automation of track support on Indian Railways after 1960s with import of on-track alters by Swiss organization Matisa, which used to pack each sleeper in turn. In 1965 Austian organization plasser and theurer began selling packing machine to Indian railroad and in February 1968, the first track support machine fabricated in quite a while by M/s Plasser and Theurer was given to Indian Railways. Over a period, number of machines have been sourced from world over and sent on Indian Railway, of which a huge extent has been provided by M/s Plasser India.[3]

IV. BASIC TAMPING PROCESS

Tamping is a process for correcting the track geometry or maintaining the correct track position by packing of the ballast under the sleepers and the machine which is used to accomplish this process is known as Tamping Machine. Therefore A Tamping Machine performs following three functions:

i. Correction of Alignment
ii. Correction of longitudinal and cross levels, and
iii. Packing under the sleepers

VI. MAIN ASSEMBLIES OF TAMPING MACHINES

(a) ENGINE:
The main source of power is the diesel engine. An engine covert chemical energy of the fuel into mechanical energy which can be used further used for working of the machine

(b) TAMPING UNITS:
A Tamping machine is furnished with at least two Tamping unit with it. The packing unit are cinched on the machine outline through vertical guide segment. In some packing machines, the packing units are fitted to the satellite casing. Indian railroad can pack one/two/three/four sleepers one after another relying on kind of the packing machine. The apparatuses are masterminded two by two and every one of the different sides of sleeper is packed by four such pairs. The units are hung on flat guide sections so as to slide sideways, which permit their programmed focusing over the rails in bends. Vibration of hardware is acquired by cylinder bars turned on unpredictable shaft driven by pressure driven engines. A layout of tamping unit is shown. The lifting and lowering of tamping units is obtained by means of a hydraulic tamping units lifting/lowering cylinder. The insertion depth of tamping tools and squeezing pressure can be varied for different types of sleepers [4].
VII. TYPES OF TRACK TAMPPING MACHINES
Following are some important tamping machine on the basis of features models and capabilities on Indian Railways are as under.
(a) PLAIN TRACK TAMPPING MACHINES
Generally these types of machine are better for plain track tamping. Following are its types:
- 08-16 Unomatic
- 08-32 Duomatic (Plasser/Russian)
- 09-32 Continuous Action Tamping Machine (CSM)
(b) POINTS AND CROSSING TAMPPING MACHINE (UNIMAT)
This is primarily a points and crossing tamping machine. Following are its types:
- 08-275 Unimat
- 08-275-35 Unimat
(c) MULTI-PURPOSE TAMPPING MACHINE (MPT)
This machine is designed for spot attention on plain track as well as point and crossing. A critical multipurpose tamping machine is given below.

![Fig.1.6. – Multi-purpose tamping machine](image)

VIII. LITERATURE REVIEW
A brief review of current status of research work carried out by various investigators is given below.

Described about Review on 'Procurement and Utilization of Track Machines in Indian Railways'. This book on the basis of CAG report 2004 described about the load capacity of all passengers and goods train and on the basis of that it estimated the cost of maintenance of track and machine. Price of imported tamping machines and their running costs calculated. Track Machine Directorate at Railway Board and TMOs at zonal level are dedicated wings responsible for procurement and monitoring of utilization of track machines. Based on the findings of the review, following recommendations are made for implementation:
- Railway Board needs to ensure that the distribution of track machines is made after judicious assessment of the requirement of the Zonal Railways so as to avoid holding of track machines in excess of requirement.
- Railway Board needs to frame a comprehensive action plan for indigenous development of track machines in a time bound manner.
- Targets for various track maintenance activities need to be realistic and fixed after due assessment of the workload of Zonal Railways.
- Track machines available in the Zonal Railways need to be optimally utilized to minimize the extra expenditure and unnecessary consumption of scarce maintenance blocks. Effective measures need to be taken to minimize idling of machines.
- Monitoring mechanism needs to be strengthened to ensure timely disposal of condemned machines.

Indian Railways Institute of Civil Engineering [6]
Described about mechanization of Indian railway and the import of tamping machine from Austrian company. It briefly described about the tamping process, various tamping machine which are imported from the foreign company. It gives the detail of all tamping parameters and general assembly of tamping machine.

Following are the details of cost of various tamping machine which India purchases from Passer.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Machine Type</th>
<th>Indicative Cost(Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CSM</td>
<td>20.08 Cr</td>
</tr>
<tr>
<td>2.</td>
<td>UNIMAT-4S</td>
<td>27.28 Cr</td>
</tr>
<tr>
<td>3.</td>
<td>DTS</td>
<td>9.85 Cr</td>
</tr>
<tr>
<td>4.</td>
<td>DUO</td>
<td>7.00 Cr</td>
</tr>
<tr>
<td>5.</td>
<td>MPT</td>
<td>6.93 Cr</td>
</tr>
</tbody>
</table>

It also provided following Preparatory Works before Introduction of Tamping Machines for Plain Track and Turnouts:
- Pre-tamping works need to be carried out before undertaking tamping of track by heavy on-track tamping machines.
- Operations During Tamping
- Post -Tamping Operations

Research Design and Standards Organisation [7]
Enforces standardization and co-ordination among various railway systems.
- RDSO is the sole R&D association of Indian Railways and capacities as the specialized guide to Railway Board Zonal Railways and Production Units and plays out the accompanying significant capacities:
- Development of better than ever structures.
- Development, appropriation, retention of new innovation for use on Indian Railways.
- Development of benchmarks for materials and items extraordinarily required by Indian Railways.
- Technical examination, testing and giving consultancy administrations.
The Indian railway wants to reduce its dependence on manual maintenance.

Indian railway is opting for the latest technology to fix the same.

For the latest technology Indian Railway purchased track tamping machines from Austria based company Plasser & Theurer. Plasser & Theurer established its unit in India and which is called as Plasser India.
Following are the machines which Indian Railway purchased from Plasser India unit:
1. Continuous tamping machine (CSM)
2. Tamping express (09-3X)
3. Track relay trains
4. Ballast cleaning machine
5. Ballast regulating machine
6. UNIMAT
7. DTS machines.
8. MPT

X. RESULT AND DISCUSSION

From the conclusions of the literature review it is clear that Indian railway purchase all tamping machine unit from the Plasser India private Limited (Foreign ownership).

Since the purchased tamping machines are very much costly Due to German standard technologies and monopoly of Plasser & Theurer in tamping machine market in maximum countries of the world. Therefore India started working on Indigenization of Tamping machines to reduce the cost of tamping machine.

Till now Indian railway has indigenized following tamping machine:

- Continuous tamping Machine (CSM)
- Tamping Machine - DUOMATIC
- Tamping Express (09-3X)
- Point And Crossing Tamping Machine (UNIMAT)

Table 2. Cost analysis of tamping units.

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Name of the machine</th>
<th>Purchased machine cost</th>
<th>Indigenized machine cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Continuous tamping Machine (CSM)</td>
<td>350 lakh</td>
<td>24 lakh</td>
</tr>
<tr>
<td>2</td>
<td>Point And Crossing Tamping Machine</td>
<td>300 lakh</td>
<td>22 lakh</td>
</tr>
<tr>
<td>3</td>
<td>Tamping express</td>
<td>550 lakh</td>
<td>40 lakh</td>
</tr>
</tbody>
</table>

XI. CONCLUSION


This would be a great achievement and will create a way to promote make In India programme.

REFERENCES

3. www.plasserindia.com
4. www.plassertheurer.com

AUTHORS PROFILE

Manas Pandey, completed degree from APJ Abdul Kalam Technical University Lucknow, Uttar Pradesh in Mechanical Engineering. Presently pursuing M.E. in Manufacturing Technology at NITTTR, Chandigarh India. Key areas of research interest includes Engineering design, CAD/CAM and RPT/RE.

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