

Automatic Urinal Flushing Using Hydraulic System: Hygienic Toilets

Harikrishna Kumar M, Prasanth S, Prassanth A, Praveen Kumar M

Abstract : Achieving the hygienic environment on the urinals, we need expensive flushing system like sensor operated flushing system but it requires electrical energy for continuous operation. Most of the cases, labors are used for cleaning and flushing the urinal systems. We can't achieve minimum water consumption when using human power for flushing. Now-a-days sensor operated systems are used in public areas for minimum consumption of water. One of the major threats in sensor systems is that failure chance. When this system fails, there may be a higher chance of wastage of water. In most cases, people who uses urinals in public toilets fails to close the valves properly which leads to loss of water. We know that water is the life sign of any living organisms. So, conservation of water is crucial and it is our duty to preserve water for next generations. The problem in the oldest and latest systems was identified and can be reduced by implementing our project. Our project was designed such a way that our project doesn't need electrical energy for functioning and requires minimum water for every flushing.

Index Terms : Urinals, Flushing, Human power, Sensor system, Water consumption, Electrical energy consumption, Failure chance, Hydraulic system.

1. INTRODUCTION

EVERYDAY all do some common things, is the intake of food and water for living and along with excretion of waste. For effective disposal of waste, we need proper flushing system in the toilets. Unhygienic environment is very common public restrooms, which causes irritation to the users along with diseases Asthma, Nausea etc., On the other hands, you may feel uncomfortable that may be due to improper closing of faucet and unhygienic environments. If no one closes the faucet, the continuous leakage of water occurs for hours. Automatic flushing system embedded with sensors and microprocessors has been used in public urinals can avoid these problems. However, these automatic flushing systems need uninterrupted electrical energy which leads to high operating cost. Additionally, it is unsuitable for public toilets in bus station, train station etc. hence, this hydraulic operated urinal flushing system can be employed in any sort of public places which doesn't requires electrical energy for working. This device permits limited quantity of water for cleaning the urinals.

2 OBJECTIVES

The main objectives of this project are to provide

1. A fresh and hygienic environment
2. Minimal quantity of water for cleaning purpose.
3. A device which stops the loss of water.
4. A device which doesn't need the power source such as electrical power and man power for operation.
5. A device which stops airing of several illnesses because of unsanitary surroundings.

- Harikrishna Kumar M, Asst. Professor, Dept. of Mechanical Engineering, Kongu Engineering College, Erode, India.
E-mail: m.harikrishnakumar@gmail.com
- Prasanth S, Prassanth A and Praveen Kumar M, UG Student, Dept. of Mechanical Engineering, Kongu Engineering College, Erode, India.
E-mail: prasanth291998@gmail.com, aprassanth1999@gmail.com and praveenkumarmech17@gmail.com

3 METHODOLOGY

The automatic flushing device is proposed with the help of hydraulic system for the energizing and de-energizing of the valve with the assist of spring. The assemblage was done by metal joining process.

4 COMPONENTS AND ITS SPECIFICATIONS

The hydraulic operated urinal flushing device suggested in this paper, is constructed by the following list of components.

4.1 Overhead Tank

The Overhead tank supplies water to this flushing device which is placed at top of the frame. The amount of water stored in this tank depending on the time he takes and weight of the person who standing on it. It loads the water from the water line and supplies to the accumulator tank while using this system. This tanks made by bending of sheet metal. The specification of this tank is 200 mm x 200 mm x 200 mm.

4.2 Accumulator Tank

The accumulator tank is the secondary source for this device, which stores the water temporarily. Water stores in this tank used to be clean the urinal automatically. This tanks made by bending of sheet metal. The specification of this tank is 200 mm x 200 mm x 200 mm.

4.3 Ball Valve

The 1" valve is employed to regulate the stream of water from the elevated tank to the urinal sink. Two ball valves are actuated by mechanical linkage. the first valve (topmost) is in normally closed condition. The secondary valve (bottom-most) is in normally open condition. Gate valve used in this system which is made by brass material.

4.4 Urinal Sink

The urinals employed to accumulate the urine(liquid waste) from an individual who favours the standing position for urination This urinal made of ceramic material.

4.5 Foot Rest

The foot-rest provides the place for standing of an individual who needs to urinate. It is connected with the hydraulic cylinder such that the foot-rest would be pressed slightly downwards to control the valves. The motion developed

depends on the weight of the person.

4.6 Base

The base used to mount all the components used in this system. It withstands the forces acting on components which are mounted on it.

4.7 Hydraulic Cylinder

The hydraulic cylinder is linked to the underneath of foot-rest. when an individual get on to the device, the foot-rest gets urged downwards so as to operate the valves. The linkages are constructed by metal joining process. The stroke length and bore diameter of cylinder 1(bottom most) is 150 mm and 32 mm. The stroke length and bore diameter of cylinder 2(top most) is 100 mm and 20 mm.

4.8 Spring

Foot rest return to its original position after the person gets off from the device. This action can be accomplished by employing tension spring. Material of this spring is spring steel.

5 PROPOSED SYSTEM

Proposed urinal system was shown in Fig. 1. The base frame is constructed with the square tubes and channels by metal cutting and metal joining process. The prototype model has overhead and accumulator tank which is made up of GI sheets. Each tank has an opening port at its end. The outlet of these tanks is linked with lever operated ball valve and these two levers are connected with links which is paired to piston rod of hydraulic cylinder connected to base frame. At the bottom portion of frame, a master cylinder is placed and its piston rod is connected with floating foot rest held by spring base. The opening port of master cylinder is connected with opening port of activation cylinder with the help of flex hose.

6 WORKING PROCEDURE

The functioning of this hydraulic operated urinal flushing system can be specified in three phases:

6.1 Pro-active Phase

In pro-active phase, the foot-rest in its normal position. The ball valve at the top is in closed condition and ball valve at the bottom is in open condition. Here, the ball valve connected in between overhead tank and accumulated tank doesn't allow the water to fill the accumulated tank. The tension spring linked with hydraulic cylinders is in original position and is shown in Fig. 2.

Overviews:

1. Primary ball valve – closed condition
2. Secondary ball valve – open condition

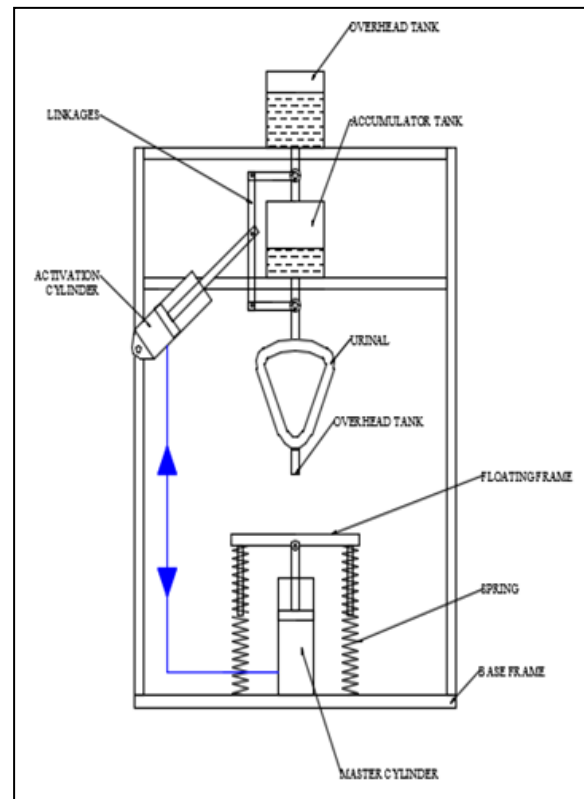


Fig. 1. Proposed System

6.2 Interactive Phase

Fig. 3. Shows the interactive phase. When the person places his feet on the foot-rest, energizing of master hydraulic cylinder (cylinder 1) and ball valves take place. Because of the load on the foot-rest, the hydraulic cylinder gets urged downward and it triggers both primary and secondary ball valve by activation hydraulic cylinder (cylinder 2) connected by means of flex hose. During actuation of ball valves, primary ball valve alters its state from normally close to open condition. Simultaneously, the secondary ball valve alters its state from normally open condition to close condition. This ball valve is to prevent the spillage of water. Due to the actuation of primary ball valve, water from main tank is allowed to store on accumulator tank and at the same time, actuation of secondary ball valve doesn't allow the water to flush the urinal until the person get off from the foot rest. The spring stays expanded during this phase of procedure.

Overviews:

1. Primary ball valve – opened condition
2. Secondary ball valve –closed condition

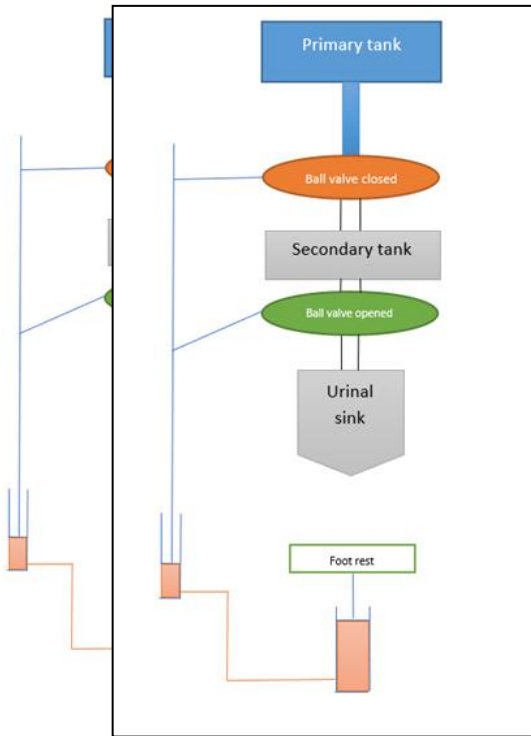


Fig. 2. Pro-active phase

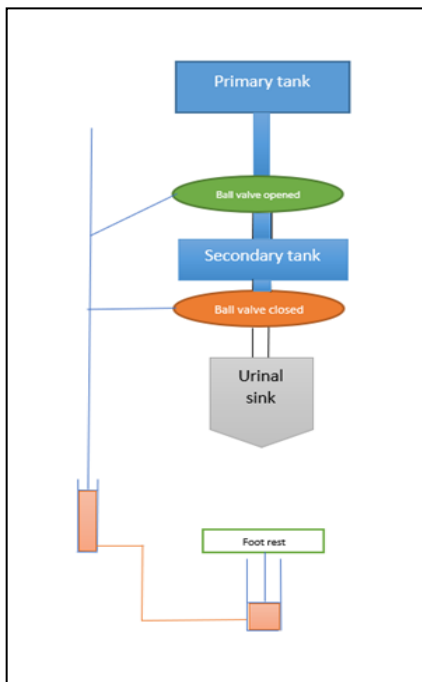


Fig. 3. Interactive phase

6.3 Post-active Phase

In the post-active phase of the procedure, the person gets off from the foot-rest after urinating. Because of spring tension, the foot-rest brings back to its original position so that the both hydraulic cylinders return to its initial position. With help of the lever, the primary ball valve gets closed and the secondary ball valve gets opened. This cause the flushing of the urinal by the water from the accumulator tank by the secondary ball valve.

The water supply to the accumulator tank from the overhead tank is halted as the primary ball valve gets closed.

Overviews:

1. Primary ball valve – closed condition
2. Secondary ball valve – open condition

Thus, water enters the urinal after the utilization of this system automatically. Water doesn't get wasted continuously in this urinal. Only limited quantity of water would be used to clean the urinal. Thus, water loss can greatly reduce by using this device. This hydraulic operated urinal flushing system is made with kinematic mechanism doesn't require for electrical power.

7 FABRICATED MODEL



Fig. 5. Front View of Fabrication Model

Fig. 5 and Fig. 6 shows the fabricated model of hydraulic urinal flushing system



Fig. 6. Side View of Fabrication Model

8 CONCLUSION

Water is that the global resource and every life depends in earth on clean and healthful water. It is our duty to protect water resources to the future generations. We have to contribute our part of duty to preserve water. This type of hydraulic operated flushing system would be employed to public places to provide fresh, hygienic environment.

REFERENCES

- [1] Ivan P George, Nikita Petkar.,2018. "Automatic Urinal Flushing System". International Journal Of trend in Research and Development, Volume 5(2).
- [2] Mohamed Aamir. M and Kamalanathan.P.,2015. "Automatic Urinal Flushing System". The International Journal of Science, Engineering and technology research (IJSETR), Volume 4.
- [3] S.B. Wath and published by Elsevier B.V. ,2015. "A Mechanical Automatic Urinal-Toilet Flusher for Swach Bharat Mission." International Conference on Solid Waste Management.
- [4] Akparibo Richard Awingot, Joyce Apanga., 2015. "Development of a hands-free urinal flushing

system".IJRET: International Journal of Research in Engineering and Technology.

- [5] Raja Kandivalasa, B. AvinashBen, G. Swamy Naidu. K.S. Raghu Ram., 2016. "Low Power Consumption Mech-Automatic Flush A mechatronic based water saver". International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT).
- [6] K. Hantarkul, P. Khoenkaw N. Tantitharanukul, K. Osathanunul, P. Pramokchon., 2016. "Design and Implementation of an Automatic Smart Urinal Flusher". 20th International Computer Science and Engineering Conference (ICSEC2016).
- [7] Cheng-Hung Tsai, Ying-Wen Bai, Ming-Bo Lin, Roger JiaRongJhang and Yen-Wen Lin., 2013." Design and Implementation of An Auto Flushing Device with Ultralow Standby Power ", International symposium on consumer electronics (ISCE), IEEE.
- [8] Parth M. Sarode., 2015. "Design and implementation of automatic flush system for sanitation in public toilets", International Journal of Researches in Biosciences, Agriculture and Technology, Vol. II, Issue (7).
- [9] R. S. Khurmi, J. K. Gupta, machine design, Eurasia Publishing House Pvt. Ltd., New Delhi, 2004, Page 820.
- [10] Raghied Mohammed Atta., 2013. "Purity sensor activated smart toilet flushing system" International Journal of Water Resources and Arid Environments, Vol .2(1).