



The Changing Patterns of the Global EMD Business

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No significant changes in the Usage of EMD:

- EMD is an essential raw material for the manufacture of primary Zn/MnO₂ batteries and today is used primarily to this end.
- The world demand of EMD for the production of primary Li/MnO₂ cells does not exceed 5,000 MT per year.
- The Li-ion secondary cells using LiMn₂O₄, which is produced from EMD, as cathode materials have not yet entered the stage of large-scale commercial production.
- The various non-battery uses of EMD (such as: ferrite, oxidant etc.) are rather limited
- As Zn/MnO₂ Battery is far from an outdated consumer good, EMD still has good market prospects for the future.

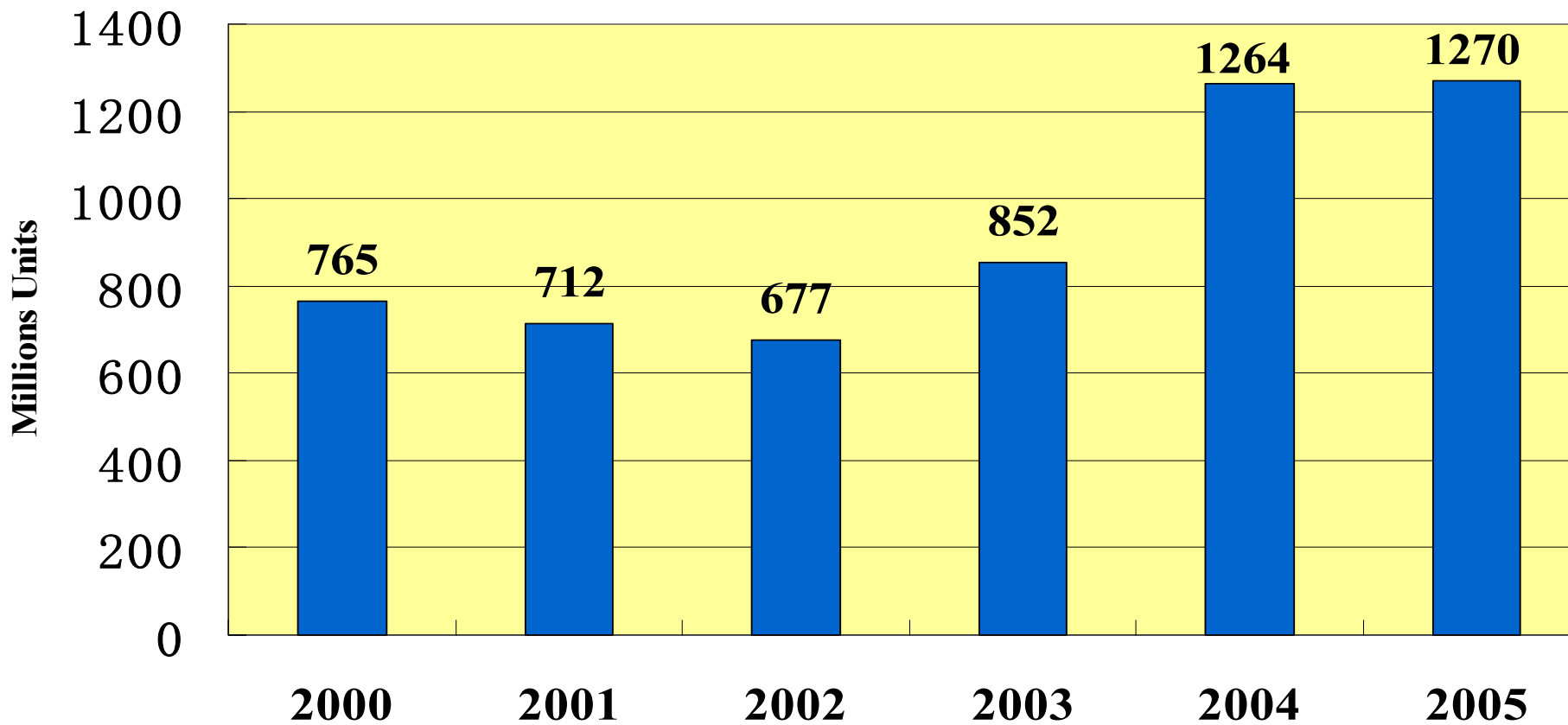


Battery Market Overview

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- Though Ni-MH and Li-Ion rechargeable cells have been developing rapidly, however, the primary MnO_2 battery remains the dominant product in the consumer battery markets, and its world average annual growth rate is estimated at 5–8% or more.
- While the alkaline battery dominates the primary market in developed countries, the C-Zn batteries still holds a major share in developing regions.
- Developed countries are moving their battery and battery materials production facilities to developing countries, such as China, Indonesia etc.
- The RAM and Ni-containing high performance alkaline battery market did not develop as expected, and have so far impacted little on the alkaline battery market share.
- The primary battery market worldwide is breeding intense competition and price wars.

US Imports of Primary MnO₂ Battery 2000-2005

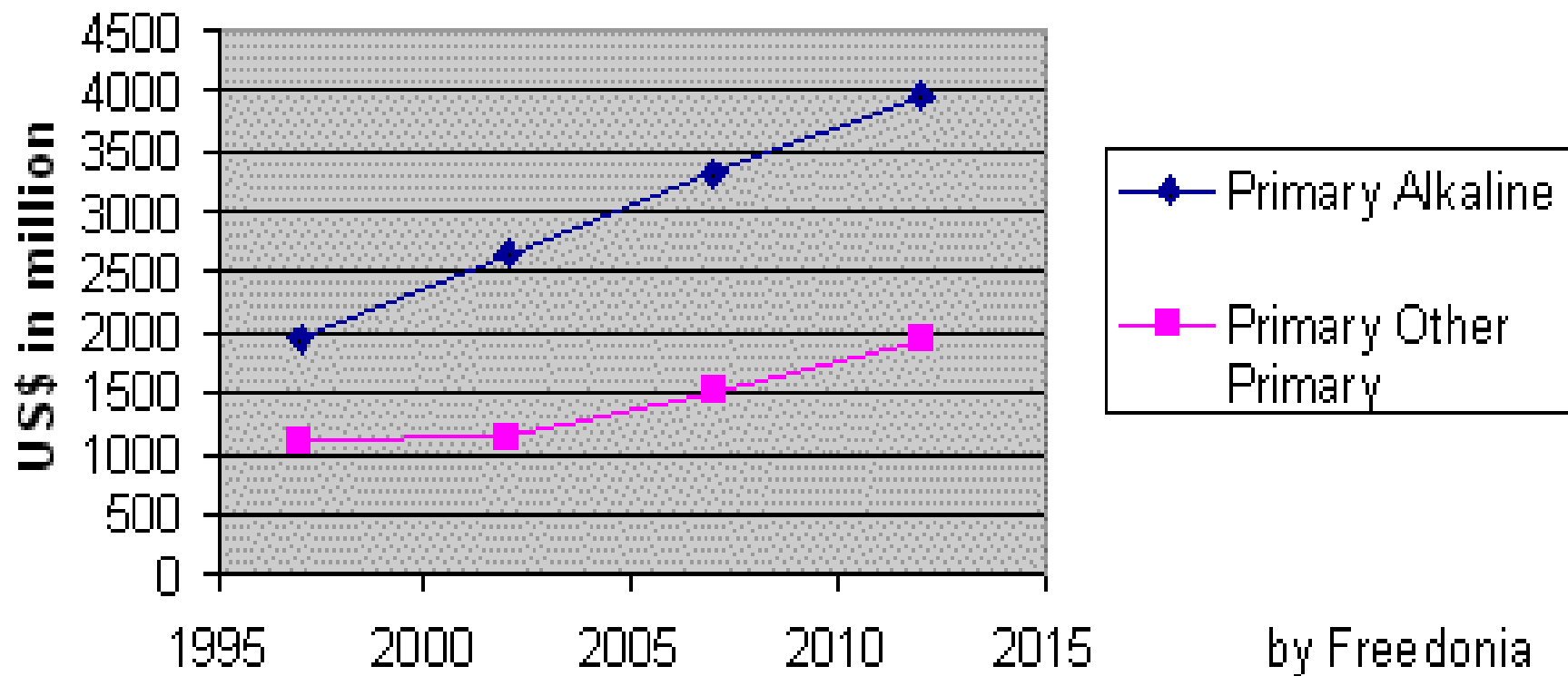




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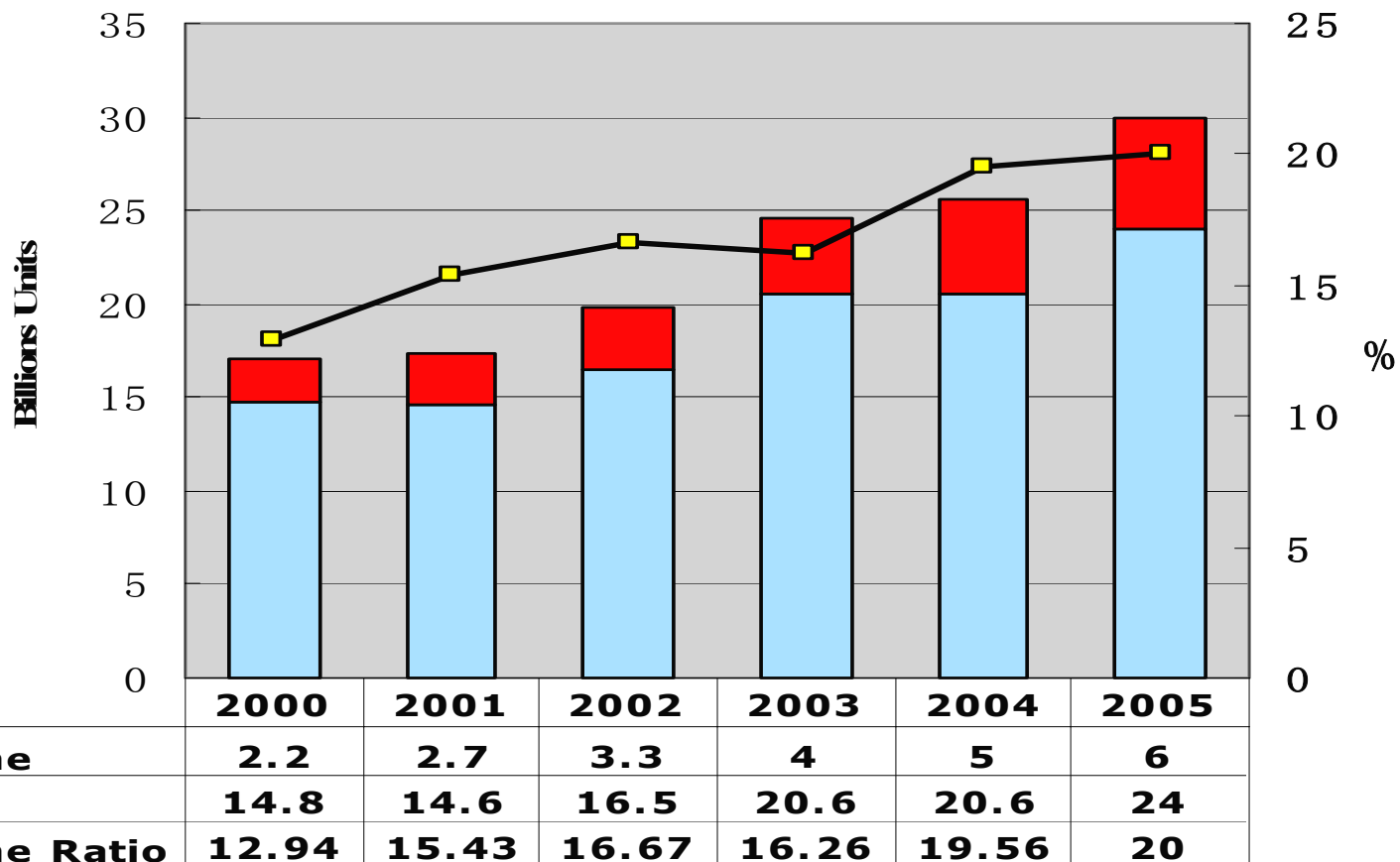
US Demand prediction for Primary Batteries

Demand for primary batteries

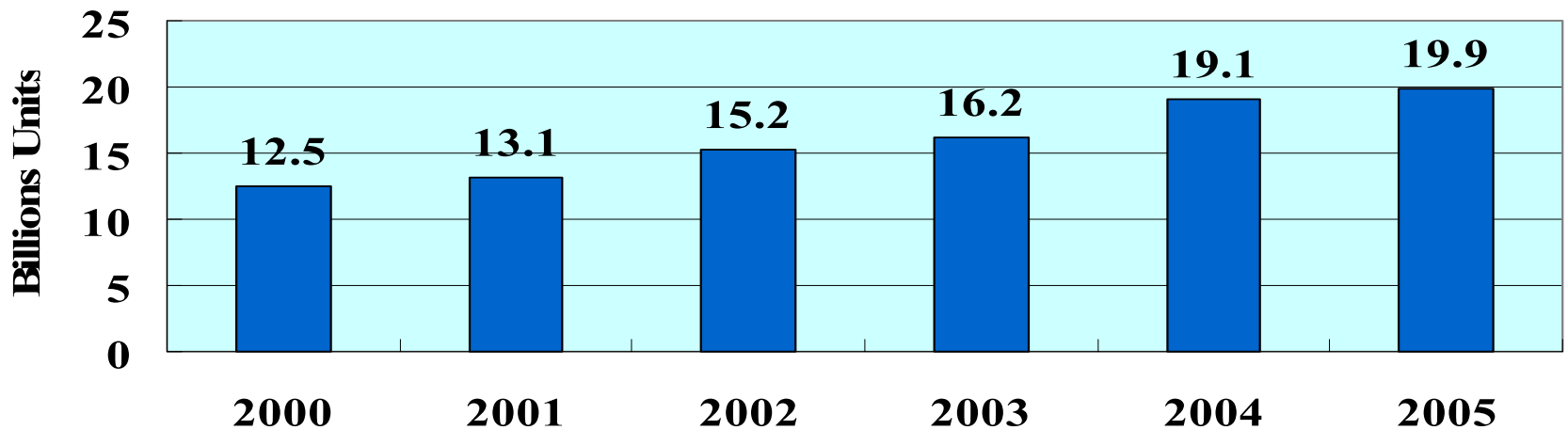




The Production of Primary Battery in China 2000 - 2005



China Exports of Primary MnO₂ Battery 2000-2005



The steady growth of production and export of MnO₂ batteries increased the demand for EMD in China during recent years.

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Global EMD Business:

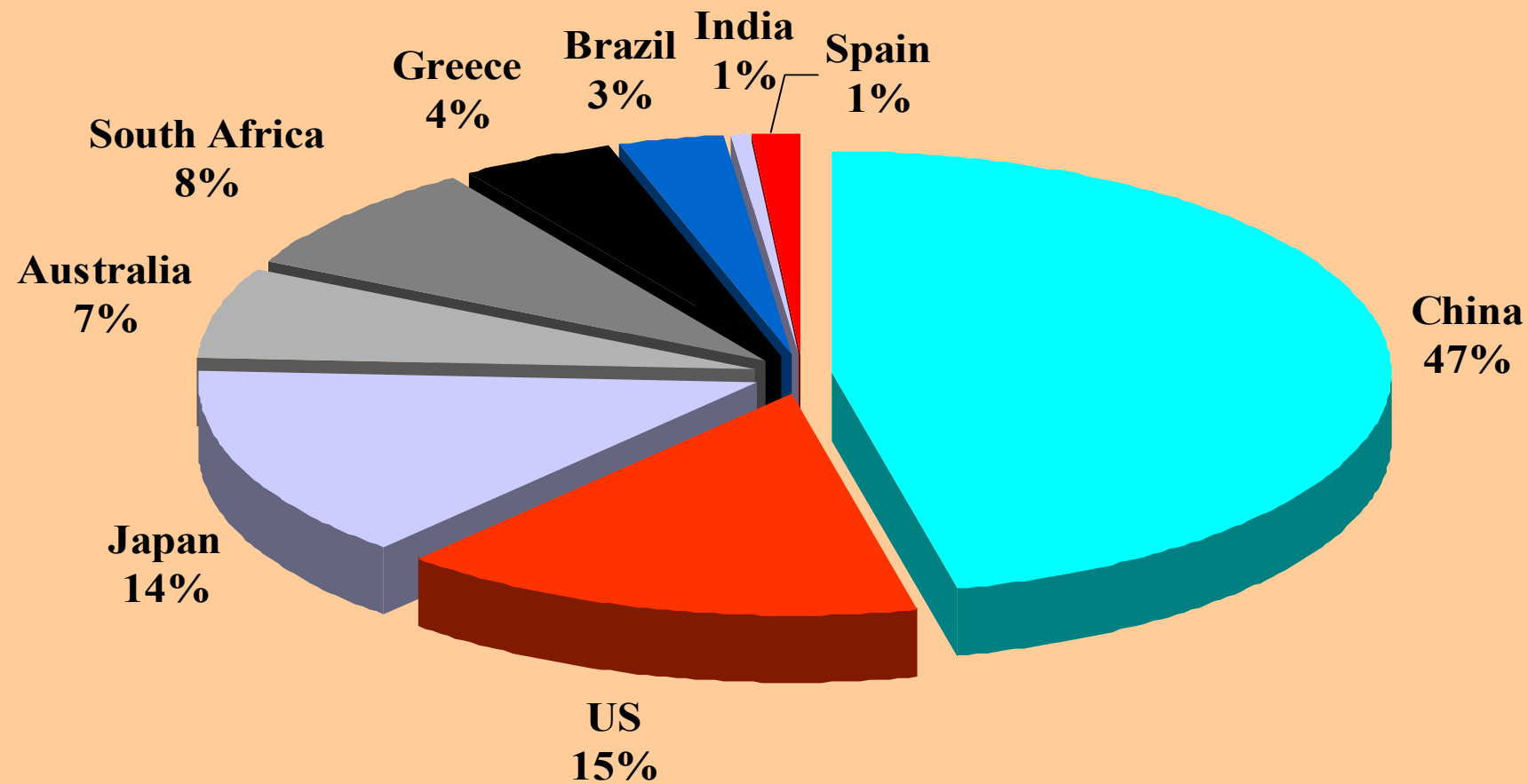
World EMD Production Capacity (at the end of 2005)

Country	Company	MT/y	Country	Company	MT/y
China	16 Companies	193,800	US Subtotal		62,500
Japan	Mitsui	24,600	Australia	Delta	27,000
Japan	Tosoh	34,000	South Africa	Delta	33,000
Japan Subtotal		58,600	Brazil	SBEL	6,000
Greece	Tosoh	18,000	Brazil	EML	5,800
Spain	CEGASA	6,000	India	MOIL	1,000
USA	Eveready	12,000	India	Eveready	1,500
USA	Kerr McGee	26,500			
USA	Erachem	24,000	Total		413,200



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Global EMD Capacity Share by Country End of 2005





The Top 10 EMD Manufacturers

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Company	Capacity (tpa)
1. Xiangtan Electrochemical	44,000
2. Tosoh, Japan	34,000
3. Delta, South Africa	33,000
4. Red Star, Guizhou, China	30,000
5. Delta, Australia	27,000
6. Kerr McGee	26,500
7. Guiliu, Guangxi, China	25,000
8. Mitsui, Japan	24,600
9. Erachem, US	24,000
10. Tosoh, Greece	18,000
Total	266,150



World EMD Market Trends

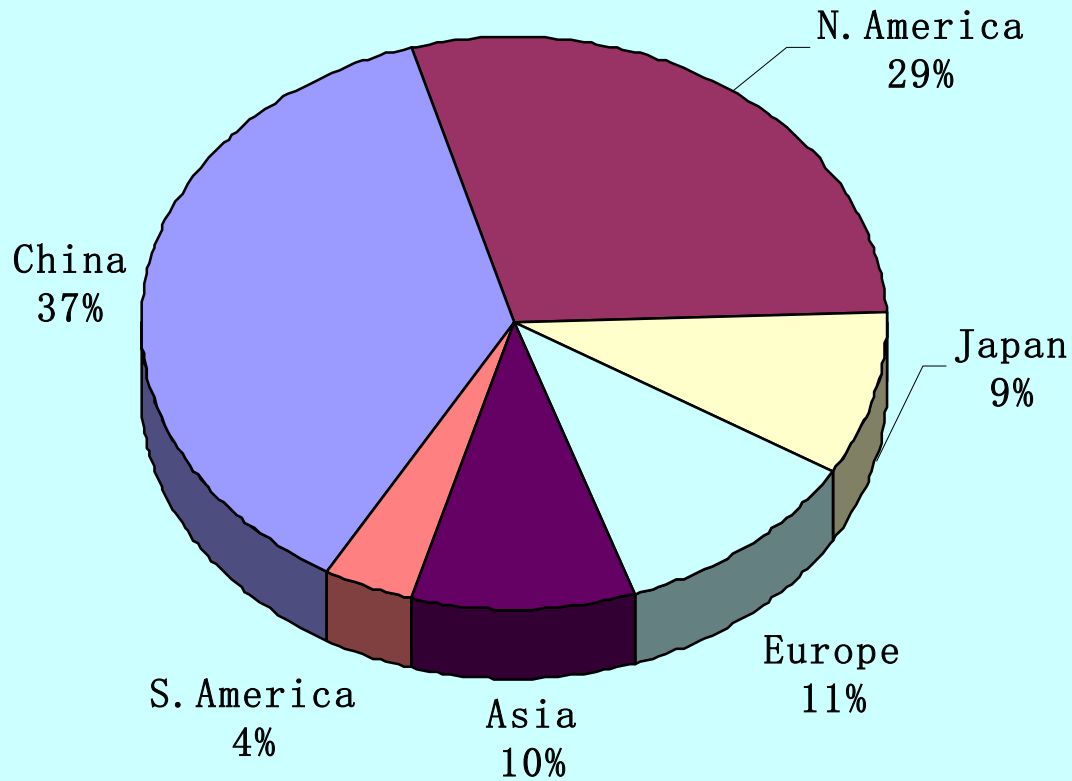
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- The world EMD market, with the exception of China, is characterized by a small number of manufacturers and customers.
- Although during the last few years the world EMD market has swung repeatedly between tight supply and oversupply, the market demand, continues to grow steadily at an estimated average rate of 5–8% per year.
- While market demand continues to grow steadily, in recent years there have been significant changes in EMD supply have been ongoing since recent years due to capacity over-expansion.
- The extensive price rises of Mn Ore, energy, transport etc., greatly increased the cost of EMD during the past two years,
- However, with the exception of the US market, oversupply last year led to a drop in prices.
- Therefore, EMD market conditions are becoming more intensely competitive.
- It is noteworthy, however, that Delta recovered from the loss of both sales and profits in 2004, as its annual sales in 2005 reached a record 65,200MT and the company earned 52.4m Rand (or 5.68m USD).



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World EMD Demand Predication 2006



Total demand: 310,000 tons

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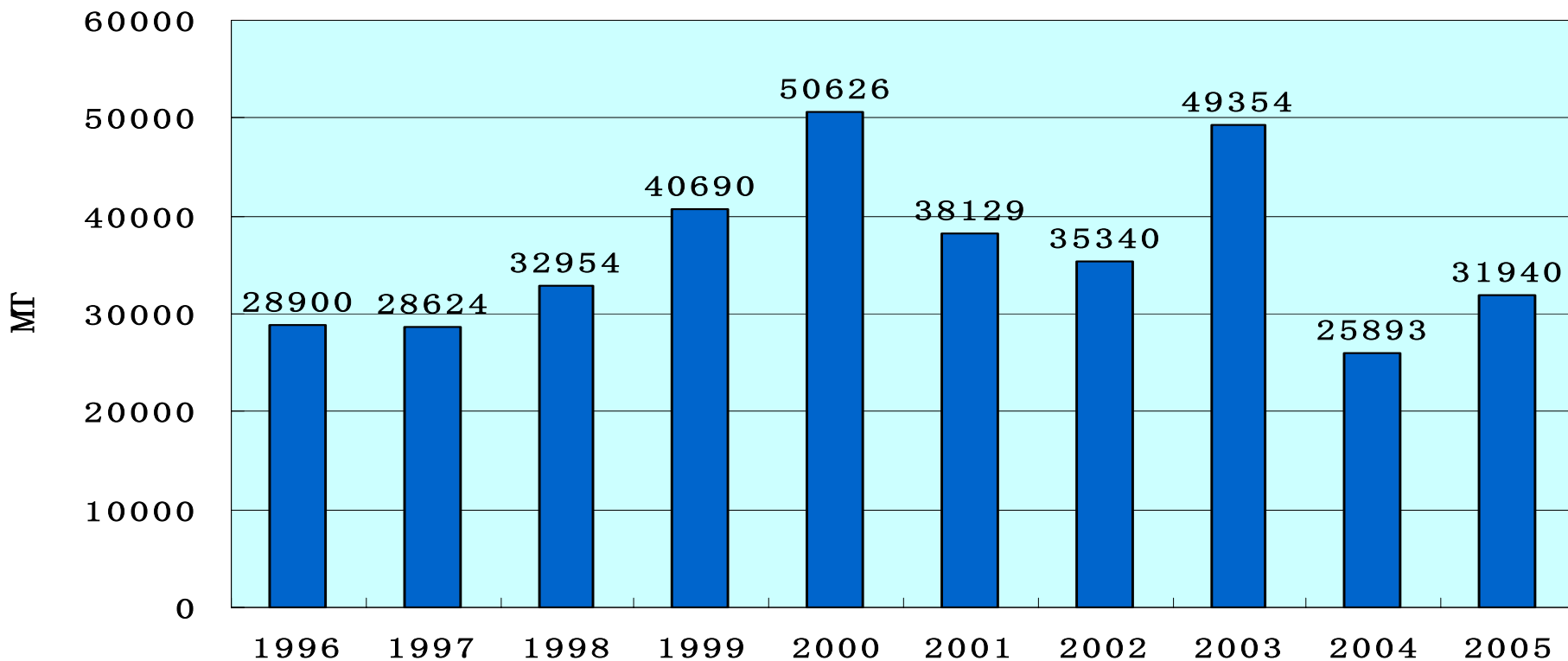
Global EMD Exports by Country

Unit: MT

Country	2002	2003	2004	2005
China	23,403	24,962	38,258	34,399
Japan	23,854	22,453	28,104	29,086
Australia	28,117	31,748	19,995	33,218
South Africa	20,947	26,723	25,782	31,979
Greece		11,310	12,496	10,171
Ireland		7,355		
Brazil	6,316	8,082	9,106	
Spain	1,764	1,995	2,308	
Total		134,628	136,049	138,853

The share of China in the world EMD export trade market was only 25% in 2005, while China imported 9,010 tons of EMD in the same year.

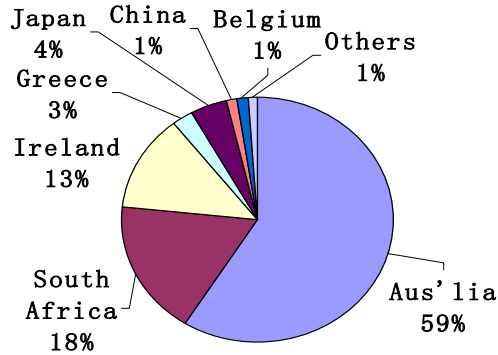
1996 - 2005 US Imports of EMD



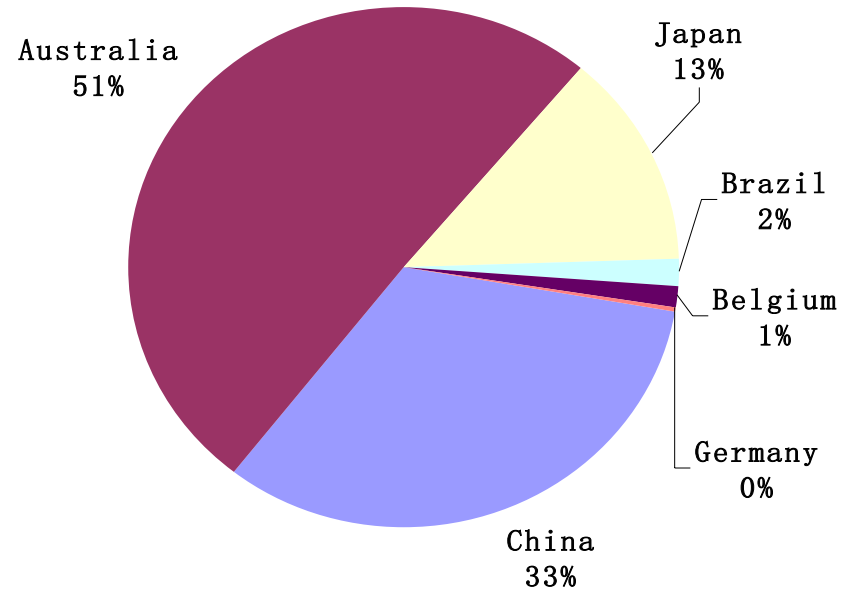
EMD Imports into the USA are a barometer of the global EMD Market

2003-2005 US EMD Imports

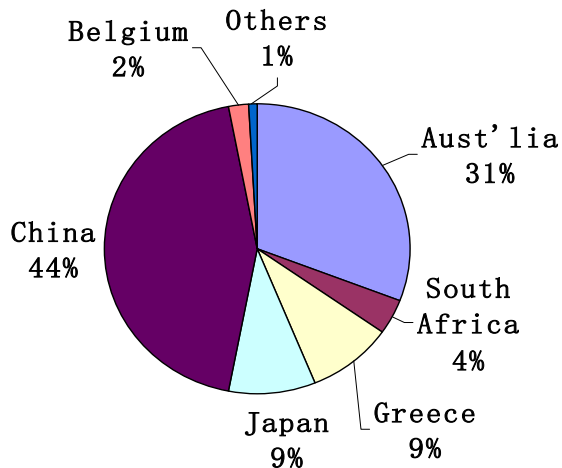
CY 2003



CY 2005

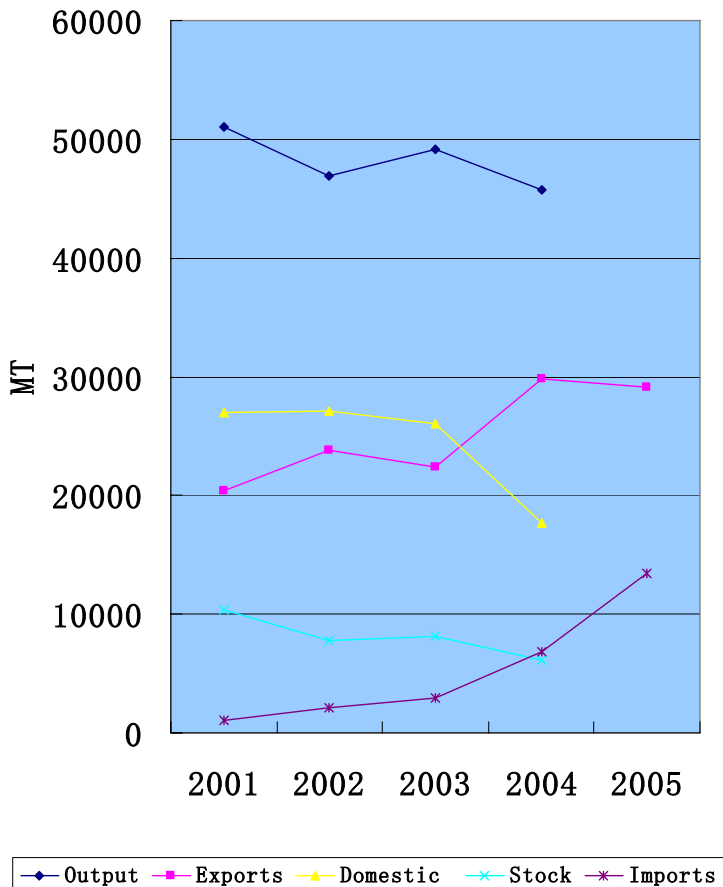


CY 2004



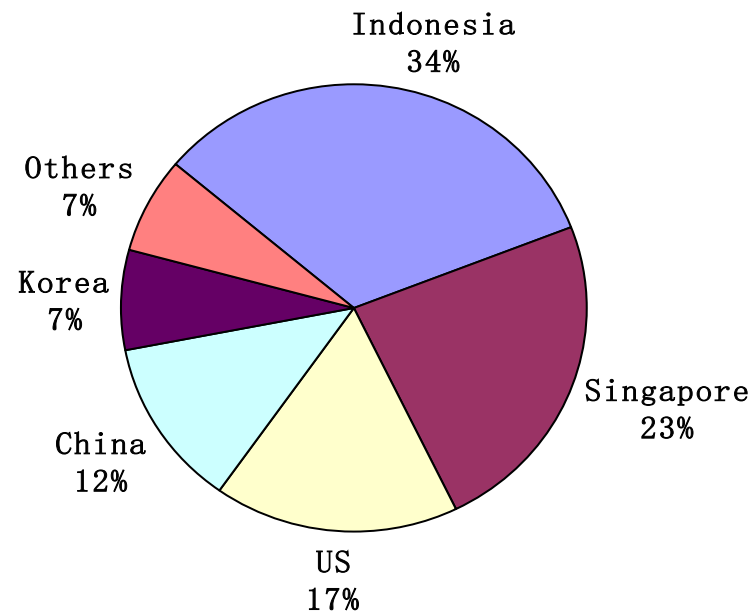
Japan EMD Markets

2001-2005



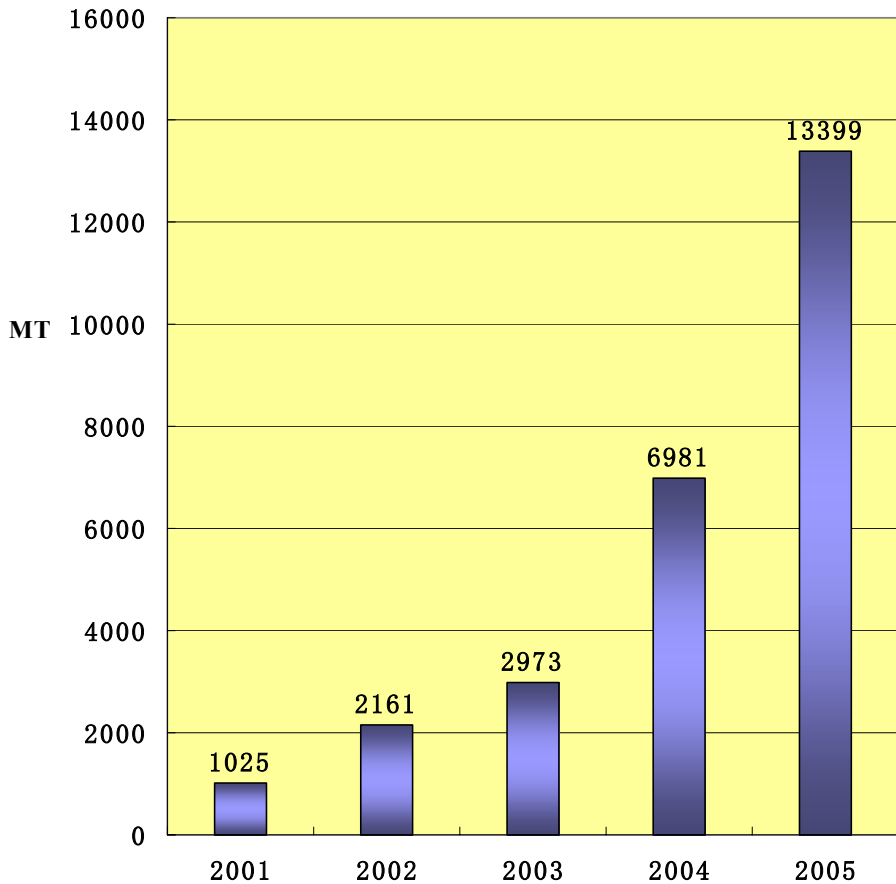
Japan EMD Exports by Country

CY 2005 = 29085 MT

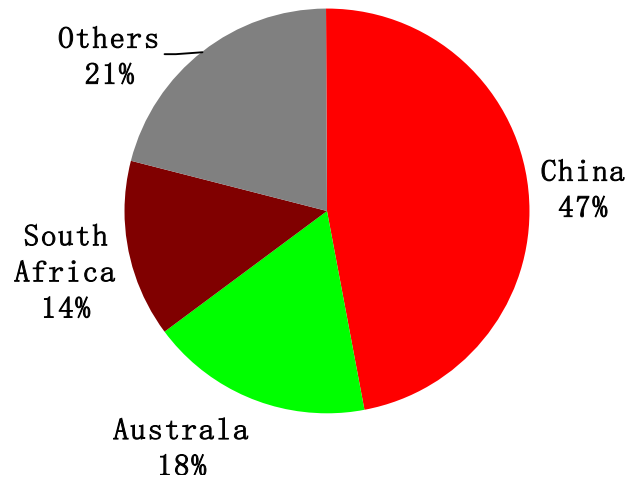




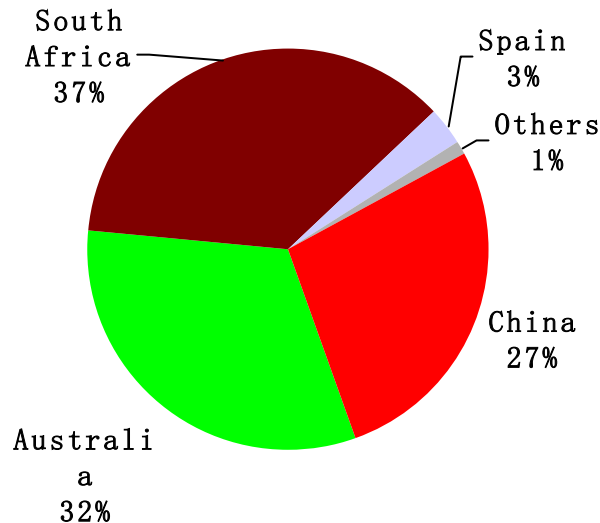
Japan Imports of EMD (2001-2005)



Japan Imports of EMD by Country CY 2004



Japan Imports of EMD by Country CY 2005

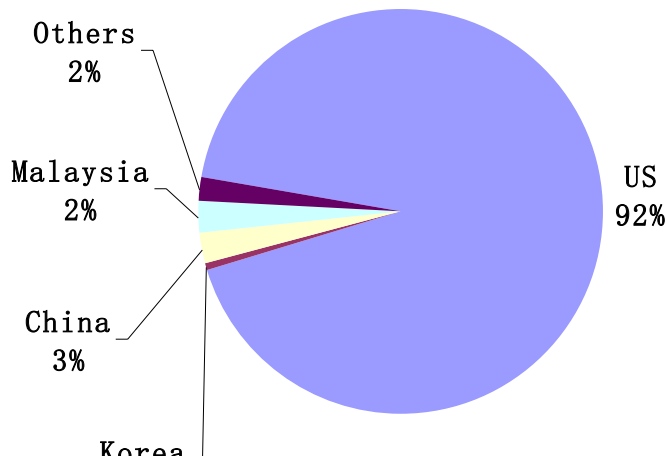




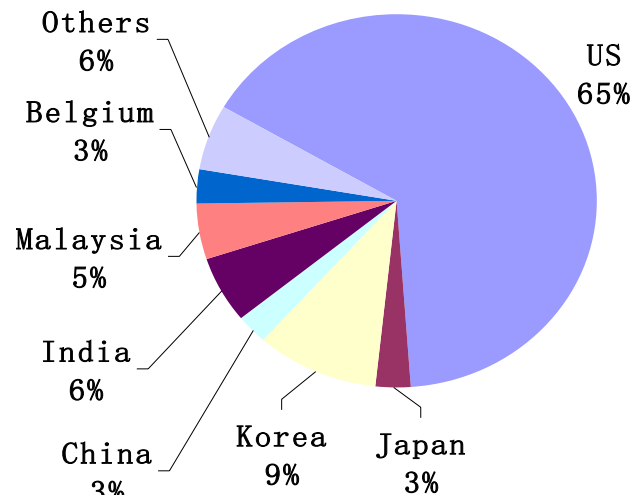
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2002-2005 Australia EMD Exports

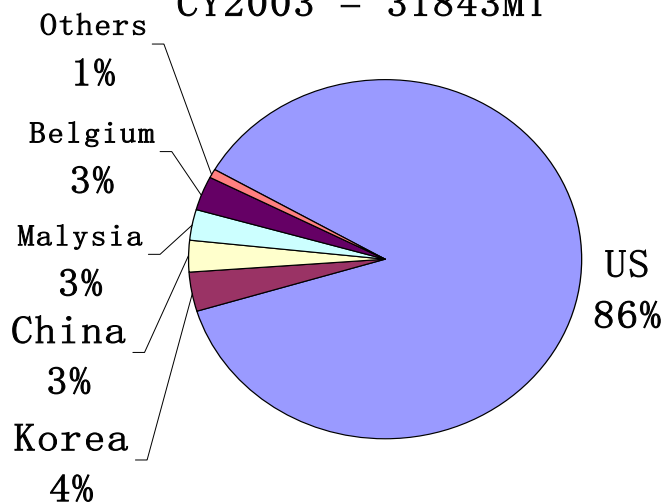
CY2002 = 28175MT



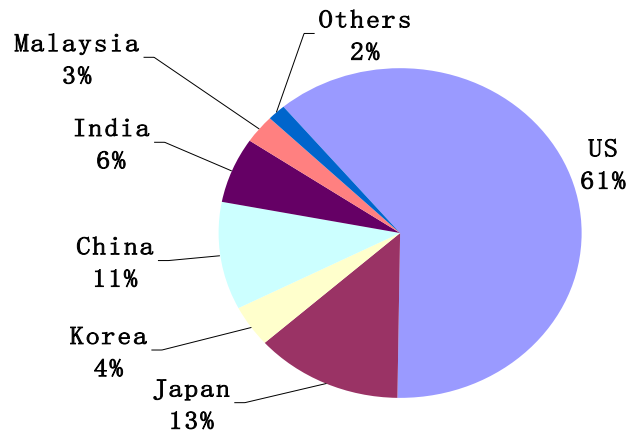
CY2004 = 19765MT



CY2003 = 31843MT



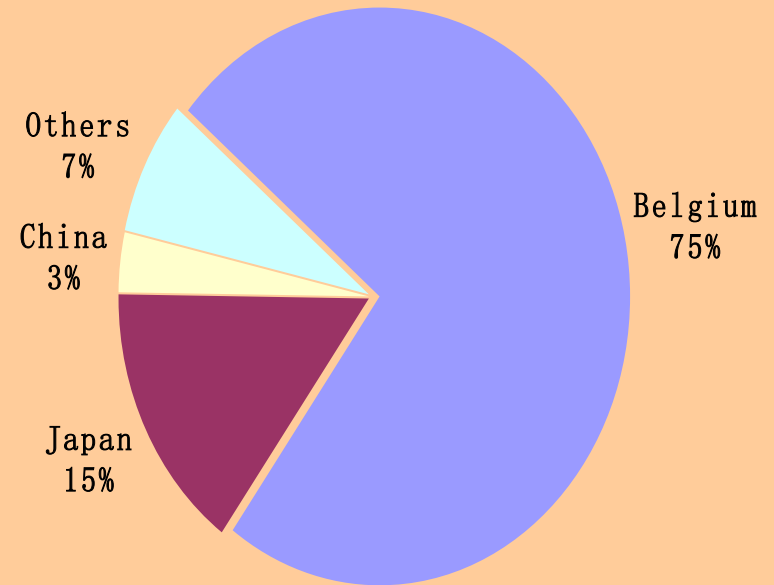
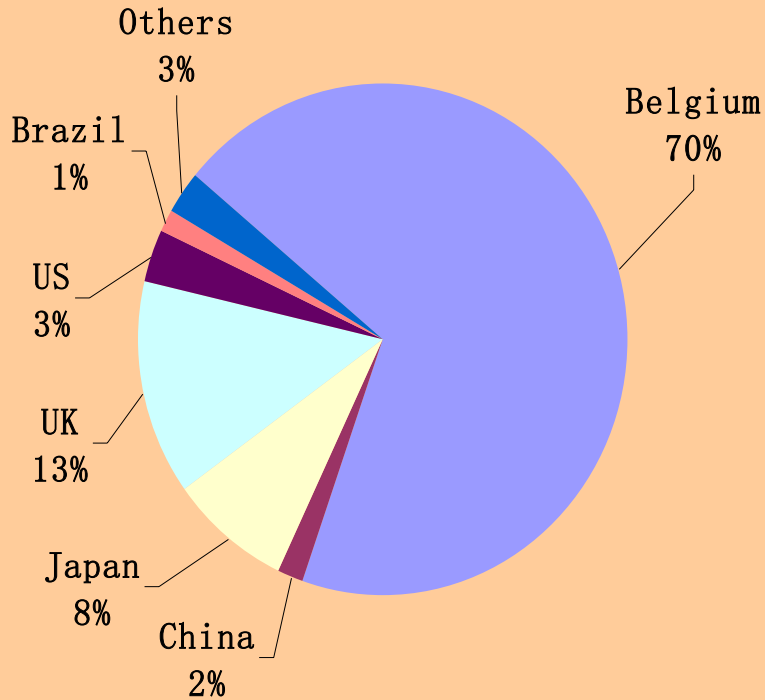
CY2005 = 33236MT



2004-2005 South Africa EMD Exports

CY2004 = 25782 MT

CY2005 = 31979 MT

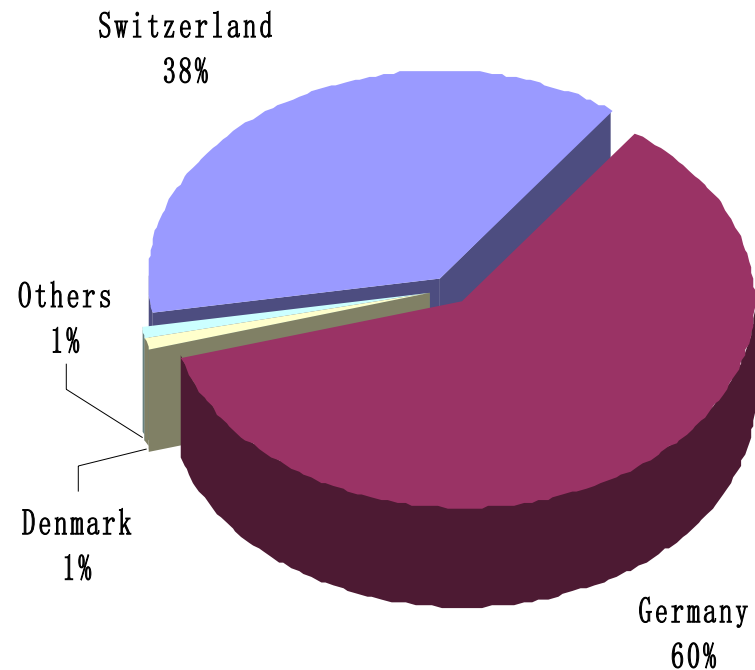
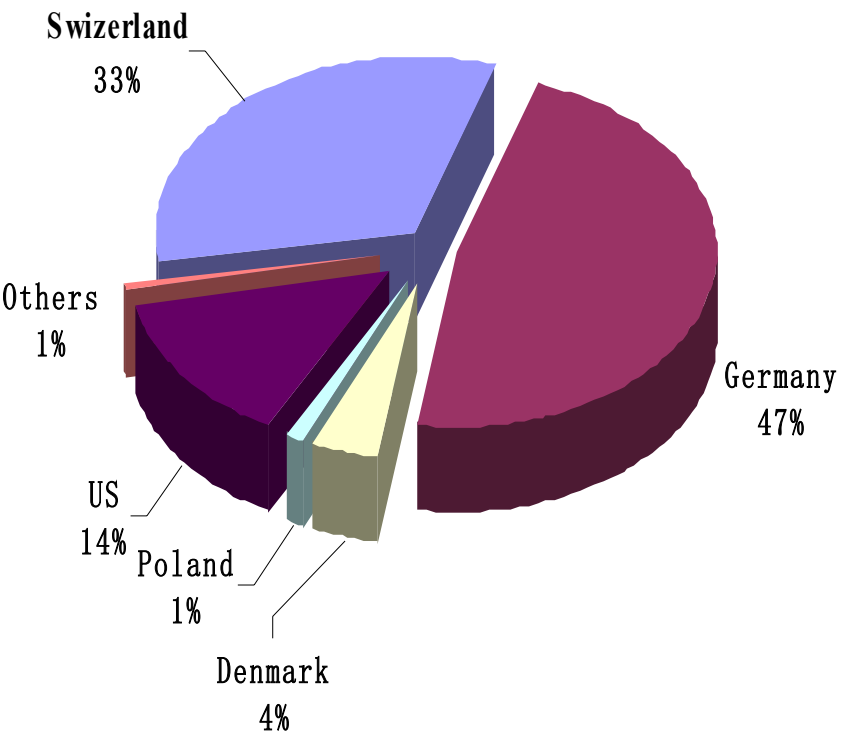




2004-2005 Greece EMD Exports

CY2004 = 12,496 MT

CY2005 = 10,174 MT





EMD Business in China (1)

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- **With an initial capacity of 300 tpy, Xiangtan Electrochemical started production of EMD in China in 1965.**
- **In China, EMD is mostly produced from local low grade manganese carbonate ore with Mn content below 18%. Low grade MnO₂ ore is also used by a few manufacturers.**
- **The production of EMD in China basically relies on effective indigenous technology, which is best suited to local low grade ores.**
- **Driven by the high growth rate of the domestic battery industry and by demand of the world market, the EMD production in China has been expanding rapidly since the late 1990s.**
- **China's domestic market demand for EMD was around 85,000 and 110,000 MT in 2004 and 2005 respectively.**



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EMD Business in China (2)

- Xiangtan has been producing alkaline grade EMD since 1998, and its unique technologies have been used by other EMD manufacturers in China in recent years.
- Xiangtan has been exporting substantial quantities of alkaline EMD to the leading international alkaline battery companies since 2004, and the Red-Star in Guizhou is also beginning to export its alkaline EMD.
- The entry of China's alkaline EMD into world market, which is traditionally dominated by producers from developed countries, has structurally altered the dynamics of global EMD/battery industries.
- Facing difficulties such as decrease of ore grade, high cost increases, power shortages and environmental issues, the major EMD manufacturers in China are exerting continuous efforts to cut down cost, promote the quality of EMD to meet the requirements of high-drain and high-tech battery applications, and protect the environment effectively.

Basic Statistics Data of EMD Business in China

Items	2004	2005	Increase Rate
Producers	16	16	
Capacity* (tpa)	145,000	193,800	+ 33%
Output (t)	116,649	149,407	+ 28%
Export (t)	38,258	34,399	- 10%
Import (t)	8,520	9,010	+ 6%
Export ratio	32.8%	23%	- 9.8%

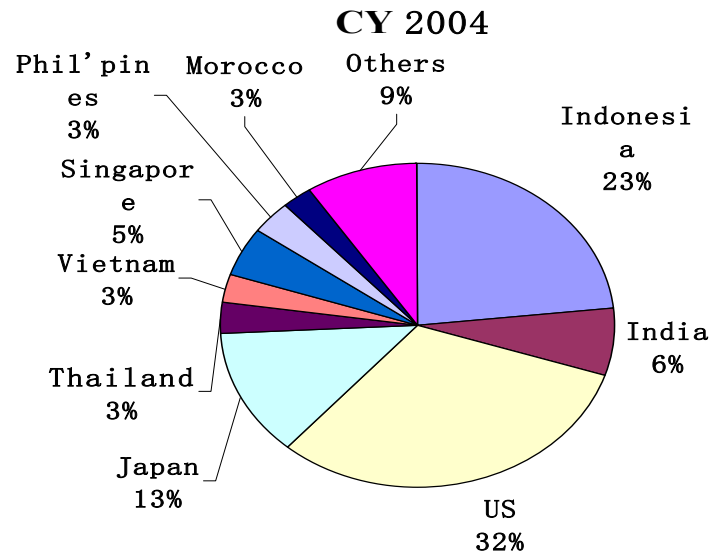
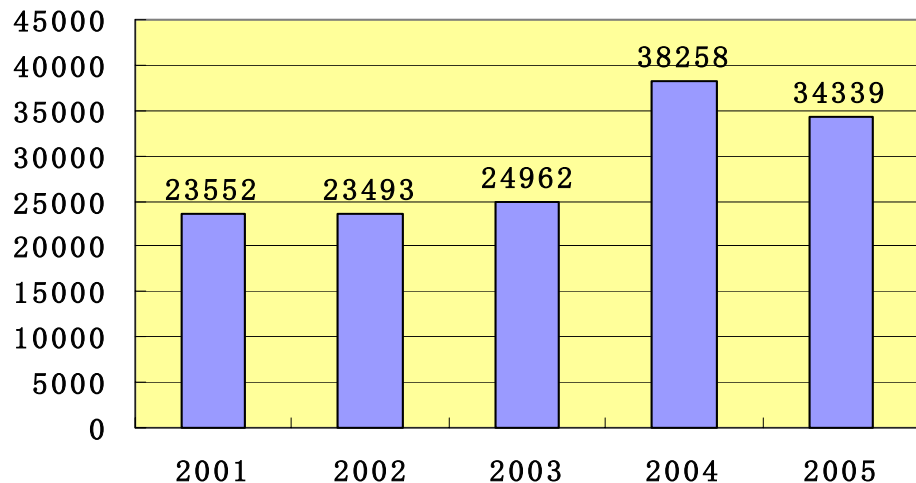
*at the end of the year.

China has become the largest producer, consumer and exporter of EMD in the world.

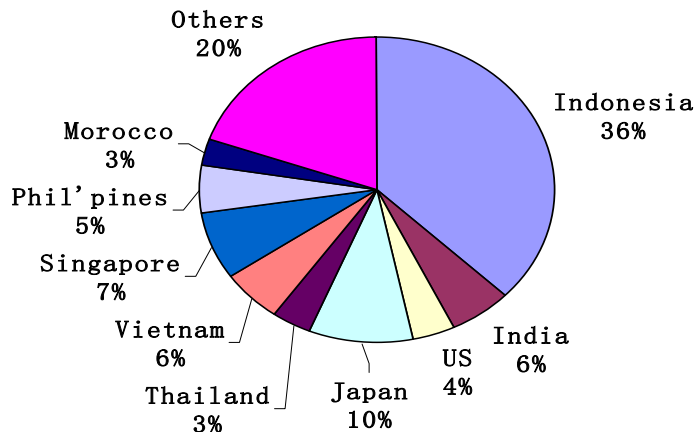


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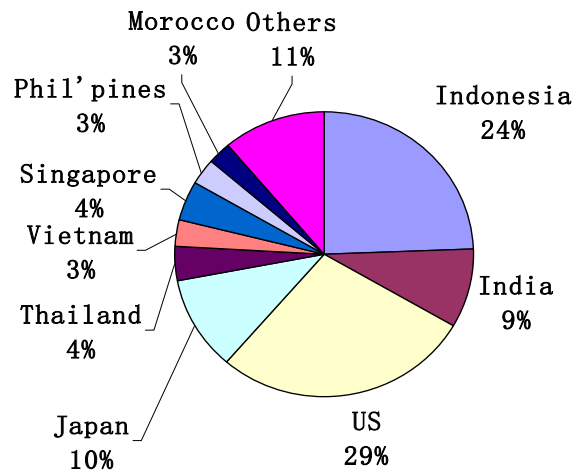
2001-2005 China EMD Exports



CY 2003



CY 2005





Future Challenges (1)

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- Due to cost & other factors, some prominent companies may close down their EMD facilities in Japan and possibly in Europe this year or later, which will result in cutting more than 43,000 tpy of capacity from the world EMD supply equation.
- On the contrary, a tide of expanding alkaline grade EMD production is still going on in China. Five alkaline EMD projects (including a project owned by Erachem) are under construction in Guangxi, southern China.
- The initial total capacity of these new projects in China will amount to more than 60,000 tpy. Furthermore, most of the projects have an ambitious “second stage” plan.
- Backed by its abundant Mn ore resources, which amounts to 140 million tons and accounts for 22% of China’s known Mn deposits, CITIC Dameng is planning to develop EMD production as one of its pillar products. A 20,000 tpy EMD facility is under construction in Guangxi, and will be using advanced technology to produce a high quality product at a competitive cost.
- It is therefore evident that the geography of world EMD industry will be reshaped over the next few years.



Future Challenges (2)

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It is estimated that the world market demand for EMD will be about 310,000 MT in 2006, and its average annual growth rate will be 4–6%.

Obviously, the abovementioned continued strong growth of alkaline grade EMD industry in China will unavoidably result in a huge surplus supply in world market.

On the other hand, battery prices will continued to be under–pressure due to increasingly intense competition in the market worldwide, and EMD suppliers will eventually feel this pressure from their customers.

Conclusions:

1. The situation of global EMD business will be extremely competitive and increasingly severe in the coming years.
2. Over the long term, however, as the world economy continues to steadily grow, and some players with limited capability quit the business due to competition, a healthy situation should emerge in the future EMD market worldwide.