

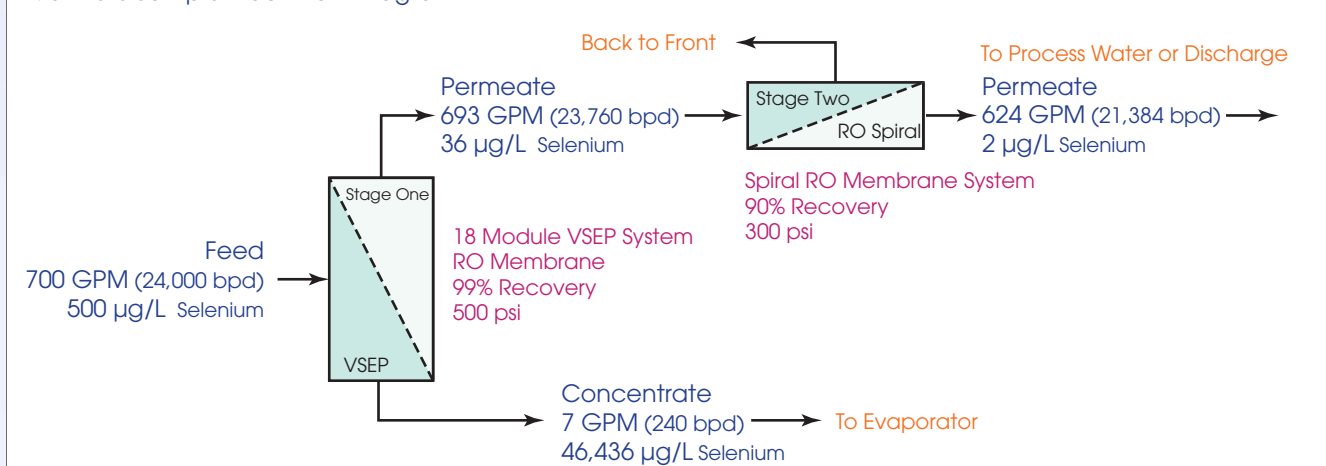
# V<sup>+</sup>SEP<sup>®</sup> STS *Vibratory Shear Enhanced Process Selenium Treatment System*

## **Selenium Discharge Regulations**

Problems caused by the discharge of selenium-laden wastewater from industries such as coal mining, coal-fired power plants, crude oil refineries, and agriculture have become hot topics in both the public and private sectors. With studies showing adverse effects to wildlife such as fish and birds from extremely low levels of the bio-accumulant selenium, the EPA has stepped in to set new limits for discharge as part of the

proven at any scale. Biological systems also require a consistent selenium concentration in the feedwater, as the population of microorganisms must balance with the selenium present in the reactor in order to achieve a reduction. Conversely, spikes in selenium levels at the reactor inlet lead to insufficient bacteria levels to properly treat the water. Washout or loss of all bacteria can occur if the selenium level drops too low during periods of heavy rain. Biological systems are also susceptible to upsets from large temperature

V<sup>+</sup>SEP STS Sample Block Flow Diagram



Clean Water Act. Technologies are being evaluated to determine the best available technology for meeting the newly lowered 5 parts per billion (ppb) discharge limit. While others continue their development efforts to meet the 5 ppb goal, New Logic Research has already installed its VSEP Selenium Treatment System (STS) at full-scale, and is meeting the new selenium discharge requirements.

## **Treatment Options – Biological Treatment**

Biological systems such as constructed wetlands and biological digesters have shown some ability to remove selenium during pilot trials. However, full-scale implementation has yet to be accomplished. The reduction potential using biological systems is not as high as the potential selenium reduction that is possible with Reverse Osmosis (RO) membranes. Biological systems require a very large footprint, which presents a problem when designing a system for an existing facility with limited space available, or for mining operations in hilly terrain. Other biological systems such as Fluidized Bed Reactors have the potential to remove selenium, but this has never been

fluctuations and do not operate well below 15°C (60°F).

## **Treatment Options – Conventional Spiral Reverse Osmosis Membranes (RO)**

While reverse osmosis (RO) membranes are capable of very high selenium rejection, the type of RO membrane system used is a very important factor. Conventional spiral wound RO membrane modules require significant pre-treatment to avoid plugging from colloidal materials and precipitated mineral salts inside the membrane module. In addition, spiral wound RO membrane systems typically leave a very large volume of reject water as a percentage of the total volume treated. This reject water must be treated and disposed of using very expensive methods, which makes the traditional RO membrane treatment process economically undesirable.

## **VSEP Selenium Treatment System (VSEP STS)**

In contrast to the biological and conventional RO processes is the VSEP STS, a vibratory reverse osmosis

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membrane-based solution from New Logic Research. At the heart of the VSEP STS is the VSEP vibrating membrane system. The VSEP module is outfitted with reverse osmosis membranes that remove up to 97% of selenium in one step. Further reductions can be accomplished using additional RO membrane stages, and levels of near non-detect are possible even with high starting selenium concentrations. The VSEP STS is capable of running at any temperature above freezing, and is able to perform with any concentration of selenium or even with very large swings in the concentrations of selenium. Furthermore, the ability of the VSEP STS to reject selenium is not dependent on the form of selenium; it can treat all forms including selenite and selenate. The VSEP STS can operate over a wide range of pH, temperature, and dissolved salt concentrations. System startup is instantaneous and does not require weeks of conditioning to reach equilibrium. The VSEP STS also recovers immediately after a shut down.

Compared to conventional RO membrane systems, the reject generated from the VSEP STS is very small. For example, one full-scale VSEP STS system currently operating in the U.S. produces 99% of the volume as clean water for discharge, leaving only 1% of the starting volume as concentrated reject. The reject is sent to a small evaporator prior to final disposal. Because the VSEP STS produces such a small reject volume, the associated capital and operating costs are much lower than a conventional RO membrane system which would require a much larger evaporator.

## **Field Proven**

Unlike other treatment options for selenium, the VSEP STS is installed at full-scale and has been running for years meeting stringent selenium discharge requirements. In addition to the VSEP

STS installations, New Logic Research has installed hundreds of VSEP systems all over the world for very difficult applications including landfill leachate, manure filtration, brine concentration, and other industrial wastewaters.

## **More Information**

New Logic has a large number of VSEP pilot systems and field engineers that are available to perform on-site demonstration trials. These units are small and easy to ship, and pilot testing can be arranged within three to four weeks. With over twenty years of experience treating difficult wastewater streams, it's likely that New Logic has collected data from projects similar to yours. For more information about the VSEP STS and how it can help you with your discharge requirements, contact a New Logic Sales Engineer today.



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