ISSN(Online): 2581-7280
VIVA Institute of Technology
10th National Conference on Role of Engineers in Nation Building – 2022 (NCRENB-2022)

VIVA-TECH IJRI
ANNUAL RESEARCH JOURNAL
VIVA-TECH INTERNATIONAL JOURNAL FOR RESEARCH AND INNOVATION
ANNUAL RESEARCH JOURNAL
ISSN(ONLINE): 2581-7280

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***Abstract* :** *Railway sleepers are one of the most important elements of the railway track system. Although timber sleepers are still the most common, use of pre-stressed concrete and steel materials is also increasing. In addition, ties produced using recycled materials are of interest, recently. By recycling plastic waste, considerable amount of money can be kept from ending up in the landfills. Composite sleeper has become a great replacement of traditional sleepers (Timber, concrete, steel). There are also now various environmental concerns regarding the use and disposal of chemically-impregnated traditional sleepers. They are superior to timber & concrete sleeper in almost every respect. Use of composite sleepers not only reduces the land pollution from stray waste plastics but also ensure less destruction to the forests. As composite ties are strong, durable, and reliable, they require less maintenance and have longer life than common railroad ties. Therefore, they can be an excellent, cost-effective and long-term solution.If we use a pre-stressed concrete sleepers or steel sleepers then then initial setup cost as well as maintenance cost will be high. So, it is necessary to introduce such a sleeper which is economical and eco-friendly.*

Keywords – *Steps Towards Greener Tommorow.*

I. INTRODUCTION

INDIA, the consumption of Plastics will grow 15 million tons by 2015(Mumbai generates 7,500 metric tons Railway sleepers are the main structural elements of railway track. As well as pressure distribution and load transfer to the underlying layers, railway sleepers are in duty to maintain track gauge, grantee lateral stability of the track and contribute in better geometrical conditions of the track. Vertical, lateral and axial forces are applied to rail sleepers. Traditionally, sleepers (known as ties) are wooden. They can be softwood or hardwood. Sleepers are normally impregnated with preservative and, under good conditions, will last up to 25 years. They are easy to cut and drill and used to be cheap and plentiful.
Nowadays, they are becoming more expensive and other types of materials have appeared, notably concrete and steel. Steel sleepers have been around for a long time. There use is traditionally associate with light axle load lines in tropical zone, where timber sleepers may be subject to attack by termites. Rail track is currently installing around 6 lakh sleepers annually on its network, which totals 32,000 track- km. Concrete is the most popular of the new types. Concrete sleepers are much heavier than wooden ones, so they resist movement better. They work well under most conditions but there are some railways which have found that they do not perform well under the loads of heavy haul freight trains.

They offer less flexibility and are alleged to crack more easily under heavy loads with stiff ballast.

Recently, composite sleepers have come in the market. They are made of old tires and recycled plastic. They can be used and spiked like regular ties, cost about 50% less and save on trees. We should encourage the use of plastic in our country and rest of the world. Do not be puzzled, it is essential in the production of recycled plastic sleepers and other tools used for laying tracks by railway sector. Plastic used in our everyday life can be used to manufacture composite plastic sleeper provided we dispose the plastic in recycling bins rather than on lands or water bodies. Recycling plastics for manufacturing sleepers for railways is an effective way in overcoming the

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environmental issues related to plastics. Plastics sleepers are more durable and efficient when compared to the traditionally used sleepers made from wood and concrete. Plastics waste scenario in the world, of the various waste materials, plastics and municipal solid waste are great concern. A material that contains one or more organic polymers of large molecular weight, solid in its finished state and at some state while manufacturing or processing into finished articles, can be shaped by its flow, is called as 'Plastic'. Finding proper use for the disposed plastics waste is the need of the hour. Plasticsof waste everyday, of which nearly 9% is plastic waste) and is set to be the third largest consumer of plastics in the world. Around 55% is being used for packing. They are mostly dropped and left to litter the environment, after the contents have been consumed. The littered plastics, a non-biodegradable material, get mixed with domestic waste and make the disposal of municipal solid waste difficult. The municipal solid waste is either incinerated or land filled. Both disposal methods are not the best ways to dispose the waste and it causes both land and air pollution. Moreover, if municipal solid waste contains PVC waste, when burnt, it produces toxic gases like dioxins. Disposal of plastic wastes in an eco-friendly way is the main thrust area of Railway sleepers are one of the most important elements of the railway track system. Although timber sleepers are still the most common, use of pre-stressed concrete and steel materials is also increasing. In addition, ties produced using recycled materials are of interest, recently. By recycling plastic waste, considerable amount of money can be kept from ending up in the landfills. Composite sleeper has become a great replacement of traditional sleepers (Timber, concrete, steel). There are also now various environmental concerns regarding the use and disposal of chemically-impregnated traditional sleepers. They are superior to timber & concrete sleeper in almost every respect. Use of composite sleepers not only reduces the land pollution from stray waste plastics but also ensure less destruction to the forests. As composite ties are strong, durable, and reliable, they require less maintenance and have longer life than common railroad ties. Therefore, they can be an excellent, cost-effective and long-term solution.If we use a pre-stressed concrete sleepers or steel sleepers then then initial setup cost as well as maintenance cost will be high. So, it is necessary to introduce such a sleeper which is economical and eco-friendly.

II. METHODOLOGY

1. SOLIDWORKS is used to develop mechatronics systems from beginning to end. At the initial stage, the software is used for planning, visual ideation, modeling, feasibility assessment, prototyping, and project management. The software is then used for design and building of mechanical, electrical, and software elements.

2. LS-DYNA is a stimulation software which is developed by ANSYS. LS-DYNA is a general-purpose finite element program capable of simulating complex real world problems. It is used by the auto- mobile, aerospace, construction, military, manufacturing, and bioengineering industries Large deformations (for example the crumpling of sheet metal parts LS-DYNA's potential applications are numerous and can be tailored to many fields. In a given simulation, any of LS-DYNA's many features can be combined to model a wide range of physical e

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III. Literature Review

SR NO.	YEAR OF PUBLICATION	PUBLICATION	AUTHOR NAME	FINDINGS
1.	2010	Science Direct	A. Manalo, T. Aravinthan , W. Karunasena, A. Ticoalu	"A review of alternative materials for replacing existing timber sleepers". This paper presents a review of recent developments and presents an initiative focusing on fibre composites as an alternative material for railway sleepers.
2.	2015	Science Direct	Wahid Ferdous, Allan Manalo, Gerard Van Erp, Thiru Aravinthan, Sakdirat Kaewunruen, Alex Remennikov	"Composite railway sleepers – Recent developments, challenges and future prospects". This paper rigorously reviews the recent developments on composite sleepers and identifies the critical barriers to their widespread acceptance and applications.

IV. CONCLUSION

Primary goal of the project is to put forth the use of railway sleepers made from waste plastic and waste rubber in order to having introduced totally new and very effective type of railway sleepers. • The prototype of sleeper casted using waste plastic (of various types) and waste rubber proved to be safe and efficiently workable for the Indian Railways. As far as strength of composite sleeper is cerned, it is three times stronger than already used concrete sleepers by the Indian Railway. 44 • This composite sleeper proves to be efficient in the skidding

portion, where turns are present at the gradient of the railway tracks. • The totally recyclable property of this composite sleepers makes it highly usable also, the life span of the sleeper is very much extensive compared to the other various types of sleepers so, this composite sleeper is very effective in manner of performance durability and life span. Also, it helps in overcoming one of the biggest present-day environmental hazards caused. Due to the over increasing amount of waste plastic causing environmental and health hazards. Thus, by putting these polluting elements the fruitful use of casting these sleepers, the concept of "Greener Earth" can be achieved.

Railway sleepers are one of the most important elements of the railway track system. Although timber sleepers are still the most common, use of pre-stressed concrete and steel materials is also increasing. In addition, ties produced using recycled materials are of interest, recently. By recycling plastic waste, considerable amount of money can be kept from ending up in the landfills. Composite sleeper has become a great replacement of traditional sleepers (Timber, concrete, steel). There are also now various environmental concerns regarding the use and disposal of chemically-impregnated traditional sleepers. They are superior to timber & concrete sleeper in almost every respect. Use of composite sleepers not only reduces the land pollution from stray waste plastics but also ensure less destruction to the forests. As composite ties are strong, durable, and reliable, they require less maintenance and have longer life than common railroad ties. Therefore, they can be an excellent, cost-effective and long-term solution.If we use a pre-stressed concrete sleepers or steel sleepers then then initial setup cost as well as maintenance cost will be high. So, it is necessary to introduce such a sleeper which is economical and eco-friendly.

Acknowledgements

We are using this opportunity to express our gratitude to everyone who has supported us throughout the completion of this project. We are thankful for their guidance, constructive criticism and friendly advice, during the project work. We express our gratitude to Prof. Arthy Menon for giving us an opportunity to carry out project on "Analysing The Railway Sleepers Using Waste Material" .We would also like to thank Prof. Lissy Jose, Head of Civil Department and Dr. Arun Kumar, the Principal for their whole hearted support.

Lastly, we express our gratitude towards all those who directly or indirectly helped us in the completion of our studies.

REFERENCES

[1] Zakeri, J., & Rezvani, F. H. (2012). Failures of Railway Concrete Sleepers During Service Life. *International Journal of Construction Engineering and Management*, *1*(1), 1–5. https://doi.org/10.5923/j.ijcem.20120101.01

a. Ferdous, W., Manalo, A., Erp, G. Van, Aravinthan, T., Kaewunruen, S., & Remennikov,

[2] (2015). Composite railway sleepers – Recent developments , challenges and future prospects. *COMPOSITE STRUCTURE*, *134*, 158–168. https://doi.org/10.1016/j.compstruct.2015.08.058

[3] Chandure, P. P., Anuradhadeshmukh, P., & Shantini Bokil, P. (2017). INNOVATIVE TECHNOLOGIES OF NON-RECYCLABLE WASTE AS REPLACEMENT IN TRANSPORTATION ENGINEERING. *International Journal of Engineering Science Invention Research & Development*, *III*. www.ijesird.com,

[4] Hameed, A. S., & Shashikala, A. P. (2016). sleepers ☪. *Perspectives in Science*, *8*, 32– 35. https://doi.org/10.1016/j.pisc.2016.01.011

[5] Manalo, A. C., Maranan, G., & Erp, G. Van. (2014). *Evaluation of the physical and mechanic properties of a composite railway turnout sleeper*. *I*, 539–544.

[6] Manalo, A., Aravinthan, T., Karunasena, W., & Ticoalu, A. (2010). A review of alternative materials for replacing existing timber sleepers. *Composite Structures*, *92*(3), 603–611. https://doi.org/10.1016/j.compstruct.2009.08.046

[7] Ghorban, A. (2013). *Polymeric composite railway sleepers*. 9–11.

[8] Taherinezhad, J., Sofi, M., Mendis, P. A., & Ngo, T. (2013). *A Review of Behaviour of Prestressed Concrete Sleepers*. *13*(1), 1–1

[9] Pawluk, J., Cholewa, A., Kurdowski, W., & Derkowski, W. (n.d.). SOME PROBLEMS WITH PRESTRESSED CONCRETE SLEEPERS DURABILITY. In IJRET: International Journal of Research in Engineering and Technology. http://www.ijret.org

[10] Kaewunruen, S., Remennikov, A. M., Aikawa, A., & Sakai, H. (2000). FREE VIBRATIONS OF INTERSPERSED RAILWAY TRACK SYSTEMS IN THREE- DIMENSIONAL SPACE.

[11] Minoura, S., Watanabe, T., Sogabe, M., & Goto, K. (2017). Analytical Study on Loading Capacity of Prestressed Concrete Sleeper. Procedia Engineering, 199, 2482– 2487. https://doi.org/10.1016/j.proeng.2017.09.409

[12] Silva, I., De Oliveira, L., Correia, C., & Rafful, K. (2018). Recovery of Cracks in Concrete Railroad Sleepers: Procedure and Case Study. Procedia Structural Integrity, 11, 130–137. https://doi.org/10.1016/j.prostr.2018.11.018

[13] Academy, J. S. S., & Technical, O. F. (n.d.). Review on Composite Plastic Sleepers in Railways. 8(2626), 2626–2628.

[14] Raja, V., Chokkalingam, B., R, V. B. I., M, D. K., & Paulvinofer, B. (2017). FABRICATION AND HARDNESS

[15] Pawluk, J., Cholewa, A., Kurdowski, W., & Derkowski, W. (n.d.). SOME PROBLEMS WITH PRESTRESSED CONCRETE SLEEPERS DURABILITY. In IJRET: International Journal of Research in Engineering and Technology. http://www.ijret.org

[16] Kaewunruen, S., Remennikov, A. M., Aikawa, A., & Sakai, H. (2000). FREE VIBRATIONS OF INTERSPERSED RAILWAY

ISSN(Online): 2581-7280

TRACK SYSTEMS IN THREE- DIMENSIONAL SPACE.

[17] Minoura, S., Watanabe, T., Sogabe, M., & Goto, K. (2017). Analytical Study on Loading Capacity of Prestressed Concrete Sleeper. Procedia Engineering, 199, 2482– 2487. https://doi.org/10.1016/j.proeng.2017.09.409

[18] Silva, I., De Oliveira, L., Correia, C., & Rafful, K. (2018). Recovery of Cracks in Concrete Railroad Sleepers: Procedure and Case Study. Procedia Structural Integrity, 11, 130–137. https://doi.org/10.1016/j.prostr.2018.11.018

[19] Academy, J. S. S., & Technical, O. F. (n.d.). Review on Composite Plastic Sleepers in Railways. 8(2626), 2626–2628.