

ASSESSING THE IMPACT OF FAECAL SLUDGE OF TRAIN TOILET AT CHITTAGONG, BANGLADESH.

Md. Soumik Sikdar¹, Monishi Roy Tutul², ZarinTasnim Arpa³

Student, Department of Urban and Regional Planning, Chittagong University of Engineering & Technology (CUET), Chittagong-4349, Bangladesh

Muhammad Rashidul Hasan⁴

Assistant Professor, Department of Urban and Regional Planning, Chittagong University of Engineering & Technology (CUET), Chittagong-4349, Bangladesh.
email:mrhasan@gmail.com

ABSTRACT

Chittagong is the second largest city of Bangladesh. In the perspective of Bangladesh railway is one of the most important and cost effective transport system. Everyday around 20 trains depart from the station in different directions to different cities or within the city of the country. Thousands of people use this transport system to move from one place to another. As the traditional system of the train of our country is totally open defecation. This paper analyze the effect of the existing toilet system of trains in Chittagong. Relevant data was collected from the Chittagong railway authority and from the literature review. It is seen that the traditional toilet system (hopper toilet) is used in all of the train. This type of toilet is not environment friendly as it discharge sludge and urine directly on the rail tracks and pollute the surrounding environment components. It has a serious impact on the human health to the people. To reduce the environmental pollution different countries are already implement different alternative toilet system which have reduced the pollution in a good amount. In respect of Bangladesh considering the feasibility and applicability a different type of toilet system is proposed that can easily be complied with the existing traditional toilet system which will be ecofriendly and provide healthy sanitation.

Key words: faecal slug, train toilet, Chittagong.

INTRODUCTION

Railway is the major and proficient mode of transport in Bangladesh as it carries more and use less energy for transportation of passengers and goods (Ahsan et al., 2016), (Hassan & Iqbal, 2017). The railway carries 20% passengers among road, water and air transport of Bangladesh (Ahsan et al., 2016) and it provide transport service in the time emergency situation like flood, cyclone etc. (Uddin, 2017). Toilet facilities have been provided in almost all the passengers train in Bangladesh (Rahaman & Rahaman, 2009). As travel time of train journey is longer, this facility is an essential during the travel (Hassan & Iqbal, 2017). But quality of this toilet facility is not up to the mark in Bangladesh (Rahaman & Rahaman, 2009). In Bangladesh passenger trains usually used for disposal of waste of toilets are known as Drop Chute Toilets or HopperToilets(Vegad & Paruthi, 2017), (Hassan & Iqbal, 2017) and this toilet system directly drop dump toilet waste onto the railway track(RMT, 2015). The main problem related to this system is completely unhygienic and injurious for environment stability(Toilet-guru, 2016)as it discharge sludge and urine directly on the rail tracks and pollute the surrounding environment components(Gensch et al., 2018).

Restriction in contamination toilet waste or excreta in the ground or surface water is the major eligible criteria of sanitary latrine and it should not spread different environmental pollution of the soil, water and air which are reason for different health risk (Abed et al., n.d.). But hopper toilet does not maintain any of this criteria. To reduce the environmental pollution occurred due to use of hopper latrine system in passenger trains different alternative toilet system, which will reduce the pollution in a good amount, should be implemented. Also different measures for reduction of pollution of environment should be undertaken.

Chittagong is the second largest city of Bangladesh (Mia et al., 2015). Everyday around 20 trains depart from the station in different directions to different cities or within the city of the country (Railway, 2017). Thousands of people use this transport system to move from one place to another. As the traditional system of the train of our country is totally open defecation which is the reason of environmental pollution. This paper aims to analyze the effect of the existing toilet system of trains in Chittagong and in respect of Bangladesh proposing a different type of toilet system considering the feasibility and applicability that can easily be complied with the existing traditional toilet system, which will be ecofriendly and provide healthy sanitation.

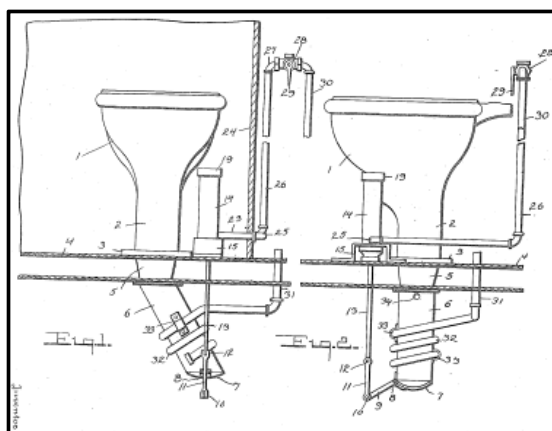


Figure 1 Hopper Toilet System

[Source: toilet-guru.com, 2016]

OBJECTIVES & METHODOLOGY OF THE STUDY

Objectives of the study are given below

- ✓ To investigate the present condition of the existing toilet of train in Bangladesh.
- ✓ To find out the generated waste from the trains depart from Chittagong railway station.
- ✓ To propose alternative toilet facility for trains.

Secondary data was collected to perform analysis for this study which all collected from the authority of Chittagong Railway Station. All the twenty trains in Chittagong Railway Station, that are reach or start, were selected to perform investigation on train toilet. Among the twenty trains, nine trains are intercity train daily that are reach or start in Chittagong and other eleven trains are local trains.

To conduct this analysis, passenger capacity was determined with the total number of compartment and capacity of the compartments for each train. The Journey time of each train was also considered as an important factor. After collection of the data, the data was interpreted and analyzed using Microsoft Excel Software. Alternative toilet was proposed based on literature review.

IMPACT OF HOPPER TOILET

Health Concerns

Germs of many water-borne diseases like diarrhea, cholera, typhoid, hepatitis and many others, are mainly contaminated with the human waste. Not only are that parasites like hookworm, tapeworm, roundworm and pinworm mainly spread through human waste. For a developing country like Bangladesh, depositing of human waste through hopper toilet in trains is very harmful for the human health, specially near the railway station where the poor people live in high-densely slums areas.

Environmental Concerns

Disposing the human waste in railway track by the train through its toilets, the environment is polluted very largely. Because it may contaminate various harmful and deadly micro-organisms which causes many diseases. The micro-organisms mix with the water of rivers, canals and streams and causes water pollution in many urban areas.

Reduction of life-time of the Railway Tracks

Because of open disposing of the human waste in railway tracks, the railway tracks are getting dirty and the life time of the tracks are decreasing. Specially in the urban areas near the railway station, deterioration of the railway tracks is seen mostly (Devwrat Vegad and Sunny Paruthi, 2017).

DATA COLLECTION AND INTERPRETATION

Survey Data Analysis of train:

Around 20 trains starts from Chittagong railway station goes to the different point of the country. From the appendix we can also find out the passenger capacity and the estimated time to their destination of trains. The data has been collected from the Chittagong railway station.

According to literature typically a person daily produce 1500 gm of excreta which has 300 gm of faeces and 1200 gm of urine (Dahi, 1996). Everyday around 12,309 person travel with train from Chittagong railway station in 20 trains. According to railway authority the trains which journey length is less than or within 50 km do not have the toilet facility. Within this criteria 5 trains do not have any kind of toilet facility. So the number of passengers of this 5 trains are excluded from this analysis.

$$\text{Total Amount of Discharge of faeces} = \text{Per hour discharge of faeces} * \text{Total Journey Hour} * \text{Total Passenger}$$

$$\text{Total Amount of Discharge of urine} = \text{Per hour discharge of urine} * \text{Total Journey Hour} * \text{Total Passenger}$$

$$\text{Total Amount of discharge} = \text{Total Amount of Discharge of faeces} + \text{Total Amount of Discharge of urine}$$

For example of the calculation of the discharge of the Sonar Bangla train is shown below: According to the schedule of the Bangladesh Railway Sonar Bangla train reach Dhaka from Chittagong within 5 hours and it has a capacity of containing 586 passengers in 14 compartment.

$$\begin{aligned} \text{Total Amount of Discharge of faeces} &= (300/24)*5*586=36625 \\ \text{Total Amount of Discharge of urine} &= (1200/24)*5*586= 146500 \\ \text{Total Amount of discharge} &= 36625+146500= 183125 \end{aligned}$$

All 15 trains with around 10,000 passengers generate approximately 1104850 gm of faeces and around 4419400 gm of urine, total amount of discharge is 5524250 gm which is around 5534.35 kg.

PROPOSED ALTERNATIVE TOILET FACILITY FOR TRAINS

Bio toilet:

Bio toilet is a solution of waste management problem which is eco-friendly through a bacterial composting process. It changes over human waste and all natural waste into clean reusable scent free water and bio Gas. Here the anaerobic procedure inactivates the pathogens in charge of water-borne maladies and treats the fecal issue without the utilization of an outer vitality source. The side-effects of the waste treatment process are without pathogen water, or, in other words cultivating, and bio-gas, which can be utilized for cooking. In bio tank, there are three or four chambers, right off the bat in chamber one the gigantic human squanders are broken by charged microbes states and after that the broken squanders and waste water goes two second and by same process it goes to last chamber where everything that remaining parts are water. Which can be release by outlet into rail tracks with not hurting the earth. Most extreme Indian railroads are currently utilizing it (Banka, 2017).



Figure 2 Bio Toilet System in Train

[Source: (Engineer, 2018)]

Vacuum toilet:

Vacuum toilets are flush toilets that utilize suction for the expulsion of dung and pee bringing about an insignificant prerequisite of water (0.5 to 1.5 liters). Vacuum toilets give indistinguishable level of solace from customary flush toilets and they help sparing expenses because of the limited measure of flush water. Vacuum toilets are particularly adjusted for the utilization in mix with discrete greywater and black water treatment; or high-impact assimilation treatment for biogas generation. Vacuum toilet systems are applicable both in large and small buildings, trains, ships and airplanes. (Stauffer, 2018)

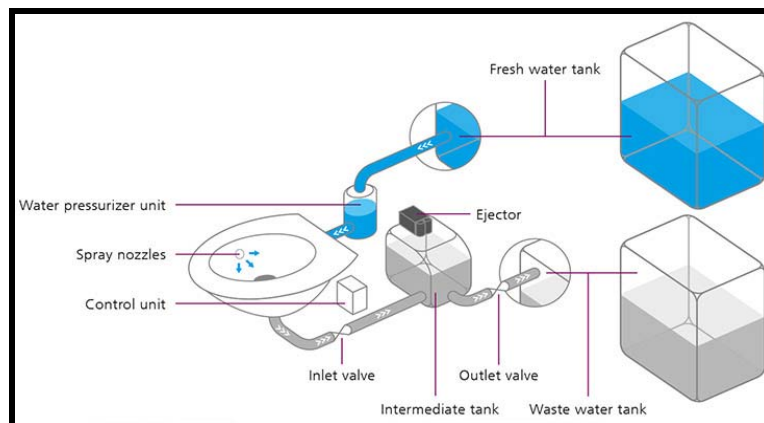


Figure 3 Vacuum Toilet System

[Source: (Aerospace, 2016)]

Composting Toilet:

Fertilizing the soil toilets utilize the common procedures of deterioration and vanishing to reuse human waste. Squander entering the toilets is more than 90% water, or, in other words brought back to the climate through the vent framework. The little measure of staying strong material is changed over to helpful treating soil by normal decay. The right harmony between oxygen, dampness, warmth and natural material is expected to guarantee a rich situation for the high-impact microscopic organisms that change the loss into preparing soil. This guarantees smell free task and finish decay of waste.

CONCLUSION

Solid waste management is very important due to various reason like environmental pollution, disease spreading & like so on. To reduce this loss we must have to take a major step by establishing environment friendly toilet system.

From the data interpretation we can easily find that a huge amount of waste is generated every day from the train as lot of passengers from all over the country journey on train for several hours. The existing hopper toilet system is not good for the environment and no solid waste management system is maintained. Considering the environmental degradation due to open defecation bio toilet can be a good solution for waste management generated from train toilet. Bio toilet is much better than other alternative like vacuum or composting. In composting toilet system the liquid part of the waste is without treatment which is harmful for environment. Though vacuum toilet is good for management but it is very much costly.

REFERENCES

- ABED, R., KABRA, R., LAND, A., & UGARTE, C. (n.d.). SAFE AND SANITARY LATRINES, 1–41. Retrieved from http://www.bmz.de/de/zentrales_downloadarchiv/Presse/emergency-sanitation-compendium.pdf
- Aerospace, Z. (2016, February 25). *evac-train.com*. Retrieved from <https://www.evac-train.com/products/vacuum-toilet-systems/evac-compact/>
- Ahsan, H. M., Rahman, F., & Hayder, T. (2016). Rail Connectivity Inbangladesh : Present and Future, (December), 21–23. <https://doi.org/10.1002/2013WR014374>
- Banka, S. (2017, 1). Bio-toilets: Transforming Indian Sanitation. Retrieved from Wash Funders: <http://washfunders.org/Blog/bio-toilets-transforming-indian-sanitation#sthash.7t6ogndn.dpuf>
- Devwrat Vegad, Sunny Paruthi. (2017). Sewage Disposal System for Trains: Current System and Future Prospects. *International Journal on Emerging Technologies*, 94-96.
- Dahi, E. (1996). *Environmental Engineering in Developing Countries*. Denmark.
- Engineer, R. (2018, March 29). The Better India. Retrieved from <https://www.thebetterindia.com/136058/indian-railways-bio-toilets-green-initiative/>
- Gensch, R., Jennings, A., Renggli, S., & Reymond, P. (2018). *Compendium of Sanitation Technologies in Emergencies*, 200. Retrieved from http://www.bmz.de/de/zentrales_downloadarchiv/Presse/emergency-sanitation-compendium.pdf
- Hassan, S., & Iqbal, K. M. (2017). Evaluation on the Impacts and Alternatives of Passenger Train Toilets in Bangladesh.
- Mia, A., Nasrin, S., Zhang, M., & Rasiah, R. (2015). Chittagong , Bangladesh, 48, 2015.

- Rahaman, K. R., & Rahaman, M. A. (2009). Service Quality Attributes Affecting the Satisfaction of Railway Passengers of Selective Route in Southwestern Part of Bangladesh. *Theoretical and Empirical Researches in Urban Management Number*, 4(12), 115–125. Retrieved from <http://www.jstor.org/stable/24872441>
- Railway, B. (2017). Chittagong Train Schedule.
- RMT. (2015). FIGHTING FOR JOBS AND SAFETY, 18(7).
- toilet-guru.com. (2016, 9 24). Toilets of the World: Train Toilets. Retrieved from toilet-guru.com: <http://toilet-guru.com/train.php>
- Uddin, M. K. (2017). Service quality of the Bangladesh Railway as perceived by the passengers Service Quality of the Bangladesh Railway The Bangladesh Railway (BR) is playing a vital role in the socioeconomic development and industrialization of the country . The BR has been, (October).
- Vegad, D., & Paruthi, S. (2017). Sewage Disposal System for Trains: Current System and Future Prospects, 8(1), 94–96.