



Technology

टेक्नोलॉजी फोकस

FOCUS

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WATER PURIFICATION SYSTEMS

Water Testing Field Kit

Ascertaining the quality of drinking water is a basic requirement in order to get rid of water borne diseases. Water contaminated with different impurities including toxic elements in different parts of the country, can be tested with the help of this kit in field conditions by a semi-skilled person to ascertain its portability for drinking purposes. The kit is provided with testing facilities for both physio-chemical and bacteriological parameters. The test are semi-quantitative and are based on accept/reject basis.

Salient Features

- Total eight parameters like pH, total hardness, iron, chloride, fluoride, nitrate, residual chlorine and coliform bacteria can be tested with this kit
- Reagent provided for analysis of 100 samples
- It can be performed by a semi-skilled person with little training
- Cost-effective
- No electricity required



Water Testing Field Kit



Integrated DRDO Water Testing Kit

An integrated water testing kit was developed jointly by DRL, Tezpur and DL Jodhpur.

- Total eleven parameters can be tested using this kit
- The parameters are pH, total hardness, iron, chloride, fluoride, nitrate, residual chlorine and arsenic, TDS, sulphate and Faecal coliform

Transfer of Technology

- M/S Plasti Surge Industries Pvt. Ltd., S.V. Patel Marg, PB No. 95, Amravati, Maharashtra, India

- M/S Shrinathji Chemicals, 97-A Sector, Industrial Estate, Mandideep, Dist. Raisen, Madhya Pradesh-462 046
- M/S Rajasthan Metal Smelting Industries, Jaipur, Rajasthan

Users of Water Testing Kit

- PHED, Govt. of Assam
- PHED, Govt. of Arunachal Pradesh
- Defence Services (Army / Air Force)
- Geological Survey of India
- Total kits supplied – 247



Integrated DRDO Water Testing Kit

Iron Removal Unit (300 L/h)

Water in eastern region of our country is highly contaminated with iron causing discoloration, turbidity and deposition in distribution system apart from astringent taste and disorder in metabolism system. DRL, Tezpur has developed a simple and cost effective iron removal unit for removal of excess iron from ferruginous water which is able to bring down the iron content from 40 mg/l to 0.3 mg/l (permissible limit). The output capacity of the system is 300 L/h and can cater the need of army barracks.

Salient Features

- Adequate aeration
- Removal of major portion of iron in the sedimentation chamber
- Filter bed cracking is prevented and clogging is delayed



Iron Removal Unit MK - II

- Double filtration ensures better iron removal
- Proper back washing
- Easy operation and maintenance
- Can be operated without electricity

Iron removal unit was modified to MK-II, made of FRP with 46 % reduction in weight. Maintenance cost was also reduced as the unit is made up of anti-corrosive material.

Users of Iron Removal Unit

Defence Services (Army / Air Force)
Tezpur Environmental Society
SP, Sonitpur
PHED, Govt. of Assam
Tripura State Rifles, Govt. of Tripura

Total units supplied – 390



Iron Removal Unit MK - I



Water Dearsenification cum Deferrization Unit (200 L/h)

Arsenic one of the most toxic element to human health is present in different places of North Eastern region as well as in many parts of the world. Defence Research Laboratory (DRL) has developed one dearsenification cum deferrization unit of capacity 200 L/h for the benefits of troops and civil populace. The unit

has capacity to remove arsenic from 500 ppb arsenic contaminated water to less than 10 ppb. The unit can also remove iron from 50 ppm to less than 0.3 ppm along with arsenic.

Salient Features

- Major portion of arsenic and iron precipitate / co-precipitate in sedimentation chamber
- It has flow rate of 200 L/h (approx)



Water Dearsenification cum Deferrization Unit (200 L/h)

Iron Removal Unit (3000 L/h)

In many parts of India, ground water is contaminated with heavy metals like iron and arsenic. Armed forces and civil populace in North Eastern India are struggling for potable drinking water. Various adverse health effects occur due to intake of contaminated water. DRL has developed one iron removal unit of capacity 3000 L/h for community use. The unit is capable of removing iron from 54 ppm to less than 0.3 ppm in water.

Salient Features

- Made of mild steel
- Consists of one aeration system with an aeration cover around it and six filtration chambers
- Iron removed by the system from 54 to < 0.3 ppm (WHO/BIS limit)
- TDS, pH, Turbidity, Conductivity of filtered water are within limit
- Flow rate of output water : 3000 L/h

Users of Iron Removal Unit

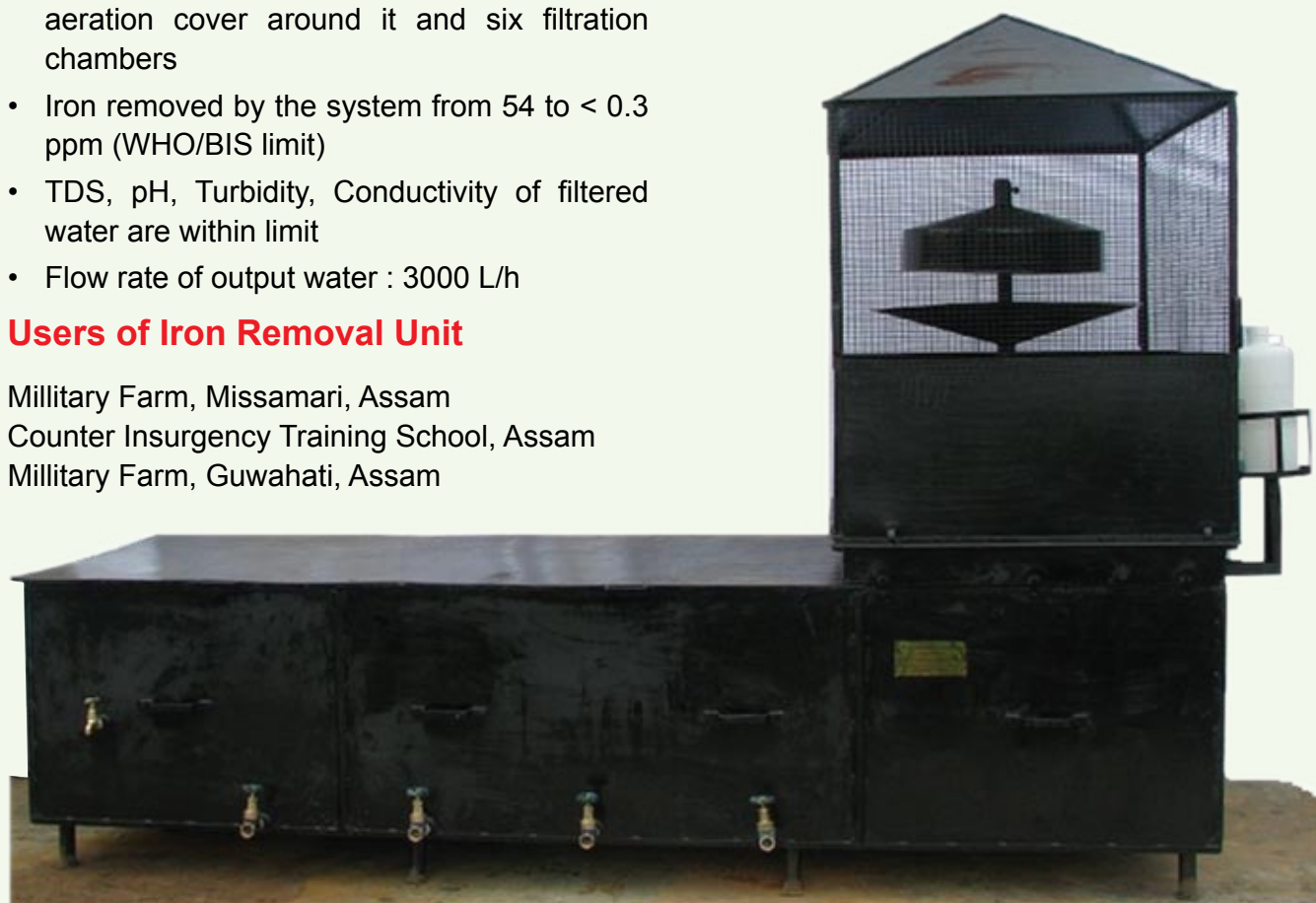
Military Farm, Missamari, Assam
Counter Insurgency Training School, Assam
Military Farm, Guwahati, Assam

Total units supplied : 03

Transfer of Technology

Transfer of technology for iron removal unit (300 L/h), water dearsenification cum deferrization unit (200 L/h) and iron removal unit (3000 L/h) has been done to the following farms :

- M/S HES Water Engineers (India) Pvt. Ltd, K27, Five Star Industrial Zone, MIDC, Butibori, Nagpur - 441 122
- M/S PD Scientific Industries Pvt. Ltd., C 46, Road No.12, Site V, Udyog Kunj, Panki, Kanpur - 208022



Iron Removal Unit (3000 L/h)

Household Water Purification Unit

Contamination of drinking water with toxic elements like iron, arsenic, manganese, fluoride etc. is common phenomena in most parts of the country. Slow poisoning affect of these contaminants are irreversible and has no remedy. Online removal technology for these contaminants for domestic level use is not available at present. With this view, DRL has developed an integrated technology for taking care of few of these contaminants upto certain limits. The unit has the capacity to remove iron, manganese, arsenic, bacteria (E. coli). The laboratory test condition of the unit shows that it is very effective that can bring down iron from 30 mg/L to less than 0.3 mg/L, Arsenic from 200 µg/L to 10 µg/L, Manganese from 2 mg/L to 0.2 mg/L and bacteria from 1000 CFU/ml to nil. The unit is under user trial.

Salient Features

- Having adequate aeration through diffuser
- pH adjustment facility
- Removes excess iron, arsenic, manganese and bacteria from contaminated water
- Filtration rate: 1.2 L/h
- Can be operated either by using electricity or by using battery
- Easy operation and installation



FOOD RADIOACTIVITY CONTAMINATION MONITORING SYSTEM

Radioactivity in excess from its natural presence in environment can have harmful effects on living being. The radiation exposure can be of external or internal origin or both. The main route of internal radiation exposure is through the contaminated food chains. The concentration of natural radioactivity in food items has been reported globally in the range of 40-600 Bq/kg.

The major contributor of natural radioactivity in food item is ^{40}K with typical radioactivity, as 50 Bq/kg in milk, 420 Bq/kg in milk powder, 165 Bq/kg in potatoes, and 125 Bq/kg in beef (IAEA-TECDOC-1287, 2002), thus the main contributor of natural radiation doses to human being. Radioactivity concentration limits for food items have been stipulated by the International Atomic

Energy Agency (IAEA) for general and children consumptions for major radioisotopes produced during the nuclear detonation or nuclear reactor accidents. For ^{134}Cs , ^{137}Cs , ^{103}Ru , ^{106}Ru , ^{89}Sr isotopes, the allowed limit for general food items as well as in milk, infant foods and drinking water is set to 1000 Bq/kg. For ^{131}I the limit is 1000 Bq/kg for general food items, however it is 100 Bq/kg for milk, infant foods and drinking water. For ^{90}Sr , the allowed limit is 100 Bq/kg for both types of consumption. For alpha emitters, such as; ^{241}Am , ^{238}Pu and ^{239}Pu , the limit is 10 Bq/kg for general consumption, whereas it is 1 Bq/kg for milk, infant foods and drinking water. The stipulated radioactivity limits reflect the importance of radioactivity measurement in food items and drinks in controlling the internal exposure to human being especially in case of nuclear disaster / emergency.

The majority of radioisotopes produced during nuclear weapon detonation and nuclear reactor accidents and any other radiological accidents & emergencies are gamma emitters. Detection of gamma rays is easier since its attenuation through material is very less and may travel far distances without losing significant energy. The equipment based on gamma detection has potential in fulfilling the requirement of radioactivity contamination measurement in emergency situations. Though, the laboratory equipments for radioactivity measurement are available globally, there is a need of portable instrument for Defence Services which could accommodate raw samples for radioactivity assessment in food items. Quick radioactivity assessment may help in mass screening of food items fit / not fit for consumption in case of nuclear / radiological emergencies.

Defence Laboratory, Jodhpur has developed a radiation measuring system, FRCMS in collaboration with an industry partner for estimating the presence of radioactivity in edible items. This equipment is an outcome of the project RCMS under NBC Defence Technologies Programme. The system can measure radioactivity presence in food samples within activity range 50 to 10^6 Bq/kg in 60s data acquisition time. It is an indigenous development first of its kind in India, which accommodates raw food samples and drinks for radioactivity measurement. It generates visual warning (Green, Yellow & Red) depending upon the presence of radioactivity level in food stuff and drinks. It identifies the radioisotope/s and computes gross as well as individual isotope activity. At a time it can identify 10 radioisotopes presence in the contaminated samples and computes their respective activity concentration simultaneously. The system finally generates sample contamination analysis report and save it for future record and application. A photograph of FRCMS is shown in the Figure.



FRCMS in integrated / mounted form



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Working Principle: FRCMS is based on detection of gamma rays emitted from radioactive materials and converting into the electrical signal through scintillation process. The electrical signal produced due to gamma ray is fed to the multichannel analyser (MCA) for its further processing and identifying the type and level of contamination in the sample under examination. The system compares the sample count data with natural background and generates the warning level and subsequently computes the activity concentration in food sample. The system is user friendly and does not require special skill for operation.

Current Status: The FRCMS technology has been established encompassing the unique concept of computer controlled data acquisition and processing, detector shielding and field portability etc. The system has been demonstrated

to the services and BARC scientists and shown interest in acquiring the system.

The system is primarily developed for armed forces but can serve as an asset for NDMA/ NDRF for managing nuclear / radiological emergencies and radioactivity contamination measurement in solid/liquid samples in case of terrorist activities. The equipment may be useful to VIP security agencies such as SPG for screening the food items for radioactivity contamination. The custom departments can also use this equipment at airport and seaport for screening the imported food items. Additionally, it has scope for civilian / research applications during peace time radioactivity measurement. In totality, the equipment may be helpful in controlling the radioactivity spread and restricting the contaminated food consumption by armed forces / public if any.

Technology Focus focuses on the technological developments in the Organisation, covering the products, processes and technologies.

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