

Efficient Toilets with Nano filtration, Solar Powered Vacuum Flushing and Enhanced Comfort Level

Akshay Sharma

Delhi Technological University
 E-mail: akshay9114284@gmail.com

Abstract—The target of water conservation can be achieved greatly by designing water efficient toilets. In the paper, I have tried to divide the toilet design into various sections to get more out of these toilets. Here we are restricted strictly on the public standing urinals present on streets.

FILTRATION:- Nano filters can be made to use for filtration of urine. By filtering we segregate urea and salts of other compounds from water.

FLUSHING:- Compressors or Pumps are used to create vacuum in the flushing panel. Due to pressure difference the waste will be pushed down in the pipes and nothing will accumulate on the toilet seat. These compressors will get the power from solar panels present on the top of the toilets.

COMFORT:- To make the toilet more demanding we have to add comfort quotient in it. Comfort is something what people want to pay for irrespective of the efficiency of toilet. Squatting position is more hygienic whereas sitting is more comfortable, so a combination of both will lead to both hygiene and comfort.

1. INTRODUCTION

Efficient toilets are going to be in huge demand in coming generations. Public urinals along the streets are always flooded giving birth to diverse contagious diseases. Such efficient toilets are my inception towards hygienic sanitation.

2. SET- UP

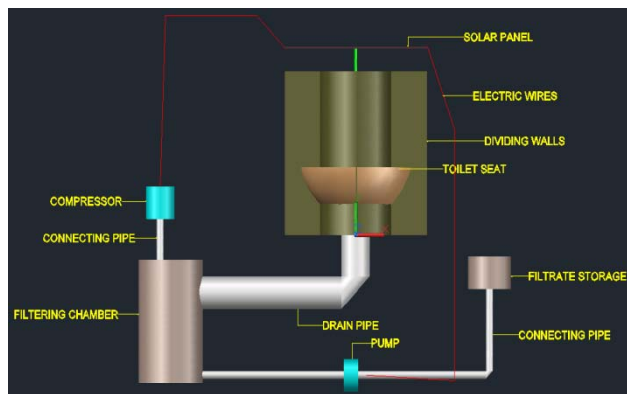


Fig. 1: Right Hand Side View

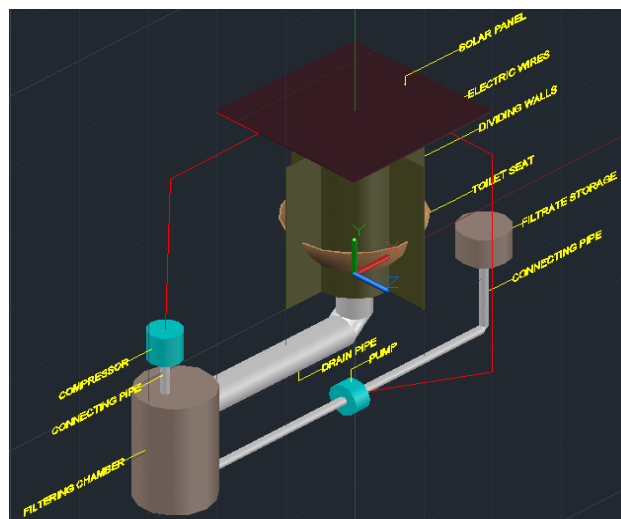


Fig. 2: SE Isometric View

The above two figures shows the CAD diagram of set up in right hand side view and south east isometric view. Both the views are made in AutoCAD 2012.

2.1 Filtration[1]

Nanofilters are incorporated for filtration process. Nanofiltration is a process in which filter is made up of nano particles having pore diameter of 1 to 10 nanometers and pore density of 1 to 106 pores per cm^2 . These nano filters are placed in filtration chamber. The Fig. below shows the sectional half of filtration chamber.

The blue color disc shows the primary filter which filters the bigger particles. The magenta color disc shows the nano filter. These nano filters would filter the urine at molecular level so that the filtrate obtained could be utilized for purposes like watering plants, washing, etc. The nano filters that can be used here are electrospun nanofibers. These nanofibers have exceptional performance for the adsorption of metal ions (Ki et al. 2007). They are highly porous and have high surface to volume ratio (Ramakrishnan et al. 2006).

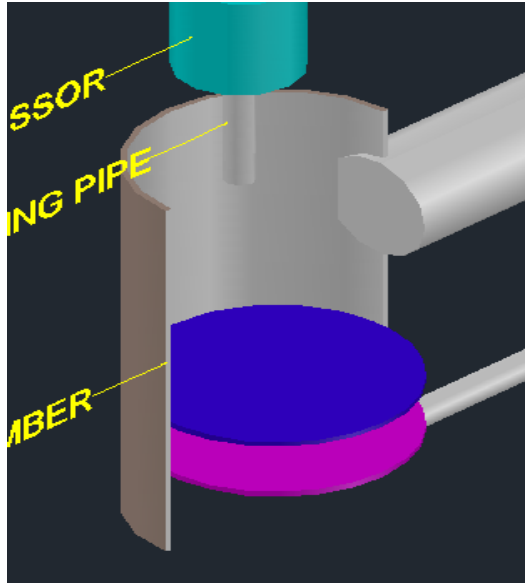


Fig. 3: Sectional View of Filtration Chamber

The filtered urine i.e. filtrate is pumped from filtering chamber to the filtrate storage tank through connecting pipe by using pump. The filtrate stored in this filtrate tank could be used later for various purposes. The pump gets the power from the solar panel and is always operated when sufficient amount of filtrate is present in bottom portion of the filtering chamber.

2.2 Flushing[2]

The compressor is a very vital part of flushing section. The compressor creates vacuum inside the top portion of the filtering chamber, due to the pressure difference the atmospheric air would push the urine inside the chamber via drain pipe. This method does not have any fear of choking as the atmospheric pressure would push everything to the chamber. This method has other advantages like there will be no requirement for pipe inclination thus reducing the space, secondly it is more hygienic and there is less odor and there is no chance of backflow of waste.

The compressor gets the power from solar panel. The battery is placed inside the main cylindrical chamber behind the toilet seat which is charged by the solar panels. The specification of solar panel and compressor is still under development.

2.3 Comfort

The cylindrical shape[3] of the toilet makes it easy to accommodate in smaller places. The height of cistern is kept low so that toilet could be used by children too. The best thing about it is its cleanliness as there would be no choking and overflowing of urine.

Besides these we could also install spitting pits and sanitary napkin vending machines near these toilets so that together

they constitute a waste hub which helps the citizens to maintain a higher standard of living.

3. RESULT

The following are the results which we could obtain:-

- Recycling of urine to get filtered water, the filtrate could be used for other purposes like watering plants, washing cars, etc.
- The salts and compounds obtained by filtration could be studied for their medicinal properties as various civilizations have talked about the medicinal properties of urine.
- The urea obtained by filtration could be used in farms and fields as fertilizers.
- The flushing system incorporated could eradicate choking of pipe and overflowing of urine.
- There is no requirement for inclination of pipe as the pressure difference developed would push the waste through the pipe.
- The whole system is extremely hygienic and user friendly.

REFERENCES

- Sharma Akshay, "Nanoscience used for urine filtration and self flushing toilets", *International Conference of Applied Research and Innovation*, 31, January 2015
- http://m.youtube.com/watch?_e_pi_=7%2CPAGE_ID10%2C3945998066
- <http://www.lushome.com/6-modern-toilet-design-trends-innovative-design-ideas/51518>