

Consideration on Chinese Ferromanganese Industry and its Investment Opportunities

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Ferroalloys are necessary raw materials in iron and steel making. It plays essential role in the control of steel qualities. Chinese ferromanganese production has been developed with the growth of the Chinese steel industry. The qualities of FeMn have been improved. The grades of Chinese FeMn products conform the international standards and satisfy the requirement of steel making .

1 Outline of Chinese ferromanganese production

The production capacity of Chinese ferroalloy is as high as 7 millions ton. In 2001 the annual Chinese ferroalloy production is 4.5 millions tons, around 60 % of the annual capacity. The Chinese FeMn production capacity is 2.8 millions ton, 38% of the total capacity. In 2001 FeMn production peaked up 2.3 million ton, 80% of its production capacity. FeMn is a major ferroalloy. Its production takes over 50% of the overall ferroalloys production.

Table 1 Annual production of ferroalloys and ferromanganese in 2000 and 2001, kt

Year	Ferroalloy	FeMn	SiMn	EF FeMn	BF FeMn	MC FeMn
2000	4030	1940	890	280	660	110
2001	4510	2300	1160	350	670	120

2 FeMn export and Mn ore import

In recent years China export ferroalloys 1million ton each year, around 25% - 30% of the annual production. Each year China exports FeMn around 50,000 t, 20% - 25% of FeMn production. It is around 40% - 50% of ferroalloy export. Because of the grade of

manganese ore is low in manganese content and high in phosphorous content each year China imports 1 million ton of rich manganese ore to supply the demand of Chinese ferromanganese production. It is about 31% of the total consumption of manganese ore in FeMn production.

In 2001 1,210,000 t of Chinese ferroalloys, around 26% of the total output were exported. Also in 2001 509,000 t of FeMn, around 22% of the output were exported. In 2001 1,710,000 t of manganese ore, 31% of Mn demand of Chinese FeMn production were imported. The imported quantity was increased 42% over 2000.

Table 2 Export of Chinese ferroalloys and FeMn and Import of Manganese ore, kt

Year	Ferroalloys export	FeMn export	SiMn export	MC FeMn export	HC FeMn export	Mn Ore import
2000	1315.9	552.4	362.7	27.4	162.3	1203.7
2001	1217.7	508.8	353.4	21.7	133.7	1710.6

3 Brief introduction of Chinese FeMn producers and production capacity

There are numerous ferroalloys producers. Most of them are small plants scattered over the country. The difference of power tariff in different areas became substantial. The number of the plants in the east and in the coast areas has been reduced. The number of the plants in the west, as well the production has been increased. Based on resource ferromanganese production predominates in the south-west China and ferrosilicon predominates in the north-east China.

The number of the key producers with the annual production capacity over 90,000 t is around 20, making FeMn, FeCr and special alloys. The overall capacity of the key producers is around 40% of the state production capacity. The number of the producers with the annual capacity of 10000t and 20000t, making FeMn and FeSi mainly is around 60. The capacity of the producers is around 20% of the state production. The number of the producers with the annual capacity of 1000 t – 10000 t, making FeMn and FeSi is around 700. The annual capacity is around 40% of the state production.

Table 3 Distribution of production scale of ferroalloy enterprises

Production scale	Number	Annual capacity	%	Products
Large	~ 20	> 90 kt	40	FeMn, FeCr, special alloys
Medium	~ 60	15 ~ 20	20	FeMn, FeSi and some FeCr
Small	Around 700	1 ~ 10	40	FeMn and FeSi

4 Ferroalloy production facilities and environment protection equipment in China

There are around 1500 sets of ferroalloys furnaces with the capacity of 6000 MVA in China. Environment protection equipment was not installed in most of the furnaces.

There are around 800 furnaces less than 3200 kVA, around 53% of the overall number of China. The total capacity is around 2000 MVA, around 36% of the overall capacity. Most of the furnaces are without pollution control.

There are 390 furnaces with the capacity of 3200 kVA to 9000 kVA, 26% of the overall number. The total capacity is around 1800 MVA, 32% of the overall capacity.

There are 110 sets of furnaces with the capacity of 9000 kVA to 50000 kVA, 7% of the overall number. The total capacity is around 1500 MVA, 26% of the overall capacity. 40% - 50% of the furnaces are equipped with pollution control facilities.

Table 4 Ferroalloy production equipment and environment devices

Furnace capacity kVA	Number	%	Total capacity MVA	%	Environment protection, %
Total	1500	100	5600	100	
< 3200kVA	800	53.3	2000	35.7	< 5
3200~9000	390	26.1	1800	32.1	5%~20%
9000~50000	110	7.3	1500	26.7	40%~50%
Others	200	13.3	300	5.5	

5 Power supply and energy consumption

Before 1998 the power supply to Chinese ferroalloy industry had been deficient. In the case of deficient power supply ferroalloy furnaces had to be shut down. The Chinese ferroalloy production capacity had not been fully used for this reason. It made the specific power consumption of ferroalloy production increased. For many years China invested a great deal in the development of power generation. Now the power supply is much improved. Since 1998 there is no more restriction of power supply for ferroalloy production. However, the excess ferroalloy production has made the market extremely weak. The operation of the production facilities is 50% ~ 65%.

The overall energy consumption of ferroalloy industry is 15126 kt standard coal. The average energy consumption is 3.35 t standard coal/ t ferroalloy. The energy consumption of the key producers is 2.45 t standards coal/t ferroalloy. The energy consumption of the small producers is 4.00 t standards coal/t ferroalloy, 19% higher than average level and 63% higher than that of the key producers.

Table 5 Ferroalloys energy consumption

Enterprise	Production in 2000 kt	Energy consumption kt standard coal	Specific consumption t St. coal/t	Production in 2001 kt	Energy consumption kt St. coal	Specific consumption t St coal/t
Total	4030	13717.5	3.40	4510	15126	3.35
Large	1680	4200	2.50	1880	4606	2.45
Small	2350	9517.5	4.05	2630	10520	4.0

6 Investment opportunities in Chinese ferromanganese industry

Followed with the above mentioned discussions the development strategy of ferromanganese industry is concluded.

- 1) No new production facilities and no new expansion should be made within the coming 5 years

At present the Chinese ferroalloy production capacity is over 7 millions tons. The demand for ferroalloys in Chinese market is only 3 millions tons. The production capacity much exceeds the demand of the Chinese market. Hence, it is proposed that no new production facilities and new expansion should be made within the coming 5 years. The innovation should be made only in the technology progress of production process, equipment and environment protection.

2) Pollution control of ferroalloy furnaces

Ferroalloy furnace discharges great deals of fume and dusts to pollute the environment. 70% of ferroalloy furnaces in China was not equipped with pollution control facilities. The profit is gained in exchange with environment pollution. For example, a furnace of 5 MVA discharges 60-70 tons of dust each year. Now the total capacity of ferroalloy furnaces is over 6000MVA. Without pollution control the weight of the discharged dust would be as much as 70000 – 80000t. It is a serious threat to the mankind biological environment. Air pollution control and improvement of environment of industrial areas has been the target of our work. Therefore, it is advised that the investment in ferroalloy industry should be put into pollution control of ferroalloy production. The discharged fume must conform “the standards of discharged air pollution materials from industrial furnaces and kiln” issued by the Chinese government.

3) Innovation of process technology

Now the number of furnaces with the capacity less than 5000 kVA in China is around 70%. 70% -80% of these furnaces are not equipped with pollution control. The condition of manual operation in most ferroalloy plants is crucial. The Chinese ferroalloys production efficiency is very low. The average personnel production is only 15-30 t/ann. per person.

In the future, the Chinese ferroalloy industry is to develop the refining process in order to improve the product quality. The furnace technology is to develop toward the type of closed or semi-closed furnaces, bigger sized and automation based the principle to eliminate of backward furnace and to decrease the overall production capacity. New

process technology, such as the technology using domestic manganese resource should be developed.

4) Chinese ferroalloy industry need to decrease its specific energy consumption

The Chinese enterprises need to reduce energy and raw materials consumption in production in order to decrease the production cost and to increase the competitiveness in the market by taking measures in power supply, smelting process control.

In 2001 the specific energy consumption in China is 3.46t standard coal/t ferroalloy. The purpose of our effort in future is the world advanced level of 2 t standard coal/ t ferroalloy.

5) Restructure of Chinese ferroalloy industry

Now Chinese ferroalloy industry is making restructure guided by the international and domestic market and based on the capital. The industry will be optimized by the combined advantages of resources and production factors, the combination of technology and personnel in the eastern areas with the minerals resource and power resource in the west areas. The new distribution of ferroalloy industry is forming. Ferrosilicon industry will concentrate in the west area. Ferromanganese industry will concentrate in the South-west area. Ferrochrome will concentrated in the east area. Several enterprise groups are forming to reduce the numerous small enterprises. It will change the unreasonable distribution of the industry.

Thank you!