Design and Fabrication of Semi-Automatic Commode Cleaner

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Abstract- *As the sanitation and cleanliness are two most important challenges being faced by our country, our project aims to address those issues. The topic of the project is "**Design and Fabrication of Semi-automatic commode cleaner**".The primary objective of our project is to fabricate a commode cleaner which will serve to clean different types of toilet wares and prevent manual cleaning of human excreta and dirty toilets. The device when operational shall be able to clean different types of commodes, wash basins and urinal pots.The device is supposed to save both time and water all while providing safer and cleaner alternative for cleaning the toilets. The training of janitors of our college have been undertaken to acquaint them with the device and their feedbacks and suggestions have been recorded for improvements.*

Keywords- cleaner, multipurpose, commode, flexible shaft, saves water.

I. INTRODUCTION

The Cleaning a toilet is a task that often gets postponed, but it's essential to keep toilets clean. A dirty toilet will look bad, smell bad and breed germs. However, as with many of life's pleasant tasks. 1000 children died per day from diarrhoeal diseases due to poor sanitation in 2013. These deaths are preventable.

Clean and safe toilets help keep more girls in school and increase attendance rates. Far too many girls miss out on education just because of lack of clean and safe toilets. A clean and safe toilet ensures health, dignity and well-being – yet 40% of the world's population does not have access to toilets. World Toilet Organization is a global non-profit organization committed to improving toilet and sanitation conditions worldwide. We believe in empowering individuals through education, training and building local marketplace opportunities to advocate for clean and safe sanitation facilities in their communities. World Toilet Organization is one of the organization whose sole focus is on toilets and sanitation. Breaking the silence on the sanitation crisis is at the heart of what we do.

Children aren't always the cleanest bunch, especially while using the restroom. Whether its inattentiveness or just plain laziness, the toilet seats tend to get the worst of it. Although it may prove difficult to keep school toilets clean all the time, it is necessary. Because of these frequent accidents, toilet seat sanitation is even more important and it's the schools responsibility to maintain a healthy restroom environment.

Good infection control starts with good hygiene. Organisms, especially viruses, can live on surfaces for hours and even days, so proper sanitation is vital for keeping student's healthy. A school can reap many benefits from keeping their toilet seats clean, which include:

- Fewer children missing school days because of sicknesses acquired by germs in restrooms and on toilet seats.
- Fewer illness for children especially diarrhoea, vomiting and respiratory illness.
- Fewer outbreaks of infectious disease.

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The infrastructure build-out in India is about modernizing highways, railways, telecom, ports, and power. But there is a very important and often overlooked element in the effort to create a better quality of life for citizens and

tourists alike: The creation of an urban sanitation infrastructure.

Eram Scientific, a Social Enterprise, has taken on the challenge of addressing public sanitation by developing a product that is portable, hygienically maintained, and eco-friendly. eToilet is India's First Electronic Public Toilet.
eToilet incorporates full cycle approach in sustainable sanitation by integrating convergence of electronics, mechanical, web-mobile technologies thereby controlling entry, usage, cleaning, exit, and remote monitoring capabilities with multiple revenue options.

The insertion of a coin opens the door of the eToilet for the user, switches on a light— thus saving energy—and even directs the person with audio commands. The toilets are programmed to flush 1.5 liters of water after 3 minutes of usage or 4.5 liters if usage is longer. It can also be programmed to clean the platform with a complete wash down after every 5 or 10 persons use the toilet.

II. PROBLEM STATEMENT

Cleanliness and maintenance of toilets should be checked daily to ensure its upkeep is being sustained. Schools may even want to include the students in the checking process so they can start to get an idea of what to look for themselves – make it a learning experience as well. Using cleaning products specifically designed for a particular job is extremely beneficial. For example: toilet bowl cleaner for the toilet bowl, toilet seat cleaner for the toilet seat, etc. Using a toxic cleaning product on the actual toilet seat could cause irritation and/or burns- not good.

Even when you have a proper cleaning regimen in place, deposits from previous users can still appear on the toilet seats causing a potential health hazard. Because of this, schools should put toilet seat covers in every bathroom so students can use them if necessary.

Toilet seat covers are made paper thin so they can be easily flushed, yet durable so they can effectively protect the user from the germs on the toilet seat. With toilet seat covers, you don't have to think about the person that sat before you.
It's easy, safe, and will benefit not only the students, but also the school as a whole. These covers, by no means, undermine the necessity of regular cleaning, and schools should still maintain their typical cleaning schedule. These covers will simply be an additional measure to fighting germs and to keeping students safe.

III. METHODOLOGY

For the Design and Fabrication of Semi-Automatic commode cleaner the following methodology was adopted: -

- Literature Review
- Calculations and design parameters
- Purchasing components
- Fabrication of parts
- Assembly of parts
- Testing
- Conclusion

IV. DESIGN PARAMETERS

TORQUE AVAILABLE

$$M_t = \frac{9.55*10^6*p}{n}$$

$$M_t = \frac{9.55*10^6*0.18}{10000}$$

$$M_t = 171.9N-MM$$

SHAFT DIAMETER

$$d = \sqrt[3]{\frac{16*M_t}{\pi\tau}}$$

Assume $\tau = 30mpa$

$$d = \sqrt[3]{\frac{16*171.9}{\pi*30}}$$

$$d = 4mm$$

CHECK FOR SHEAR STRESS INDUCED IN THE SHAFT

$$\tau = \frac{16M_t}{\pi*d^3} = \frac{16*171.9}{\lambda*4^3}$$

$\tau = 13.68MPA$ τ = 30mpa for flexible shaft

τ = *shear* stress in Mpa
n = speed in rpm
d = shaft diameter
Mt =torque in N-mm

V. CONCLUSIONS

Human habitats necessitates the need for toilets. Toilets are needed everywhere from schools to hospitals, from household to big stadium. In a country like India where population is very huge and rapidly growing sanitation is a major concern for all. open defection in our country the government of India has initiated a "clean Indian campaign" under which various sanitation programmes are being held and awareness is being spread regarding the use of toilets. More and more toilets are being built across the nation. The maintenance and cleanliness of toilets will be a major task. The prototypes developed for this project will make process of cleaning toilets an easier task.

The developed prototypes use commercially available motors and flexible shaft to fabricate a device which is user friendly and very effective in its work. The device can be used to clean all kinds of commodes wsh basin and urinal pots. The device also had a provision of solar powered batteries which

can be very useful in operating the device in remote areas where electricity is scarce.

The developed prototypes have been rigorously tested in our college feedback and suggestions of janitors were recorded to improve the device and add extra features leaving the door for future improvement in this device wide open.

This project is our humble contribution to the progress of our nation and realising the dream of clean india by upholding the human dignity of thousands of labourers and janitors who were forced to do manual scavenging.

REFERENCES

[1] Mechatronics – Principles, Concepts and applications – Nitaigour and PremchandMahilik – Tata McGraw Hill – 2003
[2] Machine Design, Robert L. Norton, Pearson Education Asia, 2001.
[3] Machine Design, Hall, Holowenko, Laughlin Adapted by S.K.Somani, TataMcGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
[4] Design of Machine Elements, M.F. Spotts, T.E. Shoup, L.E. Hornberger, S.R.Jayaram and C.V Venkatesh, Pearson Education, 2006
[5] Fundamentals ofElecrical Engineering and Electronics‖, S.Chand& Company Ltd, Reprint Edition 2013.
[6] AbhijitChakrabarti, Chandan Kumar Chanda, Sudiptanath, ¯Basic ElectricalEngineering‖, TMH, First Edition.
[7] Machine Design, Hall, Holowenko, Laughlin Adapted by S.K. Somani, TataMcGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
[8] Machine Design, A CAD Approach: Andrew D DIAMAROGONAS, JohnWiley Sons, Inc, 2001.
[9] Introduction of measurement David.G.Aliciatore&Michael. B. Bihistaned, Tata McGraw Hill,2000.