

The Future of the Permanent Magnet Industry

by Walter T. Benecki

Permanent Magnet Division of MCMA

A3 Business Forum

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The Origin of PMD

Originally founded in **1959** and operated as the Magnetic Materials Producers Association (MMPA) for over 40 years.

In **2001**, MMPA became the International Magnetics Association (IMA), expanding its scope and operations in recognition of the global nature of the magnetic industry.

In **2007**, merged into SMMA, the motor and motion trade group, and assumed the title of the Permanent Magnet Division of SMMA.

In **2015**, SMMA merged with the Motion Control & Motor Association (MCMA).

PMD continues on, with a 60 year history!

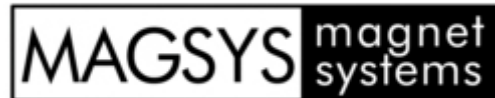
Hitachi Metals America, LLC



YUNSHENG USA



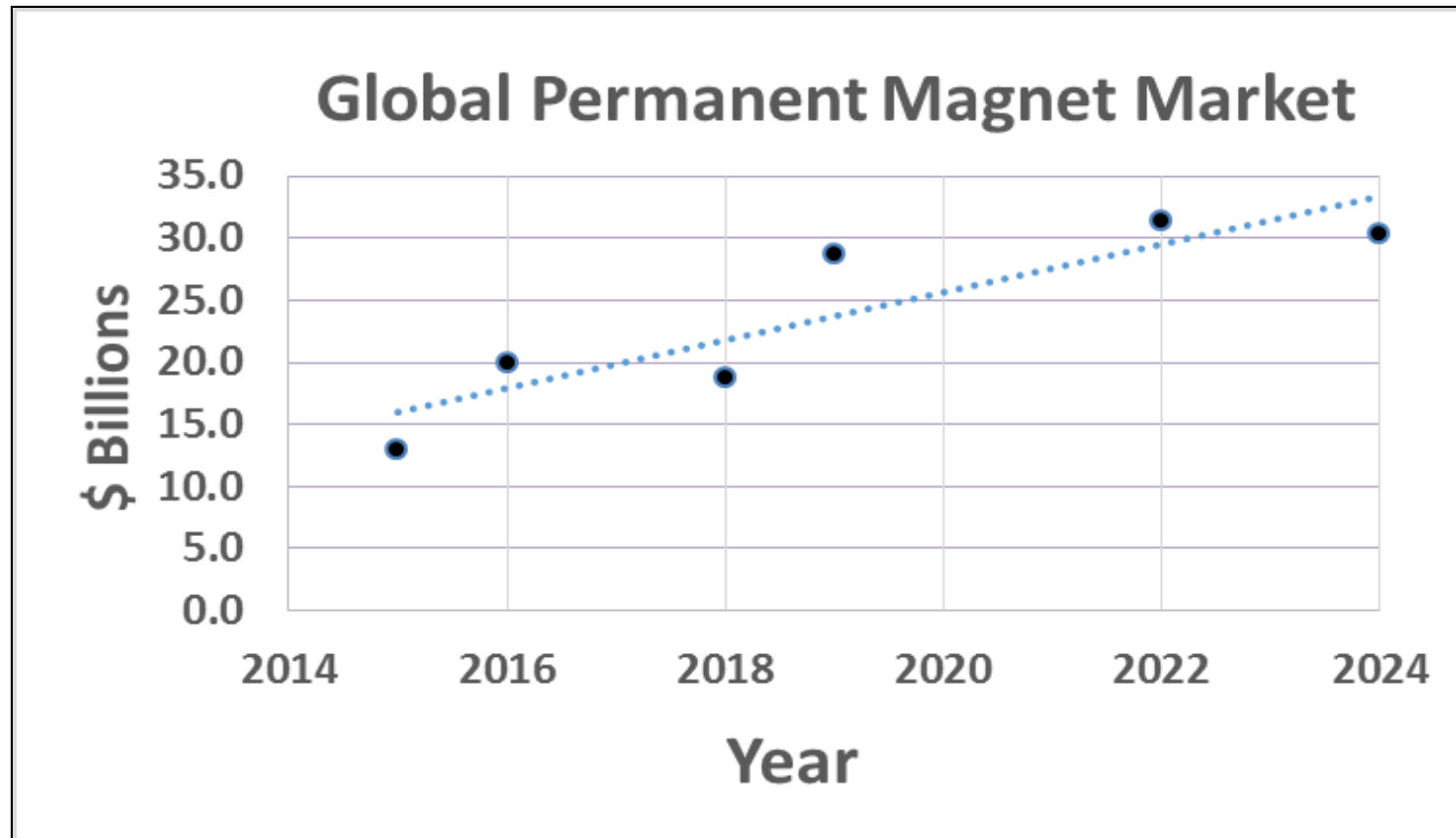
Max Baermann GmbH
Bonded Permanent Magnets



ENEFLUX ARMTEK MAGNETICS INC.

Total PM Market Growth Trend

2015-2024 AAG = $\pm 9.4\%$



Estimated Permanent Magnet Market – 2018

(Source: Updated by Dr. John Ormerod – January 2019)

Material	Weight (000's Kg)	Value (\$ Millions)
NdFeB	160,000	11,200 (59%)
Ferrite	830,000 (82%)	5,800
Bonded NdFeB	11,000	1000
SmCo	4,200	400
Alnico	6,300	350
Other	2000	150
TOTAL	1,013,500	\$18.9 Billion

The *Reality* of the Permanent Magnet Industry

- **High volume** applications (~75% of the \$'s)
 - Require substantial up-front infrastructure investment
 - Often dozen's of worthy competitors
 - Eventual customer priority: **Price/Quality/Service**
 - *Generally lower margins* (with ongoing price pressure)
- **Low volume** applications (~25% of the \$'s)
 - Potentially lower up-front investment
 - Fewer *direct* competitors
 - Customer priority: **Service/Quality/Price**
 - *Generally higher margins*



Applications That Will Impact Tomorrow's Magnet Demand

(Roughly 70% of all magnets produced in the world are used in motors!)

- **Hybrid & Electric Automobiles**
- **Robotics**
- **Wind Turbines**
- **Electric Bicycles**
- **Consumer Electronics**
- **Industrial Motors**
- **Appliance & HVAC Motors**
- **Energy Storage Systems**
- **Magnetic Refrigeration**
- **Magnetic Levitation Transportation**



Will Automotive Electrification Produce the Desired Results?

“Will the Electric Car Save the World or Wreck It?”

(Engineering.com – August 17, 2018)

- **It's a Rush (Government declaration/legislation)**
- **Technology Moving Rapidly**
- **Economics/Consumer Acceptance Remains an Issue**
- **Electrical Generation Capacity May be an Issue**
- **NdFeB Magnet Demand will Likely Increase**
- **Battery Raw Materials – Cobalt & Lithium Price & Availability**

Robotics – Hang on For a Ride!

Bob Doyle, Vice President - Robotic Industries Association



- **“Among the non-automotive industries that set new (robotics) records were life sciences, food and consumer goods, plastics and rubber, and electronics. We believe that as robots have become more dexterous, safer, and available in a variety of form factors, they have become more appealing to new users in a wide variety of industries. [We expect this to continue in 2019 and beyond.](#)”**

Robotics – Hang on For a Ride!

Shigenobu Nagamori, Founder and CEO of Nidec



- “By the year 2050, the world population is estimated to have reached 9 billion with 3 service robots for every human on earth.”
- “In turn, the average robot will contain over 100 motors. **The market potential for (PM) motors in the field of robotics is nothing short of astronomical.**”

We Will Not Have “The New Holy Grail” Permanent Magnet Material in 2019.....or 2020

- **Diffused Dy NdFeB**
- **Anisotropic Bonded NdFeB**
- **Sintered Sm-Fe-N**
- **Iron-Nitride**
- **Modified Fe-Ni Alloys**
- **Nano-structured NdFeB**
- **High Temperature SmCo**
- **Correlated Magnetization of PM's**

Recycling Initiatives are Being Focused on Reducing the Consumption of Rare Earths

- It is currently estimated that approximately 25-30% of all rare earth materials utilized in the manufacture of rare earth magnets are from recycling sources:
 - Material recycled within the magnet manufacturing process
 - Magnets recovered from obsolete end products (motors & disk drives) Two significant variables:
 - Market prices for rare earths
 - Long-term availability of magnets to recycle

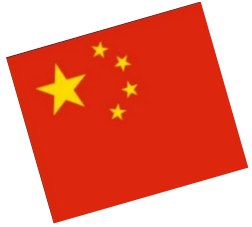
The 2018 National Defense Authorization Act

- **DFARS: "Defense Federal Acquisition Regulations Supplement."**
- **SmCo and NdFeB** now both designated as "Sensitive Materials".
- Prevents the DOD purchase of rare earths magnets from prohibited countries like China, Russia, North Korea and Iran.
- Importers and distributors can't simply ship a magnet block into another country and finish it into a final part.
- The law explicitly prohibits the purchase of rare earth magnets from being 'melted or produced' in the prohibited countries.

An Uneasy Atmosphere over Rare Earths

- **Ongoing environmental crackdowns in China are likely to continue.**
- **China is also getting increasingly restrictive in the amount of rare earths it exports.**
- **These policies can certainly create future price volatility.**
- **The political tone was further exacerbated last year, when the US included rare earths on a list of critical metals that would be subject to tariffs.**
- **The US quickly changed its mind, because the US produces no domestic rare earths!**

China will Continue Being the “Big Dog”



“Several projects in North America are advancing new rare earth separation technologies from either recycled or primary materials. Commercial-scale production levels, however, are yet to be achieved. For the time being, it seems that new rare earth supply will fill the demand gap via China.”

Source: Roskill Information Services - August, 2018

- **A dominant position in RE raw material production**
- **Continued dominance in the production of RE metals & alloys**
- **65-70% of global ferrite magnet production**
- **70-75% of global NdFeB magnet production**
- **Significant government encouragement & support**

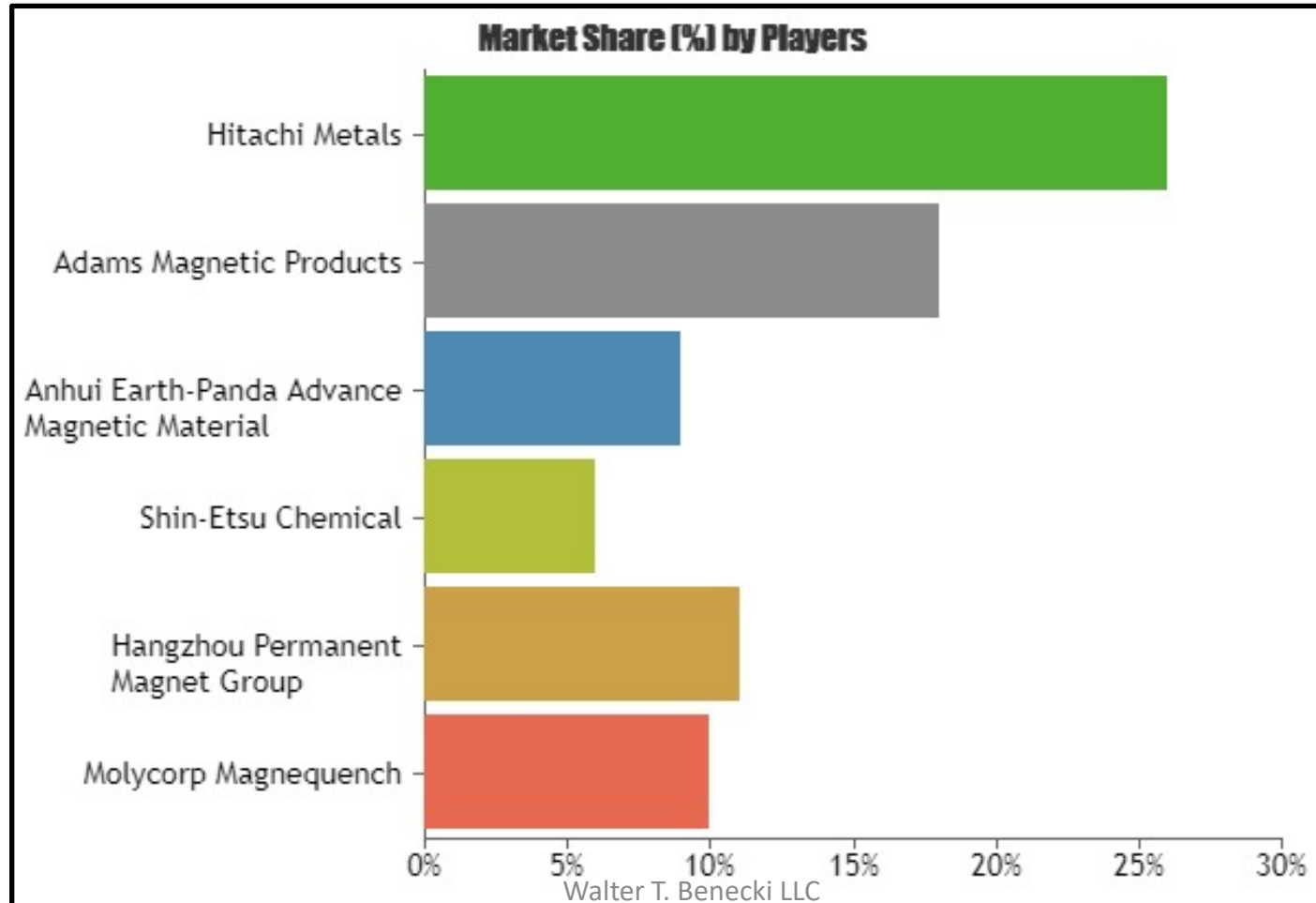
A Few Tips for Magnet Buyers

- **Beware of the “Magnet Market Studies”**
- **Know who you are buying from**
- **Understand why you are buying from them**
- **Have more than one qualified source**
- **Consider RE price adjustment formulas in your purchase contract**
- **Be prepared – the next 5-10 years could be chaotic**
- **I know some of the above seems obvious, but....just one story.**

You Can't Always Rely on The "Experts"

Source: *HTF Market Intelligence Consulting Private Limited – August, 2018*

(Only \$4,000)



You Can't Always Rely on The “Experts”

Source: *Absolute Reports* - October, 2018

(Only \$3,480)

- ***“Magnetic materials are materials that can react in some way to magnetic fields called magnetic materials.”***
- **Note:** This company claims to have published “over **1,600** market reports on Permanent Magnets” over the past two years!



Doing Business in China

There are many excellent magnet producers in China, with excellent technology and state-of-the-art manufacturing capability...

Doing Business in China

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That being said,

Believe 70% of what you read...

Believe 80% of what you are told...

Believe 90% of what you see...

The Future - Summary

- **Demand for PM's will likely experience 10+% growth**
 - Automotive
 - Robotics
 - Wind Power
 - Electric Bicycles
- **Buyers need to use common sense when purchasing permanent magnets (or buying "studies" about the industry)**
- **Don't believe all that's out there – understand your source**
- **Governmental influence and geopolitical dynamics represent serious wild cards**
- **China's influence/dominance will continue to be a significant factor**
- **Pricing & availability, especially for Rare Earth magnets, could be chaotic (plan for the possibility)**

The Future - Summary

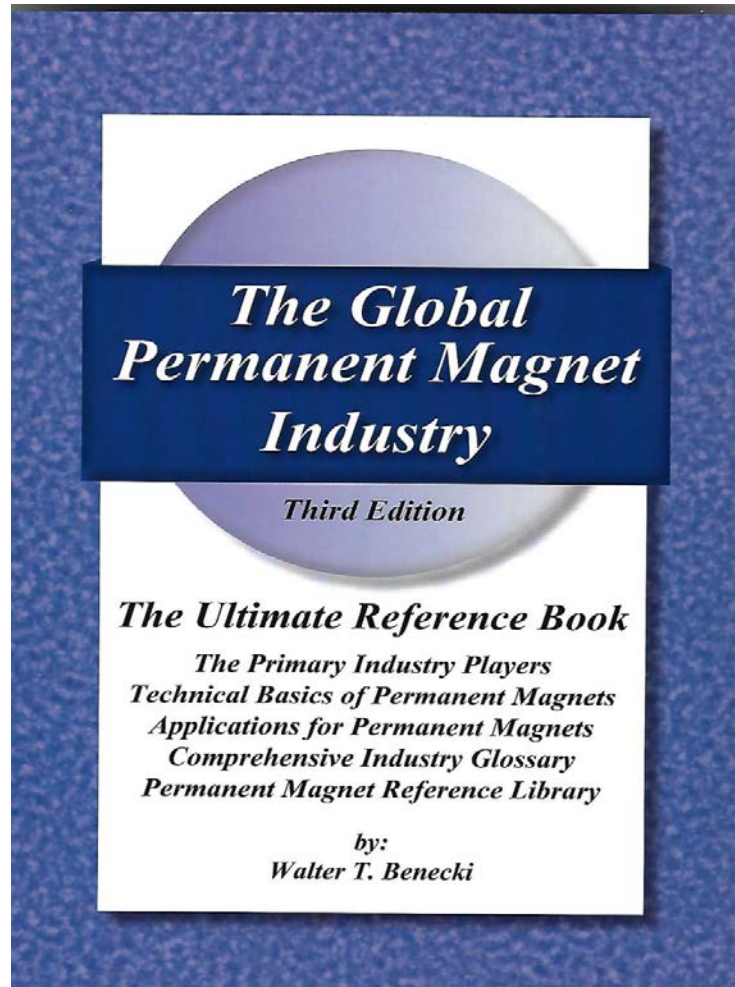
- **Electrification of the automotive industry may present some future challenges & opportunities.**
- **The emerging magnet recycling industry may end up with too many recyclers and eventual decreasing availability of products to recycle.**
- **We will likely continue to be dependent on rare earths.**
- **Hard ferrite magnets and SmCo will offer some comfort as a back-up for NdFeB magnets, if necessary.**
- **There will additional future victims of the lure of high volumes (with low margins).**
- **Any future advancements in permanent magnets are likely to be incremental...not “Breakthrough”**

Two Ways to Learn More and Follow the Action in the Permanent Magnet Industry

- **“The Global Permanent Magnet Industry”**
- **The Permanent Magnet Industry Newsletter**

“The Global Permanent Magnet Industry”

(2017 Publication - 340 Pages - \$395)



- A **Comprehensive Global Industry Directory** (Identifying and Describing Over 1,350 Companies Located in More Than 60 Countries)
- The **Technical Fundamentals** of Permanent Magnets
- Identifies **1,200+ Applications** Using Permanent Magnets
- Extensive **Magnet Industry Glossary** (390+ Items)
- A **Technology and Application Reference Library** (165 Listings)

The Magnet Industry Newsletter



- ❑ **Six Issues Published Each Year**
- ❑ **Important Future Magnet Industry News**
- ❑ **Expert Articles & Commentary**

Walt Benecki

John Ormerod

Stan Trout

Steve Constantinides

- ❑ **90+% Re-Subscription Rate**
- ❑ **Annual Subscription - \$1,295**

The Magnet Industry Newsletter

A Few Example Articles:



GM Patents Motor with Multiple Magnet Lengths

Ames Laboratory Announces Development of “Gap Magnet”

Traditional Automotive Speakers Might Represent Old Technology

Spotlight on Dysprosium: Revving Up for Rising Demand

A New Association for the Global REE Industry

New Process Extracts Rare-Earth Magnets from Discarded Electronics

Trump's Tariffs May Kill the E-Bike Revolution

Ferrite-Focused Wind Turbine Drive Developer Looking for Partners

Shin-Etsu Increasing Output of NdFeB Magnets in Vietnam

Arnold Magnetic Technologies Reports Positive Results

Quadrant Magnetics Announces Facility Expansion

Lynas Facing Serious Issues Regarding Their Malaysian Processing Facility

Thank You!



- Strategic Planning • Benchmarking • New Products**
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