Smart Waste Management System for Indian Railways

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Abstract—*Throughout the years, Indian Railways, which is being one of the largest railway systems in the world suffers with a very major problem. A problem, over which no one has looked since decades and the problem has achieved its height from the time when plastics, Bisleri bottles, and chips packet were introduced in Railway. It is a problem of waste generated inside the running train and around the railway track, and so Indian Railway itself becomes one of the biggest garbage centers. Just think a while, what we do with the plastic bottles, chips packet, and eatable things that we purchased during the journey. What result comes after all this? We are actually polluting our environment. The area around the track in India (which is around 16000 km) has never been cleaned. So here is a technological system which can solve this problem, and even generate revenue from the same waste. A smart dustbin system being connected to each other is introduced in the compartments. Input waste is crushed at the inlet of dustbin by an automatic system and crushed and being collected in one place automatically. This will almost reduce such problem, and so, this is also considered as an effective Waste Management system as well as Fluent and Effortless Revenue system for Indian Railways.*

1. INTRODUCTION

Running train in Indian railways generates enough plastic and other waste. This is one leading problem Indian railway has faced for decades, since the time railway is being introduced and this problem has taken its peak when plastic bottles and polyethylene is introduced in railway. The bottled water industry in India witnessed a boom in the late 1990s, when Bisleri launched its packaged drinking water in the country. [1] Every day, approximately 6,289 tons of plastic waste finds its way onto India's railway tracks, according a report in 2009 by the Comptroller and Auditor General. [2] What we basically do while we journey along the railroad. We purchase drinking water, snacks like chip packets and then we throw it out of the train through the windowpane. Even if we won't cast it out and save the waste inside, then the sweeper while cleaning the train throws it out. Ultimately at all the ends the waste is being cast out of the train and scattered around the tracks. This problem day by day becoming strong and strong. No one looked over this problem for decades. So here we are introducing a smart waste management system which can help in reducing the problems. Our smart waste management system operates on the principal of management and recycling. It can also generate revenue from the same. It is actually an automatic system which manages all the plastic waste at one place and from there it can sell to plastic vendors for further recycling.

2. OBJECTIVE OF PROJECT

Indian Railways is one of the world's largest railway networks comprising 115,000 km (71,000 mi) of track over a route of 65,808 km (40,891 mi) and 7,112 stations. In 2014-15, IR carried 8.397 billion passengers annually or more than 23 million passengers a day. [3] Now we can imagine the amount of waste especially the plastic waste generated by Indian railway every day. So the main objective of this project is to develop a proper waste management system. This may reduce the problem of waste scattered around the tracks since the decades. Our main goal is to assist such problem by managing the waste. We all know the plastic bottles is purchased by vendors as it is further be used for recycling. So our waste management system can generate revenue too. There is a wide range of products made from recycled plastic, including polyethylene bin liners, carrier bags, flooring and window frames, building insulation board, video and compact disc cassette cases, fencing and garden furniture, water butts, garden sheds and composters and lot more. [4] The major objectives behind the system are to improve the sterility and sanitation of the atmosphere which helps making the Indian railways wholesome.

3. MATERIAL REQUIRED

- Metallic rolling Crusher
- DC motors(150 & 50 rpm)

- Aluminium Belt Drive
- Power Supply
- Carbon Steel and stainless steel.
- Spring system.

4. CONSTRUCTION

A smart dustbin will be kept in each compartment of train below the washbasin. The height of dustbin is 75cm and it will have two openings of different sizes i.e. 18 cm & 10 cm. An automatic metallic crusher is fitted beneath the bigger opening, just 25 cm above the base of the dustbin. To crush solid waste such as plastic bottle and plastic bags etc. Just below the dustbin there is a common passage to pass all the waste from the opening inlet of dustbin to the aluminum belt drive. Similarly, each compartment is connected to other via common conveyer belt which keeps on rotating at 50 rpm and carries all waste to the last compartment called as Rail bin. Electrical power utilized by the system will be either generated by solar and wind energy or by the train itself. This is a completely closed system and all activities are undergoing in a proper channel. All such bin is connected to same belt drive, which took all the waste at one place.
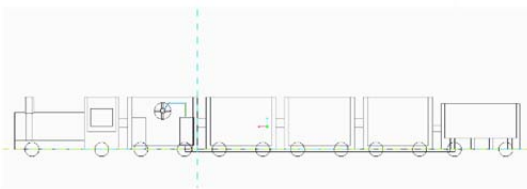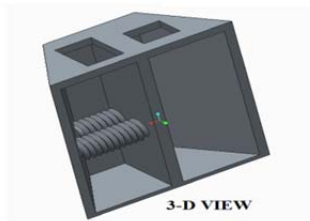

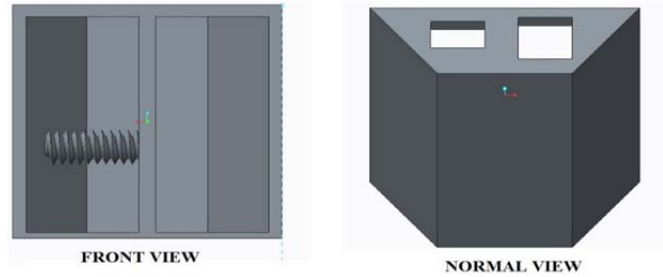**Fig. 1**

Fig. 2

Fig. 3

Fig. 4

5. WORKING

The working of this model is as simpler its construction. The first opening is only for plastics like bottles and packets. The second opening is for other wastes. As any person throws or put the plastic bottles or other plastic waste substance in the opening 1 of the dustbin which is just below the wash basin, the automatic operated helical crusher will start rotating after every 20 minutes for 3 minutes and cuts the plastic bottles into tiny granules. These tiny granules will get dropped to the channel which consists of a belt drive and Conveyer belt. All the waste is then transferred to last storage compartment. Same is happening in all the train compartments. And waste from all the compartments is collected at one place called Rail Bin through the rotating belt driven by the motors connected at two ends of the belt. Plastic waste then collected from there. A group of vendors must be assigned at some stations who can collect the waste from there and then plastic waste is send to plastic recycling industry.

The detail working is clearly shown in following flow chart.

Advantages
- Model is beneficent in reducing the plastic pollution.
- The waste can be further converted to clothes, paper.
- Plastic waste has a major application in construction of Roads.
- Flexibility provided by automation of 90% of the process which reduces the human efforts.
- Provides clean and pollution free environment.
- Improves beauty of Indian Railways.

6. CONCLUSION

Such kind of waste management system can solve the waste generation problem. This Solid waste management system is capable of reducing solid waste littering on the tracks and can generate revenue from the same. This will also benefit plastic recycling industries that need plastic at very low cost. This will also enhance plastic recycling business.

7. ACKNOWLEDGEMENT

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