

## Overview on the Worlds' Magnet Supply

The magnetic materials market is relatively small at under \$8 Billion per year of worldwide sales. However, the usage is overwhelming. Virtually all moving vehicles, computers, appliances, etc. use magnets. There are only 4 main material families and bonded versions:

**Ceramics or Ferrites** ( $\text{Fe}_2\text{O}_3$ ) consisting of about 4 main sub-grades with C5 and C8 being the most popular  
**Neodymium** (NdFeB) consisting of 7 sub-grades with differences mainly in maximum temperature exposure  
**Samarium Cobalt** (SmCo) consisting of 2 main sub-grades, so-called 1-5 and 2-17  
**Alnico** (AlNiCo) consisting of about 4 main sub-grades  
**Bonded** versions of all of the above which can be injection or compression molded

Each type has distinct magnetic, chemical and physical properties. Ceramics hold the major share at about 60% of the total (in value), however NdFeB is the fastest growing market and it is estimated that they will hold about 70% by 2025. SmCo and Alnico share about 10% total for both. Bonded magnets are the fastest growing market in the automotive and appliance industry.

During the past 20 years, magnet use for applications in automotive and consumer electronics has seen the most dramatic increase in its history. Today, the global consumption of all types of magnets is over 800,000 tons per year. Rare Earth magnets account for about 130,000 tons and \$2.5 Billion in sales. The main producers of permanent magnets are in China, India, Japan, Brazil, Europe, and USA. The following is each country's approximate market share for the main magnet families\*:

China: Ferrites 75%, Neo 70%, SmCo 80%, Alnico 70%, Bonded magnets 35%  
Japan: Ferrites 15%, Neo 15%, SmCo 5%, Bonded magnets 20%  
India: Ferrites 3%  
Europe: Neo 10%, SmCo 10%, Alnico 17%, Bonded magnets 20%  
USA: Ferrites 4%, SmCo 3%, Alnico 8%, Bonded magnets 10%

*\*Figures do not add up to 100% because of ROW. Percentages are approximate and change yearly.*

China is by far the leader for all magnet materials. They mine over 85% of the world's rare earth ores needed for most magnets. This, coupled with low labor and few health and environment policies, has enabled them to grow their magnet industry at 70-130% per year. However, starting in 2003 the industry slowed and prices climbed. Some of the reasons for this include:

- Chinese manufacturers have been pricing magnets, especially ferrites, well below operational margins. Prices had been falling every year from 1985 to 2003. Most companies have been government subsidized in one way or another. Competition for export business created an unsustainable production policy regarding income. Magnets were priced, in most cases, with no margin and a total dependence on government subsidies. Now that China gained the world's market, and now that their own market developed dramatically, they have been raising prices in order to make normal margins. In the early 2000's, the China Association of Magnetic Material Industry urged all members to raise prices of ferrites by 20% and NdFeB by 15%.
- Beginning January 01, 2004 the export rebate that China provided to companies who exported to the US was reduced from 17% to 12%. Most companies in China relied on this subsidy for their profits. This rebate will be eliminated due to China's entry into the WTO.

- Most raw materials, especially steel and Cobalt, skyrocketed until about 2008 due to the high demand created in China because of their rapid infrastructure development. All of the world's main car companies started factories in China and this market is now the world's largest with over 20 million cars per year compared to 17M in the US and 15M in EU. This has created a domino effect for the rest of the world. Magnet prices are about 80% related to cost of raw material, so the impact has been great.
- Electricity in China is expensive and sometimes insufficient. Several years ago companies had to operate either every other day, or shut half of the plant down and alternate each day.
- The US and EU are no longer as attractive for exports. China has had phenomenal growth and prosperity within.
- It is more profitable for Chinese companies to sell magnets to the EU for the Euro than to the US for the Dollar.

## Raw Materials (2019 USGS Paper)

### RARE EARTHS

Domestic Production and Use: Rare earths were mined domestically in 2018 as a primary product in Mountain Pass, CA, which was restarted in the first quarter of 2018 after being put on care-and-maintenance status in the fourth quarter of 2015. The estimated value of rare-earth compounds and metals imported by the United States in 2018 was \$160 million, an increase from \$137 million in 2017. The estimated distribution of rare earths by end use was as follows:

Catalysts, 60%;  
 Ceramics and glass, 15%;  
 Metallurgical applications and alloys, 10%;  
 Polishing, 10%;  
 Other, 5%.

#### *Events, Trends, and Issues:*

Mining of rare earths increased with renewed production in the United States supplemented with new and or increased production in Australia, Burma (Myanmar), and Burundi. In China, mine production quotas for the first and second halves of 2018 were set at 73,500 tons and 46,500 tons, respectively—an annual increase of 14% compared with the combined quota in 2017. According to China's Ministry of Commerce, production of rare-earth-oxide equivalent in China was estimated to be at least 180,000 tons based on magnet material production. In May 2018, the U.S. Department of the Interior, in coordination with other executive branch agencies, published a list of 35 critical minerals (83 FR 23295), including rare earths. This list was developed to serve as an initial focus, pursuant to Executive Order 13817, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals" (82 FR 60835)

### COBALT

Domestic Production and Use: In 2018, a nickel-copper mine in Michigan produced cobalt-bearing nickel concentrate. Most U.S. cobalt supply comprised imports and secondary (scrap) materials. The total estimated value of cobalt consumed in 2018 was \$700 million.

#### *Events:*

Congo (Kinshasa) continued to be the world's leading source of mined cobalt, supplying more than 60% of world cobalt mine production. With the exception of production in Morocco and in Congo (Kinshasa), most cobalt is mined as a byproduct of copper or nickel. China was the world's leading producer of refined cobalt and has been a leading supplier of cobalt imports to the United States. Most of China's production was from partially refined cobalt imported from Congo (Kinshasa). China was the world's leading consumer of cobalt, with more than 80% of its consumption being used by the rechargeable battery industry. In 2018, average annual cobalt prices were higher than those of 2017, owing to strong demand from consumers in the rechargeable battery and aerospace industries and to limited availability of cobalt metal.

#### **COPPER**

**Domestic Production and Use:** In 2018, U.S. mine production of recoverable copper decreased by 5% to an estimated 1.2 million tons and was valued at an estimated \$8 billion, essentially unchanged from 2017. Arizona was the leading copper-producing State and was responsible for about 66% of domestic output, followed by Utah, New Mexico, Nevada, Montana, Michigan, and Missouri. Twenty-four mines recovered copper, 15 of which accounted for 99% of production. Copper and copper alloy products were used in building construction, 44%; transportation equipment, 20%; electrical and electronic products, 19%; consumer and general products, 11%; industrial machinery and equipment, 6%.

#### *Events, Trends, and Issues:*

The International Copper Study Group projected that global mine and refined production of copper would increase slightly in 2018. Refined production in the United States increased by an estimated 6% in 2018 compared with that in 2017. The projected increase was attributed primarily to rising global demand and was partially offset by uncertainty in trade policies between the United States and China, among other factors.

#### **IRON ORE**

##### **Domestic Production and Use:**

In 2018, mines in Michigan and Minnesota shipped 98% of the usable iron ore products in the United States with an estimated value of \$4.1 billion. The remaining 2% of domestic iron ore was produced for nonsteel end uses. The United States was estimated to have produced 2.0% and consumed 1.6% of the world's iron ore output

#### *Events, Trends, and Issues:*

U.S. iron ore production was estimated to have increased in 2018 owing to increased steel-mill-capacity utilization and higher steel demand. Raw steel production increased to 86.6 million tons in 2018 from 81.6 million tons in 2017. Based on reported prices for iron ore fines (62% iron content) imported into China (cost and freight into Tianjin port), the highest monthly average price of the year was \$76.34 in January compared with the high of \$89.44 in 2017. The lowest monthly average price in 2018 was \$64.56 in July, compared with the lowest price of \$57.48 in 2017. Overall, global prices trended down slightly, but because China was working to increase efficiency and decrease pollution in steel production, prices for higher grade iron ore products increased. Globally, iron ore production in 2018 was expected to increase slightly from that of 2017, primarily owing to increased production in Australia and the completion of a mine in Brazil. Global raw steel production was forecast by industry experts to increase by 3.9% in 2018 and by 1.4% in 2019, spurred by investments in industrialized nations and economic improvement in emerging economies. Increased pressure on steel producers around the world to increase efficiency, reduce energy consumption, and meet environmental benchmarks continued the slow decline in use of low-grade iron ore and spurred investment in the production of iron metallica and high-grade iron ore products, such as pellets.

## NICKEL

**Domestic Production and Use:** In 2018, the underground Eagle Mine in Michigan produced approximately 19,000 tons of nickel in concentrate, which was exported to smelters in Canada and overseas. Approximately 47% of the primary nickel consumed went into stainless and alloy steel products, 41% into nonferrous alloys and superalloys, 7% into electroplating, and 5% into other uses.

### *Events, Trends, and Issues:*

In recent years, production of refined nickel decreased as stainless steel producers, primarily in Asia, preferred lower cost nickel pig iron. Mine production in countries that supply direct shipping ore to nickel pig iron operations increased, while mine production supplying refineries tended to decrease. Production of nickel chemicals, however, has increased, particularly nickel sulfate used in the production of batteries. Industry analysts project a significant increase in global nickel consumption in batteries for energy storage and electric vehicles

## ALUMINUM

**Domestic Production and Use:** In 2018, three companies operated seven primary aluminum smelters in six States. During 2018, two smelters that were idle at yearend 2017 were restarted and capacity at one other smelter was restarted. Two smelters operated at reduced capacity throughout the year. One other smelter remained on standby throughout the year. Production increased for the first year since 2012. Domestic smelters were operating at about 55% of capacity of 1.79 million tons per year in October. Based on published prices, the value of primary aluminum production was about \$2.3 billion, 41% more than the value in 2017. Transportation applications accounted for 40% of domestic consumption, packaging, 19%; building, 14%; electrical, 9%; consumer durables, 8%; machinery, 7%; and other, 3%.

### *Events, Trends, and Issues:*

Citing Government actions, three primary aluminum smelters restarted capacity. In May, power failures forced the shutdown of one potline at each of the smelters in Evansville, IN, and Seabee, KY, with capacities of 54,000 tons per year and 73,000 tons per year, respectively. Both potlines were restarted by yearend. On March 8, 2018, the President of the United States signed an order imposing a 10% tariff on aluminum imports under authority of Section 232 of the Trade Expansion Act of 1962. In May, the Governments of Argentina and Australia agreed to quotas at the average annual volume imported in 2015–17 and were exempted from the tariff. Effective April 2, the Government of China imposed a 25% tariff on aluminum scrap imports from the United States in response to the 10% tariff placed on aluminum imports by the United States. In February 2018, the U.S. Department of Commerce issued the final determinations in the antidumping and countervailing duty investigations of imports of aluminum foil from China. The investigation, which was initiated in November 2017, concluded that foil produced in China was sold in the United States at less than fair value and that the Government of China provided subsidies to foil producers. Antidumping margins were set at 48.64% to 106.09% and countervailing margins were set at 17.14% to 80.97% on foil from China. In June, the U.S. Trade Representative imposed a 25% tariff on aluminum alloys, semifabricated aluminum products, and unwrought aluminum produced in China following its Section 301 investigation initiated in August 2017. In November, the U.S. Department of Commerce announced its determination of the antidumping and countervailing duty investigations of common aluminum alloy sheet, initiated in November 2017. Countervailing margins were set at 32.2% to 113.3% and the preliminary antidumping rate was set at 167.16% for all material produced in China covered by the investigation. On April 6, 2018, the U.S. Department of the Treasury designated the sole primary aluminum producer in Russia for sanctions in response to activities of owners and the Government of the Russian Federation. After the primary owner of the company resigned operational control, the U.S. Department of the Treasury announced in September that in 2019, companies may import aluminum produced by that company in amounts similar to those imported in 2018.

***For the complete and unformatted USGS paper, please visit: [www.usgs.gov](http://www.usgs.gov)***

## Alliance LLC in the Magnetic Materials Market

Industry in the US has seen dramatic changes over the past 25 years as a result of China's development. Competitive pressures have forced many companies to outsource work or to purchase their products from lower priced overseas suppliers, mainly from China. The transition from domestic to foreign sourcing has not been smooth or easy. While the quality of products from foreign sources has improved significantly, the lack of customer support and unexpected delays have caused many domestic users to re-evaluate their supply chain. Most companies have realized that buying direct from overseas manufacturers has not netted them the lowest price because of the added expenses of lost customer support, unexpected import fees and long delays. Talking to your supplier or sending someone to visit them has been replaced with sending emails and waiting a long time for replies to your concerns. Production line outages, once a rarity, have become all too common.

Alliance LLC has witnessed remarkable growth because of a new trend that has helped solve these problems. Companies that once purchased their products direct from overseas manufacturers have seen good reason to redirect their supply chain to include OEM distributors local to them. This has enabled customers to buy low priced products while taking advantage of local and immediate customer support. We help our customers by providing:

- Local sales and technical support who can visit customers on a moment's notice
- Local warehousing. Alliance owns or leases 5 warehouses across North America
- Central staff to make timely deliveries, track shipments and address concerns
- All the necessary testing, design and magnetizing services in-house in the US

The list goes on; however, the basic idea is to make life simpler for our customers and to help them become more successful by reducing their costs even further.

Alliance knows that relying on China is not the answer to every customer requirement and is not a good long term solution. At some point in the future China will not be an attractive place for low cost goods. For this reason, we procure magnets and raw materials in India, Sweden and Brazil.

Please review [www.allianceorg.com](http://www.allianceorg.com) for more information. Our website provides useful tools that may be needed for your business.

Regards,



Dan P. Vukovich  
President  
Alliance LLC  
1450 Clark Drive  
Valparaiso, IN. 46385  
Tel: 219-548-3799  
Email: Dan@allianceorg.com