

Magnetics Industry Overview by Walt Benecki

JABM 2004 Symposium Highlights Raw Materials and China

The annual Magnet Symposium sponsored by the Japan Association of Bonded Magnet Industries was held in Tokyo, Japan on December 3, 2004. Approximately 125 attendees heard 12 papers delivered from speakers representing Japan, China, the U.S., Canada and Europe. The emphasis for this symposium was rare earth rare material supplies and the growth of China's magnet industry.

Terry Clagett, representing Hoosier Magnetics, was the kick-off speaker and reviewed the recent history of the hard ferrite industries in Europe and the United States. Mr. Clagett pointed out that there are now only two remaining hard ferrite producers in the U.S., TDK in Oklahoma and Hitachi in North Carolina. Mr. Clagett emphasized the current imbalance of trade between the U.S. and China in hard ferrites. He estimates U.S. total exports of hard ferrite magnets to be approximately \$2 million while U.S ferrite magnet imports from China are estimated at \$52 million. Clagett also updated the audience regarding raw materials cost and availability, pointing out that China is now a major iron oxide consumer, and this demand has created a worldwide shortage of regenerated iron oxide.

Mr. Zhang Jianliang, BGRIMM, summarized the current China production of hard ferrite magnets. Mr. Zhang estimated China production to be approximately 400,000 metric tons in 2004, with the split being 50% speaker rings, 30% motor arcs and 20 % miscellaneous. Mr. Zhang pointed out that Chinese magnetic properties and product quality are rapidly improving and he predicted China's hard ferrite production to increase by 30% in 2005. Zhang also pointed out that increased steel production in China will provide a valuable additional source of iron oxide for the industry.

Mr. Hong Feng, PRC Planning Commission, summarized the current balance between Chinese NdFeB magnet production and their raw material suppliers. Mr. Hong noted that, although there are adequate supplies of Nd₂O₃, Terbium and Dysprosium are in short supply. Hong predicted that Terbium and Dysprosium demand will exceed supply if conservation steps are not instituted. Hong also noted that he believes that Chinese prices for NdFeB and ferrite magnets will likely stabilize at approximately 50% of western price levels.

Mr. Constantine Karayannopoulos, AMR Technologies, supported Mr. Hong's material balance issue, pointing out that market prices will most certainly increase in those areas where demand exceeds supply. Karayannopoulos also pointed out a precipitous decline in Cerium prices to the point where market price is currently below production cost. The reason for this oversupply is that Cerium currently accounts for roughly 50% of rare earth production. Karayannopoulos also noted that the rare earth mines in southern China will be facing significant environmental pressures in coming years.

Mr. David Kennedy, Less Common Metals Ltd. noted the progress in NdFeB magnets, pointing out product that energy product reaching 55.8 MGOe has now been developed. Kennedy did point out that Samarium Cobalt magnets continue to be the magnet of choice for applications requiring very high temperatures and superior corrosion resistance.

Mr. Juji Oshitani, Santoku Corporation, highlighted the rare earth situation in Japan, pointing out that 25% of rare earth oxide consumption in Japan is allocated to the magnet industry. Other applications that are major rare earth consumers include battery, glass and polisher products. Oshitani predicted that, by 2005, worldwide demand for Pr, Nd, Tb and Dy could exceed availability by as much as 5-10%.

This author characterized the current era in the magnet industry as one of transition to China and corresponding expansion within China. Chinese exports of metal magnets to the U.S in 2003 accounted for almost 30% of all U.S. metal magnet imports, while the Chinese accounted for over 43% of U.S. hard ferrite imports in 2003. Future issues and trends regarding the Chinese magnet industry were summarized.

Ms. Jia Gui-yuan, Hangzhou Permanent Magnet Group provided a historical overview of alnico magnet production in China, pointing out that China's alnico production was 2000 metric tons in 1998 and is expected to increase to 3500 tons in 2004. Approximately 50% of China's alnico production is consumed by watt hour meter applications.

Professor Yang Luo offered a comprehensive summary of the global magnet industry, predicting significant growth in China's production of NdFeB through 2010. Professor Luo pointed out that China now represents the dominate producer of most magnet materials, with China accounting for an extremely large percentage of all magnet production: sintered NdFeB (73%), Alnico (44%), sintered ferrite (41%) and bonded NdFeB (25%). Luo reported that the largest high-growth market within China for sintered NdFeB is the electric bicycle. This single application consumed over 1,300 tons of NdFeB in 2003. The production of electric bicycles is expected to increase from 3.5 million in 2003 to 15 million in 2007. Each bicycle motor uses 380 grams of sintered NdFeB magnets. Professor Luo summarized: "China is the global center of the permanent magnet industry, producing the majority of permanent magnet products in the world".

Dr. Yung-Pil Yang, Advanced Magnetic Materials Ltd. discussed the advantages of NdFeB bonded magnets, pointing out that China's consumption of rapidly solidified NdFeB powder has reached 10,000 tons per year, 90% of which is utilized in spindle and stepper motors. Dr. Yang predicted that the price of NdFeB powder will likely decline to \$15/kilogram as volume increases in the future. Major future applications for NdFeB bonded magnets will include personal computers and non-PC data storage applications such as TV set boxes and computer game consoles. Dr. Yang concluded, "China has already replaced Japan as the second largest PC market in the world and there is every reason to believe that sales of PCs in both China and India will eventually exceed those in the United States".

Mr. Yutaka Matsuura, Neomax Co., Ltd summarised his company's progress in sintered NdFeB magnets, pointing out that 53 MGOe material is now commercially available. In addition, Neomax's Hilop-55 series of NdFeB magnets are capable of achieving 55 MGOe. The HILOP process is a unique wet-pressing process developed by Neomax. Matsuura pointed out that Neomax has developed a range of multipole ring magnets for electric power steering and servo motor applications.

Mr. John West, John West Consultancy, summarized the use of magnets in automobiles, describing a wide range of applications including gearbox and clutch actuators, electric

sliding doors, oil and water pumps, window lift systems, wiper motors, electric rear brakes, stability control, adaptive front lighting, electronic throttle control, power seats and electric power steering. West pointed out the leadership of Honda and Toyota in hybrid vehicles, with the top four models demonstrating fuel efficiency delivering 47-63 miles per gallon fuel consumption. West referenced a recent U.S. study suggesting that gasoline hybrids will be more successful in the U.S than diesel cars.

Walt Benecki is the former president of the Magnetic Products Group of SPS Technologies Inc. and a past president of the Magnetic Materials Producers Association (now IMA). Walt is president of Walter T. Benecki LLC, a consultancy serving the worldwide magnetics industry. For additional information, visit his website: www.waltbenecki.com