# Technology Data Sheet

## *Portable Water Treatment Solution for Shale Gas Exploration*

### *Technology Benefits*

- High System Capacity
  - Up to 10,000 barrels/day
- High Quality Effluent
  - Ca < 50 ppm, Ba < 10 ppm, Fe < 1 ppm, TSS < 10 ppm
- Dense Sludge Generation (>80% dry solids)
- Generates its own Chemical Make-up Water
- Corrosion-Resistant Equipment
- Centralized Controls for Easy Operation
- Diesel Generator Included in the Design

### *Added Value*

- Local Presence in Shale Gas Regions
- Regulatory Expertise
- Produced Water Treatment Expertise
- In-house Process Know-how
- Sustainable Treatment Solutions
- Customized Delivery Options
- Aftermarket Sales and Service

### *Equipment Options*

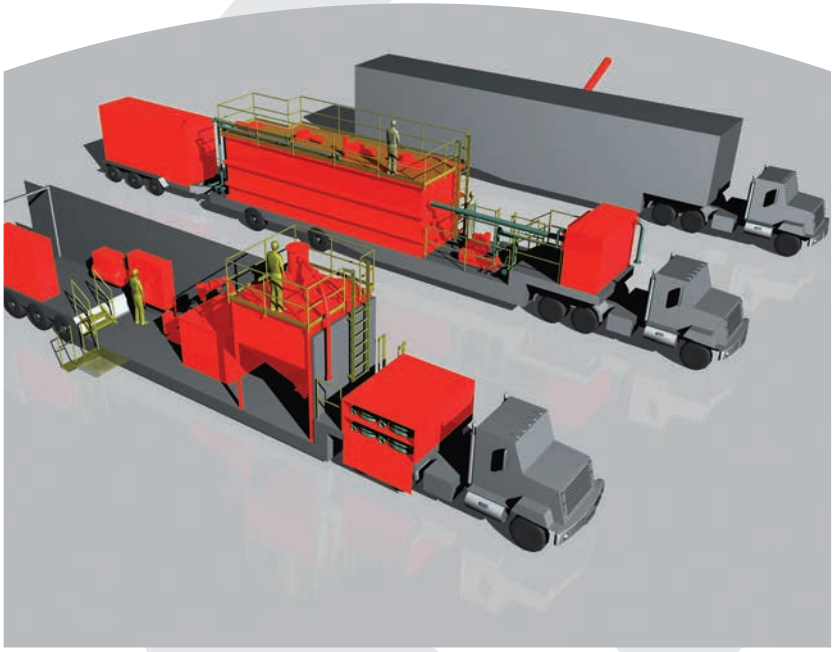
- Portable Chemical Feed System
- Portable Sludge Dewatering Unit
- Mobile Trailer Configuration

### *Optional Services*

- On-site Start-up Services
- Operator Training
- On-site Service Contracts

Veolia Water Solutions & Technologies offers proprietary transportation technology for frac water treatment and reuse, decreasing the need for fresh water supply. Our innovative design was developed to meet a variety of needs for effective water management in the shale gas industry.

When removal of scale-forming constituents is required, this versatile system can be operated in Softening mode to precipitate and settle out calcium, magnesium, barium, strontium, iron and manganese. For removal of scale-formers by water softening, treatment capacity is up to 10,000 barrels per day.



*The compact solution solution combines proven technologies from Veolia Water Solutions & Technlogies to meet the unique needs of the shale gas industry.*

If the site water characteristics require only removal of suspended solids, the system can be operated at a higher flow rate in Clarification mode.

Available either skid-mounted or trailer-mounted, our pre-engineered system is delivered ready for hook-up with minor assembly and can be moved from site to site.

VEOLIA WATER
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## Technology Description

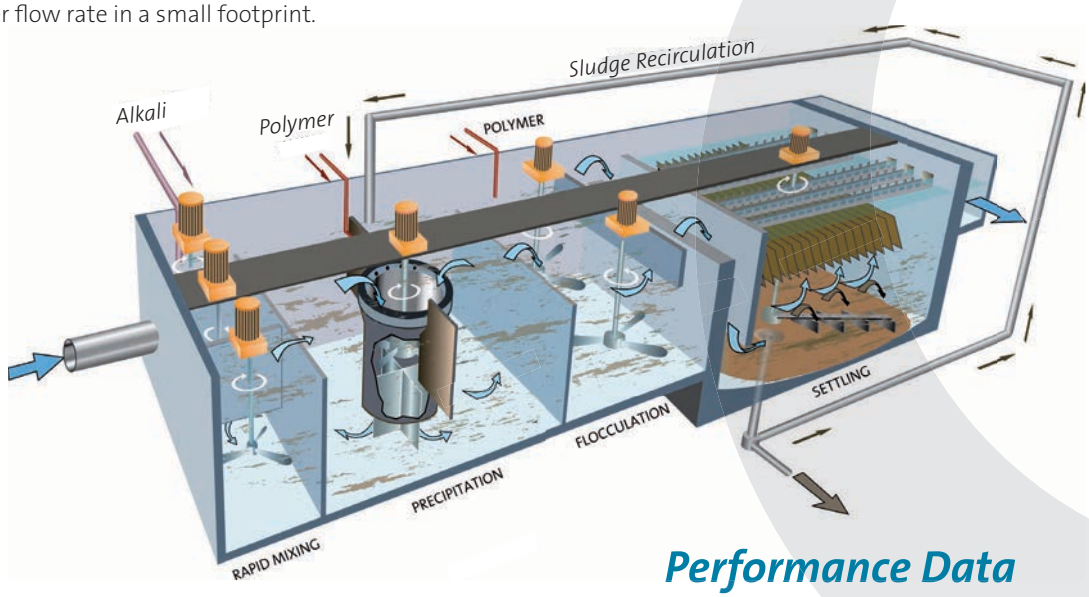
Offered exclusively by Veolia Water Solutions & Technologies, this technology is a compact process that incorporates chemical precipitation with sludge thickening, producing an effluent with low concentrations of scale-formers and a highly concentrated sludge that can be easily dewatered. Our systems are constructed of corrosion-resistant materials that are suitable for handling water that contains high concentrations of dissolved solids and chlorides.

When operated in Softening mode, the addition of chemicals, controlled sludge recirculation, and optimized hydraulics using our patented TURBOMIX™ draft-tube reactor enhance the formation of crystalline compounds that rapidly settle in a lamella clarifier.
This results in a flexible, robust process whose footprint is 10 to 20 times less than that of a conventional precipitation softening system.

In the softening process, the water first enters the rapid mix tank where softening chemicals are added. Precipitation and enhanced crystallization are aided by the complete mixing of the TURBOMIX™ reactor. Polymer addition and gentle mixing in the flocculation tank allow floc to build, increasing settling velocity.

The bulk of the solids settle rapidly, and the clear water rises through the lamella tubes, which capture any smaller particles carried in the supernate. The clarified, softened water is discharged, and a portion of the sludge is recycled to the precipitation chamber to enhance crystallization, while the excess thickened sludge is discharged from the system.

When operated in Clarification mode, the softening chemistry is eliminated and microsand recirculation is added to enhance rapid settling, enabling higher flow rate in a small footprint.




## Performance Data (Softening Mode)

| Contaminant | Influent | Effluent |
|---|---|---|
| Calcium Hardness, ppm as $CaCO_3$ | 8,000 - 40,000 | < 50.0 |
| Magnesium Hardness, ppm as $CaCO_3$ | 1,000 - 4,000 | < 50.0 |
| Iron, ppm | 25 - 200 | < 1.0 |
| Manganese, ppm | 5 - 10 | < 1.0 |
| Barium, ppm | 500 - 16,500 | < 10.0 |
| Strontium, ppm | 800 - 5,000 | < 10.0 |
| Total Suspended Solids, ppm | 100 - 1,000 | < 30.0 |

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