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Case Study on Cost Analysis of Anti-Corrosive Painting & Greasing for Railway tracks

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Abstract

This paper aimed to study the root cause for the most common corrosions of rails and cost analysis of preventive measures of the corrosion of Indian Railways. The study includes classification of rails corrosions, periodicity of measuring the corrosion levels, current methods of prevention of corrosion in the rails, along with a case study conducted in the area of Ghatkesar Railway station in Telangana which is located in Ghatkesar, Rangareddy district of telangana state.

Keywords: Corrosion, Gauge and non-gauge phase, linear seats, , anti-corrosive painting, greasing

1. Introduction

Indian Railways is one of the world's largest railway networks comprising 117,996km of track over a route of 66,030km, with 8.101 billion passengers annually or more than 22 million passengers a day and 1.107 billion tons of freight in the year from 7,137 stations throughout the length of the country. Large funds are released by the ministry of railways annually in the railway budget for the up gradation and maintenance of the Railway Track system due to its successful role as the prime carrier of goods and passengers in the country.

The railway track maintenance should be checked regularly in order to enable the safety of trains such that they could move at the highest permissible speeds, also providing the passengers a reasonable level of comfort during the ride. One of the significant aspects of railway track maintenance is the detection of corrosion of rails and the replacement of corroded rails. The corrosion in railway tracks is mainly caused due to the interaction of gases in the atmosphere and from the stuff, leaving the toilets of speeding trains, and also because of the improper maintenance of the track drainage system. The corrosion of rails reduces the expected life of rail nearly to its half life period, thus leading to the frequent replacement of rails, which causes huge economic loss to the Railways. The standard lengths of rails in India are 13mtrs and are joined by aluminothermic welding process. The main composition of rails is made of 0.7% Steel, 0.7% Carbon(C) and 1% Manganese (Mn), which are known as C-Mn Rail steel (or) popularly known as 90UTS rail or grade 880 rail based on the strength perspective (Ultimate tensile strength of 880 MPa or 90 Kg/mm^2).

To find out the different forms and severity of corrosion different types of experimental works are conducted on BZA-VSKP section during April 2004 and GDR-BZA during March 2006.The detailed study report is made based on different aspects like anti-corrosive paints, Greasing, Galvanization etc.[1].

Many experiments are conducted in an attempt to find out the effect of environmental corrosion on the commonly used pearlitic rail steel. From the studies it has been found that in a marine environment, both the yield strength and tensile strength decreases with increasing corrosion rate. In an acidic environment yield strength increased with increasing corrosion rate, although the tensile strength decreases with increasing corrosion rate [2],[3].

2. METHODOLOGY

A case study is done in the area of Ghatkesar Railway station in Telangana which is located in Ghatkesar, Rangareddy district on Secundrabad-Bibinagar line with 2 platforms and 4 tracks. The railway station is serviced by as many as 14 Intercity and MEMU trains daily, on average. The station, which is located at 477.14mtr above sea-level is classified into moderate corrosion prone area since it is located in a hot-humid climatic zone and with less volume of passenger traffic. The total study report is done for a stretch of 38Kms rail gauge track including all the 4 tracks considered for study.

- Date of study : 30-Nov-16
- Length of Railway Track Taken For Study : 4.75 Kms
- Total Stretch of Railway track : {4.75*2}*4 : 38 Kms
- Avg. Cost of Labor per day : 300.00/-
- Cost of rails for 13mtrs : 58,811
- Cost of both rails for one KM : (58811*1000*2)/13 : 90,47,846/-
- Cost for 4tracks for 4.75Km : 4*9047846 : 4,29,77,269/-
- Rail life of section for 90 UTS : 525/26 : 20 years
- Sleeper Density : M+8 : 13+8
- No. of Sleepers per KM : 1615
- No. of Sleepers for 4.5KM : 4.75*1615 : 7671

2. RESULTS

The general measures to prevent corrosion in rails are to ensure that the rail foot is away from stagnated water; maintenance of good drainage conditions; shifting of linear seat; Interchanging of gauge face to non-gauge; Galvanization of rail foot; Anti-corrosive paints in the initial laying and regular periods of intervals and greasing of the foot. Among all the methods suggested above painting of rails with anti corrosive paints and Greasing are the most prominent and economical ways to reduce corrosion and also to increase the life span of rails[4],[5],[6],[7],[8],[9]. Table 2 below gives the In-detail Study of anti-corrosive paints and greasing.

a. Anti -Corrosive Painting

Table 1: Calculation of Requirement of Anti-corrosive Paint

Requirement of Paint Volume / Painting Stage	***Initial painting [liters]***	***In-service painting [liters]***
Paint needed for gauge face	685	685
Paint needed for non-gauge face	700	700
Paint needed for bottom of rail	380	-
Paint needed for complete one KM of Rail	1765	1385
Paint needed for complete 4.75 Kms of Rail on both sides	16767.5	13157.5
Paint for 4 tracks	67070	52630

Table 2: Cost Calculation of Anti-Corrosive painting

Description	***Cost per Unit***	***No. of Units Required***		***Total Cost (In Rupees)***	
		Initial painting	***In-service painting***	***Initial painting***	***In-service painting***
Cost of Paint	250.00/- per liter	67070	52630	1,67,67,500.00/-	1,31,57,500.00/-
Labour cost	300.00/- per head	15	15	4,500.00/-	4,500.00/-
Labour cost for surface preparation	300.00/- per head	20	20	6,000.00/-	6,000.00/-
Total cost				16,778,000.00/-	1,31,68,000.00/-

b. Greasing

Table 3: Calculation of Requirement of Grease

Requirement of Grease / Greasing Stage	*No. of Units*	
	Initial greasing	***In-service greasing***
Grease required for gauge face	1615*4 = 6460 clips	1615*2=3230 clips
Grease required for non-gauge face		-
Grease required for complete one KM of Rail (for 12 clips 1Kg)	6460/12 = 538.5Kgs	3230/12 = 270 Kgs
Grease required for complete 4.75 Kms of Rail	2557 Kgs	1282.5 Kgs
Grease required for 4 tracks	10228 Kgs	5130 Kgs

Table 4: Cost Calculation of Greasing

Description	***Cost per Unit***	***No. of Units Required***		***Total Cost (In Rupees)***	
		Initial greasing	***In-service greasing***	***Initial greasing***	***In-service greasing***
Cost of Grease	97.00/- per liter	10228 Kgs	5130 Kgs	9,92,116.00/-	4,97,610.00/-
Labour cost (For 3 working days)	300.00/- per head/per day	20	15	18000.00/-	13500.00/-
Total cost				10,10,116.00/-	5,11,110.00/-

3. CONCLUSIONS:

The study report gives the details for different forms of corrosion in rails and preventive measures of corrosion based on their classification of severity. The report gives the cost analysis of most prominent and economical methods of preventive measures of corrosion (Anti corrosive-painting and Greasing) in the area of study conducted.

Table 5: Cost analysis data of maintenance of Ghatkesar railway station

Measure/Stage	***Initial stage***	***In-service stage***
Anti-corrosive paints	1,67,78,000.00/-	1,31,68,000.00/-
Greasing	10,10,116.00/-	5,11,110.00/-
Total cost	1,77,88,116.00/-	1,36,79,110.00/-

From the study report, it is clear that it takes nearly 1,36,79,110/- for the maintenance of rails for all the 4 tracks in Ghatkesar for every two years since it is classified under moderate corrosion area and the periodicity of the application of anti-corrosive paints and greasing is two years.

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