

The present and future of primary zinc-manganese battery industry

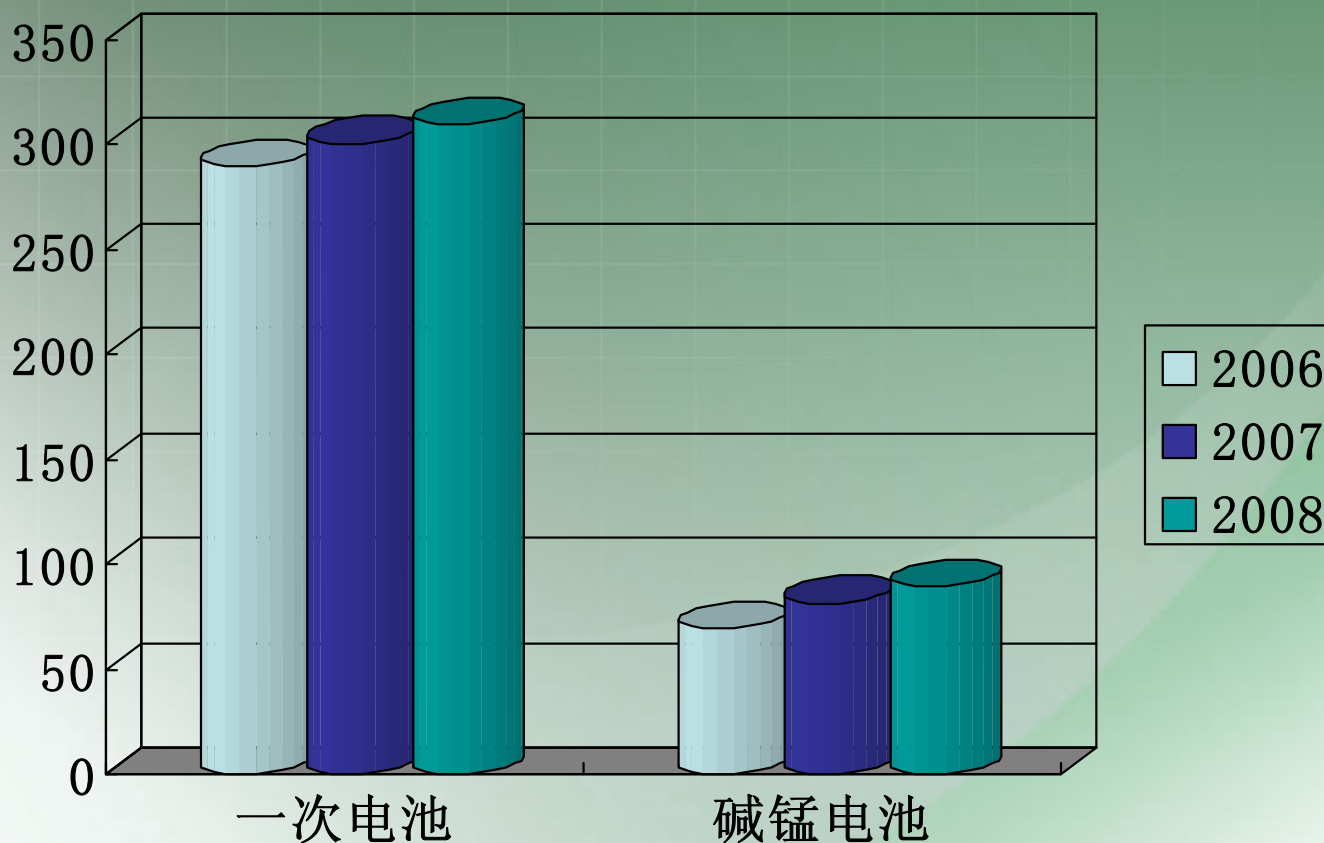
Chongqing battery manufacturer

Yang Lin, Duan Xiaoping, Yang Guangquan, Lai Yong, Fan Yindong, etc.

The Introduction of Zinc-Manganese Battery

- ☞ Zinc-manganese battery is also known as leclanche cell which was invented by a Frenchman more than 100 years ago.
- ☞ According to battery different electrolyte, they are divided into two kinds: neutral zinc-manganese battery (Mainly of ammonium chloride and zinc chloride) and alkaline zinc-manganese battery (Mainly of potassium hydroxide).
- ☞ In the development of battery technology, the product performance has been dramatically improved through the improvement of battery structures and materials. In the process of technological innovation and advance, battery industry plays a more important role day by day in modernization by the means: acetylene black in place of graphite, electrolytic MnO_2 in place of natural MnO_2 , paper-lined battery in place of paste type battery, inverse pole-type alkaline zinc-manganese battery in place of neutral zinc-manganese battery and so on.

Chinese zinc-manganese battery production and consumption of manganese dioxide



The amount of EMD (Electrolytic Manganese Dioxide) consumed by alkaline zinc-manganese battery.

☞ LR6 (AA 5#)	60%
☞ LR03 (AAA 7#)	38%
☞ LR20 (D 1#)	} 2%
☞ LR14 (C 2#)	
☞ 6LR61 (9v)	

The consumption of alkaline manganese level of EMD

Battery Model	Proportional distribution (%)	quantity (Billion)	Consumption of EMD per 10 thousand (kilogram)	Consumption of EMD (10 thousand)
LR6	60	5.4	95	5.13
LR03	38	3.42	48	1.64
LR20、LR14 6LR61、	2	0.18		0.5
Total	100	9.0		7.27

It is predicted that the consumption of EMD is 2.0 thousand tons by alkaline zinc-manganese battery. So the domestic consumption of EMD by the entire alkaline zinc-manganese production is 74.7 thousand tons.

The EMD and NMD consumption of neutral zinc-manganese battery (containing paper-lined and paste type)

In 2 billion neutral zinc-manganese batteries, according to models, specifications and the distribution of the ratio is as follows:

R20-type	60%	12.6 billion
R6-type	30%	63 billion
R03-type	10%	21 billion

The consumption of normal-grade EMD and NMD

Battery model	Distribution ratio (%)	quantity (Billion)	Consumption of EMD per 10 thousand (per kilogram)	Consumption of NMD per 10 thousand (per kilogram)	Consumption of EMD (per 10 thousand tons)	Consumption of NMD (per 10 thousand tons)
R20	60	6.3	67.5	157.5	4.25	9.93
		6.3		225		14.18
R6	30	6.3	19.5	19.5	1.23	1.23
R03	10	2.1	17		0.36	
In total	10	12.6			5.84	25.34
<p>Remark: it is hoped that the consumption of EMD is about 2 thousand tons on the basis of low R14,6F22 output and consumption.</p>						

Production and export of primary zinc-manganese battery

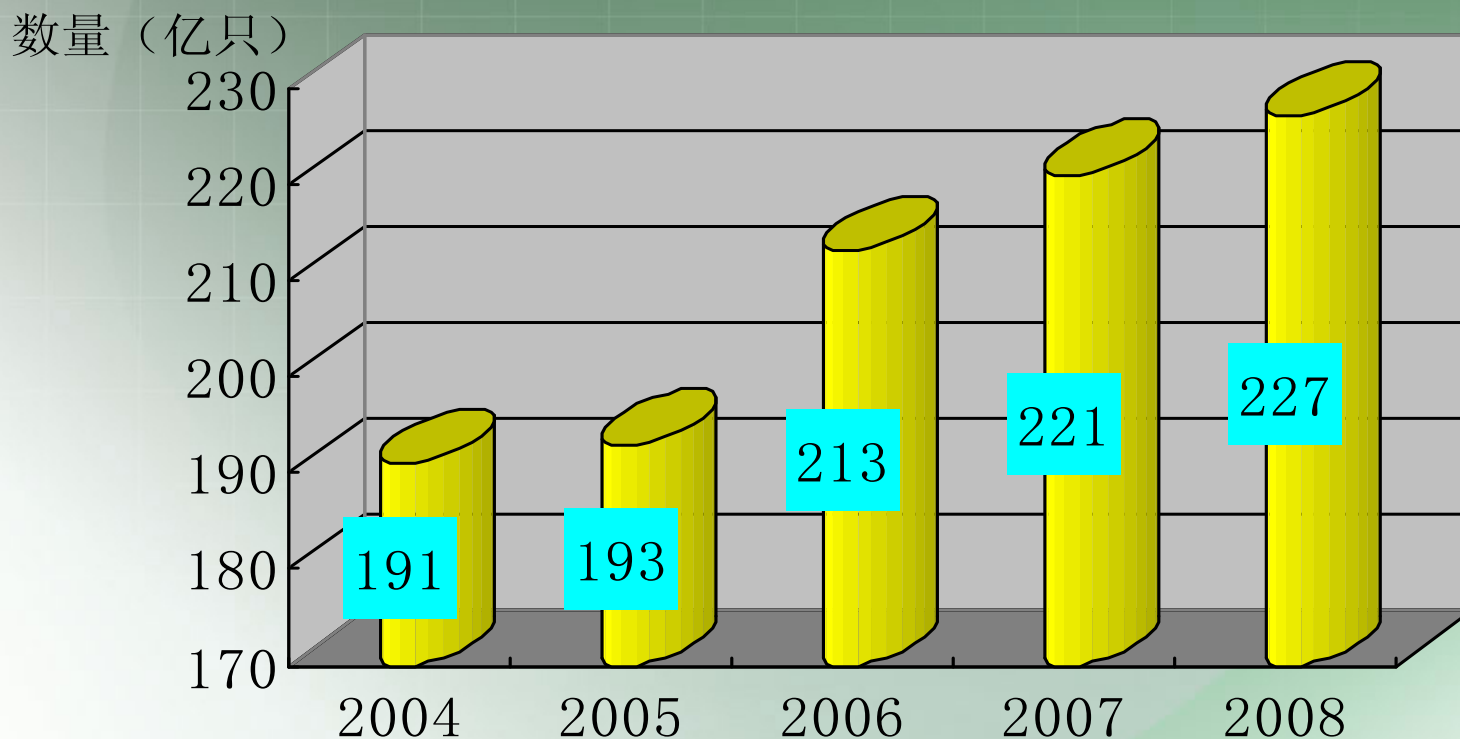
Data of primary zinc-manganese battery export in 2007

2007		2006		Compared with 2006 %	
Export Quantity (billion)	Export sum (billion dollars)	Export Quantity (billion)	Export sum (billion dollars)	Quantity increase	Sum growth
22.093	1.504	21.315	1.310	3.65	14.78

Data of primary zinc-manganese battery export from January to June in 2008

Export quantity (billion)	Export sum (billion dollars)	Export quantity %	Export sum %
12.925	0.894	5.39	7.49

The export trend of primary zinc-manganese battery from 2004 to 2008



Present situation of primary zinc-manganese battery abroad

Abroad, the alkaline zinc-manganese batteries of primary zinc-manganese batteries are mainly concentrated in the United States' Duracell, Eveready and Yeohwa, Japan's Panasonic, Fuji and Toshiba, Germany's Valta (Has been acquired by Yeohwa), Korea's Rocket and STC. Among them, the dimensions of Duracell is the largest one. Its output of various types of alkaline zinc-manganese batteries of its subsidiaries all over the world is more than 10 billion, and the output exceeds the total amount of alkaline zinc-manganese batteries in our country. The majority of ordinary zinc-manganese batteries abroad are mainly zinc chloride type steel-based batteries. Among them, Panasonic and Toshiba's outputs are relatively higher, and the equipments are relatively more advanced. Its R6 production line speed is up to 1500 / min. There are a certain amount of battery productions in India, Thailand, Indonesia, Vietnam and Pakistan, but is not large.

Output of primary zinc-manganese battery of some companies at home and abroad

Company	Output (hundred million)	Origin
Duracell USA	100 (alkaline Mn)	USA, Belgium, Dongguan Guangdong China
Eveready USA	60 (alkaline + carbon zinc)	USA, Swiss, Singapore, Tianjin China
Panasonic Japan	10~15 (alkaline + carbon zinc)	Japan, Philips Belgium, Shanghai Wuxi Zhuhai China
Yeohwa USA	20 (alkalin + carbon zinc)	USA, Varta Germany
Fuji Japan	6~8 (alialine)	Japan
Toshiba Japan	8~10 (alkaline + carbon zinc)	Japan, Guangdong China
Nanfu China	13 (alkaline)	Fujian China
Shuanglu China	23 (alkaline + carbon zinc)	Zhejiang China
Hutou China	19 (alkaline + carbon zinc)	Guangzhou China

Percentage of alkaline manganese battery of the market in main countries and regions throughout the world

Year	U. S. A.	Europe	Japan	China
2008	90	70	65	30

The development and future of primary zinc-manganese batteries

☞ The primary zinc-manganese batteries will be developed to be small, lightweight and high-power type. For example, in the country, the R20 type is changed from traditional lighting and radio recorders to gas stoves and water heaters. However, the use in water heaters is falling into disuse by the spread of the strong emission-type water heaters, but the export still takes up the market, being used a lot in lighting, tape recorders and televisions abroad. R6 and R03 will be the main types for the battery development. The environmental protection issue of ordinary zinc-manganese batteries has aroused great concern of society, and with the circulation and use of the resources, the recycling of waste batteries will be mentioned on the agenda and implemented gradually. Once the price of the ordinary zinc-manganese batteries declined, the domestic production and sales will be decreased dramatically.

☞ The alkaline zinc-manganese batteries are the most promising products for civilian use. Today when developed countries have reached 80% of the alkaline rate, our Chinese alkaline battery products and sales have great potential of development space. In 2010, Chinese alkaline manganese battery output will surpass the United States, and become the largest country of alkaline manganese battery output in the world.

Several suggestions to manganese production industry

With the depletion of manganese ore resources, the γ , β -type natural discharged manganese powder which is supplied for the battery production is fewer and fewer. However, after the consumption and disposal of primary zinc-manganese battery, its recycling and using don't have the substantial progress.

After producing the electrolytic manganese and potassium permanganate, there is a lot of abandoned manganese slag. According to the inspection for a potassium permanganate production enterprise, its manganese slag heap was as much as thousands of tons. Moreover, the manganese slag in domestic electrolytic manganese production areas such as Chongqing Xiushan and Chengkou was millions of tons. So according to the strategy of sustainable development principles and the idea of circular economy, can it through the research and technological innovation, the above-mentioned manganese slag to be made of the battery-used MnO_2 which is used in the battery production of ideal crystalline structure, a good discharge activity and MnO_2 content moderate battery-used MnO_2 ? It will play a positive role in saving resources in our country, protecting the environment and opening up the diversification of the battery raw materials. Believing that in new technologies continued to emerge today, our goal must be achieved.

Thank you !