Manufactured Housing Research Alliance MHRA

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Hungerford & Terry, Inc.

Response to MHRA questions regarding arsenic water treatment systems

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1. Name(s) of your system(s)

Ferrosand Filtration - custom designed for each application to ensure effective removal of arsenic and efficient (low cost) operation.

2. Will the system be available for installation and operation prior to the EPA mandated date of January 23, 2006?

The size of each system depends on the contaminant concentration and treatment capacity. Most systems are delivered anywhere between 12 and 24 weeks after approval of shop drawings.

3. Manufacturer and distributor contact information

Contact Hungerford & Terry, Inc., Attention: Mr. Frank Caligiuri, 226 Atlantic Avenue, Clayton, NJ 08312, (856) 881-3200 for the name of our local representative.

4. Basic description of your technology

The filtration system is based upon co-precipitation of arsenic with iron at a ratio of approximately 1 ppm of Fe to 20 ppb of As. Chlorine is injected upstream of the Ferrosand Filter to convert and As+3 to the +5 state, and to oxidize and precipitate soluble iron. The arsenic adheres to the iron precipitate and is filtered out of the water as an insoluble. When the filter reaches saturation, it is backwashed. The precipitate is then removed from the filter, and the filter is renewed for subsequent use. The precipitate from the backwash may be allowed to settle to substantially reduce the overall waste volume. If the raw water has an insufficient amount of naturally occurring iron to facilitate the process, it may be necessary to pre-feed an iron salt such as ferric chloride.

5. Maximum arsenic levels that can be mitigated to below the 10ppm standard using your system.

Just about any reasonable amount of arsenic can be removed from water using a filtration process.

6. Range of system capacities available with your system.

The Ferrosand Filtration process has been found effective for the removal of soluble iron, manganese, hydrogen sulfide, arsenic, and radium. Hungerford & Terry, Inc. offers other systems for other water treatment challenges.

7. What method of disposal has been approved for the media type? Is it considered hazardous material or will they pass TCLP as non-hazardous waste?

During the filtration process, the media is used to filter rather than absorb arsenic. As a result, the media does not retain toxicity, and can generally be land-filled as non-toxic waste.

8. Approximate cost for a typical 200gpm system, including engineering, design, drawings, specifications, equipment, installation, and start-up. Do not including the building to house the system or piping to and from the plant.

(2) 72" diameter (50% capacity each) filters would cost anywhere between $70,000.00 and $130,000.00 depending on the scope of equipment, quality of materials, and level of automation.

9. Approximate ongoing annual operational costs for a 200gpm system, including chemicals, media replacement, disposal, electrical power, etc., as applicable. Please also include approximate labor requirements in labor-hours and the level of training/skill required by operators.

Operational cost is highly dependent upon contaminant concentration. If we assume 1 ppm of iron and 20 ppb of arsenic, chlorine consumption will be approximately 1.92 gallons of 15% sodium hypochlorite (chlorine) per day. Delivered cost for 15% sodium hypochlorite is approximately $0.90 per gallon in most areas, therefore, chemical cost (including a 0.5 ppm residual chlorine for disinfecting) would be $630.72 per year. Electrical consumption from a typical control panel is nominal. The panel is fused at 20 Amps 120 VAC single phase. With respect to media and other maintenance costs, some authorities accept a factor of between 2% and 2.5% of equipment cost per year for maintenance over a 25 - 30 year equipment life span which would include corrective and preventive maintenance, media, parts, and labor.

10. What is the lead time required from purchase to operational installation?

Depending on the size of the system and the scope of supply, equipment can be delivered between 12 and 24 weeks after review and approval of shop drawings. Also depending on the size of the system and the scope of supply, shop drawings (design) can take anywhere from 2 weeks to 8 weeks following receipt of order.

11. Describe the track record of the system and supplier including examples of existing installations, if any.

Hungerford & Terry, Inc. has been a consultative industry leader in the design and manufacture of water treatment systems of all kinds since 1909. Our company is among the few firms internationally with adequate QC standards to supply water treatment systems for nuclear applications. A partial reference list is attached for your convenience.

12. List and explain any site-specific factors (such as appropriate water pH and mineral levels) that may affect the decision to use your system.

The filtration process lends itself to a pH range between 6.2 and 8.5. There are a number of other factors that would normally impact the decision to select one technology over another in any particular application. However, when a filtration process is suitable, we strongly recommend it.

13. Other information

There are a number of different arsenic removal technologies, and often times one technology may lend itself to a particular application better than another application. In essence, all the known technologies offer certain advantages and disadvantages. It is always best to match a technology to an application on its merits and suitability for the particular application in question.
When it can be used, we favor the process by which arsenic co-precipitates with iron and is filtered in an insoluble state. The filtration process enables the user to regularly "backwash" and restore the filter media, therefore, there is no continual degradation in water quality as is generally the case with absorptive media. In addition, it is generally easier and safer to dispose of arsenic in an insoluble state.