

## As China slashes exports of rare earth elements, U.S. mine digs for more

*Elements such as cerium, neodymium and dysprosium are crucial to the clean-tech and high-tech industries, but China has slashed exports. A Colorado firm hopes to fill the void by ratcheting up output from a mine in the Mojave Desert.*

**Tiffany Hsu, Los Angeles Times, 2-20-11**

In the Mojave Desert just off Interstate 15 on the way to Las Vegas, workers are digging for dirt that may be worth far more than a casino full of chips.

The massive hole is about to get even bigger. Molycorp Inc., which owns the open mine, plans to dig out about 40,000 tons of dirt a year by 2014, up 1,200% from the current rate of about 3,000 tons.

The Colorado company is boosting production to meet an insatiable global appetite for rare earth elements — minerals that have become a hot commodity because they're used in all kinds of electronics, including smart phone touch screens, wind turbines and fuel cells.

The U.S. clean-tech industry, which relies heavily on the minerals, is elated by the stepped-up production rate, but some believe it is not coming soon enough. In recent months the industry has been in a bit of a panic as China, which produces 97% of the world's supply of rare earths, slashed its exports to a trickle to feed its growing domestic needs.

Rare earth shortages could cause companies already weakened by the recession to shrivel or stall, industry officials say. Molycorp's Mountain Pass mine produces about 3% of the world's rare earths, but the company plans to eventually turn out a quarter of the total supply.

"The use of these materials has really skyrocketed, with demand outstripping supply literally overnight," said Molycorp Chief Executive Mark A. Smith. "We've got some serious issues in this industry. It's going to be a tough year."

The mine, about 16 miles from the Nevada border, has one of the world's largest deposits of rare earth elements outside Asia and is the only commercial producer in the Western Hemisphere. The elements — 17 total, all with tongue-twisting names such as neodymium and dysprosium — are crucial to the clean-tech and high-tech industries.

Rare earth elements aren't actually rare, having picked up the misleading name in the 18th and 19th centuries before it was clear how common they actually are. Cerium, one of the elements that is sometimes used as a catalyst for self-cleaning ovens, is more abundant in the Earth's crust than copper or lead.

But mining for rare earths is difficult and expensive. The elements are usually found scattered in small fragments among rocks and must be separated and then processed.

The procedure is rarely eco-friendly, creating hundreds of gallons of salty wastewater per minute, consuming huge amounts of electricity, requiring toxic materials for the refining process and occasionally unearthing dirt that is radioactive.

The high costs and damaging techniques pushed most rare earth mines out of business in the early 1990s. Only China kept its mines going, positioning itself for the ensuing high-tech boom and the resulting rare earth-hungry products.

"Bottom line, we fell asleep as a country and as an industry," Smith said. "We got very used to these really low prices coming out of Asia and never really thought about it from a supply chain standpoint."

But recently, China began cracking down on illegal rare-earth mining operations that had cropped up there because of the high demand. As shipments of the materials dwindled in the last year, prices have soared. Cerium, for example, jumped more than 600%, from less than \$10 a kilogram to nearly \$70.

The supply squeeze has raised tensions in the delicate relationship between the U.S. clean-tech industry and its Asian counterpart. The U.S. trade representative's office has said that if China continues to rebuff requests to ease export limits on rare earths, it may take the dispute to the World Trade Organization.

"We better get on the ball here or our green industries are going to be at the complete mercy of China," said Jack Lifton, co-founder of the rare commodities research firm Technology Metals Research.

Many hope the Mountain Pass facility will help loosen China's chokehold on rare earths mining and manufacturing. Investors recently pushed Molycorp stock to \$50 a share from its \$13.25 debut price in July.

The company is spending more than \$500 million to modernize and rebuild the 2,200-acre facility. The project is expected to create hundreds of permanent jobs and eventually produce rare earths at cheaper rates than mines in China.

The California mine was discovered in the 1940s by uranium prospectors and at one point became the world's largest supplier of rare earths as the demand for europium, which is used for color television screens, surged in the 1960s.

But the mine went dormant for several years after an uproar over environmental concerns in the early 2000s. Mining efforts left mounds of tailings, or leftover dirt, around the property.

Molycorp is now cleaning up the site, implementing a water recycling program, constructing an on-site natural gas power plant and planning to work the tailings back into the surrounding landscape.

San Bernardino County officials hope the activity attracts battery manufacturers and other clean-tech companies, creating a hub of research and innovation in the area.

The U.S. rare earths industry is hoping other domestic mines will open.

The U.S. Geological Survey has identified several sites, including Music Valley in Southern California, where rare earths could be mined. Congress is considering proposals, some pushing for loan guarantees for rare earths suppliers, to encourage more domestic research and production. Other countries, including Australia, Canada and Brazil, are also on the hunt for more sites.

But developing a new mine from scratch requires prospecting, exploration, permitting and construction.

And even if more mines open in the U.S., the country has few companies that can process rare earths, use them

to manufacture batteries and magnets and work them into products. Without a domestic supply chain, most of the material extracted in the U.S. would have to be shipped overseas anyway.

There aren't many researchers or industry workers in the U.S. with experience working with rare earths. Not long ago, Molycorp recruiters were unable to find potential hires or even universities that offered rare earths courses. The company has 22 scientists exploring uses and sources of the elements; China has thousands.

"It takes a lot to go from some dirt in the ground to magnets," said Lifton, the analyst. "Finding a deposit is like saying, 'George Washington slept here.' It doesn't mean much. We've got enough bananas, but now we've got to figure out how to make banana splits."

But some clean-tech executives said that the industry may be relying too much on rare earths. Metallurgy experts point to the cobalt crisis of the late 1970s as an example. The element — used in alloys, batteries, pigments and more — was in short supply as political unrest locked down the primary reserves in Africa just as demand was starting to boom.

"Tomorrow, it'll be something else," said Alexander King, director of the Ames Laboratory in Iowa, run by the Energy Department. "The thing we need to learn is how to control the economics, to develop alternative materials on a very short turnaround."

Some suggest recycling existing rare earths materials — known as "urban mining." Others are considering using substitute materials such as aluminum, copper and iron in place of rare earths.

Toyota Motor Corp., which uses rare earths for hybrids like the Toyota Prius, said it plans to switch to a special induction motor that doesn't require the elements. Battery-powered vehicles such as the Nissan Leaf and the Chevrolet Volt use rare earth magnets that are more compact than other options.

But managing fluctuating supply is a "normal risk of doing business," said Pete Savagian, chief engineer for electric motors for General Motors Co. If rare earths run low or are priced out of the market, the automaker will adapt, he said.

"Rare earth magnets are great to have, but they're also not the only way," he said. "We'll go forward using the best methods we have."