

Solving the Wastewater Challenge

Removing Sulfate and Selenium from Mining and Industrial Wastewater with HydroFlex™

The mining and power sectors are facing increasingly stringent water regulations. Meeting effluent quality standards for sulfate and selenium has been a challenge with existing technology. Conventional precipitation methods struggle to reduce sulfate concentrations below 1,200 mg/L, and costly membrane-based processes are subject to fouling and generate large streams of rejected waste. With sulfate and selenium discharge limits as low as 250 mg/L and 1 µg/L respectively, there is need for an economical solution that addresses sulfates and selenium in one efficient process.

Research recently completed at the University of British Columbia (UBC) has validated an innovative water processing technology called HydroFlex™ for the removal of difficult-to-treat contaminants, particularly sulfate and selenate. As quoted by UBS, “Selenate was effectively co-extracted with sulfate into the Winner Water Services organic solution.” Study results demonstrate that HydroFlex is an effective tool to help mining companies and other industries with sulfate- and selenium-laden wastewater meet ever-tightening water regulations.

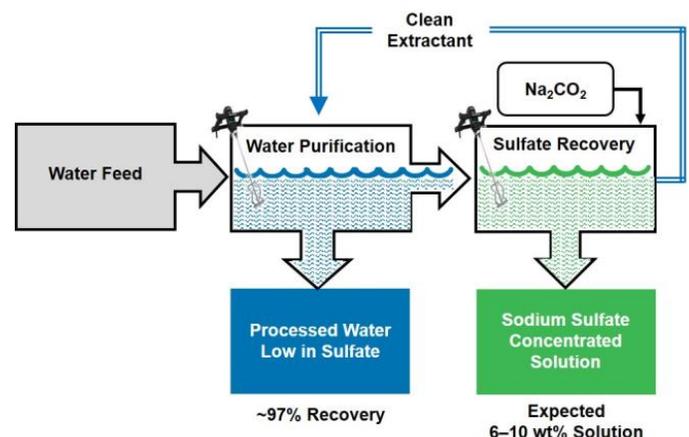
The HydroFlex Solution

HydroFlex is a platform technology based on well-understood solvent extraction principles. Solvent extraction has been practiced in the mining industry for decades to recover copper, uranium and other metals from leach solutions. Winner Water has developed a proprietary process that deploys solvent extraction principles to enable safe and effective wastewater treatment.

The HydroFlex process provides distinct advantages over current technologies in the areas of water purification, treatment efficiency, selective contaminant removal and reduced waste.

- Water Purification: Sulfate and selenate are reduced 70–90% in the process.
- Treatment Efficiency: HydroFlex produces >99% clean discharge, with no reject stream.
- Selective contaminant removal: HydroFlex focuses treatment efforts to control costs.
- Reduced waste: The selective extraction process yields concentrates that may have the potential for reuse.

The flexibility inherent to the process allows Winner Water to meet clients' effluent and/or process goals without paying for treatment that isn't needed or required.



Results

Winner Water retained the services of UBC to test the appropriateness of the HydroFlex solution for selenium removal, and specifically the difficult-to-remove selenate. Under the direction of Dr. David Dreisinger, UBC has a long and successful history in the field of mining and hydrometallurgy.

Figure 1: Sulfate Loading Isotherm

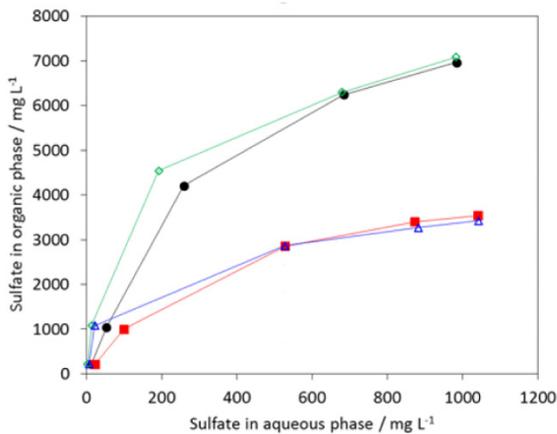
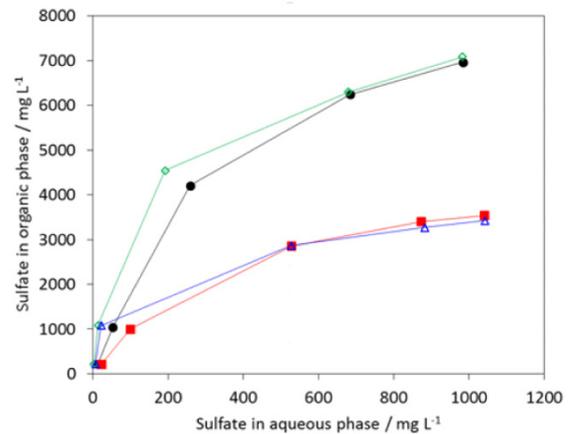


Figure 2: Selenate Loading Isotherm



Researchers tested the HydroFlex process using sulfate and selenium solutions of various concentrations. The sulfate and selenium loading isotherms are shown in Figures 1 and 2. Each line corresponds to a different concentration of extractant displaying consistent loading across a broad range of conditions. Both sulfate and selenium loading to our extractant increased with increasing concentrations in the aqueous solution indicating decreasing concentrations in the water. The isotherms can be used to project the number of stages required to meet effluent conditions across a broad concentration range, allowing Winner Water to tailor the removal to customer needs.

The UBC studies demonstrated that selenate can be readily co-extracted with sulfate utilizing HydroFlex. The resulting water was within regulatory limits for safe environmental release.

Reducing sulfate and selenium in the same process saves time and money for mining companies, allowing contaminants to be reduced to allowable discharge limits in fewer units of operation. This results in reduced labor and maintenance costs and lower environmental footprints for mining companies. Discharging water also reduces long-term liabilities associated with containment and storage of contaminated wastewater. These studies demonstrate that the HydroFlex process offers an efficient and cost-effective alternative to address wastewater challenges for mining companies.