

STRATEGIC METALS

Your monthly guide to the latest information on the world's strategic metals

Will Magnesium Batteries replace Lithium Ion?

As part of the global automakers' efforts to improve ways of powering electric cars, Toyota Motor Corporation announced earlier this month that it is developing a magnesium based battery capable of storing double the energy stored by lithium ion cells. That would translate to a higher mileage on a single charge.

The need to move beyond lithium ion cells is best explained by engineer Jeffrey Makarewicz who manages Toyota's US project. He said, "Going from nickel-metal hydride to lithium ion, you essentially double the energy capacity. Lithium ion theoretically, under ideal conditions, has a capacity of about 2,000 kWh. That's still not enough to really make a very competitive battery that's necessary for future plug-in, electric and hybrid-electric vehicles."

Work on the magnesium-sulfur battery is primarily being carried out at Toyota's technical center at Ann Arbor in Michigan. Makarewicz said that Toyota's units at Torrance in California and in Japan are also exploring the potential of aluminum, calcium, lithium air and metal air batteries. He added that vehicles capable of functioning with alternative materials such as magnesium are expected to be ready by about 2020 at the earliest.

However, before popping the bubbly, it is important to remember that the research is still at very early stages. Further, Masaki Matsui, Toyota's lead scientist on the project, has not revealed anything other than the fact that the battery's carrier ion is magnesium. Consequently, the exact magnesium compound being researched is not known to anyone outside Toyota.

Experts do accept the fact that an electric car that can run over 500 highway miles on a single charge is still far from being a reality and auto makers would have to move beyond lithium ion to achieve that. However, since almost all the advanced battery research is still based on lithium, moving away from lithium ion does not necessarily mean moving away from lithium. It just implies a different lithium based technology.

Critics of Toyota point out that Toyota bemoaning the limitations of lithium ion cells reeks of sour grapes. The company made the announcement about the magnesium based technology almost immediately after other auto majors such as GM Motors, Nissan Motor Company and Ford Motor Company made announcements about their lithium ion battery developments during the Detroit Auto Show. In comparison, Toyota's lithium-ion-powered EV is still considered to be a little behind the times and to make an announcement about a



technology that is still 9 years away from being realized seems a tad far-fetched. In addition, since Toyota has already established an extensive supply-chain for lithium ion batteries, the company's criticism of the technology is rather surprising.

So will magnesium be the new wonder element? It is still too early to tell and the auto world still has almost a decade to find out. The rush to find the most sustainable technology for plug-in hybrid and electric vehicles is not a new one and Toyota, among others, has long been on the quest for the best technology for its hybrid vehicles.

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Rare Earths Affecting Gas Prices

A Reuters poll indicates that oil prices in 2011 will be driven largely by Chinese demand and reach a little over \$90 a barrel. Prices, however, are unlikely to cross the \$100 mark given the high global inventories. Further, the current landscape is unlike that of 2008 when the supply-demand gap was massive enough to drive prices up to \$147.27 per barrel.

Frank Schallenger, head of commodity research at Germany's LBBW, said, "I think prices above the \$100 mark will not be sustainable as inventories are still very high."

Ali al-Naimi, oil minister of Saudi Arabia said that Asia, largely India and China, would drive the rise but he did not expect to see any rapid rise this year. He said, "I expect prices to continue to be stable at last year's rates (levels)."

A key factor driving up the cost of gasoline production in the US is the rising cost of Chinese rare earth metals. Prices of some of the refining chemicals have skyrocketed as a result of China's restrictive quotas on rare earth exports.

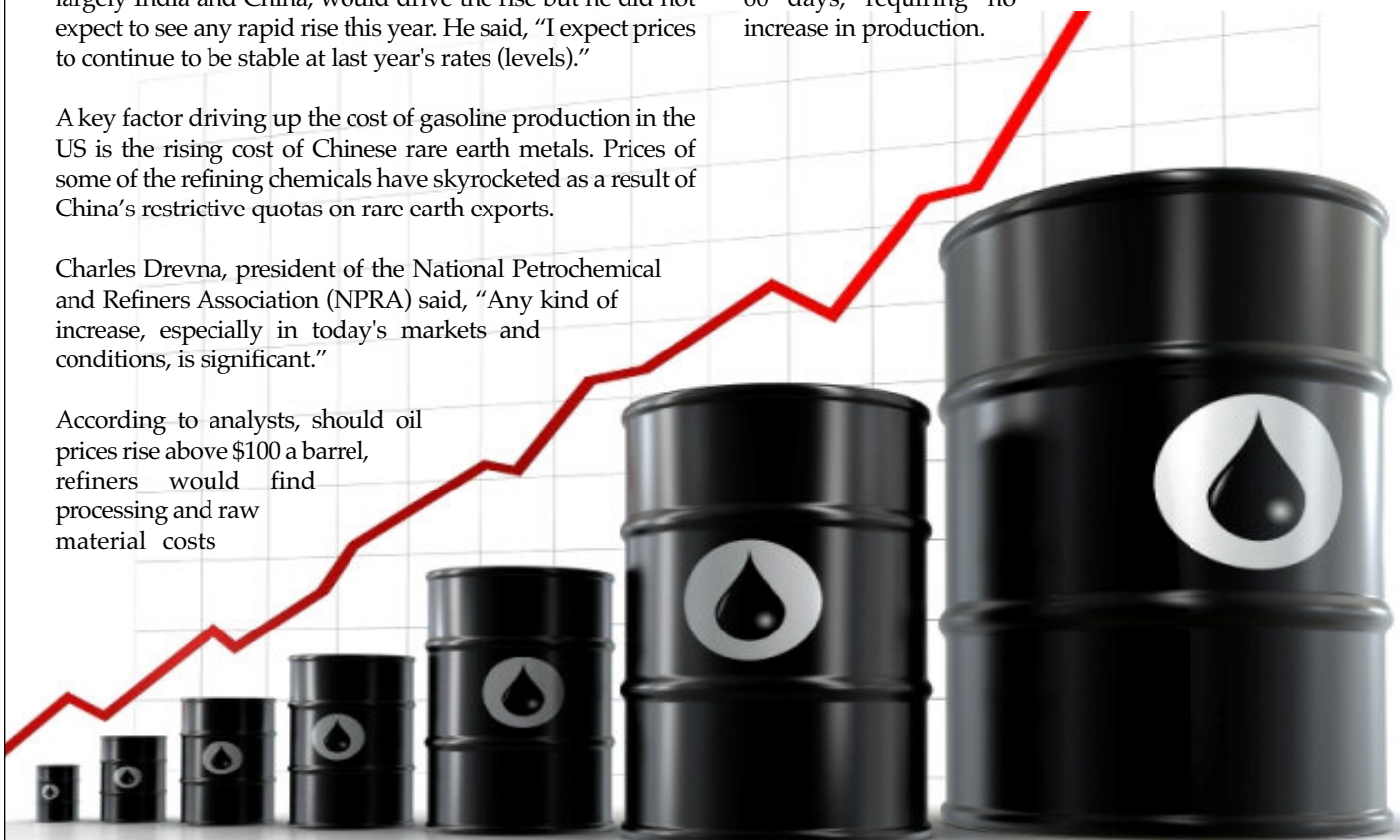
Charles Drevna, president of the National Petrochemical and Refiners Association (NPRA) said, "Any kind of increase, especially in today's markets and conditions, is significant."

According to analysts, should oil prices rise above \$100 a barrel, refiners would find processing and raw material costs

increase faster than they could charge their customers.

The Organisation of Petroleum Exporting Countries (OPEC) is, however, not particularly worried about rising oil prices and sees no reason to increase their production. In fact, OPEC has released a statement that states, "There is more than enough oil in the market." Mir-Kazemi, president of OPEC said, "The increase in oil prices toward \$100 is not worrisome enough to warrant a call for an emergency meeting."

OPEC Secretary-General Abdalla El-Badri said that the commercial stocks of oil currently stand at levels high above the 5-year average and there is enough stock to last around 60 days, requiring no increase in production.



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3M's & Rare Earth Trends

At 1.05 million tonnes, China imported its largest ever quantity of manganese ore in November 2010. As per recent data, the nation has over 3 million tonnes of ore stored at wharves of its discharging ports and stocks are continuously on the rise. Consequently, the February prices for manganese ore shipments to China will remain as it has over the last four months.

Further, November saw a decline in the production of ferroalloys, as electricity supply was restricted in the October-December quarter by the Chinese government. This translated to lower demand for manganese in the production of manganese ferroalloys.

The demand for steel over the past few years was at an all time high across Asia but with demand on a slight decline, the 2011 forecasts for molybdenum are mixed. China aggressively imported molybdenum over 2009-10 and created huge stockpiles, effectively reducing buying and stagnating prices. Pablo Bascur, managing partner of Chile-based consulting firm MolyExp said, "Added to excess production of 53 million pounds from 2009, the molybdenum market will see a surplus of 100 million pounds in 2011." If the estimate proves to be correct, 2011 may well see stagnation in prices.

Steel demand is not expected to increase significantly

in the western economies, yet that is the only factor that could possibly raise molybdenum prices by any significant amount. Although the US did see a y-o-y increase of 11.2% in crude steel production over the first two weeks of 2011, the data is not considered to be sufficient to make an estimate for the whole year.

China's dominance over the rare earth market may be coming to an end with many companies looking at alternative sources and alternate materials to meet their demands. While alternative materials are still in the development phase, many companies are going a step further to reduce the use of rare earth metals in their high tech products.

An aspect of rare earth mining rarely talked about is the effect of mining on the environment. Rare earths are an essential part of green technologies yet supporters of the renewable energy movement rarely point out the degrading effects of mining. In fact, environmental damage across China because of rare earth mining is so high that China has shutdown mining operations and announced cuts in production and limits. Michael Martina of Reuters said, "Under the rules, expected to pinch rare earths miners with raised environmental protection costs, levels of ammonia nitrogen would be cut from 25 mgs to 15 milligrams per liter, and radioactive elements and phosphorus emissions would be reduced."

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