Recent and Anticipated Developments of Ferroalloys in South Africa

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Introduction

Ladies and gentlemen, it is indeed an honour and privilege to deliver this paper on behalf of the Ferroalloys Producers Association of South Africa (FAPA). My intention is not only to convey the fact that Southern Africa is indeed a major global player in the ferroalloy markets today but more importantly to highlight the major reasons why producers in the region have remained competitive. The availability of ample reserves, relatively cheap electric power, reductants and competitive labour costs means that the region's influence in the global market for ferroalloys is likely to increase even more in the coming years. The South Africans, just like the other responsible ferroalloy producers in this room will strive to maintain stable market conditions. The aim is to offer our customers stable prices with less volatility as has been the case in the recent past. Southern Africa will remain a secure and stable source of all ferroalloys and for South Africa in particular, the recent miraculous political transformation to a true democracy will only help to underpin that goal.

Background

South Africa is fortunate to have reserves of almost all the major ferroalloys and indeed, most of these reserves are currently being exploited. Today the country is a major producer of ferrochrome, ferromanganese, silico-manganese, ferro vanadium and ferrosilicon.

Ladies and gentlemen, my talk today will cover the following topics:

- South African reserve base
- South African active installed capacity (historical, current and future) versus the rest of the world.
- Competitiveness
- Conclusion: How secure is supply from Southern Africa?

RESERVE BASE

Chrome Ore

South African chrome ore reserves constitute approximately 70% of the known economic reserves world wide with Zimbabwe second at 20%. Although the Southern African total reserves equate to 90% of the world's reserves, the rest of the world's reserves are still substantial and will remain a significant factor in the world chrome supply equation for quite a number of years.

South African chromite is found in the Bushveld Igneous Complex (BIC), which is a large geological feature extending from Pretoria about 150kms northwards and east-west for 300kms. This complex is unique in the world, in terms of its size and presence of minerals of economic interest.

Although South African ores have reasonable Cr_2O_3 content as well as relatively low chrome to iron ratio compared to those found in Zimbabwe, Kazakhstan or India for example, the extensive, shallow dipping ore bodies result in low cost mining.

This more than compensates South African producers for the disadvantage of using a generally lower grade of ore. Furthermore, the close proximity of alloy plants to the mines also reduces input costs significantly as raw material transportation is becoming ever increasingly important as a cost factor.

To date, capital investment in mining capacity has been relatively limited as outcrops and relatively shallow reserves have been mined. However, in order to provide for the future market requirements, substantial investment in capacity is being made to access deeper deposits.

Manganese Ore

South African manganese ore reserves being mostly high grade constitute approximately 80% of the world's known economic reserves whilst the CIS being low grade, constitutes some 10% of world reserves.

South African manganese ores tend to be high grade with high iron content, making them more suitable for ferromanganese rather than silico-manganese production.

There are two main ore suppliers, Samancor with mines in the Northern Cape Province and Assomang (Associated Manganese Mines) with mines in the same region. Basically two types of ore are produced; high grade (both lumpy and fines) as well as low grade (both lumpy and fines). The high grade ores contain up to 50% Mn with iron in the 10-13% range while low grade contains ± 35% Mn but also much less iron.

In general, South African manganese ores are low in phosphorous (up to 0.05%max) and thus a number of overseas producers use this ore for blending with other high phosphorous ores. South Africa is still a major exporter of manganese ores.

More recently, the opening of Chinese and CIS manganese industries to Western world producers has facilitated tolling arrangements, where low grade domestic ore is substituted or augmented by high grade imported ore. High grade ore producers are therefore able to use Chinese and CIS alloy production capacity to extend their own alloy capacity without further capital investments. However, in the current market scenario this has contributed to poor alloy prices due to market imbalance.

Vanadium Ore

It is estimated that the total global resources of vanadium are in excess of 60 million tonnes. However, many of the world's deposits have low concentrations of vanadium and as a result the world's actual reserve base is estimated to be in the region of 30 million tonnes. Based on today's mining methods and the current price level of vanadium, it is estimated that only 10 million tonnes is commercially exploitable.

The main source of vanadium are the titaniferrous magnetites of South Africa, the CIS and China. South Africa's vanadium ore reserves constitutes 45% of the world's reserves with the CIS and the USA being 25% and 15% respectively. The grade of South Africa's ore is on average about three times higher than anywhere else.

Ferrosilicon

Silica is found widely throughout the world. For South Africa, the presence of relatively cheap electricity as well as developed end-use markets (a growing steel industry) has resulted in a more or less balance of ferrosilicon units domestically. In this commodity South Africa is holding no special position as is the case with the other alloys.

INSTALLED CAPACITY - RECENT AND FUTURE DEVELOPMENTS

This slide illustrates developments in installed capacity at Southern African producers over the last 12 years and likely developments up to the end of the decade. The increasing importance of South Africa versus the world is clear for all to see. What must be noted is that during the era covering the 1960's through to the early 1980's, South Africa exported more ore. However in the last couple of decades, there has been a distinct shift to greater benefication of our raw materials.

This shift has certainly also been exacerbated by the shift of capacity from high cost countries such as Japan to South Africa attracted by the competitiveness of South Africa as a producing country. This will be dealt with in more detail a little later in my presentation.

I will now briefly talk about the different ferroalloys that are produced and the main South African companies involved. Here the focus is on current and future investment plans that have already been announced and how they are likely to impact on the overall picture from a South African perspective.

Generally investments by South African producers have focused on reducing the cost of production and increasing the alloy yields as well as giving attention to correcting the imbalance between ore lumps and fines arising from mining operations.

Ferrochrome

Southern Africa's capacity to produce high-carbon ferrochrome totalled an estimated 2,6m tonnes in 1997. This represents a significant average annual growth of +5%, on the total installed capacity of just 1,4m tonnes that existed in 1985.

Thus from only 45% of active world capacity in 1985, the Southern African's increased their share to approximately 55% in 1997. Expectations are that total Southern African capacity to produce charge chrome/high carbon ferrochrome will exceed 3m tonnes around the year 2000. This would represent almost 60% of active world capacity.

Samancor is currently South Africa's largest ferrochrome producer with installed capacity estimated at around 1.2m tpy, or around 25% of total active world capacity in 1997. Based on the company's current plans, installed capacity is forecast to increase further to reach 1.3m tpy by the turn of the century.

Samancor's Ferrometals plant in Witbank comprises six furnaces including a converter for medium carbon ferrochrome plus a metal from slag recovery plant. Total ferrochrome capacity at the plant is an estimated 415,000 tpy. In recent years, two joint venture agreements have been entered into to enable the upgrading of furnaces at this plant. One furnace is being upgraded by Poschrome, a joint venture with South Korea's Posco and Samsung Corp. The upgrading involves the construction of a pelletising, sintering and a pre-heating facility utilising Outokumpu technology and is expected to be commissioned in May 1998.

Meanwhile, another furnace is being upgraded by Crometals Ltd, a joint venture with Nishin Steel Corp of Japan. The upgrading should contribute to improved chrome yields, thereby lifting production by an additional 40,000 tpy.

At the Tubatse plant in Steelpoort, Samancor operates a six furnaces for high-carbon ferrochrome production. A metal recovery from slag plant is also situated at this site. Total capacity at this plant is estimated at 390,000 tpy. One furnace at the plant is operated as a joint venture with Nippon Denko of Japan.

In Middelburg, there are two furnaces for high-carbon ferrochrome production, two furnaces for ferro-silico-chrome and one furnace for production of low-carbon ferrochrome. In 1997 Samancor commissioned a 62MVA plasma furnace taking pre-reduced feed from the long idled 100,000 tpy chrome direct reduction (CDR) kiln. Once the CDR is fully operational, charge chrome capacity at this plant will total around 270,000 tpy.

At the Palmiet plant in Krugersdorp, Samancor has a capacity of 120,000 tpy although in the past, two of these furnaces have been shifted to silico-manganese production when ferrochrome markets were low. Since February 1997, however, the plant has been concentrating solely on ferrochrome. Finally, Samancor has a small one furnace plant at Batlhako (Ruighoek) with a capacity of 25,000 tpy which is operated by CMI on a 50/50 basis with Samancor.

Since mid-1996, **Chrome Resources**, has significantly increased its ferrochrome production capacity, a trend that is likely to continue into the future. In mid-1996, Chrome Resources had four operating furnaces and metal from slag recovery plant, all located at Rustenburg and with a combined capacity of 280,000tpy. The company has established a new plant at Wonderkop on the site of its Wonderkop chrome mine. During the third quarter of 1996, it commissioned two furnaces (No.5 & No.6) with a combined capacity of 160,000 tpy. In the fourth quarter of 1997 a further two furnaces (No.7 &No.8) were commissioned at Wonderkop. This increased the site's capacity to 320,000 tpy. The two new furnaces operate by supplementing its ore feed with pellets based on UG2 chrome ore fines. As you are no doubt aware UG2 is produced as a by-product of platinum mining. Two new pelletising plants have been commissioned at the site in recent months to increase pellet production to 200,000 tpy.

In addition to the above expansions Chrome Resources has plans to build a further two 80,000 tpy furnaces at Wonderkop. This would take total capacity to 480,000 tpy at the site and the company's overall capacity to 760,000 tpy. The rapid expansions of capacity at Wonderkop underlines the success of the new trend to locate smelters on the mine sites. This enables ore to be transported from the mine to the smelter stock yard by conveyor belt, thus reducing costs significantly.

Following the commissioning of a 70,000 tpy furnace at Lydenburg in mid-1996, **CMI** now has 430,000 tpy of production capacity at its two production sites of Lydenburg and Rustenburg. At Lydenburg, there are now four furnaces in operation with total capacity of 310,000 tpy. During 1995 Mitsui and Company became a part owner in the plant's production facilities.

Meanwhile, at Rustenburg, two 33MVA furnaces provide 120,000 tpy of production capacity. From 1998, CMI became self sufficient in its supply of ore to Lydenburg, from its Thorncliffe mine. The mine which is fully mechanised has substantial ore reserves and has a capability to produce 1.5m tpy ROM. In mid-April, JCI Ltd announced the sale of its 56.6% holding in CMI to the Swiss group Sudelektra.

The purchase by Sudelektra, which already owns Chrome Resources, means that the Swiss company will end up with ferrochrome capacity to rival that of Samancor.

Hernic Ferrochrome commenced production in May 1996. The company's plant consists of two furnaces with a combined production capacity of 135,000 tpy of charge chrome. A new third furnace, 90,000 tpy is due to come on stream in 1999 - increasing Hernic's capacity to 225,000 tpy. In addition to the third furnace, a 350,000 tpy pelletising plant for the pre-treatment of chrome ore is scheduled to be installed by mid-1999. It is anticipated that the use of a two thirds pellet feed (plus one third lump), will raise the effective capacity by a further 30,000 tpy.

The **Dilokong ferrochrome project** operated by a consortium known as Asea SA Metals, has been given the go-ahead. The R250m (US$50) plant will comprise of two furnaces, together capable of producing 135,000 tpy of charge chrome, although initially only one furnace will be commissioned. The plant will be located close to the Dilokong chrome mine near Steelpoort in the Eastern lobe of the BIC .
The project is a joint venture between the Northern Province Development Corp and the Bahamas registered East Asia Metal Investment. The latter is a joint venture between the Chinese metal enterprises CMIEC and Jilin. The company will get chrome ore from the 350,000 tpy Dilokong mine which re-opened in July 1995. The plant is scheduled to be operational during 1999. Finally, **Ferroalloys,** part of the Assomang group has a ferrochrome plant with capacity of around 140,000 tpy at Machadodorp. There are presently no plans to increase this capacity.

It should be noted that there is an increasing tendency of foreign investments in the South African ferroalloy industry. I have mentioned at least six companies that have formed joint ventures and strategic alliances with ferrochrome producers while a similar trend can be noted in the manganese arena.

Manganese

Samancor is South Africa's largest manganese ferroalloy producer with smelting facilities at Meyerton in Gauteng and mines in the Northern Cape. The Meyerton works produces both ferromanganese and silico-manganese to the tune of 465 000 tpy. The company has also used other facilities within the group to produce manganese ferroalloys from time to time. At Meyerton, Samancor has installed capacity (18,000 tpy) to recover manganese ferroalloys from slag.

The Advalloy joint venture with JMC (35%) and Mitsui (15%) has been producing refined manganese alloys at Meyerton since the beginning this year.

The other producers of manganese ferroalloys in South Africa are Ferroalloys Ltd and Transalloys. Ferroalloys has production facilities for high carbon ferromanganese at Cato Ridge with a capacity of 150 000 tpy while Transalloys has furnaces for silico-manganese and medium carbon ferromanganese production at Witbank of 175 000 tpy and 55 000 tpy respectively.

Ferroalloys has installed additional furnaces to produce refined ferromanganese at Cato Ridge in a joint venture partnership with Mizushima Ferroalloys and Sumitomo of Japan.

Vanadium

Exploitation of South African reserves started in the early 1950s via application of the roast-leach process. Anglo American started its association with vanadium when it took over the the running of the Rockefeller owned Minerals Engineering of Colorado plant (now the Vanchem site) in Witbank.
Since the vanadium was occuring within a ferrous ore body, Anglo American established an integrated steel works - Highveld Steel and Vanadium - to fully exploit the ore. The plant was commissioned in 1968 and has undergone continuous expansion and today represents one of the biggest producers in the world. Over the years several other producers were established exploring the same fragmented ore body as Highveld using the roast leach process. Although some did not survive, Vantech, Rhovan (subsidiaries of Südelektra) and Vametco, (subsidiary of US producer Stratcor) still operate today and produce high quality 80%V ferrovanadium in addition to other proprietary alloys. Transvaal Alloys, a vanadium chemicals producer was acquired by Highveld and formed part of a South African industry wide re-orientation towards producing value added end products as opposed to intermediate raw materials.

Presently expansion is taking place at the Vanchem Division of Highveld Steel. This will add one large roasting kiln to the two existing ones, raising V_2O_5 capacity by 6000tpy. Commissioning is planned for December, 1998. Together with the higher output from Rhovan and Vantech, this will replace the shortfall created by the changes at Nizhniy Tagilof Russia following the decision to convert its furnaces from vanadium slag production to steel.

South African producers' are expanding their market share of ferrovanadium and I believe that from the year 2000, some 20kt of pentoxide equivalent will leave this country in the form of 14kt of vanadium alloys (both ferrovanadium and Nitrovan) each year. South Africa supplies some 80% of World seaborne trade in vanadium, and SA producers' economies of scale allow them to swing production to meet market requirements.

Ferrosilicon

Seen against world production potential, South Africa has a very small output of FeSi at about 120 000 tons per annum and has no significant differentiating factors from other producers. Ferrosilicon prices internationally are, in common with other ferroalloys, very cyclical. Production costs are very often above market prices meaning that only the most efficient producers are able to make profits for most of the business cycle.

Most companies, at some time or other, have found it necessary to curtail production by shutting down furnaces. In South Africa, Samancor decided to exit this market a year or so ago. This has, however, had little or no impact on the supply/demand situation internationally and is motivated by alternative commercial considerations for the company concerned.

Certain producing countries seem to produce ferrosilicon at high levels and market the product at prices which, by normal standards, are well below their true cost of production. This practice is perceived to be the main driving force in keeping prices low and forcing furnace shutdowns in companies not prepared or able to suffer extended losses on sales.

Production units taken off line are usually mothballed or converted to the production of alternative and more profitable alloys. This has been the case in countries with high power costs such as China and India. Ferrosilicon production worldwide is able to meet demand with capacity to spare. It is not anticipated that any new production will be brought on line in South Africa in the foreseeable future.

COMPETITIVENESS OF SOUTH AFRICAN PRODUCERS

South Africa is well positioned to continue playing a major role in the supply of additional ferroalloy units in the coming years with average cash costs well below the world average.

To illustrate the competitiveness of the South African producers and their particular strengths and weaknesses, I am going to use ferrochrome as an example. Looking at the major variable components of ferrochrome production (electricity, chrome ore, reductants and labour), South Africa has a considerable edge over the other producers.

In general, ferroalloy production is exceptionally power intensive with ferrochrome production for example consuming between 2,800-4,800 kWh/tonne of alloy produced (the determining factor for power consumption being in the main production process employed). A major component of South Africa's competitiveness stems from the fact that energy costs are still relatively low compared to what other producers have to pay. Since 1994, South African charge chrome producers have had an agreement in place whereby the electricity price is linked to the ferrochrome spot price. Unfortunately, the South African producers sell their charge chrome on contract, rather than spot. While this has created an imbalance in the past - for example for most of 1997 when spot prices were higher than contract, possible advantages were eroded.

Where this power cost system is intended and in fact designed to be advantage neutral over the long term, much debate exists if this has been in fact to the advantage or detriment of the industry up to now.

Chrome ore costs is the most significant contributor to variable costs for many producers. However, in South Africa, costs of chrome ore are amongst the lowest in the world. Costs are estimated to range between $10-30/tonne delivered plants with the differences among producers reflecting mining costs, transport costs between mines and smelter and the proportion of fine and lump ore in the feed. South African producers also continue to enjoy relatively low metallurgical coal and char as an alternative to coke prices. Labour costs , although increasing are still relatively low compared to other producers particularly those in the OECD countries. Major strides have been made in labour productivity through training during the last decade which counters wage increases to some extent.

According to information from CRU International (London), the Southern African producers have a substantial cost saving over other producers on the basis of ex-plant costs. On the basis of total delivered costs, however, the Southern African producers lose some of their competitiveness. The incorporation of delivery charges makes a big difference to the relative position of the Southern African producers on the cost curve. On average delivery costs add around 8c/lb to the ex-plant costs of Southern African producers. This naturally is only a relative disadvantage if it is assumed that all the other producers are only supplying to nearby markets. If they however have to compete in the same global' market, this disadvantage is neutralized.

In South Africa, transport costs from plant to port vary between 2-3c/lb while costs can be as high as 5c/lb in the case of Zimbabwe. In South Africa, ferroalloys have to be transported an average of 650kms to the main shipping ports of Richards Bay and Durban. There is great interest in developing the Mozambiquean port of Maputo as a terminal for South African ferroalloys, particularly ferrochrome, as this would drastically reduce the inland freight costs. Zimbabwe's ferrochrome shipments is already going through Maputo. In addition to the inland freight Southern African producers have to add another 4-5c/lb for delivery to end consumers.

Conclusion

I can safely say that as a result of South Africa holding a significant proportion of proven economically exploitable reserves in the world, further expansion of ferroalloy production facilities will continue. As I have already stated, transport costs are significant for all ferroalloy producers in that most smelters are situated a long way from the nearest port. This problem is being actively worked on with a view to minimising plant to port costs thereby making the South Africans even more competitive internationally. Labour productivity is improving and further significant advances is expected in the coming years. To their credit, the ferroalloy producers have been fostering good labour relations and development of their workforce.

Compared with other ferroalloy producers, the Southern African producers are very competitive and as we have seen, most occupy positions at the bottom end of the cost curve. As Southern Africa increase its share of supply, the obvious question is how that will impact on the stability of supply and indeed on pricing.

As I stated at the beginning, Southern African producers with such a large investment in alloy production recognise that it is in their best interest that they strive for stable markets. The commodity cycle has a significant impact on the supply of ferroalloys to the stainless and steel industries, as relatively small changes in the supply/demand balance can result in major price changes.

The aim for us, the producers, are by ever increasing our competitiveness through cost reduction, to create the required returns that financially justify the participation and indeed growth through regular further investment in the production of ferroalloys. This would result in more stable markets with less volatility than has been the case in the past. It is hoped that this can be achieved with continuing closer co-operation between producers and consumers regarding future requirements in volume and quality, thereby creating a more stable industry for all who have a vested long term interest in the supply and consumption of ferroalloys.

I thank you for your attention.