Sehgal Foundation develops low-cost JalKalp water filter for rural communities

Gurgaon-based SM Sehgal Foundation has developed an indigenous water filter - JalKalp - that it claims removes biological contaminants, iron, arsenic and turbidity from water. The water filer, a household level technology that works under the force of gravity without using any form of energy or on-line pressure makes water suitable for drinking.

Sehgal Foundation said myriad efforts aimed at achieving the MDG of providing safe drinking water to half of the world's population have not proved to be adequate as a large bracket of the world's population continues to lack sufficient availability of good-quality water.

In India too, microbes, iron, arsenic, and turbidity are present individually or coexist in drinking water across numerous states. 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 diarrhea, which kills nearly half-million children.

Against this backdrop, Sehgal Foundation said its innovation - 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 to address arsenic, iron, biological water contaminations, and turbidity:

1. Approach innovation

The 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.

2. 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 over the 0.4 in conventional design.
- 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 do not require any special skills.

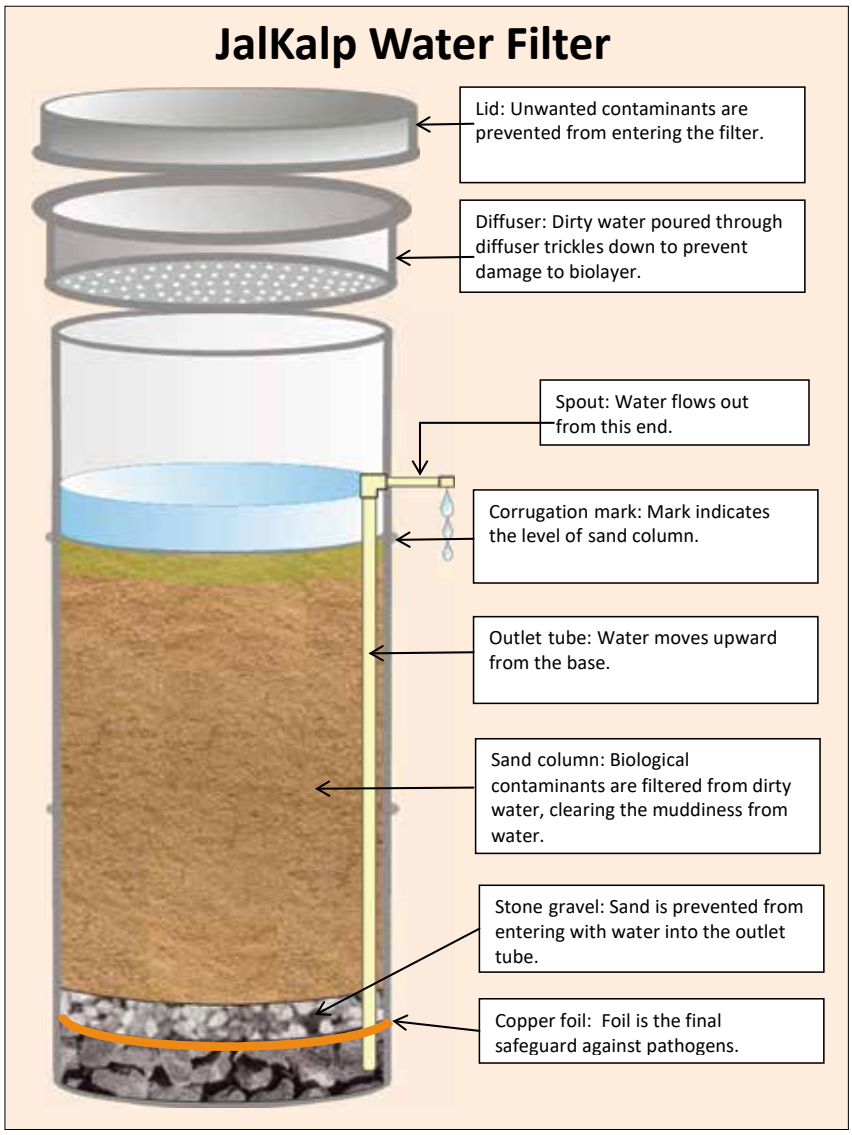
3. Process innovation

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

To overcome the challenge of delivering the filters in remote villages at the earliest, the Foundation plans to nurture 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.

So far, over 4,000 filters have been installed across Bihar, Uttar Pradesh, Himachal Pradesh, Maharashtra, Nagaland and Rajasthan.



Working & maintenance of JalKalp

JalKalp water filters remove pathogens with four processes:

- **Predation**: Bacteria and parasites available in the bio-layers interact with new ones entering with the water and 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.

The technology of arsenic removal in the filter is based on generating Fe2+ by contacting water with zero valent iron (ZVI) and efficiently using the iron (Fe2+ present in the groundwater and Fe2+ produced by corrosion of ZVI) for removal of arsenic. Fe2+ forms hydrous ferric oxide (HFO-adsorbent for arsenic) on oxidation of Fe2+ 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 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 oxidized. 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.

The copper foil at the bottom acts as a final safeguard against pathogens.

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.

The JalKalp filter has been developed by the Adaptive Technologies unit at the Foundation that develops, acquires or adapts, experiments, and demonstrates appropriate technologies suitable for implementation to solve water problems. IWR