

## 6. Arsenic Free Drinking Water: Household Chemo-Dearsenification Unit



### **Preamble:**

High concentrations of arsenic in ground waters of Bangladesh, West Bengal, approaching west-wards to Chhattisgarh just 200 Kms. away from Vidarbha region of Maharashtra state and many emerging areas in other states of India have become a major cause of concern in recent years. Implementation of major tube well drilling programmes over the last decade have resulted in large populations relying on ground water and evidence of chronic health effects such as lung, liver, bladder besides skin cancer and even loss of life in many cases resulting from ingestion of water with high arsenic content. People residing in arsenic affected areas where raw water is derived from either tube wells or shallow wells using hand pumps, are badly in need of appropriate technology for the mitigation of the problem. A variety of treatment technologies have been demonstrated to be effective in removing arsenic from contaminated natural ground water. The most commonly used technologies include oxidation, co-precipitation and adsorption onto coagulated flocs, lime treatment, adsorption onto sorptive media, ion exchange resin and membrane techniques. However, question remains regarding the efficiency and applicability/ appropriateness of the technologies - particularly because of low influent arsenic concentration and variety of source water composition. Besides, appropriate technology must be economically viable and socially acceptable. Most of the technologies are energy intensive and the operation and maintenance requires skilled personnel. The arsenic problem associated with tube well waters is more prevalent in rural areas where both energy and skilled personnel may not be readily available. A simple and affordable technology that is acceptable to users is needed.

National Environmental Engineering research Institute (CSIR-NEERI) Nagpur has developed the NEERI-ZAR Chemo-Dearsenification process for treatment of potable water with high arsenic content under a project sponsored by the Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra, Mumbai.

## Salient Features:

- The household Chemo-Dearsenification unit is suitable for treating water with arsenic concentrations up to 3000 ppb
- Reduce the Arsenic concentration below the WHO guideline value i.e. 10 ppb
- Cost of treatment with arsenic concentration of 100-3000 ppb and treated water with arsenic concentration of <10 ppb is around Rs. 4/- per 1000 litres.
- The units are suitable for the small arsenic affected villages where community water supply schemes are not economically feasible
- Taste of treated water is palatable
- Require no power (electricity or battery)
- Environment-friendly
- Easy to operate and maintain
- Cost Effective

The NEERI-ZAR Dearsenification unit consists of three plastic containers, two of 20 litres capacity and one of 15 litres for collection of treated water. The containers were arranged such that the input water (arsenic contaminated water) from top container gets into middle one with gravel layer and treated water is collected in lower container. Arsenic removal was carried out using iron salt and hydrogen peroxide (Fenton's reagent) and. Subsequent to the chemical treatment the water gets filtered through sand bed to receive purified water. The schematic diagram of the unit is given in Figure 1.

The performance of units was successfully evaluated by installing units at 5 locations in Kaudikasa village in Chowki block (Rajnandgaon district) in 2011-12. The units in Kaudikasa village were installed in collaboration with PHED, Rajnandgaon. Three hand pumps with arsenic concentrations of 48 ppb, 56 ppb and 40 ppb and 2 dug wells with arsenic concentrations of 76 ppb and 281 ppb were selected to carry out the performance evaluation at locations as per the details given below.

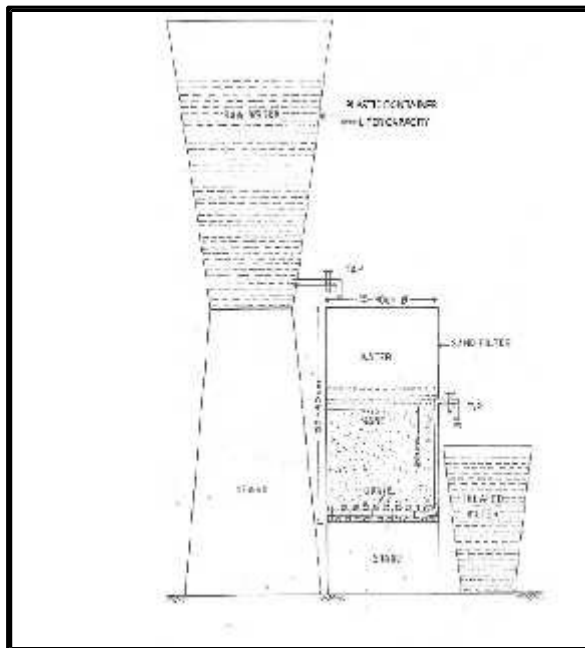
<b>Sr. No.</b>	<b>Location</b>	<b>Source</b>	<b>Total Arsenic Conc. (ppb)</b>
1	Primary School, Kaudikasa	Handpump	48
2	High School Hostel (Girls), Kaudikasa	Dugwell	76
3	Old Sarpunch House, Kaudikasa	Dugwell	281
4	Near Hanuman Mandir and Durga chowk, Kaudikasa	Handpump	56
5	New Sarpunch House, Kaudikasa	Handpump	40

**FOR DETAILS, CONTACT:**

**Dr. Leena Deshpande,**  
Technical Officer,  
Water Technology and Management Division,  
CSIR- National Environmental Engineering  
Research Institute (NEERI), Nehru Marg,  
Nagpur – 440 020  
Tel No. +91-712-2249756  
Email : [ls\\_deshpande@neeri.res.in](mailto:ls_deshpande@neeri.res.in)

**Member Secretary,**  
Rajiv Gandhi Science and Technology  
Commission,  
7th floor, Mantralaya,  
Madam Cama Road,  
Mumbai – 400 032.  
Tel. No. 022-22024711, 22024755, 22823418  
E-mail: [rgstcmaha@rediffmail.com](mailto:rgstcmaha@rediffmail.com).

**Chemo-Dearsenification Unit**



**Schematic Diag. of Chemo-Dearsenification Unit**





**Chemo-Dearsenification Units installed in Village Kaudikasa**