

A Review on Semi-Automatic Track Cleaning Machine

Balasaheb Kasure¹, Rohit Sondulkar², Rohit Zagade³, Hatim Jalal⁴, Akash Chavan⁵

¹Professor, Dept. of Mechanical Engg., PCET's Nutan Maharashtra Inst. of Engg. and Tech., Pune, India

^{2,3,4,5}Student, Dept. of Mechanical Engg., PCET's Nutan Maharashtra Inst. of Engg. and Tech., Pune, India

Abstract: It is always regarded as a key for development intervention. Sanitation generally refers to the provision of facilities for disposal of human urine and feces. The Project deals with maintenance of hygienic conditions through services such as collection and disposal of solid and liquid waste. The deadly type diseases because of lack of sanitation like diarrhea, dysentery, typhoid, malaria, filariasis dengue and schistosomiasis are the outcome of improper or lack of sanitation. Indian Railways management systems has always in a possession which has made us proud as an Indian Railway zone. Indian Railways zone cover length and breadth of country through its rails. It has more the 1,14,500 km of total track and also 7083 stations. The system has come up as a fast growing and big profit making organization. It has Open defecation system through railways, unclean toilets, choked basins, litters in bogeys cleaning and along tracks are the causes that has been compelled the environmental engineers to put a thought over sanitation in railways. The study aim to bring the topic in a focus so as to create the health awareness that how important it is to maintain sanitation in all railway premises and how environmental pollution can be controlled through railways organization system. We are celebrating '2008' as International Year of Sanitation. Similarly one of the targets set for the millennium development goal (MDG) by the members of United Nations is to 'halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation'. The above view is to target, we can contribute our big share by achieving complete sanitation in railways which is one of the most important successful and largest organizations systems in of India.

Keywords: Semi-Automatic Track Cleaning Machine

1. Introduction

Indian Railways zone organization is among the various possession owned by our country that makes India and people of India proud all over the globe and also presently. Indian Railways has become topic of discussions and seminars in national and international management institutions and universities for its tremendous progress. Indian Railways zone organization operates the most extensive, most densely utilized train system in world. It covers about 104,000 km with 7083 stations. It carries 2.2 crore people and 2.5 million tons of goods daily. In short Indian Railways zone organization transport millions of people every day through its wide network of thousands of trains all over India. The despite all these efforts in a system, one thing which needs desperate and immediate

notice is 'sanitation in Indian Railway premises'. Indian Railways zone organization have taken various initiatives to launch Operation Cleanliness.

A. Sanitation in Indian railway

This is not only in case of metros but also in most remote countryside. The toilets in train are like small compartments with hole from which the human waste is disposed off openly on tracks. These toilets are fairly in constant use. The Indian railways zone system disposes of human excreta into open throughout the length and breadth of country through its toilets becoming the biggest mobile source of environmental pollution by transporting the various harmful, deadly disease causing micro organisms by spreading them on tracks, rivers, streams etc. Millions of chargeable rupees is spent on advertising and providing funds at villagers for construction of latrines so that open defecation can be prevented and ultimately environmental pollution can be stopped. However Indian Railways have not even put a pinch of concern or thought over decades for prevention of open defecation despite of the railway ministries old promise that sanitation in railways is their foremost responsibility. The other sources of garbage from pantry cars and tray loads of hot meals are also disposed off from the doors of bogeys and from small openings from the space between. The dustbins of inadequate capacity(less than 8 liters) at the end of each bogey gets quickly filled up and overflows, spilling the trash on the floor and further causing the trash to be littered on the floor In few trains, the rats also travel continuously as they get their food because of improper cleanliness in the compartment/bogey. The passengers have to protect their bags from the rats. The trains are cleaned up on particular stations however a big part of it blows on tracks, open spaces, rivers and streams and along the tracks causing spread of various microbes, earth polluting and water polluting matter all over the tracks and adjoining fields and water bodies. Mahatma Gandhi in his book "THIRD CLASS IN INDIAN RAILWAYS" written in 1917 revealed his experiences with the rail journey he took from Mumbai to Madras. In which, he had narrated about the cleanliness in railways. The result was that every time he walked on the floor or rather cut his way through the passengers seated on the floor, he has to wade through dirt. Today also the scenario has not changed much. The compartments are rather

clean at starting station but during the journey, some beggar fellows cleaning the compartment floor and begging for money can be seen. This gives a very poor show of humanity. Cleaning of floors is actually the responsibility of railway administration. Stations suffer from problems like drains blocked by with weeds, stagnating refuse and silt, poor drain design with no links to main drains and poor maintenance. Public toilets at stations are in a deplorable condition with water-logging, leaking roofs, broken taps and tiles, broken pipes and stagnating waste. Many of the passengers find the toilets virtually unusable.

B. Role of government

Railways organization have always considered sanitation as one of its major duties. Citizens Charter on Passenger Services of Indian Railways clearly has undertaken cleanliness as its commitment towards passengers. It states that "Every effort shall be made to keep railway premises clean and hygienic with provision of safaiwalas." But fulfillment of this commitment has never been satisfactory. The Some of the clauses from this chapter are given here for the information of the readers.

C. Sanitary arrangements in stations and colonies

For the sanitary arrangements in stations and colonies, the allocation of responsibilities of the Operating, Medical and Engineering departments are as laid down by the Administration and a copy of detailed instructions should be in the possession of the Assistant Engineer and concerned staff.

2. Objective

The main goal of this project is to design a machine both efficient and effective than previously used methods for Track cleaning and to reduce the labor cost by reducing the human involvement in the process. The objectives that had to be achieved in order to achieve the main goal were designing the basic model of the machine(structure), designing the Track cleaning mechanism, assembly of the whole machine by designing the parts needed. Calculating and designing the cad needed, analyzing data and categorizing them in order to design.

3. Problem definition

The main purpose of the project is to minimize the human effort with excellent machines with precision although the time required for the process is the same for manual as well as the machine but, if we use a machine instead of the person the person can do another job by this time. Also the efforts which are given by employee will be reduced.

4. Scope

The objective of this work is to develop a New Automatic operated Machine of Track cleaning .This concept allows us to achieve our goal as well as better space management. The new model takes into account all the real time conveying system and

provides solution over their short coming. The New model will get good efficiency compare to old method.

5. Literature review

Methodology for Design and Fabrication of Human Waste Disposal System for Indian Railway – A Review [1].

This paper presents the methodology for design and fabrication of human waste disposal system for Indian railway with the related search. The study specifies factors influencing the human waste disposal and recommends a number of design options for human waste disposal system for Indian railway. These are based on a systematic study of the human waste disposal system and testing of a prototype model of it. For which we consider literature reviews & some of them are explained. The main conclusion will be drawn find out whether it is possible to automate a human waste disposal process which would avoid passengers inconvenience and uncleanliness and unhygienic condition of railway stations. Also the future scope for developing the human waste disposal system for any type of railway coaches as simple as possible. Above survey has given us guideline to accomplish the objective project work.

Intelligent Track Cleaning Robot [2]

From the times of the British raj to this date, scavenging rail tracks has been a puzzling social issue. The fact that humans have to clean human waste and other garbage thrown on rail tracks is a situation that needs immediate remedy. Manual scavenging is done now-a -days, owing to the peculiar nature of the job, and many who are engaged for this job suffer from related health problems. The prevailing condition can be rectified to some extent by the adequate use of robotics and control technology. The proposed idea of automatic railway track cleaning system comprises an automatic vehicle that goes on land and track. This proposed intelligent machine specially designed for the Indian railways can clean the railway tracks in a systematic manner. It consists of a four-wheel running robot with a suction unit, cleaning unit, automatic displacement unit, an intelligent control system, an intelligent train sensing unit, and power unit. This device is the first of its kind proposed to be developed exclusively for the Indian Railways. Also, the railways can save a lot of money on water and labour charges. The application of this project in the current railway cleaning scenario will ensure that there will not be any nauseating scenes at railway stations across the country. We have accomplished some functionality critical in the waste clean-up in railway tracks, and have also tried to find solution for connected problems. The Intelligent Track Cleaning Robot provides an efficient cleaning process and promises dirt free railway tracks in the stations with minimal human interaction. The proposed application of robotics can also be utilized for cleaning in emergency interventions. Intelligent Track Cleaning Robot is a revolutionary new way to clean around switching points. Intelligent Track Cleaning Robot is a time-saver and dirt destroyer. Our proposed robotic application may serve in

scenarios where manual scavenging is unhealthy. The system can be displaced and operated by external support making it user-friendly. The robot is an efficient alternative for manual scavenging. Compared with the presently available systems, our robot saves on labour costs and time, as a single machine can do the work of multiple labourer in less time. It is eco-friendly as well. It maintains a log of cleaned and unclean area in the secondary storage. It can be made fully automatic. The main constraint in the development of a cleaning robot is the size, since without a minimal size it will not maintain its mobility. Intelligent Track Cleaning Robot can be worked only in a specified range along the station

To study of speed controlled railway track cleaning system [3]

Indian Railways was being roundly criticized for creating an environment hazard by discharging toilet waste on tracks. Indian Railway coaches have toilet system that has hole on the floor through which human faeces and urine is flushed directly on railway tracks. Various types of environment friendly Green toilets have put on outfields trials by Indian Railways to overcome this problem. Controlled Discharge Toilet System (CDTS), Bio-toilet developed by Indian Railways engineers and DRDO bio-technologist, development of Zero Discharge Toilet System (ZDTS) by IIT Kanpur and Research Development and Standards Organization (RDSO) Lucknow, are some efforts in this direction. These technologies are more expensive due to inherent complexities, disposal problem at yards (ZDTS) and requirement of extra infrastructure at the terminal. Speed Controlled Railway Track Cleaning system, is an automatic toilet waste collection and disposal system which can be extremely helpful in Indian Railways as well as heavy long-distance transport vehicles. This system can be fitted to the existing toilet compartment without modification as it functions in either directions of the movement of the train. This similar technology can also be adopted in buses and other heavy transport vehicles with a change being that this system will have to be operated upon manually. It is important for IR to focus on the issue of dealing with fecal matter on their system. Open discharge of fecal matter must stop. Current practices are outdated. Other country railway systems have advanced in this matter. There are lessons to be learned from other modes such as aircraft and ships. Passengers can use toilet when they want, even if the train is standing on the platform. We have seen that people travelling in heavy commercial vehicles have their journey of 15-30 hours faces the problem of toilets and therefore sometimes forced to go for open excretion. With a little modification in this prototype, similar technology can also be adopted in buses and other heavy transport vehicles with a change being that this system will have to be operated upon manually. Approach of this model might not solve the world's biggest open toilet problem (Indian Railways) but gives an option to make a clean and Hygienic environment especially on Railway platforms. This System can be easily applied to the existing toilet of the compartment without modification and it

functions in either directions of the movement of the train. A fundamental principle of waste management is to reduce/reuse the waste generated. IR is the single largest carrier of passengers in the country and hence generates a large amount of waste including plastic waste. Therefore this system will definitely use to keep our country clean and will save money to the government in longer use.

Automatic inspection trolley for railway track crack detection with track cleaning [4].

In railway system, railway track security is a prime concern. Some approaches have been implemented concerning the track breakage detection. From the starting of railway transportation to this date, scavenging rail tracks has been a puzzling social issue. In this, humans have to clean human waste and other garbage thrown on rail tracks is a situation that needs immediate remedy. This manual scavenging leads to health problems. In this paper we are proposing an idea to solve both the problems. For this an inspection trolley is used for detecting the railway track crack and cleaning the track path automatically in synchronise with the database of the train details. This system comprises of microcontroller, GSM modem, GPS module, Ultrasonic sensor, IR sensor to bring into operation the crack detection, and Vacuum cleaner to clean the track path. inspect and accuracy is high. It also cleans the track automatically so it reduces the manpower required to clean the wastes. Hygiene is maintained for passenger's health purpose.

Robot based mechanism cleaning between Railway track [5]

This paper aims to present a Robot Based mechanism for cleaning between the railway track. It is a cost efficient railway track cleaning machine which would prove to be a wonderful alternative to the current system in place if implanted. The proposal prototype is designed to overcome all the disadvantages of the current machine, and would help materialize the idea of super clean railway platform tracks across the nation. In this mechanism we used the vacuum technology for cleaning the track, in which all types of waste material like, human waste, empty plastic water bottles, waste paper etc. will be collected. This mechanism suits almost all climatic conditions. It can be attached to an existing compartment of train or to a separate engine. This compartment can be made standalone and can be engineered with extremely low cost communication techniques to work without any external engine.

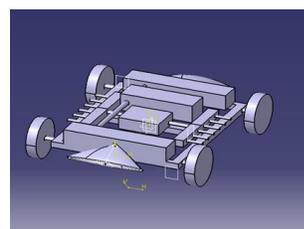


Fig. 1. 3D model

6. Conclusion

Semi-Automatic Track Cleaning Machine provides an efficient cleaning process and promises dirt free railway track in the stations with reduce human efforts. The proposed applications of machine can also be utilized for cleaning in emergency interventions. Intelligent track cleaning machine is revolutionary new way to clean around switching points. Its time saver and dirt destroyer. Our machine saves on labour cost and time. Its eco-friendly as well.

References

- [1] Indian Railway Annual report and Accounts (2006-07), Chapter: 2.
- [2] Report on the working group on Railway program for the eleventh five-year plan (2007 – 2012), Chapter: 4.
- [3] Indian Railways Works Manual, Govt. of India, Ministry of Railways (Railway Board), 2000.Chapter III.
- [4] Manoj Hedao, Suchita Hirde and Arshi Khan, "Sanitation in Indian Railway Premises: A Great Cause of Concern", International Journal of Advanced Engineering Technology, vol. 3, no. 1, pp. 50-55, March 2012.
- [5] Nguyen, and Thi Hoai An, "Management of organic solid waste from rail operation by the Vietnam railways: the current situation and possible solutions," in Journal of Vietnamese Environment, vol. 3, no. 1, pp. 34-37, 2012.
- [6] Sudhir Kumar, "Bio-toilets for Indian Railways", in Current Science, vol. 104, no. 3, February 2013.
- [7] Tejaswini Dilip Patil, Kaustubh Dilip Patil and Sunil M. Mahajan, "Efficient Use of Renewable Energy in Train and Railway Station," in International Journal of Innovative Technology and Exploring Engineering, vol. 3, no. 9, February 2014.
- [8] "Retention Tank Toilet System with Chemical Treatment", Issued by Research design and standards organization, Manak Nagar Lucknow–226011, Dated 11 Aug 2011.
- [9] "IR-DRDO Bio-toilets in passenger coaches", Issued by Govt. of India, Ministry of Railways, No.2009/Dev.Cell/ICCI/1 Vol. IV, Dated 24.12.2012.
- [10] "Compendium on IR-DRDO Bio-Toilets for Indian Railways", Issued by Govt. of India, Ministry of Railways, IRCAMTECH/2012/M/GWL/Bio-Toilets, April- 2013.