



PROMOTING COMMUNITY HEALTH AND PREVENTING WATERBORNE DISEASES WITH THE JALKALP WATER FILTER

>>> BY MR. LALIT MOHAN SHARMA



Waterborne diseases are still a major cause of illness and even fatalities on our country. While there are several technologies available to purify water, most of them are expensive while others are extremely hard to transport due to their cumbersome size and weight. However, there is one technology that bypasses all these issues. JalKalp is a portable and relatively affordable water purification solution that could be the answer to India's waterborne disease issue.

Myriad efforts aimed at achieving the millennium development goal of providing safe drinking water to half of the world's population have not proven to be adequate, as a large bracket of the world's population continues to lack sufficient access to good quality water. Microbes, iron, arsenic, and turbidity are present either individually or in various mixtures in drinking water across numerous states in India, making people sick.

The consumption of contaminated water has particularly adverse health impacts on children and women. In India, the single largest cause of ill health and death among children is diarrhoea, which kills nearly half a million children (Pacific Institute, 2010).

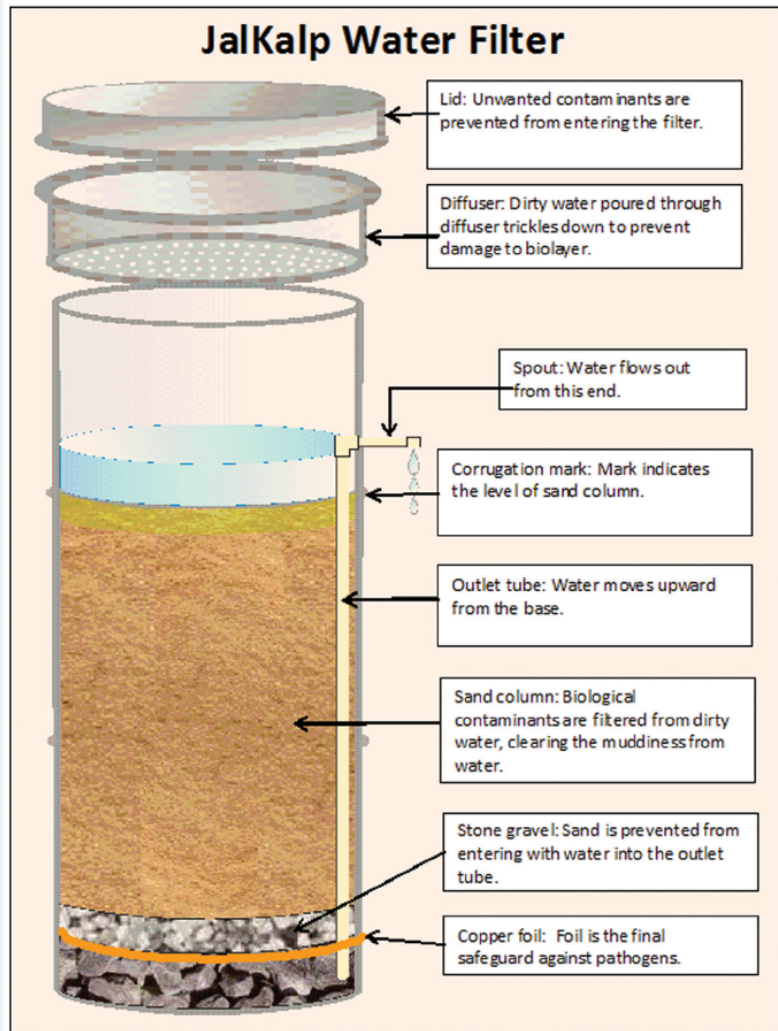
Though there have been efforts to put up water treatment plants to address arsenic and iron in some villages, most were not sustained for various reasons including:

- Technological limitations of the plants
- Plants not serviced or maintained timely/properly
- Communities not trained, mobilised, and motivated to undertake the maintenance
- Lack of community participation
- Lack of education and awareness among communities
- Poor community dynamics and socio-economic conditions

JalKalp water filter is a household level technology that removes biological contaminants, iron, arsenic, and turbidity from water, making it suitable for drinking. It works under the force of gravity without using any form of energy or on-line pressure.

Sehgal Foundation's innovation, the JalKalp filter, aims to bring a change in the life of rural people.

Innovations at three levels promote adoption of a low-cost, zero-maintenance JalKalp water filter



S M Sehgal Foundation helps promote safe drinking water with the JalKalp filter

WORKING & MAINTENANCE OF JALKALP WATER FILTER

(A) JalKalp water filters remove pathogens four processes

- **Predation:** Bacteria and parasites available in the bio-layer interact with the new ones entering with the water; both interact and predate each other.
- **Adsorption:** Viruses adhere to the surface of specially prepared sand, which has 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.

(B) The technology of arsenic removal in the filter is based on generating Fe^{2+} by contacting water with zero valent iron (ZVI) 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.

(C) The iron-contaminated water passes 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 is oxidised. The compound formed by oxidation is insoluble in water, so it is trapped on the top surface of the sand column and the iron is removed from the water.

As there are no moving parts, JalKalp filter does not require any replacements. With time, the flow rate of filtered water may

reduce due to an accumulation of silt (came with water) over the sand top layer. When the flow rate slows down, the maintenance to be conducted is simple: lift off the lid, pour water into the filter, take out the diffuser box, and do a "swirl and dump", gently swirling the water above the top layer of sand. The deposition is suspended in the water over the sand, and that cloudy water can be removed. This may be repeated once or twice more if the flow rate is not recovered.

(D) Copper foil at the bottom acts as a final safeguard against pathogens.

local social entrepreneurs who can ensure supply and service locally.

Sehgal Foundation will also build capacities of other stakeholders and NGOs on this technology to increase outreach of the product.

Till date, 4,000 filters have been installed across Bihar, Uttar Pradesh, Himachal Pradesh, Maharashtra, Nagaland, Rajasthan, and others.

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to address arsenic, iron, biological water contaminations, and turbidity:

(a) Approach innovation

S M Sehgal Foundation adopted a sustainable and affordable household safe water solution named "JalKalp" at the household-level in order to address all three commonly encountered contaminations along with turbidity. Over and above, the operation and maintenance is very easy and simple.

(b) Product innovation

JalKalp is a low-tech, low-cost, and easy-to-maintain water filter with a more innovative design than conventional biosand filters. Its innovative features include:

- Integration of germicidal properties of copper increases coliform-removal efficiency to 100%.
- Integration of Zero Valent Iron technology removes arsenic.
- Filtration rate of 0.6 litres per minute is increased as compared to 0.4 in conventional designs.
- Stainless steel cell design weighs only 4.5 kg. vs. the original concrete design weighing 70 Kg.
- Portability and quality control is better than conventional biosand filters.

- Operation and maintenance does not require any special skills.

(c) Process innovation

The key to sustainability is ownership and active participation by beneficiaries. When communities are sensitised and demand a solution, JalKalp is offered as one of the affordable safe water solutions.

To overcome the challenge of delivering filters in remote villages at the earliest, we plan to nurture

Mr. Prince of district Vaishalia, JalKalp user

Mr. Prince, age 22, lives with his family (2 male and 4 female) in Kharika of Bidupur, Vaishali district (Bihar). Most hand pumps in his village are marked RED by related departments, forbidding people from visiting the water from these pumps. Mr. Prince used to buy water for drinking before he met Mr. Dharmendra Singh from Sehgal Foundation, who told him about the JalKalp water filter. Mr. Prince immediately agreed to install and try it out. Mr. Singh first tested the water from the hand pump using a field kit, which showed arsenic contamination of over 250 PPB (parts per billion), iron over 3 PPM (parts per million), and the presence of coliform indicating biological

contamination (permissible limits for arsenic are: 10 PPB, for iron: 0.3 PPM, and no presence of coliform).

A JalKalp water filter was installed at Mr. Prince's house. The JalKalp water filter brought down arsenic, iron, and coliform to non-detectable levels.

Earlier when Mr. Prince used to prepare tea using hand pump water, its colour was almost black; but now the JalKalp filter's water shows the true colour of tea. The family no longer purchases water to drink. They not only notice better water colour, but also a better taste in their food. He said he is also very happy that since the day he started using the JalKalp his digestion problems (acidity, constipation, etc.) have disappeared.

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Mr. Lalit Mohan Sharma testing a water sample for arsenic.

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