



Magnetic Arsenic Removal Unit “Magnetic Arsenic Filter”

Name of the Technology: Magnetic Arsenic Removal Unit (MARU)

Current Stage of the Technology: TRL-8 (Commercialisation/ Production Stage)

Cost of Water: 0.15 Paise per Liter

Patent Number: Indian Patent -400769; IN Design 383012-001; IN Design 383011-001; IN Design 383013-001; PCT (International) - WO 2021/144815

The Technology Designed and developed by Research and Development Lab, Science Section Bihar Bal Bhawan Kilkari, Department of Education Government of Bihar, jointly with Training cum Research Centre 'PRANJAL' PHED, Bihar, Pilot Studies supported by BCST-DST, Bihar, UNICEF, Bihar and Scale up trial by ICICI Foundation under CSR Initiatives.

About Technology

- Several technologies have been developed to address arsenic contamination in groundwater, but current methods like softening and coagulation require significant expenditure and maintenance. Bihar Bal Bhawan Kilkari has developed a Magnetic Arsenic Removal Unit (MARU), which uses Molecular Magnetic Treatment of Arsenic+3, +5 in an environment friendly way. The technology involves filtration or separation, which separates the As+3, +5 from the flowing water as it flows through an array of cones, surrounded by an intense magnetic field. As the diamagnetic particle flowing through the trajectory, the varying/non uniform magnetic field constantly applies a torque on it and creates a magnetic moment with negative magnetic susceptibility repelling it particles along vector field lines and making it adhere to the area beneath the cones.
 - The MARU is simple to operate and maintain and provides quality drinking water. The technique has been scientifically validated through field trials and a multidisciplinary approach of engineering and sciences, conducted in nine severely arsenic-affected villages in Bihar, India with the partnership of the Research cum Training Centre, “PRANJAL” Public Health Engineering Department, Government of Bihar, supported by UNICEF and ICICI Foundation.
- The research has yielded positive results, demonstrated an innovative alternative with sustainable approach for arsenic removal with higher longevity.
- The technique utilizes a gravity-based continuous filtration process with zero wastage of water, works without electricity or any added chemicals/precipitating agents

Designed and Developed by

Research and Development Lab, Science Section, Bihar Bal Bhawan Kilkari, Department of Education Jointly with Training Cum Research Centre 'PRANJAL', Public Health Engineering Department Government of Bihar

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Magnetic Arsenic Removal Unit “Magnetic Arsenic Filter”

Adding to it, our filter generates negligible amount of sludge compared to other technologies which can be easily treated. The device has a long life since there are no moving parts and involves minimal maintenance.

- It is commercially expandable at community and municipal levels, making it a wide-ranging and feasible solution.
- The efficient removal of Arsenic+3, +5 Iron (ferrous), Sulphate, and other metallic contaminants can be removed by utilising magnetic properties. The structure is built with SS 302,318, to enable high scale removal of arsenic constituents.

Technology Excellence

1. A proven and government-approved alternative technique for arsenic removal, utilizing a magnetic approach in a sustainable and cost-effective manner.
2. Recommended and Impaneled by Technical Committee of Principal Scientific Advisor to the Government of India under Innovation Technologies for Drinking Water, Department of Drinking Water and Sanitation, Ministry of Jal Shakti Government of India.
3. Approved by CSIR – IICT, CSIR –CGCRI validated during the field trials.
4. No requirement of electricity or any consumables/chemicals, inexpensive production, and long lifetime.

5. Minimal sludge, waste, and residual separation, making it a cost-effective and environmentally friendly solution.
6. Highly scalable method suitable for any capacity, ensuring flexibility and design adaptability.
7. Cutting-edge technology for waste disposal, extraction method, and magnet cleaning through a ‘Cleaning Box’ promoting sustainable practices and minimal maintenance.
8. High Flow Rate Technology for Arsenic Removal i.e. @800 LPH - ~500ppb, @5000 LPH - ~2000 (As per recorded during the Pilot Trial of Phase 2 and 1, 2021-2023).

Vision

This vision represents a transformative force in research and innovation, introducing a new era in arsenic removal units. It embodies a comprehensive strategy without complexities of maintenance and quality oversight. The implementation blueprint is scalable, reaching across diverse domains, including educational institutions, households, pipeline schemes, and individual users. This visionary pursuit aims to reshape paradigms and redefine possibilities in sustainable arsenic mitigation.

Status - Product Available Two Capacities for Arsenic Affected Schools/ Communities areas and other habitats.

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Magnetic Arsenic Removal Unit "Magnetic Arsenic Filter"



Community Unit

Arsenic Removal Capacity 500ppb

Discharge - 800 LPH

Lifetime - 10 Years of Arsenic Removal Medium

SS- Unit High Grade

Capacity - For 1000 children's schools & for 140 households as per 55lpcd.

Municipal Unit

Arsenic Removal Capacity 2000ppb

Discharge - 5000 LPH /100KLD

Lifetime - 15 Years of Arsenic Removal Medium

SS- Unit High Grade

Capacity - 910 Households supplying 55 (lpcd) Liter per capita day following standard of Jal Jeevan Mission
(Note Calculated as per 10 hrs per day running)

The images shown are for illustration purposes only and may not be an exact representation of the product. **Cost will be reduced as per the status of currency exchange which is responsible for the cost of magnets used for manufacturing the filter unit.**

Marketing and Supply by - "SHODH Research and Innovations NAVMARG RESEARCH AND INNOVATIONS", Patna (a Startup of the inventors supported by R&D LAB, Bihar Bal Bhawan Kilkari, Department of Education Government of Bihar).

Research Team - Arpit Kumar (Project Lead), Abhijeet Kumar, Akshat Adarsh, and Shambhavi Sinha
Project Supervisor (State Appointed) - Prof (Dr.) Prolay Das (Professor, Chemistry IIT Patna)
Institutional Supervisor - Vinay Mishra (Accounts Officer cum Member Kilkari Science Research Committee)

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