International Manganese Institute Annual Conference
June 2002, Shanghai, China

Past Development and Current Status of Chinese Electrolytic Manganese Metal Industry

Tao Min, Deputy Director, National Committee of Manganese Industry Technology, China
Tang Xiaozhuang, Deputy Director, National Committee of Manganese Industry Technology

The Chinese electrolytic manganese metal industry has undergone in its development for 40 years. So far both of the production capacity and the annual output rank number one in the world. China became the biggest electrolytic manganese metal producer country. The product shares a considerable portion of the international market.

1 Development history

It has been 40 years since the production of electrolytic manganese metal in China starts in 1958. The history consists of the following stages:

1.1 Initial stage 1958 ~ 1980

4 electrolytic companies or plants of electrolytic manganese metal were constructed in this stage according to the principle of planned economy. At that time the state supplies the raw materials; the state designated the products. The annual production was some thousands tons. There were no national or industrial quality standards to conform. There was substantial difference between the quality specification of various producers. The quality was unstable. Sulfur and phosphor contents in the products were relatively high.

1.2 Primary development 1980-1993

At the beginning of 80's China started its open policy. The international trade grew substantially. The products of electrolytic manganese metal made in China entered the international market.

There are hundreds millions of reserve of manganese carbonate ore in China, average 20% of Mn content, some of which contain higher phosphor. The ore is not suitable for

manufacturing ferromanganese. However, it is suitable for electrolytic manganese metal production since it contains less cobalt and zinc.

As the internal and foreign conditions promoted the development of electrolytic manganese metal production the industry had grown up rapidly over the country. Tens of the plants were constructed. The annual production capacity reached tens thousands in 80's. Most of the product was exported.

In 1982 the authorities issued a national standard of electrolytic manganese metal (GB3418-82). In1993 the Ministry of Metallurgy made a revise and issued a new standard (YB/TQ51-93). The issues and the prosecution of the standards helped the quality improvement. However there was still a gap in qualities with the advanced ones of overseas.

Table 1 The standard of electrolytic manganese metal in China(GB3418-82), %

Designation	Mn	C	S	P	Fe+Si+Se	Total impurity
	not less than	not more than				not more than
DJMn99.7	99.7	0.03	0.005	0.06	0.03	0005
DJMn99.5	99.5	0.05	0.005	0.1	0.03	0.01

Table 2 The standard of electrolytic manganese metal issue by the Ministry of Metallurgy (YB/TQ51-93)

Mn(%)	C(%)	S(%)	P(%)	Se(%)	Fe(%)	Si(%)
not less than	not more than					
99.8	0.02	0.03	0.005	0.06	0.03	0.005
99.7	0.08	0.05	0.005	0.10	0.03	0.01

In 80's and 90's the price of electrolytic manganese metal dropped substantially. The young industry had stood a serious test. Numbers of plants were shut down, or switched to produce other products. The production was reduced greatly. The industry was in recession.

1.3 The secondary stage of the development 1994-2000

With the recovery of western economy the demand for electrolytic manganese metal was increased. The price grew up since 1994. The industry of electrolytic manganese metal entered the secondary stage. The number of the electrolytic manganese metal plants was increased to 50 –60 including new or restarted plants. The annual capacity was as high as tens thousands tons. Some of the producers absorbed domestic and overseas advanced expertise. Process innovation, construction of equipment in large scale, consumption decrease and qualities improvement made the production stepped on a new level. The products with low sulfur (less than 0.01%), low carbon (less than 0.008%), low silicon (less than 0.003%), low phosphor (less than 0.0005%), low selenium and selenium free were developed. The new products also covered electrolytic manganese metal in the form of powder and lumpy. The products satisfied the demand of the market.

In1998 the output was 85,000 t. 60000 t was exported. It was 50% of the world output of the year.

Soon the production exceeded the demand in the market. Subsequently, the price slipped down year by year. The production under went into a recession. Most of the plants were stopped their production in the late of 2000.

1.4 The third stage of the development 2001 – now

The demand for electrolytic manganese metal turned strong in Japan, Korea and China in 2001. The last electrolytic plant in US announced its shut down in the third quarter of 2001. The demand led the price growing. The highest was 50% higher. The growing price drove new projects development. The annual production capacity reached 300,000t. The situation was changed as the plants were put into stream. The production was doubled since June of 2002. As the result the supply exceeded the demand. The abrupt September 11 event made the industry trapped into difficulties. Many customers asked to delay the shipment or to decrease the price. The weak market remains till now. The price went down, down again. Now the price dropped to 50% of that in 2001.

Tremendous change of electrolytic manganese metal industry in China took place in 2001. The market manipulated the industry. No electrolytic plants survived in north China where power and ore fines supply has been deficient. However, in Guizhou, Guangxi, Western Hunan and Chongqing many new plants were constructed. The development concentrated in the areas with the advantage of power and resource.

2 Current status and problems

2.1 Current status

The production capacity of electrolytic manganese metals in China exceeded 300,000 t. The number of electrolytic manganese metal plants is around 60. The annual capacity of the largest one is 200,000 t. The annual capacity of the smallest one is only 2000 t. Because of the resource, no plants exist in north China. Most of the plants concentrated in Guizhou, Guangxi, Western Hunan and Congqing.. The industry in China has been developed in the areas with the advantage of resource and power.

Because of the expansion of the production capacity the market competition became hot. It forced the industry to improve the process technology, especially in the aspects of energy saving, acid saving and ore saving. The old plants were shut down or the old process was disposed. The new progress or the innovation results in 20% power saving, 30% acid saving, and 20% reduction of the production cost. Deep purification improved the quality substantially.

In view of the progress of the process technology the enlargement and the automation of the equipment for combination and filter press, electrolytic cells were innovated. The progress of purification resulted in low selenium or selenium free products. The improvement of post-treatment substantially reduced sulfur and silicon contents in the product.

The traditional application of electrolytic manganese metal is in the field of special steel making, nonferrous alloy making, welding materials, diamond catalysis. The rapid

development of magnetic materials drives the growing demand for the metal in raw material of Mn_3O_4 production, which becomes a big consumer of electrolytic manganese. The quality requirement of Mn_3O_4 for Electrolytic manganese is higher than that of the other application. It requires less Si, C, Se. It also requires less S, K, Ca, Na, Mg. In order to suit the demand of the market the process must be innovated. The National Manganese Industry Commission with other 2 producers is to revise the standard and make a supplement standard, which makes strict requirement for electrolytic manganese. It will be completed in this year.

Now electrolytic manganese production in China is more than 100,000 t, 70% of it was exported. China ranked number one in Electrolytic manganese production in the world. The production exceeded the second largest producer-South Africa to a considerable extent.

2.2 Problems

1) Small production scale and backward facilities

Only several producers in China are with the capacity more than 10000 t. Most of the producers, in which the volume of leaching tanks is only 50 m^3 and the area of polar plates is less than 0.6 m^2, are with the capacity of thousands tons. Unloading operation of filter press is usually manual. The productivity in these plants is too low to be economic.

2)Less grades and less famous brand

Most producers manufacturing sole product of Mn 99.7%-99.8% are not competitive.

Many plants do not have trade mark or brand. It is hard to recognize their products in market.

3) Loose management and incapable in innovation

Most plants are copies of the same technology. The producers are deficient in technology and information and incapable in innovation. The production and the price are passive in the changed market.

4) The product quality is not adapted by the demand of market.

Though some producers made efforts in quality improvement in order to get approach the international level a gap still exists compared with the advances level of the world. Regarding to the quality of Mn_3O_4 the impurity contents are still higher than the demand. It is expected to be improved.

3 Aim of development and measure to be taken

3.1 Increase the investment in technology and R&D

The aim of ours is to become a strong country in technology. It is necessary to increase the investment in technology and to upgrade the products. The producers are to extend their product scope to satisfy the demand of their customer's industry and to expand the market and to become competitive.

3.2 To be aware the importance of brand and to make famous brand

In market economy it is important to be aware the function of brand. The stable quality and the good service of post-sales will be assured through the way of technology improvement, strict management, ISO9003 certification. The famous brand will be resulted thereafter.

3.3 To play the role of the industry association and to expand the international cooperation.

A self-discipline leading group of China Electrolytic Manganese Metal Industry was organized in 1997. The group has made coordination and administration work. It also promotes the development of the industry. It is expect that the group may play the role in the coordination in price and production and the promotion of new technology. Another important work of the group is to develop the cooperation with foreign countries, such South Africa.

China’s accession of WTO brings more opportunities and challenge to the industry. We are sure that the industry will get a new development and get rid of the recession as it is taking the opportunities and meeting the challenge.