

***A Producer's and Buyer's
Perspective: The
Permanent Magnet Outlook***

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Outline

- **Permanent Magnet Market - 2020**
- **The China Factor**
- **Raw Material Supplies and Prices**
- **US Rare Earth Criticality**
- **New Technologies Driving Demand**
- **Industry Consolidation**
- **The Industry “Top 25”**

Market Growth Toward 2020

- **Overall PM market will average physical growth of at least 4-6% per year**
- **Two major economic corrections will likely occur – US dollar will also be a wild card**
- **Bonded magnet demand will continue well above the industry average**
- **By 2020, the total market for permanent magnets will grow to over \$20 billion**
- **China will represent over 80% of the total world magnet production**

The PM Market – 2020

Source: WebMagnetics (2007 Data)

Tons (000)	Ferrite	NdFeB	Alnico	SmCo	Total
2007	725	63	6	3	797
2020	1210	120	4	4	1338
% Change	67%	90%	(33)%	33%	68%

The PM Market – 2020

Source: WebMagnetics (2007 Data)

Dollars (Million)	Ferrite	NdFeB	Alnico	SmCo	Total
2007	3,260	5,240	145	310	8,955
2020	6,155	14,245	160	460	21,020
% Change	89%	172%	10%	48%	135%

The PM Market – 2020

Source: WebMagnetics (2007 Data)

Dollars Per lb.	Ferrite	NdFeB	Alnico	SmCo
2007	\$ 2.25	\$ 41.59	\$ 12.08	\$ 51.67
2020	\$ 2.54	\$ 59.35	\$ 20.00	\$ 57.50
% Change	12.9 %	42.3 %	65.6 %	11.3 %

The China Factor

- **“In 2007 China contributed more to global growth than the United States, the first time another country had done so since at least the 1930’s”**
- **“In two decades China has experienced the same degree of industrialization and social transformation as Europe did in two centuries”**

– Newsweek (January 7, 2008)

China's Labor Cost Advantage Over The West is Formidable

- **\$ 10.00 per hour (Competitive US)**
- **\$ 0.50 per hour (Typical Chinese)**

Many Argue That the Chinese Cost Advantage Will “Soon Be Gone”

- **Wage and materials inflation**
- **Electrical supply problems**
- **Pollution & congestion issues**
- **Government manipulation of supply chain parameters (tariffs & export restrictions)**
- **Exchange rate shifts**

China's Labor Cost Advantage Over the West will Continue!

- **\$ 10.00 per hour compounded at 3% per year to 2020 = \$ 14.26 per hour**
- **\$ 0.50 per hour compounded at 20% per year to 2020 = \$ 4.46 per hour**

The China Advantage

(Another Example)

- **China's current labor cost advantage (\$/hr) in the automobile industry is formidable:**

- Industrial Nacional Autopartes (Dec 2007)

China	\$ 0.84
Mexico	\$ 2.59
Brazil	\$ 3.56
Czech Republic	\$ 5.82
South Korea	\$ 12.88
Japan	\$ 21.53
United States	\$ 23.17

China Will be Out-Producing the US Before 2020

- **On a “dollar value” comparison, China may still lag the US....but:**
 - **China will be producing MORE cell phones, cars, computers, steel, soft drinks and energy!**
 - **The driver is China’s population, which is more than four times the US.**

Chinese Consolidation

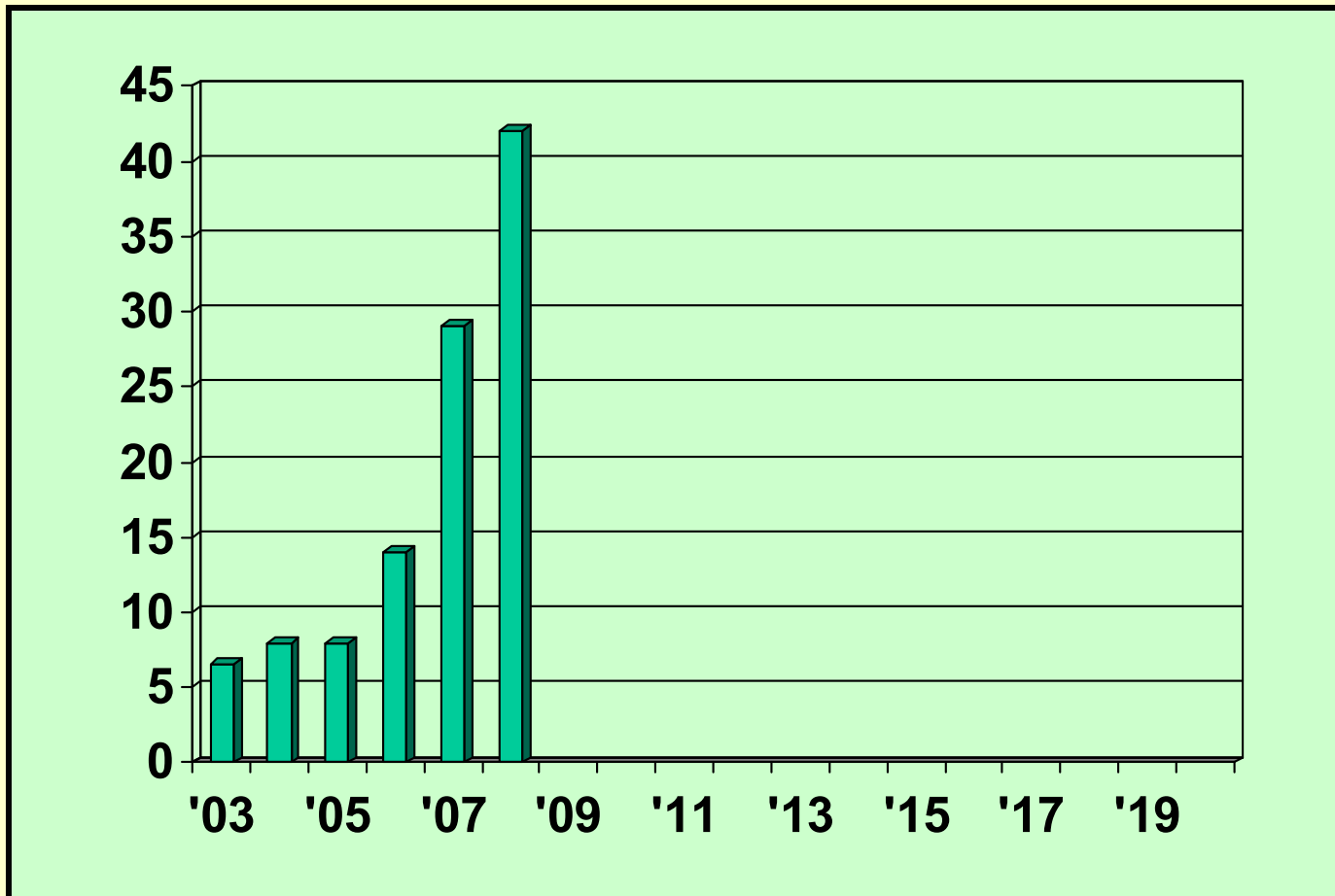
- **Small, less sophisticated magnet producers will be squeezed out**
 - **Raw material availability**
 - **Marginal technology position**
 - **Cash flow & bottom line profitability**
- **Consolidation of the magnet industry in China could be significant**

The China Summary

- **China will continue to dominate the world's production of permanent magnets**
- **Chinese cost increases will only marginally reduce their economic advantage**
- **Chinese domestic magnet demand will increase substantially (10+%) over the next twelve years**
- **The Chinese will be confronting Japan for permanent magnet technical leadership by 2020**
- **By 2020, China will be the world's major producer of high quality iron oxide**

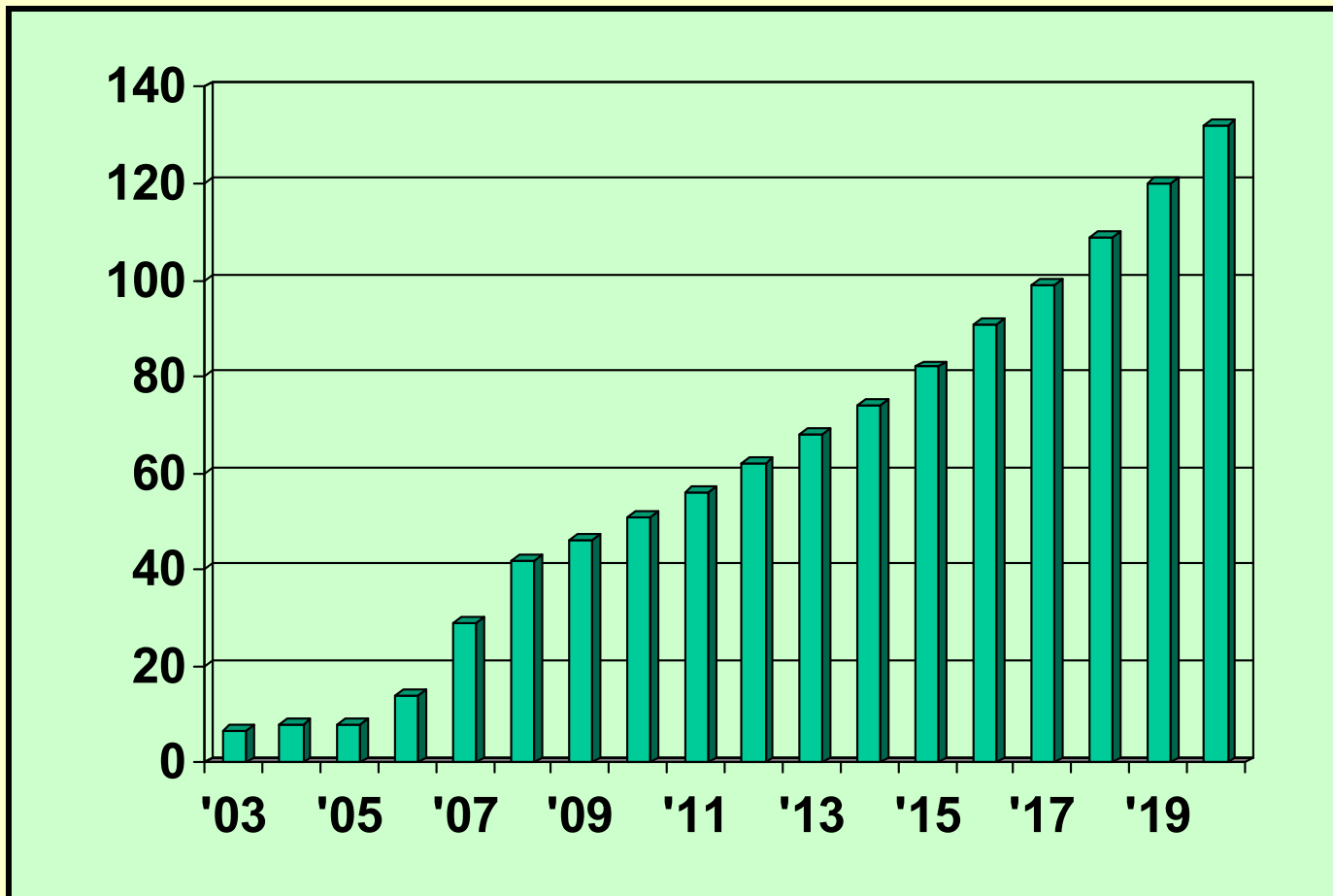
Recent Nd Oxide Price Trend

Actual February \$ per Kilogram (Metals Pages)

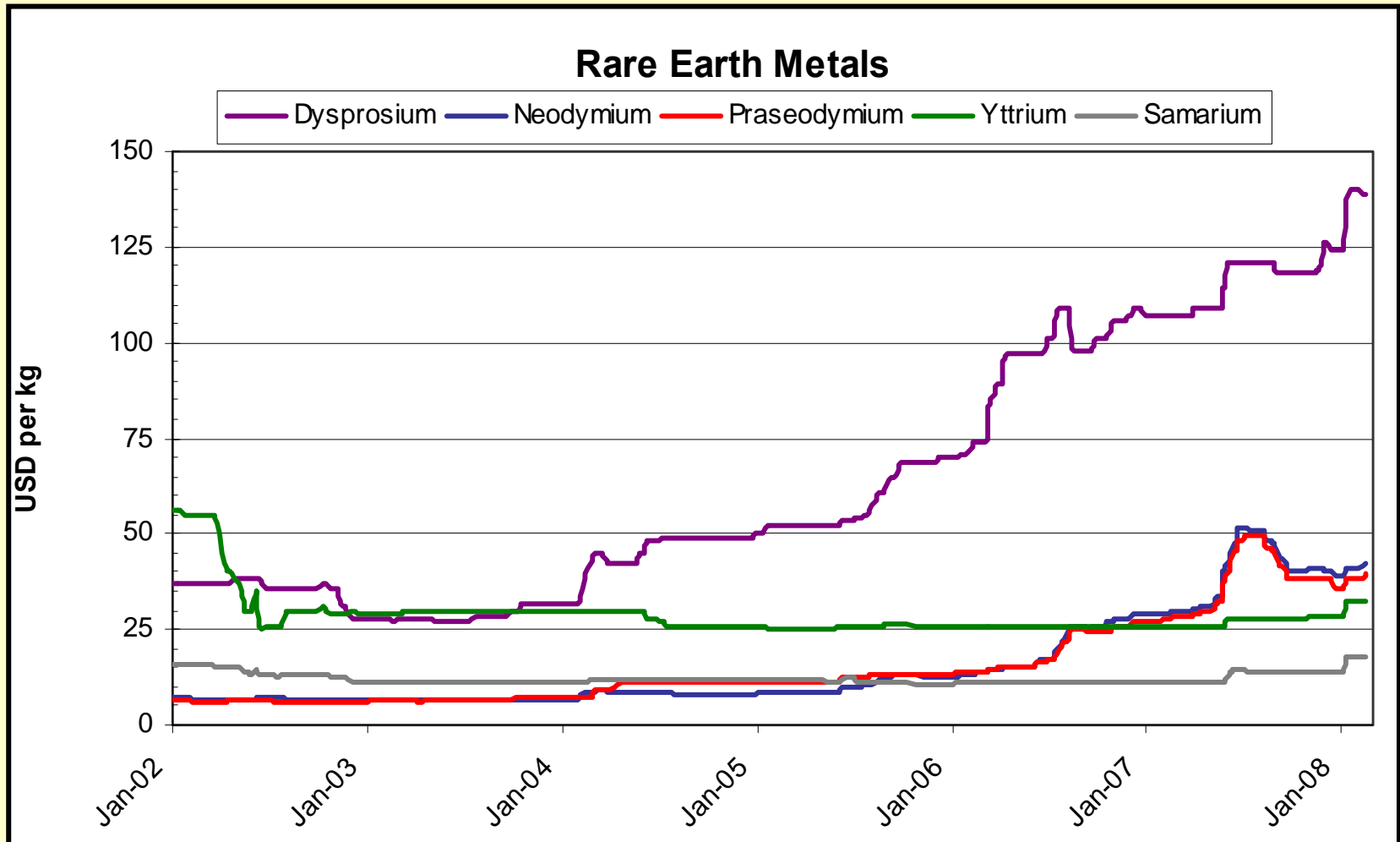


Future Nd Oxide Price Trend

(\$ per Kg - Increasing 10% per year)



Dysprosium Prices are Also Following a Serious Upward Trend



Raw Material Supplies and Prices - 2020

- **Chinese domination of world REO production will drop to 70-75% from the current level of $\approx 95\%$**
- **North American and Australian production will represent approximately 25%**
- **REO prices will continue to climb (easily as much as 200%) as demand continues to challenge supply**

US Rare Earth Criticality

- **Jet Fighter Engines**
- **Guided Missile Systems**
- **Electronic Counter Measure Systems**
- **Anti-Missile Systems**
- **Satellite Communications Systems**

- **Source: Objective Capital**

US Rare Earth Criticality

- **“The predominance of US importation of rare earths from a single country coupled with that country’s (China) own growing demand for minerals, represents potential for restrictions regarding future US access to rare earths, at any price.”**

- **Source: National Academy of Science**

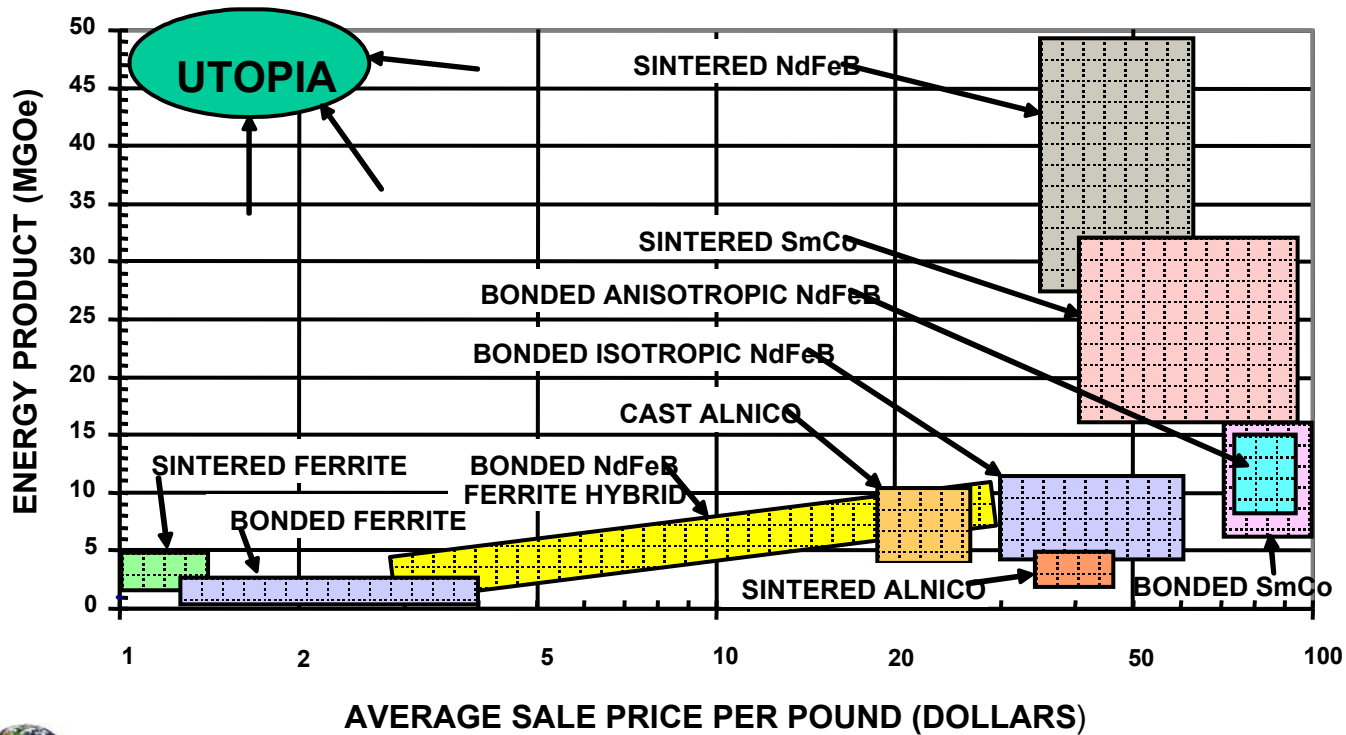
Advanced Technologies Will Drive Future Permanent Magnet Demand

- **Hybrid & Fuel Cell Vehicles (+++)**
- **Wind Power (+++)**
- **Consumer Electronics (++)**
- **Military & Aerospace (++)**
- **Energy Storage Systems (++)**
- **Medical Products & Systems (+)**
- **Solid State Memory Drives (--)**

We Will Not See “Utopia”



Average Selling Price of Magnets



Our world touches your world every day...

5

North American Magnet Landscape Predictions - 2020

- **One hard ferrite producer**
- **One injection molded magnet producer**
- **One meaningful sintered NdFeB producer**

North American Magnet Landscape - 2020

- **A phase of acquisition/consolidation will occur in the distributor/fabricator segment of the industry**
- **4- 6 distributor/fabricators (existing in 2007) will be acquired or close their doors by 2020**

Permanent Magnet Industry

The World's Top 25

- **Size matters** (>\$30 Million Sales in 2008)
- **Market Share will be critical** (Usually #1 or #2)
- **Technology, Application Support & Value-added Niches are vital**

Permanent Magnet Industry

The World's Top 25

- **Size matters** (>\$30 Million Sales in 2008)
- **Market Share will be critical** (Usually #1 or #2)
- **Technology, Application Support & Value-added Niches** are vital
- **Sustained profitability and cash flow will be a necessity**
- **Solid management will be very important**
- **Exclusion from “the list” doesn’t mean you won’t be a player!**

North America

- **Adams Magnetic Products Co.**
- **Arnold Magnetic Technologies Corp.**
- **Bunting Magnetics Co.**
- **Dexter Magnetic Technologies Inc.**
- **Eriez Magnetics**
- **Magnet Sales & Manufacturing**
- **Magnum Magnetics Corp.**

Western Europe

- **Bakker Magnetics BV**
- **Eclipse Magnetics Ltd.**
- **Farinia Industrial Group (Ugimag)**
- **Goudsmit Magnetics Group BV**
- **Vacuumschmelze GmbH**

Japan

- **Daido Electronics Co., Ltd.**
- **Hitachi Metals, Ltd.**
- **MagX Co., Ltd.**
- **Seiko Epson Corporation**
- **Shin-Etsu Chemical Co.**
- **TDK Corporation**

China

- **Advanced Technology & Materials Co.**
- **Beijing Zhong Ke San Huan High-Tech Co.**
- **BGRIMM**
- **Guangzhou New Life Magnet Electricity Co., Ltd.**
- **Hengdian Group DMEGC Magnetics Ltd.**
- **Jiangmen City Powder Metallurgy Factory, Ltd.**
- **Ningbo Yungsheng High-Tech Magnetics Co., Ltd.**

Summary

- **NdFeB will continue to lead permanent magnet growth**
- **China will continue to dominate the world's magnet industry**
- **NdFeB magnet prices will steadily increase at least 3-5% per year – plan on it!**
- **The United States is currently extremely vulnerable with limited domestic REO and NdFeB magnet production**
- **A renewed phase of magnet industry consolidation is about to occur**

The Permanent Magnet Division of SMMA – The Motor & Motion Association

- A new organization formed following the dissolution of the IMA- Magnet Division
- Now a formal division of SMMA
 - www.smma.org
- Two formal meetings each year
 - Spring Management Conference (May)
 - Fall Technical Conference (October)

The Permanent Magnet Division of SMMA

Mission Statement

**“Increase the understanding,
promotion and effective utilization
of magnetic materials, assemblies
and systems for the benefit of the
Permanent Magnet Division
members and all users of permanent
magnet products”**

The Permanent Magnet Division of SMMA

Membership Criteria

Magnet producers

Magnet distributors and fabricators

**Suppliers of materials and services
to the permanent magnet industry**

**Related media and academic
organizations**

Current PMD-SMMA Members

- **Adams Magnetic Products**
- **Anshan DeKang Magnetic Materials**
- **Arnold Magnetic Technologies**
- **Dexter Magnetic Technologies**
- **Electrodyne Company**
- **Electron Energy Corporation**
- **Energy Conversion Systems**
- **Hitachi Metals America**
- **Magnequench International**
- **Magnet Applications Inc.**
- **Magnetic Instrumentation**
- **Quadrant Magnetics**
- **Shin-Etsu Magnetics**
- **TDK Corp. USA**
- **Tengam Engineering**
- **Thomas & Skinner**
- **Tridus Magnetics**
- **Ugimag**
- **Vacuumschmelze USA**
- **Walter T. Benecki LLC**

True Fish Stories *by Walter T. Benecki*

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Thank You !

Walter T. Benecki LLC

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