COMMENTS ON THE GROWTH PERSPECTIVES OF THE MANGANESE ALLOY INDUSTRY

by E. Madero B.* (presented by Mr. Madero B.)

It is with much pleasure that I take this opportunity to exchange a few ideas and preoccupations with you on the possible direction of the world manganese alloy industry.

I hope that as a result we will all arrive at a greater understanding of the current situation of the industry and of its immediate future.

In the first place, we must acknowledge the fact that the use of manganese as an alloying element in the steel manufacturing process continues to be the most important factor in today's manganese economy and in the development potential of the manganese alloy industry (Table I).

From this premise must follow the acceptance of our role as the major suppliers of an industry whose world growth will not exceed an average annual rate of 2.5% over the course of the next five years. Furthermore, increases in steel production capacity will be more frequent in developing nations and in those with lower energy costs.

A second premise is that, despite the great quantity of resources currently being invested in research to minimise the quantity of manganese used per ton of steel, such technological advances will not lead to its substitution. In fact, reductions in consumption in certain types of the more common steels will be partially balanced by increasing its role in total steel production as a consequence of the use of manganese in the production of special steels requiring a greater average manganese content (Table II).

In our opinion, the average consumption of manganese per ton of steel by 1985 will range from between five and six kilos per ton in the most advanced industrial countries.

A third premise must also be considered here, namely that the immediate likelihood of raising real prices of manganese both as a mineral and as an alloy is relatively limited, despite the fact that its commercial value is at present very much less than its real value, and that the cost of transporting the mineral over great distances, both by land and by sea, has become, and will continue to be, a very limiting factor in the economy of the alloy industry (Graph I and Table III).

Upon considering a fourth hypothesis, we are forced to conclude that the most important factors in the make-up of the direct cost of manganese alloy manufacturing continue to be electrical energy and manganese ore (Table IV).

We must also recognize another hypothesis, which is that manganese alloy production in blast furnaces is becoming uneconomical and will eventually disappear entirely, given the relatively high cost of coke.

The sixth hypothesis entails consideration of the growing and uneconomical costs of installing new alloy production facilities in countries where there is strict legislation against environmental pollution, where costs of energy

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are high, and whose geographical location is unfavourable in terms of reserves of raw materials.

It should be acknowledged, too, that currently proven strategic manganese deposits are in the hands and under the control of a few producing nations (Table V).

In addition, we must accept the fact that some countries enjoy not only reasonable energy costs, but also have large ore reserves with a greater-than-average increment potential in domestic steel production capacity and less restrictive regulation of pollution (Table VI).

Finally, given the foregoing premises, we can set up a working schema of the trends we can expect in the manganese industry during the 1980s.

The most characteristic features we can foresee for this schema are as follows:

(a) Increases in manganese alloy production capacity in the principal industrial nations that do not enjoy mineral reserves or attractive energy costs may be minimised (Tables VII and VII B).

(b) Acquisitions of alloy-producing facilities either by ore producers or by organisations vertically integrated towards raw materials could proliferate in industrial nations (Table VII C).

(c) In some countries, such as Canada, Mexico, Venezuela, Brazil and Norway, the installation of new plants may be sought in order to benefit from their proximity to large close or captive markets and/or from the relatively low prices of electrical energy that some of these countries currently offer.

(d) The majority of nations with manganese deposits, including South Africa, Gabon, the U.S.S.R., Australia, Mexico, Brazil and India, may possibly continue increasing the exploitation capacity of their respective ore deposits as well as their alloy-producing capacity (Tables VII A and VII B).

(e) It appears that the ore producers will continue the tendency of the past few years to export lesser quantities of manganese ores in favour of maximizing their transformation into alloys in order to increase the added value of their exports.

(f) Under these general conditions, we believe that an upward trend should be effected in the real prices of manganese ore, at least to levels to compensate for inflation. The enormous cost of mine exploration and development can only be justified if the mining companies are compensated with realistic prices for their ores. In the same token, we believe that the steel industry should soon recognize the need for the manganese alloy producers to obtain compensation for their ore, energy and capital cost increases through fair market prices. Otherwise new investments in manganese alloy plants will not be justified and this could eventually produce a supply crisis or excessive dependence in one or two sources of supply.

(g) As a logical reaction to the pressure that the integrated ore-alloy producers exert on the local converters of industrialised nations, it is quite possible that some countries such as the U.S., Japan, and members of the E.E.C. may consider establishing legal means to protect their manganese alloy producing enterprises.

I thank you for your attention.

TABLE I - WORLD STEEL PRODUCTION BY SELECTED COUNTRIES (Thousands of Metric Tons)

COUNTRY	1976	1977	1978	1979	1985(e)
Western Germany	42,413	38,980	41,245	46,040	47,882 (e)
Italy	23,455	23,335	24,253	24,022	27,817 (e)
France	23,227	22,106	22,838	23,360	28,751 (e)
Great Britain	22,466	20,435	20,262	21,551	22,848 (e)
Belgium/Luxembourg	16,710	15,586	17,392	18,392	27,388 (e)
Spain	10,982	11,135	11,282	12,081	16,374 (e)
Sweden	5,139	3,968	4,325	4,928	5,833 (e)
Austria	4,476	4,093	4,334	4,936	5,238 (e)
U.S.S.R.	144,800	147,000	151,500	149,500	180,000 (e)
Poland	15,340	18,000	19,430	19,130	24,037 (e)
Czechoslovakia	14,693	15,000	15,160	15,060	18,072 (e)
Rumania	10,970	12,200	11,660	12,756	18,935 (e)
Japan	107,384	102,401	102,104	111,750	127,043 (e)
China	21,000	23,400	31,000	35,350	47,067 (e)
India	9,364	10,000	9,450	9,500	13,700 (e)
U.S.A.	116,313	113,152	123,740	126,110	140,111 (e)
Canada	13,162	13,669	14,899	16,050	19,339 (e)
Brazil	9,253	11,238	12,205	13,730	22,549 (e)
Mexico	5,288	5,506	6,735	7,100	11,500 (e)
Australia	7,794	7,334	7,613	8,135	9,541 (e)
Other countries	52,177	54,536	55,846	66,619	99,775 (e)
World total	676,406	673,074	707,273	746,100	913,800 (e)

Source: MANGANESE CENTER

(e) = Estimated

TABLE II - SPECIFIC MANGANESE CONSUMPTION IN SELECTED COUNTRIES

(KG. Mn/Ton. CRUDE STEEL)
(Total all Alloys)

COUNTRY	1975	1976	1977	1978	1979
U.S.A.	6.32	6.16	6.02	5.90	6.16
Japan	5.68	5.54	5.46	5.54	5.50 (e)
Brazil	N.D.	6.94	7.26	7.26	N.D.
Germany (F.R.G.)	6.79	6.55	6.40	6.53	6.45
Italy	6.10	5.86	6.50	5.98	6.10 (e)
France	6.80	5.88	5.87	5.93	5.97 (e)
Belgium	6.40	6.02	5.72	5.52	5.80 (e)
Luxembourg	7.04	6.98	6.68	6.45	6.50 (e)
Great Britain	7.64	7.15	7.21	6.75	6.80 (e)
Mexico	8.58	8.54	8.55	8.54	8.55
Average	7.25	6.95	6.96	6.83	6.86 (e)

Source: MANGANESE CENTER/C.M.A. - P.D.

(e) = Estimated

GRAPH 1 - TIME-PRICE RELATIONSHIP FOR MANGANESE IN ORE (Min. 48% Mn) AND PERCENTAGE INCREMENT

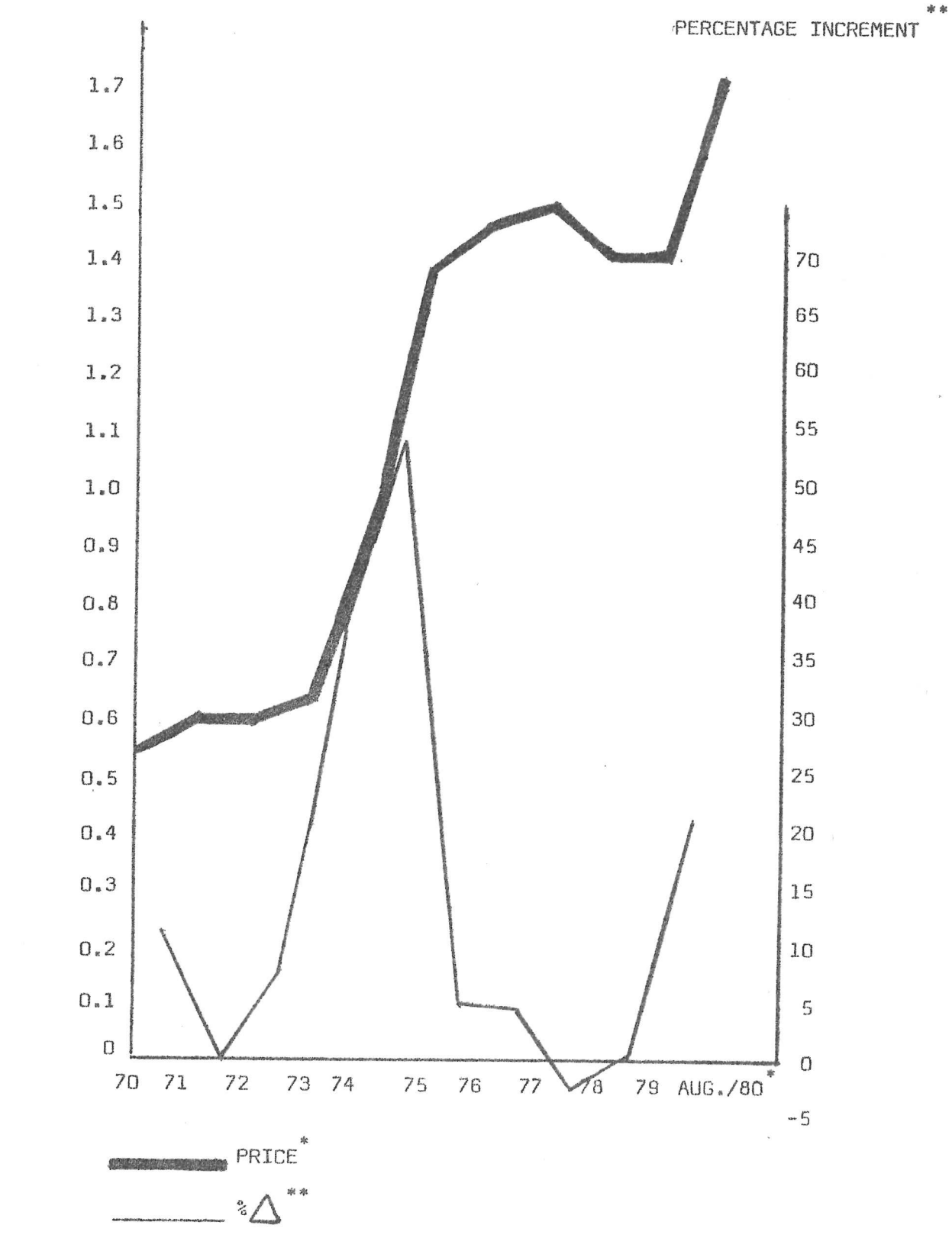

TABLE III - PRICES OF MANGANESE ORE AND FERRO-ALLOYS

YEAR	MANGANESE ORE (U.S.$/LTU)	FeMn 78% Mn		US PRODUCER SiMn 2 % C (¢ / LB)
		US PRODUCER (U.S.$/LTU)	IMPORTED TO US (U.S.$/LTU)	
1974	0.9	440	480	21.5
1975	1.38	425	440	21.5
1976	1.45	435	400	21.5
1977	1.48	400	320	21.5
1978	1.40	440	375	21.5
1979	1.40	490-530	425-460	24.5
Jan. 1980	1.38-1.42	490-530	430-440	24.5
Feb. 1980	1.38-1.42	490-530	430-440	24.5
March 1980	1.66-1.73	490-530	430-440	24.5
April 1980*	1.66-1.73	490-530	430-440	24.5
May 1980*	1.66-1.75	490-530	430-440	24.5
June 1980	1.66-1.75	490-530	430-440	24.5
July 1980	1.66-1.75	490-530	430-440	24.5
August 1980	1.66-1.75	490-530	430-440	24.5

* Nominal

Source: MANGANESE CENTER/METALS WEEK

TABLE IV - PERCENTAGE OF THE MOST IMPORTANT FACTORS IN THE FERROALLOYS DIRECT COST COMPOSITION

	% COST OF Mn Ore	% COST OF ELECTRIC ENERGY	SUB-TOTAL	% OTHER COSTS
	(1)	(2)	(1) + (2)	
FeMn 72/74%	56	20	76	24
FeMn 78/80%	56	20	76	24
SiMn 62/65%*	36	33	69	31

* All those percentages represent prime costs bases

Prime cost equals to: Mn Ore + reducers + quartzite* + electrode paste + power + direct labor

TABLE V - WORLD MANGANESE ORE PROVEN RESERVES AND PRODUCTION

COUNTRY	(1) 1978 RESERVES	OTHERS	* TOTAL	(2) PRODUCTION 1977	1978	1979	1980
U.S.S.R.	630	540	1170	8600	9060	9000 (e)	9162 (e)
South Africa	711	701	1412	5290	4410	4960	5274 (e)
Brazil	39	23	62	1260	1700	1600 (e)	1635 (e)
Gabon	77	-	77	1860	1700	2300	2360 (e)
India	25	11	36	1824	1570	1800	1828 (e)
Australia	144	14	158	1130	1300	1620	1735 (e)
Mexico	5	45	50	442	475	446	420 (e)
(3) Mexico	21.3	200	221.3	-	-	-	-
Main Producers - Total	1631	1334	2965	20406	20215	21726	22414 (e)
Others	24	34	58	2795	2752	2540	2206 (e)
World Total	1655	1368	3023	23201	22967	24266	24620 (e)

(1) In millions of M.T.

(2) In thousands of M.T.

(3) Ore in situ (not added in the world total)

* Manganese content

Source: MANGANESE CENTER

(e) = Estimated P.D. - C.M.A.

These figures include Autlan latest estimates about the reserves of the Molango District in Mexico

TABLE VI - COUNTRIES WITH POTENTIAL PRODUCTION OF MANGANESE ALLOY EXPANSION

COUNTRY	DEPOSIT OF MANGANESE ORE	ACCELERATED STEEL PRODUCTION	LOW COST OF ELECTRIC ENERGY	ANTICONTAM. LESS RESTRICTIVE	IMPORTANT MARKET	NEAR MARKET	
					U.S.A.	JAPAN	EUROPE
Australia	x	1/2	-	x	-	x	-
Brazil	x	x	x	x	1/2	1/2	1/2
Canada	-	x	x	-	x	1/2	-
China	x	x	x	-	-	x	-
Gabon	x	-	1/2	x	1/2	1/2	x
Ghana	x	-	1/2	x	1/2	1/2	x
India	x	x	1/2	x	-	1/2	x
Mexico	x	x	1/2	x	x	-	1/2
Norway	-	-	x	-	1/2	-	x
South Africa	x	x	1/2	x	1/2	1/2	1/2
South Korea	-	x	-	-	-	x	-
Taiwan	-	x	-	x	-	x	-
Venezuela	-	x	x	x	x	1/2	-

Source: D.P. - C.M.A.

TABLE VII A - WORLD FERRO-MANGANESE PRODUCTION IN SELECTED COUNTRIES (Figures in Thousands of M. Tons)

COUNTRY	1976	1977	1978	1979
U.S.S.R.	1,000	1,000 (e)	1,000 (e)	1,000 (e)
Japan	522	426	392	450
South Africa	380	297 (e)	334 (e)	532 (e)
France	365	373	390	443
Norway	375	284	260	N.D.
U.S.A.	437	303	244	194
Fed. Rep. Germany	220	175	209	233
India	168	207	144	N.D.
Spain	132	145	135	135 (e)
Brazil	92	120	108	120 (e)
Mexico	54	99	107	121
Belgium/Luxembourg	84	55	87	99
Others	592	527 (e)	912 (e)	N.D.
WORLD TOTAL	4,421	4,011 (e)	4,322 (e)	4,450 (e)

Source : MANGANESE CENTER

(e) = Estimated

TABLE VII B - WORLD SILICOMANGANESE PRODUCTION IN SELECTED COUNTRIES (Figures in thousands of M. Tons)

COUNTRY	1976	1977	1978	1979
Japan	521	465	392	447
Norway	168	127	185 (e)	220 (e)
U.S.A.	116	107	143	185
Spain	80	66	108	N.D.
Brazil	64	75	106	115 (e)
Italy	41	40	40 (e)	N.D.
South Africa	71	72	71	100
Mexico	17	27	24	38
France	36	N.D.	19	N.D.
Yugoslavia	26	9	N.D.	N.D.
Australia	15	23	5	10
Others	55	89	67	130
World total	1,210	1,100	1,160	1,390 (e)

Source: MANGANESE CENTER

(e) = Estimated

TABLE VII C - WORLD MANGANESE ORE PRODUCTION (Thousands of M. Tons)

COUNTRY	1977	1978	1979	1980 (e)
U.S.S.R.	8,600	9,060	9,000	9,162 (e)
South Africa	5,290	4,410	4,960	5,274 (e)
Brazil	1,260	1,700	1,600 (e)	1,635 (e)
Gabon	1,860	1,700	2,300	2,360 (e)
India	1,824	1,570	1,800 (e)	1,828 (e)
Australia	1,130	1,300	1,620	1,735 (e)
Mexico	442	475	446	420 (e)
Others	2,795	2,752	2,540	2,206 (e)
WORLD TOTAL	23,201	22,967	24,266 (e)	24,620 (e)

Source: MANGANESE CENTER

(e) = Estimated D.P. - C.M.A.

TABLE VIII - WORLD FeMn PRODUCTION (Thousands of Tons)*

COUNTRY	1976	1977	1978	1979
South Africa	350	400	480	519 (e)
India	176	167	220	241 (e)
Brazil	99	129	135	148 (e)
Japan	632	527	456	436 (e)
Norway	375	244	276	259 (e)
Mexico	54	99	125	139 (e)

(e) = Estimated P.D. - C.M.A.

* Steel and Ferro-Alloys Production and Consumption by Countries as Specified by the Ferroalloys Association U.S.A., 1979

TABLE IX - WORLD SiMn PRODUCTION (Thousands of Tons) *

COUNTRY	1976	1977	1978	1979
Brazil	64	75	80	92 (e)
South Africa	22	25	30	35 (e)
Australia	15	23	24	28 (e)
Japan	373	333	303	359 (e)
U.S.A.	117	109	129	185 (e)
Spain	91	67	111	115 (e)
France**	12	21	19	21 (e)

** Include Spiegeleisen

(e) = Estimated - P.D. - C.M.A.

* Steel and Ferro-Alloys Production and Consumption by Countries as Specified by the Ferroalloys Association U.S.A., 1979

TABLE X - WORLD MANGANESE ORE PRODUCTION (Thousands of M. Tons) *

COUNTRY	1977	1978	1979	1980 (e)
U.S.S.R.	8,595	8,600	9,000	9,162 (e)
South Africa	5,048	4,317	4,960	5,274 (e)

(e) = Estimated - P.D. - C.M.A.

* Steel and Ferro-Alloys Production and Consumption by Countries as Specified by the Ferroalloys Association U.S.A., 1979

DISCUSSION

Mr. H.C. Andersen*

I would like to congratulate Mr. Madero on his very interesting presentation which certainly has enlightened us on some of the very important factors influencing our present and future life in the manganese industry. He has emphasized specifically on the energy situation and on the ore supply situation as being the major factors determining the future location of Mn-operations. This, of course, although admittedly they are very important factors cannot be the whole truth. If we relate the same emphasis to other areas we may easily derive to the dramatic conclusion that Japan in a few years will stop producing steel. We hardly believe that this will be the case.

Transportation costs and pollution costs have been mentioned and they are major issues in every production of ferro-alloys. I would not think, however, that they will be determining factors as to where the production will take place in the future. As we have heard earlier today, cost of transportation of ore versus transportation of finished product, does not vary that much. On the other hand, also the energy cost will probably even out in the future. There must be it seems some other determining factors that could be of decisive importance.

I believe that one such factor might be capital cost. To build new plants today and to have your capital paid back compared to old plants where the capital has already been recovered, will cost you more than the cost of energy per ton of product. As a matter of fact, it will probably be in the range of double cost as compared to the energy cost in production of standard ferro-manganese. In a new plant capital cost will account for approximately 75% of the Mn-ore cost for production of Std. FeMn. So the establishing of new industries may probably be one of the major cost problems for the development of manganese production.

I wonder whether the development in this industry over the last few years or the last decade, may be more a problem of different types of economy matching or not matching each other, the development of protected economies in some parts of the world working their way into areas of more free enterprise in other parts of the world. This might be the real conflict that we see in today's ferro-alloy picture. If Mr. Madero would like to comment on this, we would appreciate it.

Mr. E. Madero:

First of all, Mr. Andersen, I have to agree with you that the energy and the ore locations obviously are not necessarily the only major reasons for selecting the location of an alloy plant. The market is a very important consideration. I think that we all recognize this as being a very major factor to the extent that in the particular case of Autlan the market was the motivator which triggered our decision for our company to purchase last year the Mobile ferro-alloys plant in Alabama and it has prompted SAMANCOR to buy its ferro-alloy plant in the United States. So, certainly, the market is a very important consideration.

In connection with the capital costs, that is a very major consideration and that is why I made a couple of remarks and one is that we believe that vertically

* Elkem a/s, Norway

integrated organizations are going probably to follow the tendency of acquiring existing plants in industrial nations because capital investment is much lower than the building of new capacities.

I also believe that it will be indispensable to change the structure of the prices if we are going to have a long-term profitable industry which could support continuous modernization in the same way as it has taken place in the past 15 years. To have a healthy manganese alloy industry, you must have good profitability. However, we have been passing from one recession into another without full recovery of the manganese industry profitability.

I think that the theme is so extensive and is so importantly complex that we could add a substantial number of other considerations to our list.

I have tried to call the attention of this group to the major facts as I see them, which are going to be of very important bearing in the decision-making process for the managers of the manganese alloy industry in the next 10 years.

Mr. R. Nordheim*

One point, Mr. Madero. You told us here that steel production would probably rise towards 950 million tons in 1985; at the same time, you said that the blast furnace production of ferro-manganese is probably out. What steel production do you think the present electric furnace capacity for ferro-manganese could support, i.e. what new capacity would we have to make available for 1985 if this prognosis is true?

Mr. E. Madero:

I think that, in the first place, although I believe that the blast furnace ferro-manganese production is going to be phasing out, I do not contemplate that it is going to be phasing out in the very near future. I contemplate that it is going to be phasing out throughout the decade.

Secondly, I believe that the major increases in the steel capacity will - and this is not something that I am inventing but this is an information supplied by the International Iron and Steel Institute - i.e. the new steel production will be coming from the developing nations, such as: Brazil, Venezuela, Mexico, South Korea, Taiwan, Indonesia, India and several of those countries will be requiring alloy production capacity when and if the conditions are right for an installation there.

Other countries will import the alloys from existing producing countries such as South Africa, Norway, etc., but I think that there is going to be simply a redistribution. I do not think that there is going to be any expansion outside of the few developing nations where the steel industry is growing and which have resources such as energy or manganese. I don't think that any major increases in manganese alloy capacity are going to be built in the next five years. I think that there is simply going to be a redistribution.

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