JOURNAL OF MINES, METALS & FUELS www.jmmf.info

DISCUSSION-OPINION-EDITORIAL

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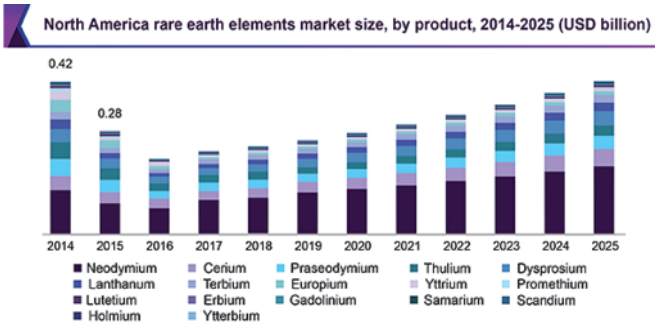
Do you know why are your next car and smartphone costlier now and what minerals have got do with it?

Introduction

Both chips and rare earths form critical supply chains that power the manufacturing of the smartphones and car electronics, among other things. Rare earths are a group of 17 metals crucial to the manufacturing of high-tech products. If a lack of chips has idled auto plants from India to Canada, what can be done to minimize the risk that a dearth of rare earth products will disrupt wind turbine and electric vehicle battery manufacturers? The current global chip shortage is driven by the pandemic and increased demand for products used while people work at home. The shortage has hampered auto production around the world. Ford Motor Co. recently said that it would cut production of the F-150 pickup truck – one of its most profitable and popular models – because of the shortage. General Motors Co. has extended shutdowns at some North American plants into March, 2022.

What are the Rare Earth Minerals?

Rare earths are metallic elements, and therefore contain unique properties, including high heat resistance, strong magnetism, high electrical conductivity, and high luster. These specific properties make them well suited for use in a variety of products, including cellphones, batteries, loudspeakers, lights, magnets, and even wind turbines. In addition, they are often key elements used in the creation of components used in everyday objects, such as light-emitting diodes (LEDs), fiber optics, compact fluorescent lights, and are used as catalysts, phosphors, and polishing compounds for air pollution control, illuminated screens on electronic devices, and the polishing of optical-quality glass. Some of the rare-earth metals (and their atomic weights) that are commonly used in electronics include lanthanum (57), cerium (58), neodymium (60), samarium (62), europium (63), terbium (65), and dysprosium (66). Other products, such as electric vehicles and wind turbines, were just in the prototype phase two decades ago, but have since seen significant commercial



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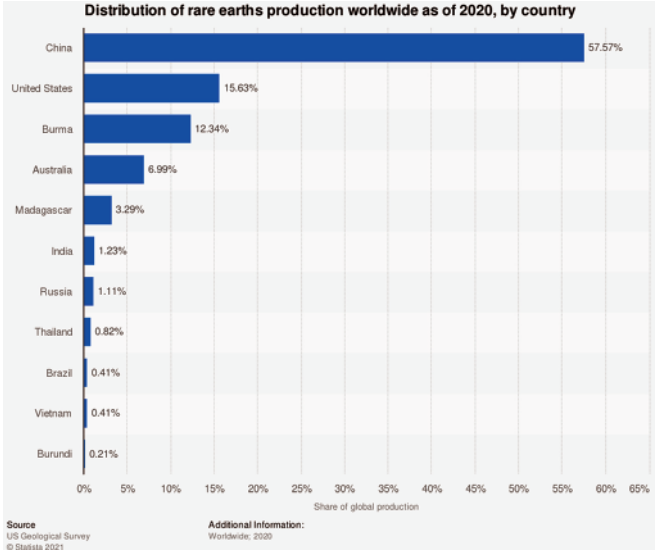

deployment, with positive demand forecast over the next several decades. As a result, demand for rare earth elements is likely to grow over time; combined with a relatively limited base of suppliers, rising demand could drive up the cost of rare earths for manufacturers, both in the U.S. and around the globe. In the 1990s, mining companies in China began

Bags of rare-earth concentrates at a California mine. China dominates the market for rare-earth elements.
Photo: JOE Buglewicz/Bloomberg news

focusing on rare earths; mines in other countries could not compete with low-cost Chinese mining and processing.

Why are their demands soaring?

When prices of rare earths spiked in the past, manufacturers were able to get their engineers to reduce the requirements for rare earths in some products, such as reducing or eliminating the use of europium and terbium in fluorescent lighting products, says Pierre Neatby, vice president of sales and marketing with Avalon Advanced Materials, Inc., a Canadian mineral development company with three mining projects expected to enter commercialization, including rare earth elements tantalum, niobium and zirconium. A new red phosphor that uses manganese 4+(Mn4+) activated fluoride compounds was developed to replace rare earth materials in lighting. However, Neatby says, some products simply require rare earths in order to provide the level of performance demanded by customers.

However, suitable substitutes for neodymium magnets, which are valued because they are extremely powerful and lightweight, have yet to be found, Neatby says. "So, the neodymium magnet is still the most powerful magnet in the world, and for [electric] car applications, you do want the smallest, lightest, motor, because the heavier the car, the bigger the engine has to be in order to move it forward," Neatby says. "Whether it's an F-35 [fighter jet], a big submarine, or electric car, rare earth magnets are going to be used."

Dialectics Catch Up

Every adoption of technology and management comes with pushback and upending. When just-in-time (JIT) approach was adopted it helped the customers to reduce inventory cost, kept costs low by spreading out the supply chain globally and placing orders on an as-needed basis rather than stocking a large inventory. Little one could appreciate that it presents its own risks. The stark awakening came in the form of the Covid pandemic. When the pandemic brought about a sudden swing in demand, with consumer spending first hitting bottom before ramping up soon after, it set in motion the bullwhip effect up and down the supply chain. Now, the chips shortage is expected to last through at least middle of 2021. And the cost is priced down to the customers. A similar yet magnified effect is clearly being seen in the fuel shortages, now taking place in Britain. Demand-side management has its own effects; dialectics play and catch up in difficult times.

Similarly, a shortage of rare earth magnets, would risk throwing manufacturing processes of critical components of climate economy products like electric vehicles and wind turbines into quandary.

And even if supply disruptions were temporary – say, a short-term export ban or a months-long shutdown of a major rare earths mine and processing facility due to financial constraints – the impact on prices, demand, production, and capacity could extend years beyond the actual period of disruption. That's according to a study published in January by researchers from the US Department of Energy's Argonne National Laboratory, who modeled the effects of different disruptions like mine closures and natural disasters on the global rare earth market. For one, the semiconductor industry's supply chains are comparatively more diversified geographically, though manufacturing is dominated by three countries. By contrast, rare earth supply chains have a higher degree of concentration. For instance, China is responsible for nearly 90% of all rare earth processing. It also accounts for 87% of global rare earth magnet production.

Still, some of the events that have spurred and exacerbated the chip shortage – a spike in demand followed by severe weather that disrupted major manufacturers – are things that the rare earth industry can be vulnerable to as well. A rare earth magnet could be USD100, but they are irreplaceable in many daily use systems.

Desperation

Consider the case in the US. A handful of suppliers from Europe, Asia and the U.S. dominate the global auto-chip market. Many of the American companies outsource production of their chips to a small number of contract chip makers, often based overseas. In a letter to Mr. Biden on 29th September, 2021, Sens. Marco Rubio and Chris Coons recommended he invoke the Defense Production Act to "incentivize or, if necessary, require American companies to retain their domestic capacities during this time." The officials said the administration could use the Defense Production Act, which Mr. Biden has been using for vaccine production and securing more Covid-19 equipment, to spur more domestic manufacturing of critical products. The US government and many other are expected to also look to public-private partnerships while aiming to shore up relations with allies to address common supply vulnerabilities, such as semiconductors, they said.