

How Environmental Technologies Are Driving Better Cost Competitiveness In U.S. Rare Earth Production

Rare earth elements are vital to smart phones, computer, hybrid vehicles, clean energy technologies and many military and homeland security systems. While the U.S. is currently dependent upon China for more than 97 percent of these strategic materials, that is about to change. In 2012, America will achieve virtual independence in rare earth production following completion of Molycorp's modernization project at our Mountain Pass, California Rare Earth Facility. This new, state-of-the-art facility will allow Molycorp to manufacture rare earths at a rate that meets or exceeds all U.S. consumption.

Molycorp's new manufacturing supply chain will produce rare earth oxides, metals, alloys, and permanent magnets. It will be the most technologically advanced and environmental superior rare earth supply chain in the world. It also will position the U.S. to be the world's lowest-cost rare earth producer – a powerful combination that reverses conventional wisdom that environmental superiority necessarily increases costs.

Environmental Technology Advances

All rare earth ore bodies contain the full range of the naturally occurring rare earth elements. However, separating individual rare earth elements into high purity oxides is complex, capital intensive, and technically challenging. With the exception Molycorp, few facilities outside of China are currently capable of doing this work.

One of the key byproducts of the separation of rare earths is saltwater. Traditional rare earth operations at Mountain Pass, California produced hundreds of gallons of saltwater per minute, which was piped to off-site holding ponds where the water was evaporated. At the height of production in the 1980s and 90s, the Mountain Pass facility produced up to 850 gallons of saltwater per minute. Molycorp experienced a series of wastewater pipeline breaches in the 1990s, which caused environmental impacts that had to be addressed.

While these pipeline-caused environmental impacts have since been remediated, Molycorp's new leadership did not want to rely on "business as usual" approaches to rare earth production as they planned for the facility's modernization. They challenged the company's research scientists and engineers to come up with new, breakthrough technologies that could dramatically shrink the environmental footprint of rare earth production. The goals were to reduce emissions, increase energy efficiency, boost mineral recovery rates, and become a near-zero-emission process water facility.

After more than five years of painstaking research and development, Molycorp's scientists developed truly revolutionary technological breakthroughs that will achieve each of these goals. Molycorp is now incorporating these technologies into its new facility at Mountain Pass, which will be mechanically complete by mid-2012.

Environmental Superiority and Production Costs

Most industries that seek to go beyond environmental compliance and achieve environmental superiority expect increasing production costs. In Molycorp's case, however, deploying new technologies to achieve environmental superiority drove down our production costs – so much so that the Molycorp facility in Southern California will produce rare earth products at a cost of production estimated to be one-half that of the Chinese.

Molycorp's Technology Innovations in U.S. Rare Earth Production

Process	Traditional Method	Molycorp's New Innovations
Chemical Reagent Use	Traditional processes at Mountain Pass required between 15-25 tanker trucks per day of chemical reagents that were transported by truck to the facility, from locations such as Las Vegas, NV and beyond.	Molycorp's new facility will recycle salt water produced in the operation and use it as a feedstock to produce new chemical reagents in a continuous closed recycling loop.
Power Generation and Use	Mountain Pass' traditional process required large amounts of costly grid power from the local utility. Poor power quality and service interruptions increased production costs. Many pieces of on-site equipment used high-emission fuels such as diesel, propane and "bunker fuel."	The on-site natural gas-fired combined heat and power (CHP) plant at the new facility will provide high quality power and steam, increasing system efficiency and greatly cutting production costs. Other combustion operations across the new facility will use cleaner-burning natural gas.
Fresh Water Use	Traditional rare earth operations require large amounts of fresh water pumped from local underground sources, which then produced large amounts of wastewater as a byproduct.	Molycorp's new facility will recycle process water used in the operation, dramatically reducing the need for fresh water.
Wastewater Production	Legacy processes produced up to 850 gallons per minute of waste saltwater at Mountain Pass, which had to be piped miles away to permitted evaporation ponds for disposal.	The new plant at Mountain Pass will be a near-zero wastewater disposal facility, recycling virtually all process water.
Evaporation Ponds	Mountain Pass used to require extensive use of evaporation ponds to deal with waste water produced by legacy systems.	Molycorp's new facility will recycle process wastewater, eliminating the need for over 120 acres of evaporation ponds.
Tailings Dams	The business-as-usual process at Mountain Pass required storing mine tailings and process water behind a tailings dam.	Molycorp's new facility will form a paste by removing most of the water from tailings. The water will be recycled and the paste will be deposited in successive layers that achieve structural integrity in a short time period, eliminating the need for a tailings dam.
Ore Milling & Processing	The legacy mill and processing facility at Mountain Pass could achieve a recovery rate of only about 50-55% of rare earths from the ore to solution.	Molycorp's new facility incorporates a variety of operational improvements to dramatically increase rare earth recovery rates, which will extend the life of the resource.
Air Emissions	The traditional processes at Mountain Pass produced significant emissions per unit of production.	Molycorp's new processes will increase overall system efficiency and reduce air emissions – including CO ₂ – as compared to the business-as-usual technology approach.
Desert Tortoise Protection and Species Recovery	The previous facility conducted endangered species protection protocols according to permit requirements.	Molycorp worked closely with the Bureau of Land Management and other stakeholders to develop an innovative "Desert Tortoise Conservation Facility" in the local area, which will help promote species population recovery.