Human Waste Disposal System in Railway

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Abstract— In recent decades railways are used normally the conventional toilets systems. Due to this major problems are produced because of human wastes are discharged on railway platform. By using modern toilet system all this problems are totally eliminated. Also overcome the drawbacks of bio toilet system. In this system the discharge of railway Toilet is control by using the speed of railway and it is operated fully automatically. The basic purpose of introductions human wastages disposal system in the railways to eliminate the practice of spillage of toilet waste on to railways stations area and in the polluted area city this system semi-automatic so there is no any man power is required. Indian railway coaches have toilet system at the either end of coach that has hole on the floor through which human feces and urine is flush directly on the railway tracks which may cause environment hazard and unclean toilet cause bad smell which makes people uncomfortable and spread various disease in order to minimize the problem this system is designed automation in locomotive toilet which open and close toilet ducts according to speed of railway.

Keywords: Human Wastage, Governor, Tank, Sliding Plate

I. INTRODUCTION

The aim of this project is to control the problems which are produced due to human wastes which are discharge on railway platform. Not only human but also protect the life of railway track due to corrosive losses. Now a day, the requirement of water as well as man power for washing and cleaning the railway platform are the major issues. Hence by using this system we overcome all this types of problems. In this system, when railway engine is coming at platform, the reservoirs of modern toilet system are coming under working by using the speed of railway shaft. and the human wastes are store in main reservoir till the train are stand on platform. When train leaves the railway platform at a certain distance from end of platform the human wastes discharge.[1]

Indian railways represented the pride of Indian. the Indian railways is an Indian state and owned operated by the government of Indian through the ministry of railways more than 40,000 coaches has to operate 1,60,000 toilet , on coaches speeding up 100km/ph .IR and DRDO jointly installed 5300 controlled discharge toilet system (CTDS) in 1900 coaches since 2011 but ended in failure . Though CTDS keeps the station clean but after the train reaches speed of 30kmph it discharges waste on the run which may splash on the under carriage bogie frame . Generally illustrate people of India who misusing this system by dropping dispersant bottles in CTDS causes failure in opening of discharge valve. [2]

In order to overcome this failure the blockage inside tanks can be eliminated by using governor operated discharge system. In these governors, the change in centrifugal forces of the rotating masses due to change in the speed of the engine is utilized for movement of the governor sleeves. The mechanical governor actuates according to the feed given to it by the shaft between two parallel wheels of boogies. As the speed from zero to thirty kmph (0-30) governor start to gain a centrifugal force due to its rotary motion, expanding the terms and lifting the sleeve along with the linkage lever .these governors are commonly used because of simplicity in operation.[3]

Types of Environment friendly toilets-

A. Bio Toilets

Bio digester is provided; effluent is discharged on track after bio degradation.

B. Vacuum Toilets

Direct transport from the toilets bowl to the tank added by vacuum creations in the tank and pipe line.

C. Zero Discharge Toilets System

Waste is collected at terminus ad proceed, solid and liquid separations is done in the tank itself. An action plan involving a multi-pronged strategy for development of green toilet was evolved in Jan 2010.it includes signing of memorandum of understanding with defense research and development and organization(DRDO) so that DRDO bio- technologists and Indian railway's mechanical engineers could work together to take care of problem faced during the trials. Human waste into harmless and odorless products. A joint working group consisting of IR engineers and DRDO biotechnologists for joint development of technology using DRDO bio-digester for toilet system on coaches of IR was formed in march 2010.f Varanasi bundhelkhand express on 18th January,2011 further ,14 toilets coaches based on the fourth design option have been inducted in service in the beginning of August'2011 integral coach factory (ICF) has also developed designs and prototype rake our design variants were introduced in service in Gwalior- ned out in September, 2011for service in guwahati-channai express. Five more rakes will be turned out by RCF Kapurthala by March '2012.ir is targeting total of than 500 green toilets in service by March '2012.43IR-DRDO prototype bio toilets have completed eight months of service. Their performance has been reviewed by the joint working group and based on encouraging results, instruction of about 2500more bio -toilets has been recommended. Several other efforts are also in hand in parallel. One such effort is development of a prototype train rake based on Zero Discharge Toilet System (ZDTS) developed by IT/Kanpur and Research Development and Organization (RDSO)/Lucknow. Another effort is provision of vacuum toilets in two rakes of Shatabdi express .ZDTS uses both recycling and evacuation & is at the second stage of prototype. These technologies are more expressive due to inherent complexities and envisaged in premium trains only.[4]

Indian Railways is also setting up a unit of Environment Friendly Toilets technology at Motibagh workshop at Nagpur in SEC Railway. As far as IR -DRDO bio-efforts are concerned, various organization have played

critical role in this Endeavour. Apart from DRDO Scientists Engineers from various Railways units viz. Rail coach Factory ,RDSO, North Central Railway, Integral Coach Factory, Northern Railway and Indian Railway centre for advance Maintenance Technology have made important toilets contributions and are continuing to do so.[3]

Indian Railways is striving to achieve the long term objectives of elimination of induction of new coaches with direct discharge toilets by the end of 12th Five Year Plan and covering of all Passenger coaches with Green toilets in little over 10 years by the end of 13th five year plan provided no significant setback is experience during the development and the induction process.[3]

II. WORKING PRINCIPLE

Spindle is rotated by using train shaft with the help of bevel gear. Centrifugal force acting on ball is to lift weight of sleeve. Lifting of sleeve is equal to plate displacement required. Due to sliding of plate the wastage material is fall down on leaving the platform

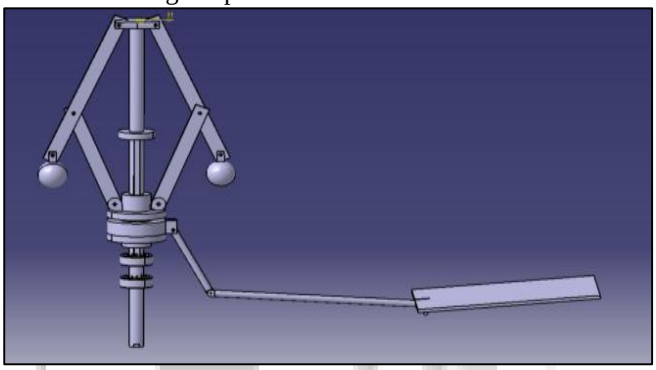

Fig. 1: Working of governor

III. DESIGN AND CALCULATION

Dimension of centrifugal governor

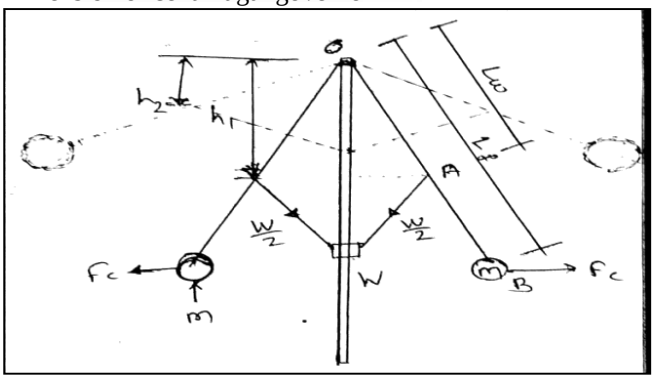

Fig. 2: Design of governor

oa =15cm , α=20 degree
h1 = (oa cos α)
h1 =15*cos20
h1 = 14.095 cm
Total lift = 10cm
Second height (h2) =h1- lift =14.095 – 10 =4.095mm
Minimum speed in rpm =
N Max =$\sqrt{895}$/h1 =63.49 rpm
N Min =$\sqrt{895}$/h2 =218 rpm
Operating speed =
It is the speed at which governor can hold total weight acting on the sleeve
Consider the highest speed of the governor =N2 =218 rpm
ω =2 Π N/60 =2*Π*218/60 =22.18 rad/sec
ω = 22.18 rad/sec

IV. CONCLUSION

From this we conclude that if this system is used free from waste and odorless railway station will obtained. People will feel comfortable while will waiting for railway at station.

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