SORB 33™  
Arsenic Removal Systems

Arsenic Solutions Start Here
Since 1995, Severn Trent Services has been actively involved in providing efficient and effective arsenic removal solutions. Severn Trent’s SORB 33™ arsenic removal system employs a robust granular ferric oxide (GFO) media, Bayoxide® E33, developed by Bayer AG, for the adsorption of arsenic from contaminated water sources. The Bayoxide® E33 GFO media is made available exclusively from Bayer to Severn Trent for use in their SORB 33 Arsenic Removal process. As a large chemical company specializing in applied iron oxide technologies, Bayer has the technical expertise and capacity to meet global needs for the supply of GFO for arsenic removal.

**SORB 33™ Process**
The SORB 33 arsenic removal system employs a simple “Pump and Treat” process that flows pressurized well water through a fixed bed pressure vessel containing the GFO media where arsenic is adsorbed. Severn Trent Services Guarantees Performance on the SORB 33 process.

**SORB 33™ Features**
- Removes both As (III) and As (V) to < 4 µg/L
- Robust GFO media has a high capacity for arsenic
- GFO media life is 6 months to 2 years
- Very low residual effluents: < 0.1% of water treated
- No re-pumping required
- No chemicals for regeneration
- Low Maintenance: no moving parts
- Small footprint
- Dry media

**SORB 33™ Advantages**
- Low capital and operating costs
- Simple process control: unattended operation
- Easy Disposal of spent “fixed” media: Passes TCLP Test - no hazardous waste generated.
- Guaranteed Performance
- Low extractables (NSF approval applied for)
- Low shipping cost and long shelf life due to “Dry Media”.

As the contaminated water passes through the GFO media, arsenic is adsorbed and removed to a level below the drinking water standard of 10 µg/L. The GFO media was developed to have a high capacity for arsenic. As a result it achieves long run times ranging from six months to two years before the media becomes exhausted. Once exhausted, the media can be removed and sent to a non-hazardous landfill for disposal, meeting TCLP test. System design and operation does not require cleaning, regeneration or any of the other complex process steps required for competitive technologies. This is a simple “PUMP and TREAT” solution for water treatment at the well sight. In addition to its simplicity, the SORB 33 process is a cost-effective solution for arsenic removal at well water sites from installation to full operation.
Technology Comparison
Severn Trent Services offers a broad range of available technologies such as adsorption, reverse osmosis, coagulation/micro-filtration and ion exchange that are capable of removing arsenic problems in drinking waters and waste waters. The SORB 33 process was specifically developed for the removal of arsenic from large municipal water systems. It is a cost effective, simple and proven process.

The Simple Solution Concept

<table>
<thead>
<tr>
<th>Technology</th>
<th>STS Product</th>
<th>Process</th>
<th>Chemical Use</th>
<th>Waste Generated</th>
<th>Water Wasted</th>
<th>Impact on Water Quality</th>
<th>Applicability/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SORB 33</td>
<td>Yes</td>
<td>Simple</td>
<td>None</td>
<td>Low</td>
<td>&lt;.1%</td>
<td>None</td>
<td>Simple, Cost Effective Solution for &quot;PUMP and TREAT&quot;</td>
</tr>
<tr>
<td>RO</td>
<td>Yes</td>
<td>Moderate</td>
<td>Cleaning Chemicals</td>
<td>Low</td>
<td>10-25%</td>
<td>Improves</td>
<td>Applies for in home POU application. Applies if additional salt removal or other ion removal is required.</td>
</tr>
<tr>
<td>Ion exchange</td>
<td>Yes</td>
<td>Complex</td>
<td>Regeneration Chemicals</td>
<td>High</td>
<td>5%</td>
<td>Could Spike Arsenic</td>
<td>Applicable only for special applications with unusual water chemistry</td>
</tr>
<tr>
<td>Activated Alumina (AA)</td>
<td>No</td>
<td>Complex</td>
<td>Regeneration Chemicals</td>
<td>High</td>
<td>5%</td>
<td>None</td>
<td>Similar process to SORB 33, except capacity is limited and will require regeneration. Regeneration makes process complex, generates waste and increases cost</td>
</tr>
<tr>
<td>Coagulation Microfiltration</td>
<td>Yes</td>
<td>Complex</td>
<td>Cleaning, Coagulation Chemicals</td>
<td>Moderate</td>
<td>5%</td>
<td>None</td>
<td>Will only apply to central &quot;WATER TREATMENT&quot; facilities. Will apply for surface water applications.</td>
</tr>
</tbody>
</table>

For a comparison of the capital and operating costs between the SORB 33 process and other technologies for a 1 MGD system with 35 µg/L of arsenic refer to the corresponding figures.
SORB 33™ Installations
The SORB 33 process has been successfully piloted and placed in full-scale plant operation since 1999. The full scale process effectively removes both As (III) and As (V) to levels well below 4 µg/L. Due to the proven success and extensive experience with the SORB 33 arsenic removal system, Severn Trent Services Guarantees Performance on the process! Severn Trent Services has installed 46.6 MGD of full scale plant systems. Two of these installations are shown here.

Chaddesley Corbett Plant
(1.9 MGD Capacity)

Hilton Plant (6.0 MGD Capacity)

Skid Mounted Demonstration Unit
To help validate the adsorption process Severn Trent Services offers pilot programs with the SORB 33 arsenic removal system. Pilot units are available either skid mounted as a mobile plant or as individual column units.

- Two 4”- diameter columns
- Parallel flow for 2 operating conditions
- Series flow for Fe/Mn pretreatment
- pH adjustment * data logging