Review on Composite Plastic Sleepers in Railways

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ABSTRACT

As we are aware that the plastic disposal is a global problem and India is no exception since the country producing 1500 tonnes of plastic everyday and there is lack of landfills and proper treatment of those disposals. An approach to sustainable development is,the plastic should be used for multipurpose such as in plastic composite railway sleepers by replacing concrete sleepers as well as wooden sleepers. The Indianrailways are making a leap forward in expansion of new routes as well as in up gradation of the older routes and also, can play a major role in reducing plastic menace and the recycling of existing plastic landfills. So,it can be changed into a larger production of these sleepers so that serving the railways for more than seventy years can reduce the menace of plastic.

Keywords

Plastic Composite Sleepers[(1)], High Density Polyethylene (HDPE)

INTRODUCTION

Due to improper load distribution along the sleeper-ballast interface, irregular maintenance of sleepers affects the performance of the concrete sleepers as well as the whole railway installation. To increase the efficiency of the railway network and overcoming environmental threats by plastic disposal, usage of plastic composite sleepers is the best solution.By using composite sleepers, railroads can increase the profitability of their operations by reducing track maintenance costs, reducing downtime and improving performance. Composite sleepers have proven to be viable replacements for traditional wood sleepers and have accumulated over 1 billion gross short tons of high tonnage load in a Class 1 rail environment.

Composite sleepers are composed of HDPE which is impervious to insect and moisture damage, resistant to fungus, electrically non-conducive, resistant to chemical damage, and reduce vibration that can shorten the life span of other track material. Long after most comparable wood or concrete sleepers have been replaced, composite sleepers maintain their superior performance characteristics – up to 80 years, according to company estimates after extensive field-testing.

Figure 1. HDPE Composite Sleepers weighing around 60kgs

Table 1.Comparison Of Sleepers

Item	Type of Bridge Sleepers			
	Wooden	**Steel**	**Composite**	**Concrete**
Durability (Years)	8-10	15-20	40-50	35-40
Weight (kg)	100-171	110	50-60	285
Replacement of sleepers	Easy	Difficult	Easy	Difficult
Handling	Not so easy	Difficult	Easy	Difficult
Suitability for Track circuited area	Suitable	Problematic	Suitable	Problematic
Cost per Sleeper with fittings	Rs. 3500/	Rs. 9500/-	Rs. 19240/-	Rs. 7400/-
Life Cycle cost (Rs./Year)	402/-	575/-	385/-	211/-

Table 2.Cost per mile with installation, on a per cycle basis[(2)]

Replacement Cost	Initial Cost	Cycle 2 Cummulative Cost	Cycle 3 Cumulative Cost	Cycle 4 Cumulative Cost	Total Cumulative Cost
Wood	255000	510000	765000	1020000	1275000
Concrete	375000	750000	1125000	1500000	1875000
Composite	435000	435000	435000	435000	435000

CONCLUSIONS

1. Polymeric composites may a good alternative for current railway sleepers as they have properties such as corrosion and chemical resistance, environmental durability, and high specific strength.
2. They will create ecological benefits due to their recycleability, causing decrease of plastics in landfills, and reduction in forest degradation.
3. Composite sleepers are manufactured from recyclable materials and are 100%recyclable after production. Since composite sleepers incorporate readily available waste materials

in the manufacturing process, they have no harmful impact on theenvironment. Because composite sleepers are recyclable themselves, there are nodisposal issues[3].

4. Even though installation cost is high, serves double the period compared with other types of sleepers with very less maintenance cost.
5. Best suitable to use in the bridges since it reduces the dead load and in railway crossings due to the change in load from one track to another to overcome accidents.

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