

## The US Magnet Cluster: Critical for the US Economy



The United States is on the threshold of a green revolution. The world is suddenly becoming more electric and less reliant on fossil fuels. This transition is underway and seemingly unstoppable as “green technologies” enter the marketplace with alarming speed. Nearly all of these alternative energy technologies focus on how to produce clean electrons. This focus is creating a tremendous amount of innovation and business opportunity, especially for the magnet industry.

New and exciting ways are being developed to harness the energy all around us, turn it into clean electrons, and use them to power our lives. Often, this transition to clean electrons comes with an undeniable reliance on high performance magnets. These magnets play a critical role in both the generation and use of those clean electrons. Everywhere we turn, electric machines are taking center stage, often with permanent magnets inside.

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With a long, proud history, the US magnet industry should be the leading candidate to take advantage of this new green economy. Tragically, this is not the case. Because of fierce, and often unfair, competition by the Chinese, whole sections of the magnet manufacturing value chain have been wiped out. This has left the weakened US magnet industry in no position to lead. Currently, a great deal of the innovation involving magnets and green energy is taking place overseas, in places like Japan and Europe. Part of the reason this is happening can be explained by looking at three factors:

1. Lack of innovation
2. Reduction in knowledge spillover
3. Decline and weakening of industrial clusters.

The importance of these factors and how they can be improved in the US is an important topic. Its ramifications will be felt not just within the magnet industry, but throughout the whole US economy. Because the US magnet industry is a key enabler for many other industries, especially when it comes to green energy, if the US wants to participate in the new green economy, the US magnet industry must be strong and vibrant.

The importance of innovation to the US economy is clear. Business Week, in its April 6, 2009 issue, noted that innovation is a key trait of its Business Week 50, an annual ranking of the top-per-

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forming companies in America. Business Week went on to say that “Innovation remains a powerful engine of success.”

In many ways, I think we as Americans take innovation for granted. We assume that US companies must be the most innovative simply because they are part of the largest economy in the world. Surprisingly, a recent study by the Boston Consulting Group and the National Association of Manufacturers suggests otherwise. The study found that the US barely makes it into the list of the top 10 most innovative countries.

Top 10 Most Innovative Countries (BW, April, 6, 2009)

- |                |              |
|----------------|--------------|
| 1. Singapore   | 6. Hong Kong |
| 2. South Korea | 7. Finland   |
| 3. Switzerland | 8. US        |
| 4. Iceland     | 9. Japan     |
| 5. Ireland     | 10. Sweden   |

The study looked at a variety of factors, including tax policies, education systems, infrastructure and the number of patents issued. Apparently, the US is not as good at innovation as we tend to think. What’s caused this lack of innovation? To begin with, we have lost a great number of the knowledge bases required for innovation to occur. As manufacturing facilities move offshore, the engineering, research and design functions go with them. An excellent example is the domestic magnet industry. As the US magnet industry has declined, many participants have moved operations overseas. This

has included the research and design facilities associated with the magnet manufacturing sites. Magnequench is a prime example. Not only did the manufacturing facilities move offshore, but the R&D facilities moved to Asia as well.

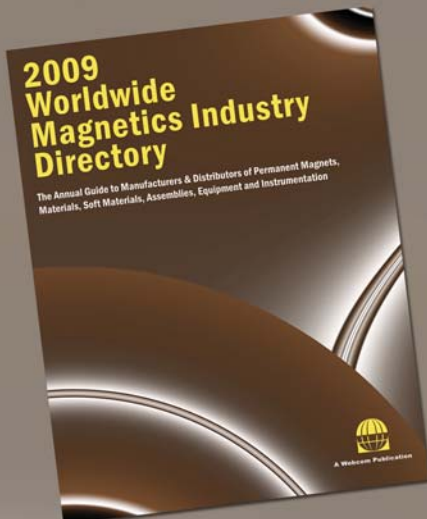
Studies have shown that knowledge spillover — the exchange of information critical for innovation that takes place between industry experts and product manufacturers — occurs when industry participants are geographically localized (Jaffe et al., 1993; Audretsch and Feldman, 1996; Thompson and Fox-Kean, 2005). In other words, suppliers, manufacturers and design engineers need to be close together in order for knowledge to be shared and innovation to occur.

Studies specific to the magnet industry have indicated that this is especially true for magnets (Fifarek, Veloso and Davidson, 2008). For innovation that involves magnets, market participants need to be in or near an industrial cluster. If they are not close together geographically, innovation tends to not occur.

If a magnet industry cluster is critical for knowledge spillover, and ultimately innovation, to occur, the question that naturally follows is, “Does a magnet industry cluster exist in the US?” I believe it does, though in a weakened state. If you take a US map and put one point of a compass on Dayton, Ohio, extend the other point out roughly 500 miles and draw a circle, you’ll capture the bulk of what is left of the US magnet industry cluster. It’s a wide swath in the center of the US. In the past, this cluster was much more vibrant. It contained many more participants in all areas, including suppliers, manufacturers and consumers.

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The US magnet cluster, which was born out of the steel industry, had a great deal of research and development centers connected to manufacturing sites. This created a suitable environment for the industry to innovate and create new products and businesses. Customers and markets, such as the appliance industry and the automotive industry, were close by, and drew from the knowledge base within the cluster to develop and create new products. Though the cluster remains, it's now a mere shadow of its former self. Innovation still occurs, but patent data, as reported in a recent study by Fifarek, Veloso and Davidson published in 2008 in the Journal of Operation Management, shows that for those types of magnets that are no longer produced in the US, innovation has nearly stopped. In other words, once magnet production leaves the US, companies stop inventing new products that utilize magnets.

Some will argue that this outline of a magnet cluster leaves out the fabricators and distributors. While they are part of the magnet industry, I contend that because they utilize products typically manufactured from other areas of the world, they are merely extensions of clusters located overseas. As a general rule, fabricators and distributors do not provide the proximity to the manufacturing base that many innovators require.

While often a useful substitute for a manufacturing base, these fabricators and distributors often do not provide the knowledge spillover required for vigorous innovation to occur. This is certainly a contributing factor in the fact that Japan leads the world in hybrid car manufacturing and Europe is the world's leader in wind turbines. It's no coincidence that both Japan and Europe have maintained the production of NdFeB magnets, while the US has not. The type of innovation required for hybrid car and wind turbine development is not the type of R&D any large manufacturer will depend on a fabricator and distributor to help supply. For large projects like these, manufacturers will want the operations of the original supplier, along with engineering support for the components, close at hand.

The idea of a US magnet cluster is important because of the competitive ramifications for the US economy as a whole. Since so much of the new green economy will involve technologies that utilize high performance magnets, a robust US magnet cluster is imperative for green businesses to develop and prosper. This is a story that the magnet industry needs to be talking about. It's a compelling story that people respond to. But it can't just be a story.

To strengthen the magnet cluster, significant investment needs to be made in the industry. Investment dollars, regardless of whether they are from commercial or government sources, need to start flowing into our industry. This investment needs to be made in all areas of the supply chain, including manufacturing, research and development and promotion of the industry.

We've seen this happen before in other industries. Commercial and government dollars can work together to foster an environment that leads to the development (or redevelopment) of an industry. Some will argue that the magnet industrial cluster is no place for government spending. This short sighted and naïve viewpoint ignores the fact that 26 of 31 European countries have active cluster initiative programs (Mills, Reynolds and Reamer, Clusters and Competitiveness), while both Japan and Korea have active cluster initiative programs as well.

And no one will argue that China doesn't actively target and

invest in strategic industrial clusters. Investment in clusters is happening all over the world. The US is competing globally, and it needs to wake up and get into the game if it doesn't want to be left behind. The opportunities are too large to pass up, and the stakes too high to ignore.

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