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Design and Devlopment of controliing Overflow of Water in Railway Coaches

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Abstract: *Indian Railway is striving for providing better and comfortable service to the travelling public. Whenever a train starts its journey from particular station or originating stations, the water generally is used by the passengers for toilets and wash basins, it comes from the water line present in the original station. In Railway there is problem of overflowing of water. When the workers are filling water in the tanks there is wastage of water occurs. When the water tanks are filled totally then overflowing of water takes place and water is wasted because for filling the water there is 4 to 6 persons for whole railway (i.e.18 to 24 coaches). .It may see that only 2 seconds are required for opening of hydrant valve after fitment of pipe. Similar time is taken in closing of valve after filling up. Thus saving of time by having automation (through quick coupling) shall be only 12 seconds per coach 4 i.e. roughly 48 seconds in 4 coaches assuming one person is deployed for watering of 4 coaches. So focusing on problem that is overflow of water takes place during coach watering Suppose coach no 1 is filled and person is at coach no 10 , so he comes from coach no 10 to coach no. 1 that time the water is wasted. It is slightly impossible for worker to stop the flow, when the tank is sufficiently filled in 18 to 24 coaches of railways. The tremendous amount of water is wasted daily so it needs solution to save water.*

Keywords: *coach, railway CAMTECH, RDSO …*

1. INTRODUCTION

Indian Railways were firs. introduced to India in1853.On 16 April 1853, the first passenger train service was inaugurated between Bori Bunder in Bombay and Thane. By 1947, the year of India's independence, there were forty-two rail systems. In 1951 the systems were nationalized as one unit, becoming one of the largest networks in the world. This forty-two separate railway systems was decided to replace the existing networks by zones. The Indian Railway now has 17 Zonal Railways. Indian Railways is the fourth largest network in the world after US, Russia and China. It is world's largest Employers with more than million employees. Water availability in coaches is one of the most essential requirements, then how water is filled in coaches? How water is stored? Therefore CAMTECH and RDSO are important organization. Research and development is very important part of any organization. On IR Research and development is carried out by Research Design and Standards Organization (RDSO) . RDSO is also mandated to test and certify new technologies or innovations in train operation. CAMTECH is the centre in which the directorate of RDSO is engaged in standardizing and preparing maintenance handbooks, pamphlets, reports, videos, etc. On various subjects related to Railway Engineering for improving maintenance activities and efficiency. Water is generally used by passengers, this water is stored in tanks for storing water in tanks one system is present in IR that is "Coach Watering System" Coach watering system is facilitate watering of 24 coach train in about 5 minutes with minimum number of persons. With the use of quick watering system, a 24 coach train can be filled up within five minutes and multiple trains can be simultaneously watered at same time. Earlier the water in the coaches was filled with the help of 4" pipes. This earlier system is replaced with present coach or carriage watering system

2. LITERATURE REVIEW

S.C.Singhal /CAMTECH/M/C/2008/ COACH WATERING /OCT 2008 [1], a number of coach watering points were visited and observations were taken regarding time of filling up of coaches and water discharge rates etc. Some other alternatives were also explored such as running of water pipe throughout the length of the train with interconnecting hosepipe to facilitate filling up from one end of the train. Dr. Debasis Roy [2] Water level indicator and controller/vol2/march 2016, unnecessary wastage of water due to over flow in overhead tank .Automatic water level indicator and controller can provide a solution to this problem. The operation of water level controller works upon the fact that water conduct electricity due to the presence of mineral within it. So water can be used to open or close a circuit. As the water level rise or falls, different circuit in the controller send different signals this signals are used to switch on or switch of the motor pump as per our. Milind Rane [3] Water level indicator and controller/vol6/Nov 2017, a water level indicator may be defined as a system by which we can get the information of water level within the reservoir. Each and every time It might not be possible for the operator to keep an eye on the water filling process in the reservoir and immediately switch the motor OFF manually once the reservoir is completely filled.

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3. METHODOLGY

3.1. Problem Statement

Indian Railway is striving for providing better and comfortable service to the travelling public. Whenever a train starts its journey from particular station or originating stations, the water generally is used by the passengers for toilets and wash basins, it comes from the water line present in the original station. In Railway there is problem of overflowing of water. When the workers are filling water in the tanks there is wastage of water occurs. When the water tanks are filled totally then overflowing of water takes place and water is wasted because for filling the water there is 4 to 6 persons for whole railway (i.e.18 to 24 coaches). .It may see that only 2 seconds are required for opening of hydrant valve after fitment of pipe. Similar time is taken in closing of valve after filling up. Thus saving of time by having automation (through quick coupling) shall be only 12 seconds per coach 4 i.e. roughly 48 seconds in 4 coaches assuming one person is deployed for watering of 4 coaches. So focusing on problem that is overflow of water takes place during coach watering Suppose coach no 1 is filled and person is at coach no 10 , so he comes from coach no 10 to coach no. 1 that time the water is wasted. It is slightly impossible for worker to stop the flow, when the tank is sufficiently filled in 18 to 24 coaches of railways. The tremendous amount of water is wasted daily so it needs solution to save water

Coach watering system is facilitate watering of 24 coach train in about 5 minutes with minimum number of persons. With the use of quick watering system, a 24 coach train can be filled up within five minutes and multiple trains can be simultaneously watered at same time. Earlier the water in the coaches was filled with the help of 4" pipes. This earlier system is replaced with present coach or carriage watering system.

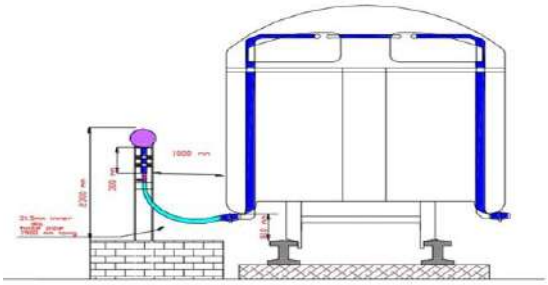

Figure: 3.1 Overhead Tanks

A number of coach watering points were visited and observations were taken regarding time of filling up of coaches and water discharge rates etc. Some other alternatives were also explored such as running of water pipe throughout the length of the train with interconnecting hosepipe to facilitate filling up from one end of the train. However, this alternative was not found practicable due to abnormally high time taken in filling whole train with single pipe of 2"-3" and also adding leakage points at the couplings at every coach. Another alternative of interconnecting all the 4 overhead tanks in a coach was also explored to reduce the water filling points by half as this will lead to filling up from one end only instead of present system requiring filling up from both the ends of the coaches. This requires lot of changes in existing arrangement of water piping in the coach including a running water pipe line thought the length of coach in under frame.

Some other problems in system like connection issues, leakages, etc. Water leakages are substantial in the present design of water filling. The only way to know that water filling has taken place is overflow from the other end.

In some situations, the staffs do not insert the hose pipe in the bracket provided at the hydrants, due to which pipe ends lie on the ground, sometimes lie in the drains, which make the water unhygienic.

In large number of coaches, water inlet pipes were found to be without end cover and sieve hence water leakage takes place.When multi trains are filled, the pressure drops and time required also more. Minimum 4 to 6 persons are required for completely watering a train but sometimes due to absenteeism or shortage of staff, they were doing very selective watering.

3.2 Objectives

The main objective is to eliminate limitations from existing Coach watering system and system make more effective.Modification and slight Automation in coach watering system that results in less wastage of water.

System can show the water level present in the tank before actual watering starts; hence it will reduce the work of connecting hose pipe for already completely filled tank.

By applying demonstration model of "Design and development of controlling overflow of water in Railway coaches", it will work more efficiently than before.

3.3 Flow Controlling

For this demonstration model the design and parts required to assemble the project let see different aspects and components regarding to the project. Flow control is a mechanism that regulates the flow or pressure of liquid. To be able to effectively manage flow control, flow control valves are used. The flow control of liquids is regulated as these respond to signals that are produced by independent devices like temperature gauges as well as flow meters. Flow control is an important aspect in process plants where there are many control loops that hold essential process variables like flow, pressure, temperature and level. With proper flow control the quality of the end product can be guaranteed and disturbances that could cause corrosion damage can be prevented.

There are many different types of flow control valves available for a variety of different uses. Flow control valves are used to regulate pressure and flow rate in their most basic form. However, there are different types of valves available such as ball, diaphragm, needle, butterfly, and plug valves. A basic flow control valve contains an opening that can be changed to increase or decrease the flow rate.

The ball valves contain an inner ball that is attached to a handle, that when turned, allows or stops the flow. Butterfly valves are similar but use a metal plate attached to the handle to open and close the aperture. Needle valves allow for more control over the system through the use of a needle to open or close the flow of fluid. Some of the many benefits that come from using flow control valves include the variety of materials that they can be made of (such as brass, carbon steel, stainless steel, and zinc).

Flow control valves offer manufacturers many options for simple and complex systems that adjust for pressure, temperature, and other flow variables.

Solenoid valve

Solenoid valves are used wherever fluid flow has to be controlled automatically. They are being used to an increasing degree in the most varied types of plants and equipment. The variety of different designs which are available enables a valve to be selected to specifically suit the application in question. Solenoid valves are used wherever fluid flow has to be controlled automatically. They are being used to an increasing degree in the most varied types of plants and equipment. The variety of different designs which are available enables a valve to be selected to specifically suit the application in question.

Figure: 3.2 Overhead Tanks

Figure : 3.1 Setup

4. CALCULATIONS

The calculations based on the standard coach watering system data. For demonstration model this calculation are considered to develop prototype model as it is to coach watering system. All the parts used in demonstration are considered as it can work effectively in actual coach watering sysytem also. This calculations are reference and standard for the demonstration model because this project will easily contribute to coach watering system with less changes and all material, parts can be used as it is in actual sysytem.

The main pipe of water in actual coach watering system

Diameter of pipe = 4 inch =101mm

Required discharge for filling up 24 coaches

Capacity of one water tank in coach = 450 lit

Total no of tanks 4 = 450×4 = 1800

Total capacity of tank in one coach = 1800 lit

Assume 24 coach train , water reqd to discharge = 1800×24
= 43250 lit

For 24 no of coach filling points per coach is '2'

Total no of filling points (approximate for one train)= 45

Water required at each point = 43250/45

= 960 lit .....(a)

Requirment of water to the extent of 60% of capacity in each coach= 1080 lit

= 1080×24/45

= 576 lit.....(b)

Available Discharge (pump or gravity) = 6600 lit/min

Discharge available at each point =6600/45= 147 lit/min

= 147 lit/min

Time for filling up water =water avaliable at each point / discharge available at each point

Case (a) =960/147 Case (b) = 576/147

=6.53min =3.91 min

In above cases this is time requires filling up water for one train, this two are certain conditions. 6.53 min for full capacity watering in coaches and 3.91 for some amount of water remaining in coaches

Mostly case (b) has been observed .i.e. 3.91 min time for one train, hence in standard coach watering system mentioned that watering of one train of 24 coach is less than 5 minutes and for two trains watered simultaneously in about 5 to 6 min time.

Time required to connecting the pipe and disconnecting the pipe to coach is= 2 sec

Total time for one coach assumed= 12 sec

For 4 coaches= 12×4=48 sec

1 person is deployed for 4 coaches(24 coaches .i.e. 6)

Total time for filling up water in one train

= 3.91 min+ 48 sec

= 234 sec + 48 sec

= 282 sec

= 4.7 minute

Total time required to filling up water for one train= 4.7 minute

Overflow calculations

Water wastage per tank= 50 lit

Water wastage per coach= 100 lit

Water wastage per train= 2400 lit (24 coach)

For example, In Kolhapur railway station, there are 31 trains are coming in a day approximately

Water wasted per day=31×2400= 74,400 lit

Water wasted per month= 74400×30= 22,32,000 lit

Water wasted yearly= 22,32,000×12= 26,784,000 lit

This are some rough calculations with respect to overflowing of water takes place during coach watering. This tremendous amount of water is wasted during coach watering in Indian railways. The main objective of project is to save wastage of water.

Because of this problem 'Demonstration Model' is prepared as it is like in coach watering system. Automation is provided to this model so that it stops the overflowing of water.

Calculation of Demonstration model

Two joined tanks has capacity= 100lit

Diameter of pipes= 1 inch

Overhead Domestic tank for filling up water= 500 lit

Time taken to fill 1lit of water= 5 sec

Available discharge at filling point=1/5 = 0.2 lit/sec

For filling 100 lit of tank =100/0.2×60=8.33 min

These are the simple calculation of demonstration model. When tank is filled in 8.33 min automatically the water supply stops and there is no wastage of water occurs.

5. RESULTS AND DISCUSSION

Water is one of the most important substances on earth. All plants and animals must have water to survive. If there was no water there would be no life on earth. the useable water available on the earth is less. So it is responsibility of all the people who lives on earth to save it. When water is filled in railway there is tremendous amount of water is wasted. For controlling this water this circuit is very useful. By using this circuit the flow is controlled automatically. It reduces the Human efforts and the wasted water. In the future, even more water will be needed. For our future we all will be tried to save the water. For railway we are prepared designs given below in the fig. In this fig the long GI pipe is Available on the platform. In that pipe there are sub pipes are at the distance of 2 m is fitted in this pipe actually water is filled on that pipes. We are fitted solenoid valve on this pipes and the circuit is fitted near it. Other circuit of water level indicator is fitted in the train and the floats are fitted on the tanks. When train comes to fill the water then the workers are going to Attach the pipe as well as the wire we provided at the bottom of the train. This wire is attached to the station circuit.which.is operating the solenoid valve. When the water is filled and tank is FULL then sensors gives signal to the circuit and the solenoid valve is stopped. So we can control the wastage of water. For this we prepare general modified layout for coach watering system

6. CONCLUSION

This project is solution for overflowing of water in this to indicate the water level in the reservoir or into the water tank that indicates different levels in an overhead tank. The connection runs to check the availability of water level in tank before it is filled by the workers.

Human efforts are reduced by using solenoid valve and the circuit arrangement. The wasted water is also controlled by using solenoid valve.

The system consume less power i.e.12V two supply is required only for running circuit and solenoid valve. The power required is less. The circuit is simple and it is more reliable. If the voltage is in the range then the life of circuit is good.

As we all know the water is the source of all life, in this project the tremendous amount of water is saved. This project is also used in homes, hotels, apartments, commercial complexes, drainages, industry's.

According to the present results, it is expected that the system is very useful for railway coaches. And the cost of this circuit is less so we can use this system for all coaches of trains.

6.1 Future Scope.

In this system if we do some modifications then the system is totally automatic. In this if we are using the wireless connection using iot (internet of things), Bluetooth, transmitters, receiver circuit then system is fully automatic. In this the we are connect mobile with this system and when tank is empty then the message is going to the next stations workers mobile and he need to fill only that tank which is empty.

Domestic purpose: this system is useful for domestic purpose also. In home when the water is filled in tank then some water is wasted when tank is filled then the overflowing of water takes place. In whole country there is huge amount of water is wasted daily. By using

this system we can save tremendous amount of water and save for our next generation. This system is also useful for industrial purposes and where the overflowing of water Take place. Various firms were searching for development of flexible pipe which can get automatically detached when water in all tanks of one train totally filled, thus saving time in closing of hydrants & detachment of flexible pipe.

Wireless communication: Wireless Communication is the fastest growing and most vibrant technological areas in the communication field. Wireless Communication is a method of transmitting information from one point to other, without using any connection like wires, cables or any physical medium. Generally, in a communication system, information is transmitted from transmitter to receivers that are placed over a limited distance. With the help of Wireless Communication, the transmitter and receiver can be placed anywhere between few meters to few thousand kilometres. Some of the commonly used Wireless Communication Systems are: Mobile Phones, GPS Receivers, Blu

REFERENCES

[1] S.C.Singhal/Centre for advanced maintenance technology (CAMTECH) reports no CAMTECH/M/C/2008/ coach watering /OCT 2008.

[2] Dr.Debasis Roy/Water level indicator and controller/IJETED/vol2/march 2016/ISSN 2249-6149.

[3] International research journal of engineering and technology (IRJET)e-ISSN:2395p-ISSN:2395- Water system for railways.

[4] Milind Rane / Water level indicator and controller/vol6/Nov 2017.

[5] Programmable Logical controller, Gary Dunning Cengage Learning 3rd Edition.

[6] "Mechatronics Source Book" N.C. Braga, Cengage Learning.

[7] "Mechatronics and Microprocessor''Ramachandra Willey India,(2009).

[8] "SCADA", Surat A Boyer, ISA Publication 4th Edition.

[9] "Automated Manufacture system ", S. Brain Morris, Tata McGraw Hill.

[10] Baccara water 2017 irrigation product catalogue.

[11] ASCO engineering information of solenoid valve.

[12] prof.F.B.Sigalo department of physics River state university/ Journal of Scientific and Engineering Research/The Mechanism of Thermal Stability of an Electronic Device (Diode)

[13] Susan Walsh Sanderson /Kenneth L. Simons /Light Emitting Diodes and the Lighting Revolution: The Emergence of a Solid-State Lighting Industry.

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