

Note on Biosand Filter

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Majority of households in rural areas, particularly the poor households are not sensitized about the water contamination and related health issues, and do not have knowledge of the appropriate solution. They either do not use any solution for purifying water or the solutions they use are inadequate. The widespread occurrence of **turbidity, iron, arsenic and biological contaminants** and lack of awareness have created a public health crisis in major parts of Bihar. This calls for immediate attention. Thus, there is a daunting requirement of a solution that could facilitate removal of these frequently occurring contaminants simultaneously. Household water treatment technologies hold an edge over the community based as they minimize the chances of secondary infections.

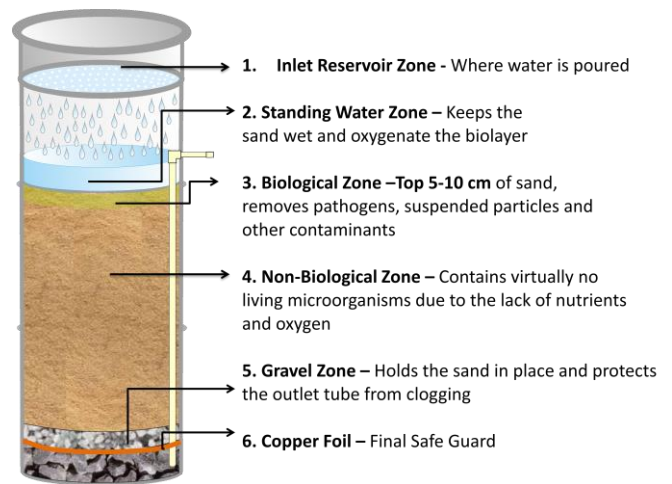
Biosand Filter

Biosand filter is a household water filter, initially developed by CAWST (Canada). S M Sehgal Foundation further adapted this technology to address turbidity, biological, arsenic and iron contamination in water. A published article in this regard “Reinventing the Biosand Filter: An Easy Solution for Safe Drinking Water” is available at

<http://www.iosrjournals.org/iosr-jestft/papers/vol10-issue1/Version-1/H010114348.pdf>

A Biosand filter remove pathogens through following four processes:

- Predation – the BioLayer that forms on top of the sand contains bacteria that consume harmful bacteria and parasites as the new water enters the Filter.
- Adsorption – Viruses adhere to the surfaces of the specially prepared sand, which have a slight electrostatic charge, and die there.
- Anaerobic Die-Off – As there is no oxygen, light, or air further down in the Filter, any remaining microbes die off
- Mechanical Filtration – Fine-grain sand prevents the passage of bacteria, parasites, and worms, which are relatively large.



The zero valent iron (ZVI) technology is integrated in biosand filter to remove from water: generating Fe^{2+} by contacting water with and efficiently using the iron (Fe^{2+} present in the groundwater and Fe^{2+} produced by corrosion of ZVI) for removal of arsenic. Fe^{2+} forms hydrous ferric oxide (HFO - adsorbent for arsenic) on oxidation of Fe^{2+} during subsequent

filtration; HFO is an effective adsorbent for arsenic. The process is so designed that efficient oxidation of As(III) to As(V) is achieved and As(V), thus formed, is adsorbed on HFO.

The iron contaminated water passed through the diffuser, drips down in the form of droplets and the surface area of the water increases. With the increased surface area, the oxygen absorption of the water also increases and thereby Iron in the water gets oxidized. The compound formed by oxidation gets trapped on the top surface of sand column and the iron from water gets removed.

Operation and Maintenance

This filter is an intermittent household filter. Raw water is poured in the filter and the filtered water comes out through the spout. In one pour it can filter about 18 ltr and filtration rate is about 0.7 ltr per minute.

As there is no moving part, Biosand filter does not require any replacements. With time the flow rate of filtered water may reduced. It happens due to accumulation of silt (came with water) over the sand top layer. When the flow rate slows down, the maintenance exercise to be conducted is: lift off the lid, pour water in the filter, take out the diffuser box, and do a “swirl and dump” which means gently swirling the water above sand top layer. The deposition over the sands gets suspended in the water. Now remove the cloudy water above the sand. This may be repeated 3 or 4 times to “clean” the layer of accumulated silt. As this cloudy water contains arsenic compounds also, it is proposed to collect and store this water and dispose in construction with cement.