

# Mine Waste Technology Program

## Success Stories

Prepared by:  
MSE Technology Applications, Inc.  
P.O. Box 4078  
Butte, Montana 59701

The Mine Waste Technology Program (MWTP) is sponsored by the U.S. Environmental Protection Agency through the U.S. Department of Energy and is implemented by MSE Technology Applications, Inc.

## Success Stories

MSE Technology Applications, Inc., has been able to transfer a number of the technologies developed within the Mine Waste Technology Program (MWTP) to other Federal Agencies and private entities. Deployments include the following.

***Alumina Adsorption with Microfiltration*** – ZENON Environmental Inc. (ZENON) of Canada successfully demonstrated their alumina adsorption with Microfiltration technology to remove arsenic from process waters from the ASARCO East Helena, Montana lead smelter and from the TVX Mineral Hill Mine 1300 foot Portal water located in Jardine, Montana. Alumina adsorption is a widely recognized technology for the removal of arsenic from water. ZENON developed the innovative approach using alumina adsorption combined with microfiltration. ZENON has successfully marketed this technology since the demonstration. In addition, their microfiltration technology, Zee Weed Microfiltration, has since become a preferred filtration technology in the food processing industry and drinking water markets.

***Catalyzed Cementation Process*** – Dr. Larry Twidwell, President of Montana Enviromet and Metallurgical Engineering Professor at Montana Tech, is the developer of the Catalyzed Cementation Process. MSE licenses the technology. Catalyzed Cementation is a proprietary process developed to remove arsenic and other heavy metals such as selenium, antimony, and thallium from water. The process removes contaminants from solution by cementation. The Catalyzed Cementation has the ability to treat and remove arsenic from solution regardless of its valence state (+3 or +5), i.e., a pre-oxidation step is not required. Proprietary reagents catalyze the cementation process and optimize the removal efficiency of the process. Through the MWTP, the catalyzed cementation process was demonstrated treating selenium contaminated groundwater west of Salt Lake City, Utah at the Kennecott Utah Copper properties. This process has the ability to reduce arsenic concentrations to well below the EPA regulatory discharge standard. The catalyzed cementation chemistry centers around the use of zero valence iron. The proprietary knowledge deals with the addition of catalyst to enhance the reaction rates of the process. Successful treatability studies were performed in an effort to market this technology. The potential customers are Newmont Gold Company, MERCK Manufacturing Division, The Sherwin-Williams Company, and Salt Lake City, Utah Supply Water facilities.

***Mineral-Like Precipitation Process*** – Dr. Larry Twidwell, President of Montana Enviromet and Metallurgical Engineering Professor at Montana Tech, is the developer of the Mineral-Like Precipitation technology. MSE licenses the technology. This technology removes arsenic from solution by incorporating the arsenic into a mineral matrix. This mineral-like precipitated product is stable for long-term storage in a tailings pond environment, i.e., stable against atmospheric reagents such as carbon dioxide. The precipitation of the mineral-like products is capable of removing arsenic from solution to well below the U.S. Environmental Protection Agency (EPA) regulatory discharge standard, as well as removing other heavy metals. During the MWTP, the mineral-like technology was successfully demonstrated removing arsenic from process waters from the ASARCO East Helena, Montana lead smelter and from the TVX Mineral Hill Mine 1300 foot Portal water located in Jardine, Montana. Since the MWTP field demonstration, MSE has been actively marketing this technology. The mineral like chemistry has been successfully applied to many industrial process waters, and contaminated groundwaters

in treatability studies. Some projects where this technology was successfully tested were Newmont Gold Company, Barrick Goldstrike, Pegasus Gold, Kennecott Utah Copper Company, J.R. Simplot Company, Hecla Mining Company, Sherwin-Williams, MERCK Manufacturing Division, and Potlatch Corporation.

The mineral-like chemistry has also been applied successfully to stabilize arsenic, lead, and other constituents in soils. An example of this is the successful completion of the Treatability Study for Lead Shot Recovery, Abatement, and Sludge Stabilization for the Former Peninsula Sportsmen's Club Project near San Francisco, California.

***Oil Company*** – The Sulfate Reducing Bacteria technology has been considered by an oil company for use in a barrier to prevent the migration of lead in a groundwater plume.

***Photo Oxidation of Arsenite to Arsenate*** – CRC for Waste Management and Pollution Control (CRC) and Australian Nuclear Science & Technology Organization (ANSTO) patent (US 05688378) ultra violet (UV) iron process was successfully demonstrated treating water from the Susie Mine in Rimini, Montana. Researchers at ANSTO discovered that, in the presence of light and dissolved iron compounds, the oxidation rate of dissolved arsenite to arsenate by oxygen can be increased by more than four orders of magnitude. Since the MWTP field demonstration, the technology has been marketed all over the world for treating industrial process waters and drinking waters that contain arsenite. CRC and ANSTO have improved on the efficiency of the UV photo oxidation process by developing the UV/Sulfite Photo-Oxidation Technology.

In 2001, the U.S. Environmental Protection Agency funded a number of SBIRs in the area of arsenite oxidation by UV for contaminated drinking water supplies. The positive information developed in the MWTP oxidation project fueled the opportunity for further development.

***Reductive Precipitation Technology*** – Dr. Larry Twidwell, President of Montana Enviromet and Metallurgical Engineering Professor at Montana Tech, is the developer of the Reductive Precipitation Process. MSE licenses the technology. Reductive Precipitation is a proven technology that effectively removes arsenic and other heavy metals by forming insoluble salts. Pilot-scale studies have proven that the Reductive Precipitation effectively reduces arsenic and antimony concentrations to less than the EPA drinking water standards of 10 parts per billion (ppb) for arsenic and 6 ppb for antimony. MSE has been successfully marketing this technology. The technology was implemented at a high profile superfund site in Emeryville, California to remove arsenic from groundwater. MSE designed, installed, and commissioned the full-scale plant. The Reductive Precipitation process has been operating successfully since March 1999. The Reductive Precipitation process has reliably operated since March of 1999. Current potential customers interested in the implementation of this process are Rhone-Poulenc Basic Chemicals Company; Salt Lake City Supply Water facilities; and Camp, Dresser and McKee.

***Water Treatment Facility – Forest Queen*** – A passive water treatment facility based on the use of sulfate reducing bacteria was designed and installed at the Forest Queen Mine near Silverton, Colorado in 1997. This facility was developed for the U.S. Bureau of Land Management, Colorado State Office, as a portion of the Rocky Mountain Headwaters Mining Waste Initiative.

***Water Treatment Facility – Moran Tunnel*** – A passive water treatment facility based on the use of sulfate reducing bacteria was designed and installed at the Moran Tunnel near Arco, Idaho in 1999. This facility was developed for the U.S. Bureau of Land Management, Idaho Falls Regional Office, as a response action under the BLM Idaho State Response contract.

***Water Treatment Facility – Constitution Mine*** – A passive water treatment facility based on the use of sulfate reducing bacteria was designed at the Upper Constitution Mine in the Pine Creek Drainage of Northern Idaho in 2000. This facility was developed for the U.S. Bureau of Land Management, Coeur d’Alene Regional Office, as a response action under the BLM Idaho State Response contract.

***Water Treatment Facility – Margaret Mine*** – A semi-passive water treatment facility based on the addition of alkaline reagents to the contaminated water using the technology that was originally developed for the Remote Mine Project under the MWTP was designed at the Margaret Mine near Silverton, Colorado in 1997. This facility was developed for the U.S. Bureau of Land Management, Colorado State Office, as a portion of the Rocky Mountain Headwaters Mining Waste Initiative.

***Water Treatment Consultation – Richmond Hill*** – Consultation services were provided to LAC Minerals Corporation, the owners of the Richmond Hill Mine near Lead, South Dakota, related to their efforts to treat contaminated waters associated with the mine. The facility being developed is to be based on the actions of sulfate reducing bacteria.

## **2. Geographical Locations ([Click Here](#))**

EPA

East Helena, MT– ASARCO Smelter

Butte, MT– Berkeley Pit

Elliston, MT– Lilly Orphan Boy Surething Mine

Lincoln, MT– Mike Horse Mine

Rimini, MT– Peerless Mine

Mammoth, MT– Mammoth Tailings Site

Townsend, MT–Miller Mine

Anaconda, MT–Smelter  
Fallout Zone

Basin, MT– Crystal Mine

Butte, MT– Calliope Mine

Whitehall, MT– Golden Sunlight Mine

Gardiner, MT–TVX Mineral Hill Mine

Black Hawk, CO

Deadwood, SD – Gilt Edge Mine

Clear Lake, CA – Sulphur Bank Mine

Reno, NV – Heap Leach Detox

Battle Mountain, NV – Echo Bay

Salt Lake City, UT – Kennecott

Joplin, MO–Phosphate Treatment of Soils

Desloge, MO–Leadwood Chat, and Big River Tailings

