

A Survey Report on Optimization and Efficiency of Toilet Pan Structure

Anil Kumar Pandey *, Dr. P S Charpe **

* Research Scholar, Kalinga University

** Head of Department, Kalina University

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Abstract- In all over the world there is 7.75 billion of human population. They need proper place for defecation and urination to save humanity and environment. That safe place may be toilet. civilization began not with the advent of written language but with the first toilet.(Horan 1997.Altho, it is seen that much less that what is needed in the world toilet is available .It is found that approximately forty percent of the world population has access to flush toilets .so if you take approximately 3 billion people have toilets. There need 20 to 25 liters drinking water to flush toilet after use per day .that may be 75 billion liters .on other hand there is another problem to safe discharge of used water .to avoid these problems it is necessary that toilet bowls should be water efficient .I.e toilet bowls should be so designed that may use very little quantity of water (100 to 200ml) per flush .This may be achieved by changing the design of toilet pan.

Index Terms- toilet, flush, defecation, urination, design water.

I. INTRODUCTION

As a sanitation [6] facilities toilet pan is a civil engineering structure which is used by human body to defecation and urination comfortably. Easily and safely inside the house, outdoor, or any other places where ever required .Toilet pan is of two types 1. Squatting or Orissa pan 2.uropian or pedestal pan. This study assessed the generation of airborne bacteria from a flushing toilet in a patient area at VGH using Bacterial inoculums. [7]



(a) Structure of Toilet

Squatting Pan:

Squatting pan is also known as eastern style water pan ,or Orissa's pan basically an Indian plumber from Pattamundai ,kendrapara Orissa had designed this type of toilet .it is used by squatting i.e. bending down with knees and full support is given to the ground level. It can be flushed manually or by cistern attached with the pan.

Pedestal Toilet Pan:

A CFD [11] model of air-jet pump is established after EWC is designed to sit in a toilet .this type of toilet comes with cover and flushing tank. Flush tank may be made of plastic or ceramic. A water seal is made of 50mm water retained, which will protect the smell coming from toilet pan . It is made of 500mm to 550mm ht. weight of the pan may be 12 kg to 20 kg .It may stand a minimum weight of 400kg. It may be classified according to the trap design

1. S Trap Type.
2. P Trap Type.

It may be classified according to the mounting system.

1. Floor Mounts Type
2. Wall Hung Type

On the basis of visibility of trap it may be classified as

1. Concealed Trap Way Type
2. Visible Trap Way Type.

The structure of toilet:

A toilet pan [1] is designed so as that human body can urinate and defecate comfortably keeping in mind the comfort during utilization the toilet pan is associated with toilet seat ,cistern ,pedestal support .to know the structure of toilet pan we may look the diagram down below.

To be sure the new toilet will cover the area, check the dimensions of the space in which the toilet is to be installed, including the footprint of the old toilet. [9]

(d) Structure of Toilet

Base:

The base of a toilet pan is the bottom part of the structure which comes in contact of floor or wall (in case of wall mounted) .It holds the pan correctly during its use and transfer the load of user to the ground .The base is fixed with floor by screws.

Stand:

Stand is the middle part of the toilet pan .A suitable height is maintained for comfort of users .this part also functions for flushing space [2] in the toilet.

Bowl:

Bowl of a toilet pan works to collect human excreta during defecation or urination .It also function as cleaning space during flush.

Trap:

It is a part of a pan connected with sewer line for disposal of excreta .Trap also protects bad smell entry from sewer to toilet room .It works as water [3] seal.

Wax ring:

Made from a molded wax loop around a short plastic tube, wax rings are pretty foolproof, inexpensive and shape themselves to fit almost any toilet and floor drain. They also resist mold and bacteria their sealing ability after years of use. Wax ring is connected with cover .it gives support to users .it provides way to flush water in bowl. [4]

Seat cover:

A toilet seat cover or in other word we can say that the toilet sheet is a disposable piece of paper shaped like the toilet seat itself that can be placed on the seat by human. Its purpose is to protect the toilet's human from germs that may be resting on the seat by creating a protective barrier. Seat cover is upper part of toilet pan it is used to cover the pan after use.

Toilet flush:

Toilet flush is used for clean the toilet pan after use. The custom will offer a dual flush function. The flush will be activated by a button setup that will be easy for the user to understand. [10]

Advantages of current structure of toilet pan

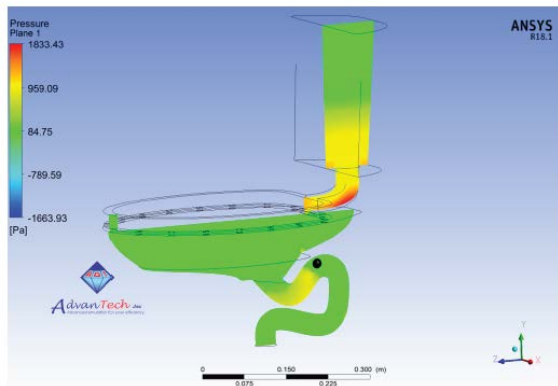
Toilet pans available in market are more comfortable for users. Increasing design and compactness requirements, combined with water consumption reductions [9] and increasingly demanding standards requirements, need to be considered when proposing new toilet bowls to the market. [8]

Disadvantages of current structure of toilet pan:

Current structure of toilet pan need more water for clean .Material used for toilet pan structure are breakable, maintenance of toilet pan is also a tough work.

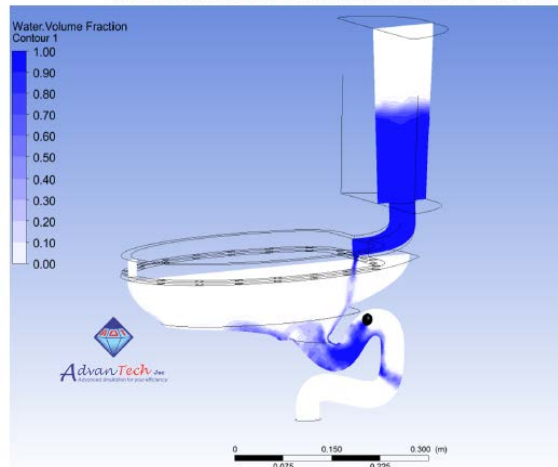
Future of toilet:

In future toilet [7] may be water less .waste obtained may be utilized for manure.



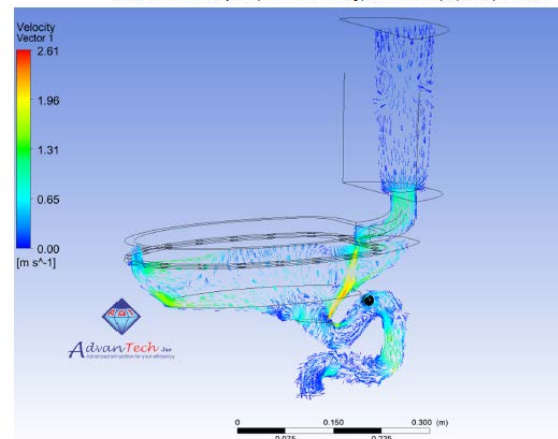
Pressure contour on symmetry plane
 (b) Structure of Toilet

Simulation of 3D Unsteady Multi-phase Flow in Flushing process with fake poop of a Siphonic Toilet



Water volume fraction contour on symmetry plane
 (c) Structure of Toilet

Simulation of 3D Unsteady Multi-phase Flow in Flushing process with fake poop of a Siphonic Toilet



Velocity vector of air on symmetry plane

Through the use of these innovations, future sanitation practices will: [5]

1. Use Less Water
2. Separate Urine and Feces
3. Utilize Water as Fertilizer
4. Foster Social Responsibility
5. Be Identified as a Technology toward Zero Emission Community.

II. CONCLUSION

In this paper, we have study major problems of current toilet practices in different areas. These problems that exist within different sanitation systems should be considered and resolved using smart and green urbanism practices. [5] To solve this problem, this paper suggests several innovative designs for toilet practices.

REFERENCES

- [1] Roubi A. Zaied "Development of water saving toilet – flushing mechanisms" Springer Link 2019.
- [2] Boonyakan, Klaiwad Changkamanon, Attawit "Water efficient toilet: setting a suitable automatic flushing duration", International Conference on Digital Arts, Media and Technology (ICDAMT) 2018.

- [3] Mourad, Khaldoon A Berndtsson, Ronny "Potential fresh water saving using greywater in toilet flushing in Syria", Journal of Environmental Management 2011.
- [4] Taemthong, Wannawit "Grey water recycling for reuse in toilet flushing: A case study in Thailand" Journal of green building 2018.
- [5] Shervin Hashemi, Mooyoung Han, Tschungil Kim and Yeonsik Kim "Innovative Toilet Technologis for smart and Green Cities" True Smart and Green City 8th Conference of the International Forum on Urbanism 2015.
- [6] K. Munshi "Hygienic Rural Toilet (dry sanitation system)", ministry of drinking water & sanitation, Government of India, September 2013.
- [7] Jesse Cooper "The Role of Hospital Toilets in Microbial Dissemination and the Effectiveness of Ultraviolet Cirradiation" The University of British Columbia 2009.
- [8] Antonio Gameiro Lopes, Vitor Costa "Using CFD in the Design Process of a Toilet Bowl" Proceeding of the 5th International Conference of Fluid Flow, Heat and Mass Transfer (FFHMT18) Niagara Falls, Canada, June 7-9 2018.
- [9] United States Environmental Protection Agency "Wastewater Technology Fact Sheet High – Efficiency Toilets" EPA 832-F-00-047 September 2000.
- [10] Asa Jacobsson "Design of a New Toilet Cistern for the Replacement Market" Lulea University of Technology, Department of Human Work Sciences, Division of Industrial Design 2006.

AUTHORS

First Author – Anil Kumar Pandey, Research Scholar, Kalinga University, anilpandeyresearch2019@gmail.com
Second Author – Dr. P S Charpe, Head of Department, Kalina University, prabhkar.charp@gmail.com