

## What Rare Earth Crisis? *by* Walt Benecki

For the past five years or so, some in the magnet industry have been wringing their hands over the pending *Rare Earth Crisis*. The argument occasionally seems compelling. The Chinese have dominated rare earth oxide production for over two decades. They have also demonstrated a willingness to limit the export of their rare earths. Demand within China is growing at a double digit pace, placing more pressure on the Chinese to use their REO production capacity to support their domestic growth. In addition, the Chinese have recently positioned themselves with equity positions in some Australian rare earth companies. In spite of all this ominous news, I must argue that the magnet industry does not face a crisis.

The real crisis regarding our domestic NdFeB magnet industry actually occurred many years ago when Crucible Magnetics, Hitachi Magnetics, Ugimag and Magnequench were all forced to close their US operations. Many hundreds of jobs were lost. Today, dozens of Chinese companies are offering NdFeB magnets for sale and are quite capable of providing excellent service and product quality.

The recent round of angst seemed to begin a few years ago when the Chinese began raising REO prices and restricting exports. About two years ago, in this magazine, while discussing what many viewed as an alarming rise in NdFeB magnet prices, I wrote the following:

*“Before anyone pushes the panic button, it is important to put the recent price increases in a longer term perspective. In spite of the recent price hikes, price levels for most REO and related alloy products (and magnets!) are actually lower than they were 10-12 years ago. The fact is that, in their zeal to promote their rare earth industry and solidify their position as the dominant world producer, the Chinese probably lowered REO prices more than were appropriate.”*

Now, two years later, the world has been thrust into a massive economic correction and REO and magnet prices have eased, thus becoming even less of an issue. But the hand-wringing now focuses on the future supply of rare earths. So the rare earth “crisis” talk continues.

Much of the North American publicity over the past few years has focused on companies like Avalon, Great Western Minerals and Molycorp as they tout their future readiness to address the crisis. But little progress has been achieved to bring new REO production capability on stream. In spite of this lack of progress, here’s the rational supporting a “no crisis” position:

First, the Chinese can, at anytime, elect to increase their production of rare earth minerals. Sure, they face obstacles like weather, environmental and other regulatory issues. But the Chinese government can, if they chose to, increase their own production capacity. Actually, the Chinese will likely have an easier time increasing production than the North American companies who will continue to face their own economic, political and environmental challenges.

Secondly, if rare earth supply becomes seriously short and prices skyrocket, there is no doubt that alternate technologies will surface that will substantially reduce the worldwide demand for

NdFeB magnets. Let's examine four of the largest consumers of rare earth magnets: hybrid automobiles, wind turbines, computer disk drives and industrial motors.

There are alternate automotive technologies that can reduce the industry's demand for NdFeB magnets. Solar and natural gas are just two examples. I will grant that the time required for such a transition will be lengthy, but we do have the "old fashioned" gasoline automobile as an option in the dealer's showrooms today!

The fact is that many wind turbines being installed today *do not utilize* NdFeB magnets. The industry does seem to prefer the direct drive design (using NdFeB magnets) because of its inherent economy and reliability. However, if future availability and price of NdFeB magnets puts pressure on the wind turbine industry, they will shift to design alternatives that are available today that will not require NdFeB magnets.

Computer disk drives have been one of the top consumers of NdFeB magnets for decades. However, solid state memories currently stand ready to fill the bill. There is little doubt that, as solid state drive utilization increases, their costs (and prices) will decline and they will gradually replace the traditional magnet-consuming VCM we have taken for granted for so many years. Shortages of rare earths would simply accelerate this transition.

It is true that many industrial motor applications favor permanent magnet designs because of their economics, performance and energy efficiency. But if NdFeB magnets become dear, motor designers will turn back to ferrite, SmCo or non-PM alternatives.

So before everyone jumps on the rare earth crisis bandwagon, we need to recognize that alternate technologies currently exist or are on the horizon to avert a massive NdFeB magnet shortage.

A third factor to consider is the expectation of a painfully slow economic recovery, particularly in Europe and North America. At the Magnetics 2009 Conference in Chicago, Terry Clagett (WebMagnetics.com) predicted a very slow recovery from the current economic recession. I agree with Terry's assertion that it will take many years for the magnet industry to recover to 2007 levels.

Another issue that has recently been emphasized within the magnet community is the availability of specific rare earths like dysprosium and terbium. The fact is that both elements provide specific performance advantages for certain NdFeB magnet users. Unfortunately, there will continue to be significant imbalance between the various rare earth elements. Since the separation process has limited ability to selectively capture rare earth elements, the supply and cost of some rare earths will continue to be an issue.

To deal with this problem, magnet producers will likely be forced to offer NdFeB magnets with modified compositions, even if some performance is sacrificed. For example, a reduction of dysprosium or terbium content could result in an  $H_{ci}$  reduction of 10-30%. Cost considerations may eventually dictate such compositional changes for some applications.

Finally, the magnet industry needs to recycle rare earth content in scrap magnets and grinding swarf. In the past, such recycling has been deemed too difficult and most in the magnet industry have ignored the value existing in NdFeB scrap materials. This attitude will likely shift as material costs continue to climb. One more potential relief valve!

One ray of light regarding the U.S. magnet industry was the July 2009 Molycorp and Arnold Magnetic Technologies announcement regarding their intention to establish a US-based joint venture to produce rare earth magnets. This is an admirable initiative. But for such a venture to be successful, they will need to demonstrate the ability to be reasonably cost competitive with the Chinese.

I'm certainly not pleased with our dependency on Chinese NdFeB magnets. But they do enjoy a unique raw material position coupled with low labor costs and advancing magnet technology. In reality, the Chinese really *want to expand their exports of rare earths*. Unfortunately, their strategy is to expand the export of magnets, motors, generators, computers and other components and devices (including wind turbines and automobiles) that *contain* rare earths. They simply prefer to export the valued-added products, not the rare earth oxides!

The fact is that abundant rare earth deposits exist almost everywhere. The trick is not finding them...the trick is economically recovering them and successfully bringing REO products to market. Those who continue to tout their future ability to offer rare earth oxides to industry must demonstrate both production capability and economic viability. This is not a slam dunk!

I'm afraid that the only driver to assure Western REO success is substantially increased prices. However, if massive price escalation occurs, market demand for NdFeB magnets will adjust as economics dictate new directions for magnet producers and magnet buyers. These "demand adjustments" represent the logical solution to avoid "the magnet industry rare earth crisis".

So magnet users should take note. You need to establish a business strategy that includes a flexible and strategically sound sourcing strategy for NdFeB magnets. You also need to do the preparatory homework on alternate designs and new technologies. Do this and you may well find there is no crisis on your horizon. In fact, such transitions may well represent *opportunity* for the fleet afoot.

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