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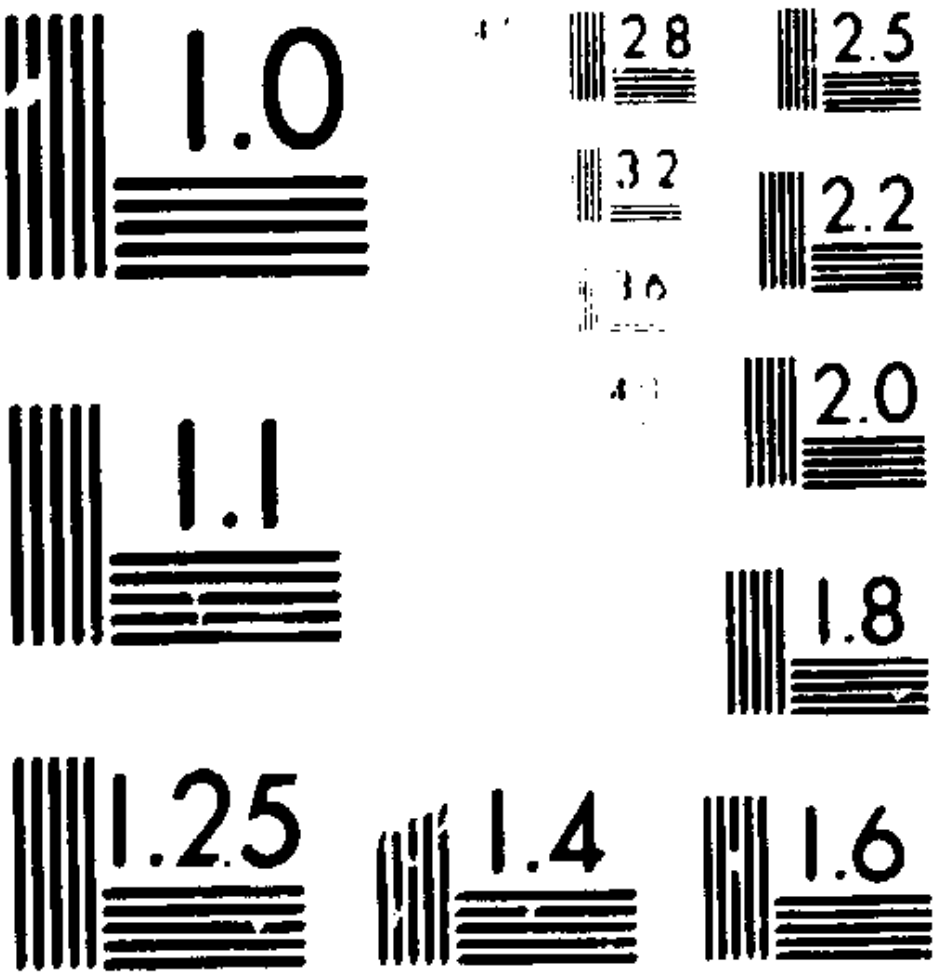
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org



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SECTORAL PROFILES OF ELECTRICAL INDUSTRY, MINING, PULP AND PAPER, PETROLEUM INDUSTRY, STEEL. IN MEXICO *

by

A. Bozzollo **
G. Robinson **
J. Malkus **
R. Prufello **

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** UNIDO Expert

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I N D E X

ELECTRICAL INDUSTRY

1. - General situation

In recent years, electrical energy generation in Mexico grew at a compound annual rate of 11.5%, requiring installed capacity to be doubled every 6 years in order to satisfy consumption needs.

To maintain the supply of electrical energy at an adequate level at all times, the Federal Electricity Commission (CFE) prepares its Works Investment Budget (P.I.O) on the basis of 10 year periods, thus enabling sector requirements to be evaluated in advance.

Up to date of the last study (1976), installed capacity for electrical energy generation had reached 10.522 MW, with the following structure:

	%	%
Hydroelectricity	*41.5*	
Thermoelectricity using hydrocarbons		*57.5*
Thermoelectricity using coal		*0.3*
Geothermoelectricity		*0.7*
		100.0

It is estimated that between 1977 and 1986, demand growth will make necessary an expansion of supply reaching 26.467 MW by 1986, with the following structures:

	%
Hydroelectricity	*32.3*
Thermoelectricity using hydrocarbons	*42.6*
Thermoelectricity using coal	*9.2*
Geothermoelectricity	*11.0*
Nuceloelectricity	*4.9*
	100.0

The total investment program for reaching this increase of installed capacity would be 280,000 million pesos, of which 177,000 million correspond to power generation plants, transmission lines and substations; of this 54,110 million pesos would be spent on capital goods within the three categories mentioned.

In general, it was calculated that the most relevant categories of capital goods selected for the electricity industry would share in the investment structure in the following proportions:

	%
Power generation plants	*43.4*
Transmission lines	*7.4*
Substations	*12.3*
Expansion of operations	*21.6*
Frequency synchronization	*0.2*

	%
Rural electrification	*1.7*
General construction expenditure	*5.7*
Miscellaneous	*7.5*

Considering only the capital goods items, the total value and weight of the three main groups, power generation plants, transmission lines and substations, is the following:

	Value (Thousand of pesos)	*%*	*Weight (Tons)*	*%*
Power generating plants	*27.136.833*	*(50.2)*	*135.131*	*(20.1)*
Transmission lines	*11.235.743*	*(20.7)*	*376.878*	*(50.2)*
Electrical substations	*15.373.748*	*(29.1)*	*158.989*	*(23.7)*
Total	*54.110.324*	*(100.0)*	*499.109*	*(100.0)*

Among the capital goods used in the sector there are 11 important categories whose total value comes to almost 80% of the value of the three groups mentioned above:

Conductors	*6.321*
Turbogenerators	*5.902*
Instruments	*5.365*
Power transformers	*5.050*

Steam generators	*5.018*
Gates for hydraulic turbines	*3.929*
Transmission towers	*2.414*
Main transformers	*2.307*
Hydraulic turbines	*2.090*
Circuit breakers	*1.690*
Generators	*1.645*
Total Million US	*41.641*

These data give a clear idea of the importance of the demand for capital goods in the electrical industry which represents an annual market of about 6000 million pesos.

The study concludes that "this market could support the expansion of existing enterprises and the creation of new ones" to produce materials and equipment that are currently imported.

The probable share of national components in the period from 1978 to 1986 can be seen in Table No. 1.

There is a stable situation in the areas of line installations, operation expansions, and, on estimate, the category of "miscellaneous". However, the national component could grow in the area of plant installations which, being 50% of the total of investments in capital goods for the electrical industry, represents the most decisive group in terms of growth probabilities.

Table 1

Possible evolution of the share of national production in the investment program of the electrical sector 1977/85

Year	Plant installation	Line installation	Substations	Frequency synchroni-zation	Rural electrifi-cation	Expansion of operations	Payments outstanding for works	General office expenses constructions	Miscella neus	Total
1977	43.4	80	40.1	100.0	100.0	70.0	100.0	100.0	50.0	56.4
1978	42.1	79.8	40.0	100.0	100.0	70.0	100.0	100.0	50.0	57.0
1979	43.1	80.0	39.9	100.0	100.0	70.1	--	100.0	50.0	56.1
1980	43.0	80.0	40.1	--	100.0	69.9	--	100.0	50.0	57.2
1981	41.0	79.9	40.0	--	100.0	70.0	--	100.0	50.0	55.7
1982	37.7	80.1	40.0	--	100.0	69.9	--	100.0	50.0	55.1
1983	41.4	79.7	40.0	--	100.0	70.0	--	100.0	50.0	55.9
1984	47.5	79.9	40.1	--	100.0	70.0	--	100.0	50.0	57.3
1985	51.4	79.7	40.1	--	100.0	70.0	--	100.0	50.0	58.9
1986	56.8	80.0	40.0	--	100.0	70.0	--	100.0	50.0	60.3
1977/86	45.0	80.0	40.0	100.0	100.0	70.0	100.0	100.0	50.0	51.1

2. Methodology for calculating capital goods demand

On the basis of the forecast short, medium and long term requirements for materials and equipment in the Electrical sector 1978-1985" prepared by the Federal Electricity Commission in October of 1977, the study attempts to determine the demand for capital goods for the electrical sector during the period from 1978 to 1986 and to express it in terms of required equipment with corresponding monetary values and weights.

The study was based on projects that had been defined or already approved by the CFE for generating, transmitting and transforming high tension energy.

The most important equipment in these projects was identified and, subsequently, projects were standardized in order to add up the equipment units. The criterion"Similar projects require similar equipment" was used.

In the future, the study can be made more extensive in terms of time or capacity of installations, through variations in the program which could introduce modifications in the kinds of plants considered and kinds of equipment.

The weigth and value (market value, 1977) of the equipment was estimated. Prices were CIF (site of installations) for

national products and FOB (factory) for imported products.

Total equipment was divided into three groups: equipment for power plants, for transmission lines, and for substations.

a) Power generation plants

Only hydroelectric, thermoelectric and geothermic plants were included, leaving the nuclear plants (to be installed) outside of the period considered in the study, diesel and gas plants were also excluded because of the small investment involved.

Thermoelectric plants were compared with existing coal and fuel oil plants, classified by capacity and type; a breakdown of major equipment was made and an estimate made of total equipment needs for the total number of plants.

Hydroelectric plants were studied individualy because of their dissimilarities.

Geothermic plants were analyzed through a study of the plant at Cerro Prieto. 1/

1/ Process system equipment was deliberately excluded since, according to the study, it ought to be examined separately.

b) Transmission lines

Eight components were selected for tensions of 115, 230 and 400 KV, with 1 and 2 circuits; 69, 138 and 160 KV lines were included in the group of 115 KV.

c) Electrical substations

Tensions were divided into 4 groups: 400 KV, 161/230 KV, 69/138 KV and 13.8/34.5 KV. Equipment and materials were selected on the basis of these four groups.

In synthesis, 43 families of capital goods required by the sector were indentified:

List of families of capital goods and components required for the generation, transmission and transformation of electrical energy, selected for the 1978/86 period of development.

1. *Steam generators*
2. *Hydraulic turbines*
3. *Turbogenerators*
4. *Steam collectors*
5. *Moisture separators*
6. *Generators for hydraulic plants*
7. *Feeder pumps*
8. *Condenser pumps*
9. *Circulation pumps*

10. *Condenser*
11. *Low pressure heaters*
12. *High pressure heaters*
13. *De-aerator heater*
14. *Travelling crane*
15. *Auxilliary cranes*
16. *Compressors*
17. *Cooling tower*
18. *Main transformer*
19. *Auxiliary transformer*
20. *Starter transformer*
21. *Power transformer*
22. *Main bus bars*
23. *Auxilliary bus bars*
24. *Machine shed*
25. *Warehouses*
26. *Vertical gates*
27. *Intake gates*
28. *Sluice gates*
29. *Transmission towers*
30. *Substations*
31. *Power transformers*
32. *Current transformers*
33. *Knife switches*
34. *Circuit breakers*

35. Lightning arresters

36. High pressure pipes

37. Low pressure pipes

38. Complementary pipes

39. Valves

40. Instruments

41. Insulators

42. Hardware

43. Conductors

3. Quantification of capital goods needs for expansion of electrical energy generation supply, 1978 to 1986.

A summary of the major factors that play a part in the quantification of capital goods needs for the programmed expansion of electrical energy generation capacity in 1978/86 can be found in Table 2.

It can be seen that, starting with the three major subdivisions (power generation plants, transmission lines and substations), the kinds of plants, kinds of lines and groups of substations are analyzed. Mention is made of the major categories equipment required and their share in the value of the capital goods corresponding to each group, as well as their share in the total value of capital goods

considered for the electrical industry as a whole.

It has been noted that equipment for power generation plants constitutes 50% of the total value of capital goods for the three main groups considered (power generation plants, transmission lines, substations); it can now be seen that thermoelectric plants occupy 72.4% of investments in capital goods within the total for power plants; hydroelectric plants cover 22.8% and geothermical plants 4.8%. 1/

Transmission lines were organized into 6 groups for each of which the extension in kilometers was estimated, 400 KV (684 Km); 230 KV (1338 Km); 164 KV (12 Km); 138 KV (18 Km); 115 KV (1379 Km); and 69 KV (259 Km) in 1 and 2 circuit lines.

Substations were divided into 4 groups: 400 KV ; 161/230 KV; 69/138 KV; and 138/34.5 KV.

On the basis of these divisions, the 43 families of capital goods and components were distributed and their corresponding value and weight were estimated.

All of the above is given in summary form in Table 2,

1/ This only involves the expansion of the plant of Cerro Prieto.

only a few major equipment categories received a more detailed listing of values. The equipment mentioned for thermoelectric plants (steam generators, turbogenerators, cooling towers and main transformers) constitute 70% of the total value of capital goods for those plants.

Since the thermoelectric plants represent 72.4% of the total capital goods investments for power generation plants which, in turn, cover 50% of the total capital goods considered in the report, that 72.4% represents 25.3% of all the capital goods studies for the electrical industry.

Likewise, the generator turbines, power transformers, metallic structures, travelling cranes, vertical gates, intake gates and high pressure pipes (47% of the value of capital goods for hydroelectric plants), constitute 5.4% of the total for capital goods considered for the electrical industry.

It is noteworthy that the programming of electrical energy expansion for the period being considered is fundamentally based on these kinds of plants, made up of twenty new units: 4 fuel-oil driven plants, 5 coal-driven plants and 11 hydroelectric plants.

Geothermical capacity will be expanded by amplifying the present operations of the Cerro Prieto plant. The equipment needed

for this plant, turbogenerators, cooling towers and transformers, (77% of the value of capital goods for this type of plants) represents 3.7% of the total for capital goods considered in the study.

Summarizing, the value of capital goods for the different kinds of plants presented in Table 2 is equivalent to 34.4% of the total for capital goods established in the report.

Of the capital goods mentioned in Table 2 for transmission lines, share in value was mentioned only for structures and conductors which together make up 54% of the value of capital goods in this category and 10.8% of the total of capital goods considered for the industry.

In the substations grouping, the power transformers, relays, structures, breakers and current transformers, added together, make up 90% of the capital goods value in that category and 27% of the total capital goods considered for the electrical industry in the period 1978-1986.

The sum of capital goods value for the electrical industry presented in the report, which are found in the form of the major equipment categories in Table 2, comes to 72.2% which is considered to be a representative figure for the purposes of this summary.

Table No. 2

DEMAND OF THE PRINCIPAL CAPITAL GOODS FOR THE ELECTRICAL INDUSTRY

1978 - 1986

Equipment Groups	Kinds of Plants	No. of Plants	Major Equipment	Share in Capital Goods Value within each group	Share in total value of Capital Goods for the Electrical Industry
Generating Plants	Thermoelectric 72.4%	14 Fuel oil 5 Coal	Steam generators Turbogenerator Cooling tower Main transformer	70% in thermoelectrics	50%
	Hydroelectric 22.8%	11	Turbines Generators Power transformers Metallic structure Travelling cranes Vertical gates Intake gates High pressure pipes	47% in hydroelectrics	
	Geothermic 4.8%	Expansion of Cerro Prieto	Turbogenerator Cooling tower Transformers	77% in geothermics	
Transmission Lines	Kinds of Lines Tensions (KV) 400 (651 Km) 230 (2 38 Km) 161 (122 Km) 138 (18 Km) 115 (1379 Km) 69 (259 Km)	(1 and 2 circuit lines)	Structures Insulators	21% in T.L.	20%
			Conductors Support cables Concrete or wood posts Hardware	33% in T.L.	
			Others	37% in T.L.	
	Group of Substations Tensions (KV) 400 161/230 69, 138 138/34.5		Power transformers Relays	58% in Substations 9% in Substations	30%
			Structures Circuit breakers Current transformers		

MINING

1. *Estimate of demand for minerals 1980-2000*

The estimate of demand for capital goods for the mining industry in México was based on the following data and criteria:

1.1 *In all, 14 minerals were considered, among which 6 are metallic, and 8 non-metallic. These 14 minerals represent 90% of mining production.*

1.2 *The historical behaviour of these minerals was examined in terms of production, internal consumption and exports during the period from 1968-1977. The main features of the study revealed slow dynamism in production, and although there was sustained internal consumption, the growth rate was lower than that of some other industries.*

1.3 *Internal demand and future exports of these minerals were evaluated and, on that basis, the total supply was estimated in such a way as to assure national self-sufficiency in all of the minerals considered excepting iron and phosphorite, from 1985 on.*

Even though margins for exports were calculated, mineral exports were not emphasized and only a few products have a notable export standing, such as silver and sulphur.

1.4 It has been assumed that mineral production in the future will show a greater dynamism than the historical level and that certain mineral resources will be obtained whose potential is not yet confirmed definitely.

2. Estimate of production capacity for minerals, 1980-2000

Based on the production required for satisfying the demand mentioned above, production capacity was calculated according to the following method.

2.1 Mining activities were classified according to the following scheme:

Extraction	*Beneficiation*
Capacity for moving materials in mines	*Capacity for:*
1) Open cast	*1) Grinding*
2) Underground	*2) Separating*
	3) Concentrating

2.2 In order of importance of the major minerals and their distribution among the different mines, as well as the tasks to be carried out in both extraction and beneficiation, the following system was followed:

*Capacity for movement of Materials in open cast mines**	*Principal minerals: copper; secondarily iron and coal*
*Extraction capacity in underground mines **	*Polymetallics and coal; secondarily fluorite and barite*
*Grinding, separation and concentration in benefication plants"**	*Copper, Iron, Polymetallics, and coal.*

* *As a general phenomenon, it is assumed that the scale of production units will increase.*

3. *Estimate of demand for machinery and equipment*

On the basis of production and process capacities calculated in 2 (2.1 and 2.2), the total demand was estimated for machinery and its typical components, for the period considered and for average growth rates. In this estimation, the same system was followed once again, i.e.

Machinery and equipment for extraction for open cast and underground mines	*88%*	*Open cast 43%* *underground 45%*
Equipment for beneficalion of minerals	*12%*	
	100%	

3.1 Kinds of machinery and equipment

A group of 33 classes of equipment and machinery was chosen as most representative of the needs of this industry; 8 for extraction in open cast mines; 14 underground extraction; and 11 for beneficiation plants.

The general scheme is the following:

3.1.1 Mining operations

3.1.1.1 Open cast

		Structure of accumulated demand 1980 / 2000 %
	(Copper, iron, coal)	
Major Equipment	Rotary drills	6
	Power shovels	21
	Draglines	9
	Off-highway trucks	53
	Tractors	2
		91

		Structure of accumulated demand 1980 / 200 (%)
3.1.1.2	Underground (polimetallics and coal)	
Major Equipment	Drills	26
	Movable supports	7
	Automatic loaders	22
	Low profile trucks	5
	Hoists	21
		81
3.1.1.3	Benefication	
Major Equipment	Crushers	18
	Mills	40
		58

4. Complementary considerations regarding assumed criteria

Other complementary assumptions which were included in the evaluation criteria were:

4.1 In order to calculate the gross production of minerals and consequently, the movement of materials which would have to be mobilized and sumitted to treatments, certain mineral averaging laws had to be adopted since such calculations must be based on the metallic content of each mineral.

4.2 A gradual decrease in such laws during the period in question was also assumed, on the basis of a known historical trend.

4.3 A trend toward future increases in productive units was assumed, along with the resulting increase in productivity.

4.4 The discovery and future exploitation of minerals which, up until now, have only been found occasionally and have not been explored nor evaluated, has been assumed.

5. Comments

The most basic characteristics of the report being considered is that it is of an indicative nature based on desired goals for the autonomous development of the mining industry as a fundamental element of support for the development of the capital goods sector in Mexico.

Apart from the above, work on 28 specific mining projects is currently being carried out, which will guarantee a sequence of total investments in equipment and machinery, and establish volumes of minerals to be produced, up to 1985.

TABLE I

- FORECAST OF PRODUCTION AND INTERNAL DEMAND - 1980 - 2000

(Production Internal Demand)

	1975	1980	1985	1990	1995	2000
Metallics						
Silver	1183/174	1826/255	2195/341	2431/456	2722/611	3078/817
Lead	179/72	275/120	344/176	440/258	543/346	676/463
Copper	78/71	206/111	393/175	546/264	675/379	810/544
Zinc	229/63	346/94	427/42	521/199	625/260	752/340
Iron	3962/3479	4453/4891	6097/8218	1007/12798	15141/19907	22768/30266
Manganese	154/58	180/85	180/125	360/184	360/270	540/397
Non-Metallics						
Sulphur	£164/748	2440/949	3151/1413	4044/2029	5116/2780	6518/3809
Baryta	300/186	698/566	842/689	975/798	1130/925	1311/1073
Fluorite	1089/63	1410/313	1676/464	2026/688	2497/1020	3144/1573
Coal	5193/6957	8212/9170	13023/13023	19582/19582	29444/29444	44274/44274
Silica	519/734	850/980	1407/1407	2020/2020	2703/2703	3618/3618
Gypsum	1806/907	2491/1382	3334/2110	4579/3228	6378/4886	9069/7421
Phosphorite	282/1770	873/2200	1726/3000	2358/3833	3025/4892	3740/5952
Limestone	18652/18652	28717/28717	44283/44283	68383/68383	105743/105743	163726/163726
Rock and Sand	58000/58000	91000/91000	143500/143500	226000/226000	355750/355750	56 0000/560000

A general summary of such projects would indicate the value(in millions of pesos, current value) of both the total investment and the investment corresponding to equipment and machinery (see Table 2).

If the data related to programmed and in-process investments in Table 2 are compared with investments calculated as indicative, general goals for the development of the mining industry upto the year 2000, no significant differences are found: the programmed investment comes to 492.9 million dollars and the estimated (indicative) investment is calculated at 465.3 million dollars.

The same is true for the"programmed investment" of 1985/90, since the indicative value for that five year period is roughly the same. In contrast, for the ten-year period from 1990/2000 the "indicative goals" show strong growth.

In conclusion, considering investment evolution as representative of mineral production capacity and, thus, of supply, the estimate of investments in equipment and machinery since 1977 does not present significant differences when compared with other time periods.

Historical Time Periods

(Millions of dollars)

Annual average programmed investment in equipment and machinery		*Annual average indicative investment in equipment and machinery*
1977 =	*199.7*	*91.3*
1980 =	*98.6*	*97.5*
1985/90	-	
1990/2000	-	*148.3*

That is to say, the larger annual investments in machinery and equipment in the period from 1990 to 2000 are not excessive if it is considered that such annual investments will be even greater, according to the programmed investment, during the 1977-81 period. And those figures could become even higher if it is taken into account that the industrial projects for capital goods manufactures being promoted now, which will be in full production in the next decades, will require a variety and quantity of minerals unprecedented in the mining history of the country.

TABLE 2

TOTAL INVESTMENTS AND INVESTMENTS IN EQUIPMENT AND MACHINERY FOR 28 METALLURGICAL PROJECTS FROM 1977 / 1985

(Million of pesos, current value)

Years	*Total Investments*	*Investments in Equipment and Machinery*		
1977	*3.988*	*2.565*		
1978	*8.805*	*5.195*		
1979	*8.209*	*6.173*		
1980	*7.146*	*5.880*		
1981	*6.307*	*2.674*		
1982	*2.674*	*1.180*		
1983	*1.029*	*557*		
1984	*863*	*433*		
1985	*703*	*372*		
T o t a l	*39.804 (100 %)*	*25.029*	*(629%)*	*(100%)*
– Machinery and equipment for foundry and refining.		*8.671*		*(34.6%)*
– Machinery and equipment for plants and mines		*16.358*		*(65.4%)*

Source: *NAFINSA/UNIDO Capital Goods Project, Mining-Metalurgical Branch, Ing. Manuel Toron, NAFINSA, Oct. 1976.*

TABLE 3

COMPARISON OF DATA FOR POSSIBLE INVESTMENTS (1980 - 2000) AND PROGRAMMED INVESTMENTS (1977 - 1985) IN EQUIPMENT AND MACHINERY FOR MINING OPERATIONS

(Millions of 1977 dollars)

Year	Programmed Investments (28 Projects)	Periods	Estimated (indicative Investment
1977	114		
1978	230.9		
1979	274.3		
1980	261.3		
1981	118.8	1980/85	456.3
1982	52.4		
1983	24.7		
1984	19.2		
1985	16.5		
(Total	1112.1		
		1985/90	487.3
		1990/95	1482.9
		1995/2000	

Source: Capital Goods Project. Mining-Metallurgical Branch; Ing. Manuel Torón, NAFINSA, October 1976.
Study related to the Demand forecast for Machinery and Equipment in the Mining Sector, 1975/2000.
(Preliminary version) NAFINSA-UNIDO, Oct. 1978.

PULP AND PAPER INDUSTRY

1. Historical evolution, present conditions and future prospects.

1.1. Principal characteristics.

The principal characterics of the pulp and paper industry in 1977 were:

- *Insufficient national production; imports of cellulose in variable annual volumes and of paper in constant volumes.*

- *Capital-intensive; dynamic growth pattern (1971/1977 = 7.1% per year).*

- *Structurally characterized by two types of enterprises: integrated (producing both pulp and paper) and non-integrated (producing only pulp or paper).*

- *In 1977: 1. integrated*	*15*	
2. non-integrated	*50*	
2.1 pulp producers		*12*
2.2 paper producers		*38*
Total number of enterprises	*65*	

- *Geographical distribution:*

  12 enterprises in the Federal District and 53 in thirteen of the Mexican States.

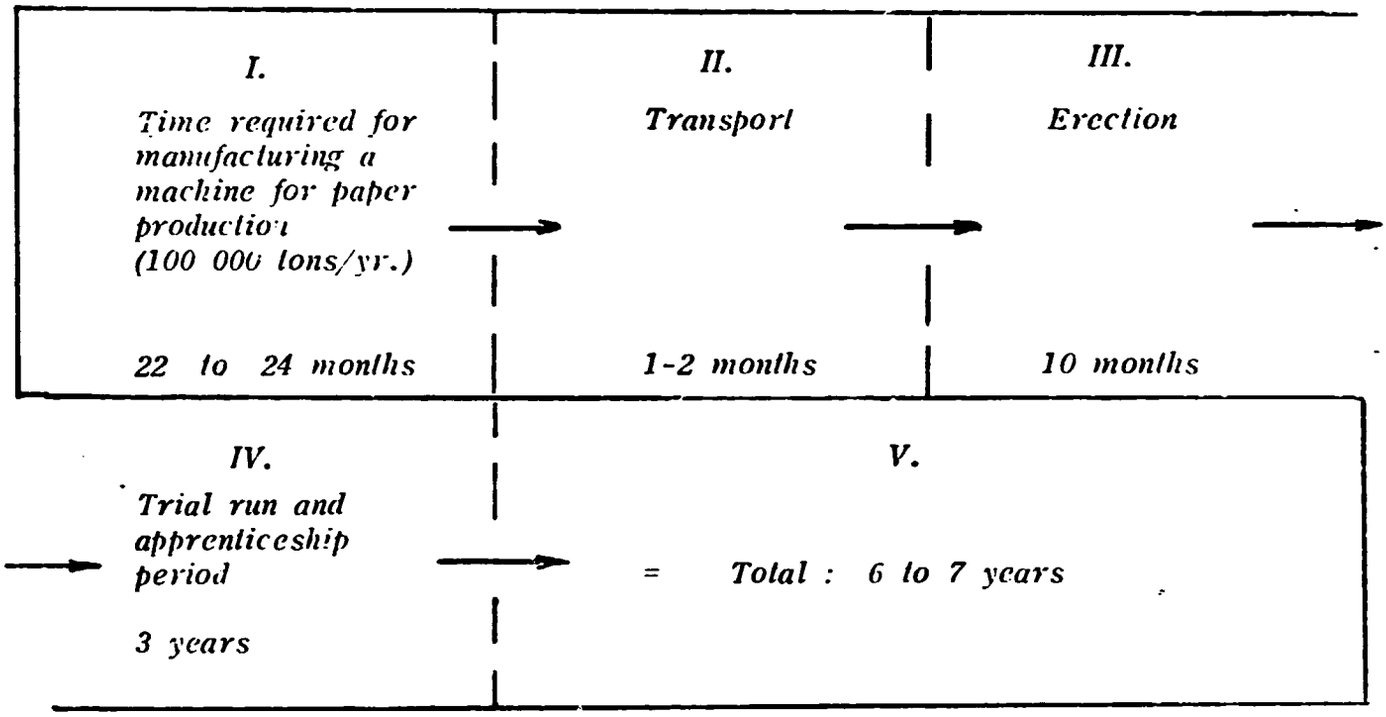
- *Installed production capacity is 821 000 tons/year of pulp and 1 790 000 tons/year of paper.*

1.2 *Methodology used in the study.*

- *On the basis of statistics related to apparent pulp and paper consumption, demand for a decade starting in 1978 was forecast, taking into consideration trends in utilization and/or substitution of different kinds of pulp and paper.*

- *Considering present installed capacity and possible future demand, an estimate was made of the number of the future plants required, and from that, machinery and equipment needs.*

- *The following figure shows the time sequence considered for the initiation of operations of the new plants:*



1.3 Pulp and paper demand

1.3.1 Kinds of pulps and paper derivatives

Eleven kinds of pulp are produced:

Sulphate wood pulp, bleached

Sulphate wood pulp, unbleached

Sulphite wood pulp, bleached

Sulphite wood pulp, unbleached

Straw pulp, bleached

Straw pulp, unbleached

Cotton waste pulp

Mechanical wood pulp

Other pulps

Use of the pulp depends on its type:

- Bleached	*Paper for printing and writing, sanitary tissues Bristol broad.*
- Unbleached	*Paper for wrapping, bags, sacks, cardboards and boxes.*
- Paper waste	*Assorted paper.*

1.4 National production of pulp: historical evolution

The pulp supply comes from 27 enterprises, 11 of which produce only pulp and 15 produce both paper and pulp in an integrated system.

Production in 1977 and 1978 was the following (in thousands of tons per year): 1970 = 472.9 and 1977 = 672. That is to say, production grew at an average rate of 5.2% per year.

The largest production volumes and their respective participation during the period mentioned correspond to the following pulps:

Unbleached sulphate wood pulp	*33.1 %*
Bleached wood pulp	*19.0 %*
Bleached sugar cane bagasse	*21.3 %*
Unbleached sugar cane bagasse	*7.6 %*
	81.0 %

The most dynamic production growth is seen in bleached sulphite wood pulp, bleached sulphate wood pulp, and unbleached sulphate wood pulp (17.1%, 7.5% and 5.1% per year, respectively) and also bleached sugar cane bagasse (12% per year).

Among pulp-producing materials, there has been a decreased use of mechanical wood pulp, as well as pulps from wheat, barley and cotton waste.

In general, it seems that there has been a decrease in use of the most costly raw materials for pulps.

1.5 Pulp imports, 1970/1977

All together, imports in cellulose pulp, and paper wastes have increased from 168 565 tons in 1970 to 203 218 tons in 1977, which gives an average annual rate of 2.7%.

There was a decrease in imports of mechanical wood pulp (-21.0%) and chemical sulphite wood pulp (-22%) and chemical shulphate wood pulp from non-coniferous woods (-23.0% annually) while increases were registered in imports of chemical sulphate wood pulps from coniferous woods (7.4%), and, especially, paper wastes in white and natural pulp colour (17.8%).

1.6 Apparent consumption of pulp.

The evolution of the apparent consumption of pulps between 1971 and 1977 indicates growth from 545 876 tons to 739 629 tons, i.e., an annual average growth rate of 5.2%.

Total participation of Mexican-produced pulps and imported pulps during those years was the following:

	1971	1972	1973	1974	1975	1976	1977
National (%)	86.9	85.3	73.9	74.6	85.5	83.9	91.2
Imported (%)	13.1	14.7	26.1	24.4	14.5	16.1	8.8
T o t a l	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The different kinds of pulps considered in apparent consumption estimates their shares in those years: sulphate wood pulp consumption increased notably to an annual rate of 7.7% and annual-plant pulps increased as well (6.8%) while, in spite of variations in annual consumption, mechanical wood pulps had a decreased share; the grouping called "other pulps" was more or less stable.

In summary, the behaviour of the different kinds of pulp materials was irregular, due to the growing substitution of some pulps for others because of cost or reasons of plant functioning (improved utilization of installed capacity, initiation of operations of plant expansions or new plants, etc.).

1.7 Paper demand

For the purposes of this study, classification according to use was chosen to define paper types. The following is a list of the different use classifications:

Paper for printing and writing

Coated papers and light board

Bristol board and light board

News print

Paper for bags, sacks and wrappings

Paper for boxes

Sanitary and facial tissues

Other papers

1.8 National paper production

The total number of paper producing enterprises in Mexico is 53; 15 are integrated and the remaining 38 produce only paper.

Paper production between 1970 and 1977 grew from 896 687 tons to 1 453 656 tons (7.2% annually), with variations for the different kinds of paper.

In terms of production growth, the most outstanding groups were: in first place, coated paper and light board, newsprint, and

sanitary and facial tissues; in second place, papers for printing and writing, and papers for boxes, and in third place, with limited growth, paper for bags, sacks and wrappings and other papers. Non-coated Bristol board and light board showed decreases.

Considering the production structure, from the point of view of tonnage and evolution during 1971/1977, the most outstanding groups were (%):

	1971	1977
Paper for boxes	31.6	34.3
Paper for bags, sacks, etc.	22.1	15.9
Paper for printing and writing	13.6	15.1
Non-coated Bristol board and light board	10.2	5.3
Covered papers and light board	8.3	12.0
	85.8	82.6

The market seems to be characterized by the following trends: paper for boxes shows sustained growth and share in total production; paper for sacks, bags and wrappings tends to have a decreasing share, being replaced by other materials--such a tendency could become accentuated even more in the future; paper for printing and writing have an important and increasing share in production, which reinforces the observation made regarding facial and sanitary tissues as well, i.e. that the trend is toward a larger participation

of the lighter papers; coated papers and light board show a more dynamic increase in production share than do the other groups; finally, in newsprint, the higher quality kinds (couché and rotogravure) tend to have a larger share in production because of more extended use of the new rotary offset printing presses.

1.9 Paper imports

Paper imports are basically complementary to internal production and, except for newsprint, are made up of special papers whose local production would not be economically justified. Three kinds of special papers are imported: paper for printing and writing, papers for packing and "other papers". The first group have gradually reduced their share from 1971 to 1977; the second group has increased and the third has decreased so much that its share in imports is almost insignificant.

Newsprint must be considered as a special case in terms of its share in imports and dynamic growth. From 1973 to 1977 its annual average growth rate was 17.9% and in the last year of that period (1977) its share in imports was 84.3%.

1.10 Apparent consumption of paper.

For the purposes of evaluating the apparent consumption of paper, three groups were considered: A includes the eight classes of paper established above; B includes 7 of the classes, excluding newsprint and C includes only newsprint.

An analysis of the three groups reveals the following facts:

- The apparent consumption of group A grew at a higher rate than that of national production (7.1% vs. 6.9%), which was compensated by import growth of 8.5%;

- Imports decreased in group B and increased in group C (newsprint).

- The most important phenomenon is the accelerated growth of national newsprint production (23% annually - 1973/77) in spite of which, import volumes doubled during the same period (1973 = 120 717 tons; 1977 = 233 217 tons, i.e. an average annual growth of 17.5%).

- The apparent consumption of newsprint shows a yearly rate of 19.2% and a larger share in total apparent consumption.

- The apparent consumption of group B papers, while showing decreases in recent years, is still predominant (81.6% in 1977).

1.11 Newsprint - a special case

There are many reasons why it is definitely in Mexico's best interests to begin to substitute newsprint imports with nationally produced newsprint:

- Local production was previously limited because other countries produced cheap newsprint in large volumes up until 1973.

- In constrast, since 1973 it has become profitable to produce newsprint locally, and in this field Mexico has certain comparative advantages since the sugar industry (an important sector in Mexico) already can provide adequate technology and supplies of bagasse.

- The outflow of foreign exchange for newsprint imports makes it desirable to undertake national production, which would be based on wood pulps, bagasse pulp and waste paper.

2. Demand forecasts for pulp and paper

Two sets of hypotheses were used to examine the possible future demand for pulp and paper:

a) Correlations between apparent consumption of the different kinds of papers and the indicative variables of their behaviour.

b) An hypothesis related to the rates at which the explanatory variables of apparent paper consumption will grow.

2.1 Future demand of paper 1977/1987

Total paper demand will grow at a rate of 8.0% per year, slightly higher than the growth rate of the period from 1970 to 1977, which was 7.2%.

At the same time, there will be different rates of growth for each of the eight kinds of papers considered, which would also be interesting to compare with the previous period.

	1970/77 (%)	1977/87 (%)
Paper for printing and writing	8.7	5.3
Coated papers and light board	12.9	12.2
Non-coated papers and light board	-2.4	3.4
Newsprint	12.2	6.9
Paper for bags, sacks etc.	2.2	4.9
Paper for boxes	8.4	8.9
Sanitary and facial tissues	12.2	10.1
Other papers	2.3	4.6
T o t a l	7.2	8.0

In synthesis, it can be concluded that the demand for non-coated papers and light broad, papers for bags, etc., and other papers will be strengthened while demand for papers for printing and writing, newsprint and sanitary and facial tissues will decrease. Coated papers and light board and paper for boxes will remain fairly stable.

2.2 Future demand for pulp

The hypotheses related to pulp demand calculated as adequate for satisfying the estimated volumes of paper demand were based on technological relations between the different kinds of pulps and their substitution tendencies along with the advances in process technologies, some of which have already been developed in Mexico, such as bagasse exploitation.

On this basis, pulp demand calculations would indicate growth double that of the period from 1970 to 1977 (10.0% vs. 5.2% annually).

A comparison between demand for different kinds of pulp during 1970/77 and estimated demand during 1977/87 would show the following facts:

	1970/77 (%)	1977/87 (%)
Bleached sulphate wood pulp	7.7	9.7
Unbleached sulphate wood pulp	7.7	6.5
Bleached sulphite wood pulp	-4.8	11.1
Unbleached sulphite wood pulp	-4.8	8.9
Bleached bagasse pulp		20.5
Unbleached bagasse pulp	6.8	8.9
Unbleached straw pulp	6.8	8.9
Cotton waste	6.8	7.2
Mechanical pulp	-5.0	7.1
Other pulps	-4.1	14.1
Waste materials		8.6
Mechanical waste pulps		1.6
T o t a l :	5.2	10.0

It is considered that the estimated growth of pulp demand carries with it implicit indications of changes in the structure of supply and demand, such as:

- *Import substitutions would be intensified*
- *There would be a strong increase in national production of newsprint, mainly through the Mexicana de Papel Periódico, S. A. plant (100 000 tons/year capacity).*

- There would be a trend toward greater production of bagasse pulp, especially bleached pulp which would have a greater proportional share in production of newsprint and paper for printing and writing.

- There will be a rapid growth of chemical wood pulps, and, in contrast, a drop in the demand for pulps from straws, cotton waste, and the mechanical pulps of wood and waste materials, at the same time the use of recycled waste paper pulps will maintain a predominant rôle even though there will be a slight decrease in its participation.

3. Programming for additional installations required to satisfy the future demand for paper and pulp.

3.1. Methodological considerations.

Stages:

I. Determine demand for paper and pulp, in homogeneous groups of products and similar equipment.

II. Define modular plant types.

III. Formulate the number of new installations and equipment needed, differentiating:

a) Projects for existing enterprises

b) Projects for new plants in new enterprises

c) Periods for initiation of operations

d) Periods for "training curves"

e) Examine possibilities for improving existing installations in order to increase efficiency and/or make them specialized.

IV. Examine consumption trends along with production technologies, and comparative advantages of raw material substitutions.

In synthesis, establish a program proposal for increasing the capacity of this industry in the 1978/87 period.

3.2 Regrouping paper and pulp types.

Plant preparation requires grouping similar products together so as to obtain better equipment utilization for both paper and pulp.

The number of modular plants and their respective scales were determined with this in mind:

Future demand for re-grouped paper products

The following listing shows the new paper groupings and their demand in 1978/87 (in thousands of tons per year):

Groups	*1977*	*1987*	*Annual %*
Printing and writing papers	*396*	*837*	*7.8*
Newsprint	*318*	*618*	*6.6*
Sanitary and facial tissues	*134*	*349*	*10.0*
Packaging papers	*947*	*2 074*	*8.2*
T o t a l	*1 795*	*3 878*	*8.0*

Future demand for re-grouped pulps

The future demand for pulp, re-grouped into five classes, was estimated as follows (in thousands of tons per year):

Groups	1977	1987	Annual %
Chemical wood pulps	574	1 303	8.5
Sugar bagasse pulp	225	1 217	18.4
Unbleached straw, cotton waste and other pulps	36	98	10.5
Mechanical pulp and mechanical waste pulps	689	1 480	7.9
T o t a l	1 678	4 376	10.0

3.3 Modular plants

Paper production

Two major sections were identified in paper production plants: pulp preparation and paper manufacture. Equipment differs according to the kinds of paper to be manufactured, their weights, equipment capacities and raw material to be used.

The study considered the machinery necessary for producing the four new selected classes of paper in their respective modular plants.

Equipment design

The most important unit in the equipment for paper production is the paper machine, because of its high cost and the tendency to use machines with high production capacities.

The modern trend is to use designs for reaching high production capacities with low initial cost and lower maintenance and operation costs. Such designs differ in capacities, raw material to be used and kinds of controls.

For this study, various kinds of machines were considered according to the modular model plants examined.

Equipment capacities and trends

In chosing the capacity ranges of equipment, the conditions and trends characterizing the industrial development of the country were taken into account, some of which could establish comparative advantages for Mexico in foreign competition with certain products.

There is great variety and heterogeneity in the equipment currently in use in Mexico. Along with many models which were bought second-hand and have since been discontinued, there are modern and efficient machines. The latter are being utilized in the production of sanitary and facial tissues and for one newsprint unit.

In some cases, the local tendency has been toward installing integrated pulp and paper production plants, in others toward non-integrated plants, for various reasons. The present study has chosen to consider equipment for non-integrated pulp plants and paper plants

and, therefore, there is duplication of certain equipment which could be consolidated in the case that integrated plants were preferred.

Modular paper plants

The modules adopted were:

- *Newsprint plant using sugar bagasse (100 000 tons/yr.)*
- *Packaging paper and cardboard plant (90 000 tons/yr.)*
- *Printing and writing paper plant (50 000 tons/yr.)*
- *Sanitary and facial tissue plant (25 000 tons/yr.)*

In terms of weight, the following ranges were adopted:

Kind of paper	*Weight gram/meter^2)*
Sanitary and facial	*12 to 20*
Printing and writing	*more than 40 to 90*
Packaging	*more than 40 to 90*
Newsprint	*52*

A net production year was considered to have 350 days.

The basic equipment needed in a newsprint plant using sugar bagasse was determined on the basis of an integrated sugar bagasse pulp and newsprint plant with the same capacity as the chosen model plants. This kind of plant was selected because of the ample availability of such raw material in Mexico.

Table 1 presents the equipment groups that make up the modular paper plant types, and their comparative costs.

Modular pulp and mechanical paste plants.

The modules chosen, production scales and a comparative listing of equipment groups and their estimated costs is found in Table 2.

Plant capacities were planned in relation to the needs of paper plants, in order to supply one or more such plants, taking into account the pulp mixtures they use.

As in case of paper plants, these model plants were not considered to be integrated. Nevertheless, an attempt was made to ensure that they would have capacities corresponding to the capacities of the model paper plants.

TABLE 1

Group of equipment making up the model paper plant and their cost structure

(Thousands of 1977 Mexican Pesos)

Items	Bagasse newsprint Plant (100,000 tons/ year)	%	Paper and cardboard for packaging. (90 000 tons/year)	%	Painting and Writting. Paper(50 000 T./yr)	%	Sanitary and facial tissue (25 000 Tons/ year)	%
Pulp preparation		-		3.		-		4.9
Constant equipment pool (used in all plants)		-		4.1		1.6		5.7
Water Recovery		2.4		-		1.6		-
Waste recovery		-		-		-		2.4
Paper making machine		65.9		78.3		82.4		61.5
Infrastructure equipment		19.8		5.8		4.5		10.4
Maintenance equipment		2.8		3.2		3.5		5.4
Electrical motors		-		-		1.6		2.3
synchronous		-		-		-		-
D. C.		-		-		-		
Electrical equipment		2.3		2.5		2.7		4.8
Fire-extinguishing equipment		-		-		-		-
T o t a l	548 364	93.2	466.035	96.9	285 321	97.9	813.4	97.4

TABLE 2

Group of basic equipment for modular model pulp plants and their cost structure

(Thousands of 1977 Mexican Pesos)

Items	Sugar bagasse pulp plant (100 000 tons /year)	%	Chemical wood pulp plant. (122 000 T/yr.)	%	Ground wood Mechanical pulp and refined pulp plant. (56 000 T/yr.)	%	Waste paper pulp plant (56 000 T yr.	%
Reception and depithing of bagasse		14.		14.3		5.1		2.3
Cooking, washing and purfying		18		25.3		66		50.8
Bleaching and washing of pulp		6.2		8.1				
Recovery and preparation of chemicals		19.3		39.7				
Plant infrastructure		17.9		4.5		9.1		18.1
Maintenance equipment		20		-		2.2		5
Electrical motors		2.2		3.		7.3		11.7
Electrical equipment		1.8		2.8		8.1		8.1
Fire-extinguishing equipment		-		-		2.2		4.
Total	602 427	99.4	455 753	97.7	133 006	100.0	61 843	100.0

3.4 *Installed capacity for pulp and paper manufacture*

As can be seen in Figure 1, the installed capacity for pulp and paper manufacture in 1977 came the following total tonnages: paper 1, 790,000 tons/yr., andpulp, 821,000 T/yr., with the structure described below:

1) *Paper*	*for printing and writing*	*20.5 %*
	and cardboard for packaging	*62.2%*
	sanitary and facial	*8.1%*
	newsprint	*7.0%*
	specialities	*2.2%*
	Total utilization of installed capacity	*100.0%*
2) *Pulp*		*81.0%*
	Chemical wood	*52. %*
	Chemical bagasse	*32.4%*
	Mechanical	*8.8%*
	Annual plant	*3.4%*
	Others	*0.8%*

Total utilization of installed capacity *82.0%*

3.5 Programming for new modular model paper and pulp plants

Once the relation between apparent consumption of paper and pulp and the capacities installed for their manufacture was established, the development of the new installations was programmed in keeping with the estimates of future demand.

Obviously, the expansion (in -process or to be developed) of existing plants was also considered and calculations made as to the supply situation after the initiation of operations of such expansions, estimating the times required for installation and training.

Finally, a program was designed which is graphically represented in figure 2.

3.6 Basic equipment and machinery needs for 1978/87

Equipment and machinery needs for 1978/87 were determined from the calculations for the modular model plants: four major groups were defined:

- *specific machinery and equipment: a) to produce pulp and b) to manufacture paper;*
- *selected electrical machinery and equipment for the pulp and paper industry.*
- *Standard machinery and equipment chosen for the pulp and paper industry:*

Within each group, basic equipment and machinery was classified into general categories and within each category, specific machines and equipment units were determined and the value estimated for each item.

In Tables 1 to 4 the over-all quantity of machinery and equipment and their global value in millions of 1977 pesos was summarized according to general categories (no detailed information is presented).

TABLE 3

TOTAL INVESTMENT REQUIRED IN MACHINERY, BASICS AND EQUIPMENT FOR THE PULP AND PAPER INDUSTRY FOR 1978 - 1987

Items	Total value 1/ (million of pesos)	Structure %
I. Equipment for handling and preparing raw materials	144 2	1.3
II. Equipment for shredding and purifying	774.2	7.1
III. Equipment for washing and purifying pulp and paste	1 025.8	9.5
IV. Equipment for bleaching and washing pulp	364.5	3.3
V. Equipment for cleaning and refining paste	83.3	0.8
VI. Equipment for cellulose and paste dehydration	593.5	5.5
VII. Equipment for recovery and preparation of chemicals	1 369.4	12.6
VIII. Equipment for preparing pastes and for water and waste recovery	358.2	3.3
IX. Paper machines	6 136.0	56.7
Total sum	10 849.1	100.0

Source: NAFINSA/ONUDI

1/ At Oct. 1977 prices. LAB suppliers plants.

TABLE 4

TOTAL INVESTMENT REQUIRED FOR STANDARD ELECTRICAL EQUIPMENT CHOSEN FOR THE PULP AND PAPER INDUSTRIES DURING 1978 - 1987

Items	Total value 1/ (million of pesos)	Structure %
I. Electrical motors and equipment	2 048.6	38.1
II. Pumps and agitators	670.0	12.5
III. Fire-extinguishing equipment	478.0	8.9
IV. Maintenance equipment	284.0	5.3
V. Travelling cranes and hydraulic cranes	390.1	7.3
VI. Steam generators and boilers condensors	741.9	13.8
VII. Steam generators and boilers, condensers, evaporators	239.7	4.5
VIII. Steam turbocompressors	174.1	3.2
IX. Water treatment equipment	196.6	3.6
X. Pumps for fuel oil	19.6	0.4
XI. Laboratory measuring and testing equipment	131.3	2.4
Total sum	5 373.9	100.0

Source: NAFINSA-ONUDI Capital Good Project.

1/ At Oct. 1977 prices LAB suppliers plant.

4. CONCLUSIONS

1. *Total investment in machinery and equipment will reach 16 223 million pesos (current value)*

2. *The investment corresponding to machinery and basic process equipment comes to 10.849 million pesos (current value)*

3. *Investments in electrical machinery and equipment and in standard equipment are, respectively, 2,042 and 3331.9 million pesos, that is, a total of 5,374 million pesos (current value)*

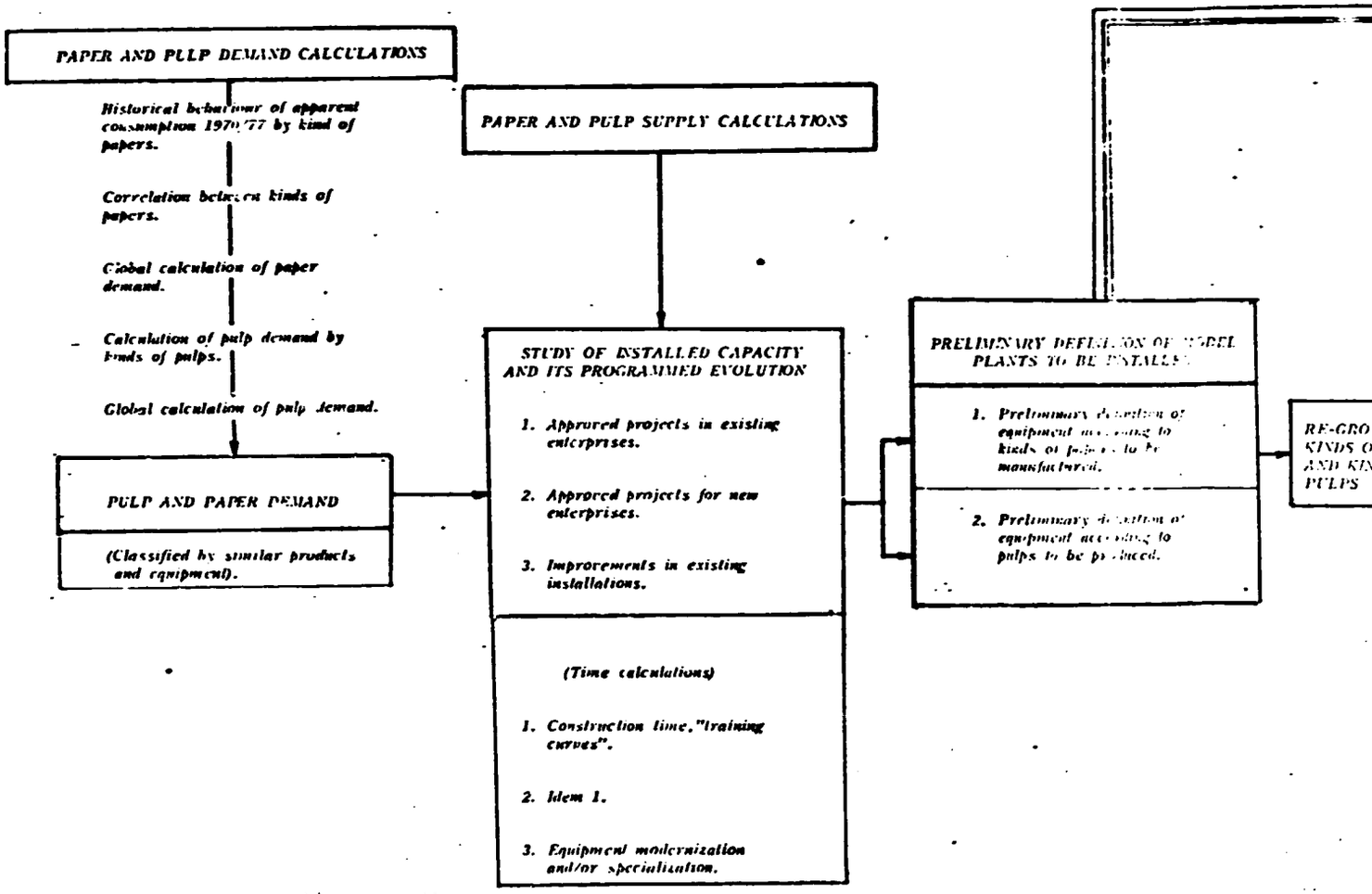
4. *Total gross investment for the paper and pulp industries is estimated at some 32,400 million pesos*

	Million of pesos (current value)
- *Total investment in machinery and equipment*	*16 223.00*
- *Investment in basic processes machinery and equipment*	*(10 849.00)*
- *Investment in electrical equipment and machinery*	*(2 042.00)*
- *Investment in general use equipment*	*(3 332.00)*
- *Investment in land; civil works; erection and setting-up, engineering, and technology; organizational and pre-operational financial expenses; freight, insurance and working capital.*	*16 200.00*
	32 423.00

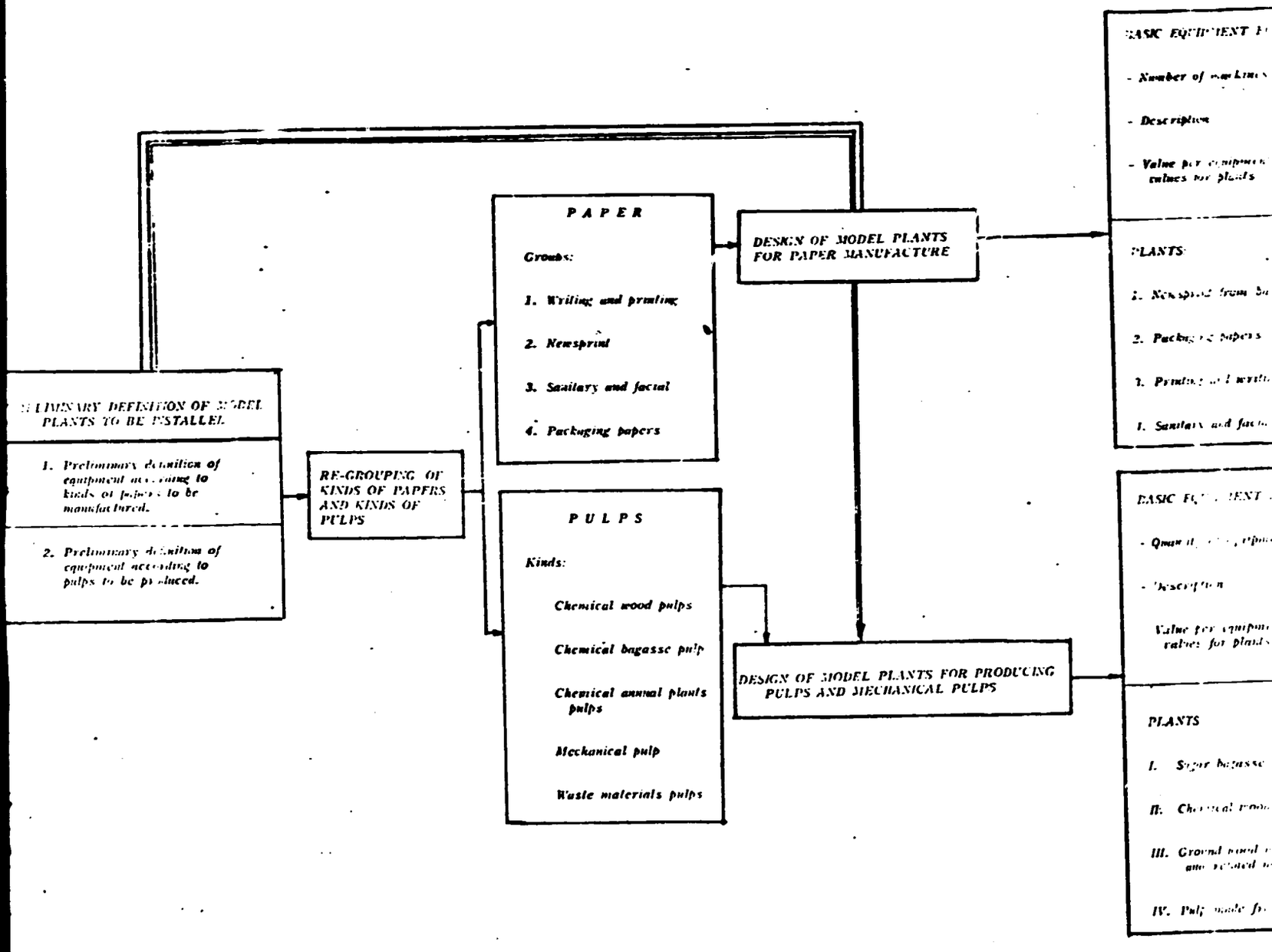
FIGURE 1

ESTIMATE OF THE EVOLUTION OF PAPER AND PULP SUPPLY AND DEMAND BETWEEN 1977 AND 1987 M ton/year

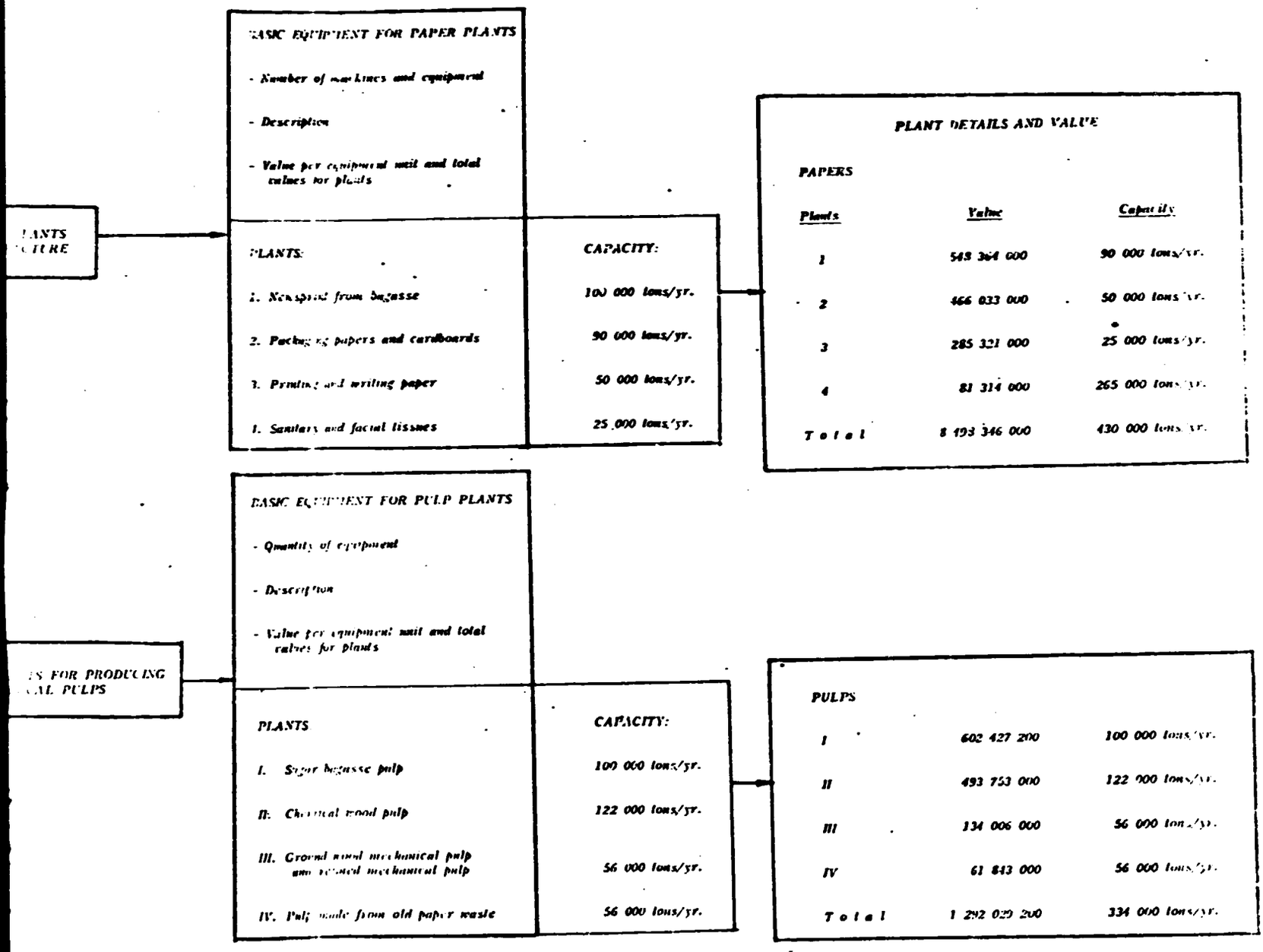
	Present Situation (1977)				Future Situation (1987)		
Paper	Apparent Consumption	Installed Capacity	Installed supply plus expansion projects	Deficit or surplus in regard to apparent consumption	Expanded supply capacity plus installation of additional plants	Estimated Apparent Consumption	Deficit or surplus in regard to apparent consumption
Groups	- 1977 -	-1977-					
Printing and writing							
a)Newsprint, free books	393	367	406	+ 13	818.5	838	19.5
b)Bristol board and others	323	90	90	233	536	618	82
- Packing	924	1114	1114	+ 90	1969	2074	10.5
-Sanitary and facial	126	145	145	+ 19	319	349	30
-Specialities		38.5					
Total	1766	1754.5	1610	11	3642.5	3879	236.5
Pulps							
- Chemical wood a) sulphate	574	426.5	447.5	126.5	1167.	1303	136
b) sulphite		21			1061	1217	156
-Chemical bagasse	225	266	266	+ 41			
- Annual plant pulps					272.5	278	5.5
- Mechanical pulp	154	72.5	72.5	81.5	1222	1480	258
- Recycled	689	40	40	649			
Total	1651	826	826	815.5	3722.5	4278	555.5


PAPER AND PULP DEMAND CALCULATIONS
Historical behaviour of apparent consumption 1970/77 by kind of papers.
Correlation between kinds of papers.
Global calculation of paper demand.
Calculation of pulp demand by kinds of pulps.
Global calculation of pulp demand.
PULP AND PAPER DEMAND
(Classified by similar products and equipment).
PAPER AND PULP SUPPLY CALCULATIONS
STUDY OF INSTALLED CAPACITY AND ITS PROGRAMMED EVOLUTION
1. Approved projects in existing enterprises.
2. Approved projects for new enterprises.
3. Improvements in existing installations.
(Time calculations)
1. Construction time, "training curves".
2. Idem 1.
3. Equipment modernization and/or specialization.
PRELIMINARY DEFINITION OF MODEL PLANTS TO BE INSTALLED
1. Preliminary definition of equipment according to kinds of papers to be manufactured.
2. Preliminary definition of equipment according to pulps to be produced.
RE-GRO
KINDS O
AND KI
PULPS

SECTION 1


PRELIMINARY DEFINITION OF MODEL PLANTS TO BE INSTALLED
1. Preliminary definition of equipment according to kinds of papers to be manufactured.
2. Preliminary definition of equipment according to pulps to be produced.
RE-GROUPING OF KINDS OF PAPERS AND KINDS OF PULPS
PAPER
Groups:
1. Writing and printing
2. Newsprint
3. Sanitary and facial
4. Packaging papers
PULPS
Kinds:
Chemical wood pulps
Chemical bagasse pulp
Chemical annual plants pulps
Mechanical pulp
Waste materials pulps
DESIGN OF MODEL PLANTS FOR PAPER MANUFACTURE
DESIGN OF MODEL PLANTS FOR PRODUCING PULPS AND MECHANICAL PULPS
BASIC EQUIPMENT
- Number of machines
- Description
- Value per equipment
values for plants
PLANTS
1. Newsprint from
2. Packaging papers
3. Printing and writing
4. Sanitary and facial
BASIC EQUIPMENT
- Quantity
- Description
Value per equipment
values for plants
PLANTS
I. Sugar bagasse
II. Chemical wood
III. Ground wood
IV. Pulp

SECTION 2


PLANTS
TURE
BASIC EQUIPMENT FOR PAPER PLANTS
- Number of machines and equipment
- Description
- Value per equipment unit and total values for plants
PLANTS:
1. Newsprint from bagasse
2. Packaging papers and cardboards
3. Printing and writing paper
4. Sanitary and facial tissues
CAPACITY:
100 000 tons/yr.
90 000 tons/yr.
50 000 tons/yr.
25 000 tons/yr.
PLANT DETAILS AND VALUE
PAPERS
Plants
Value
Capacity
1
548 364 000
90 000 tons/yr.
2
466 033 000
50 000 tons/yr.
3
285 321 000
25 000 tons/yr.
4
81 314 000
265 000 tons/yr.
Total
8 193 346 000
430 000 tons/yr.
S FOR PRODUCING
AL PULPS
BASIC EQUIPMENT FOR PULP PLANTS
- Quantity of equipment
- Description
- Value per equipment unit and total values for plants
PLANTS
I. Sugar bagasse pulp
II. Chemical wood pulp
III. Ground wood mechanical pulp and refined mechanical pulp
IV. Pulp made from old paper waste
CAPACITY:
100 000 tons/yr.
122 000 tons/yr.
56 000 tons/yr.
56 000 tons/yr.
PULPS
I
602 427 200
100 000 tons/yr.
II
493 753 000
122 000 tons/yr.
III
134 006 000
56 000 tons/yr.
IV
61 843 000
56 000 tons/yr.
Total
1 292 029 200
334 000 tons/yr.

SECTION 3

PETROLEUM: (REFINING, TRANSPORT AND DISTRIBUTION OF HYDROCARBONS) AND PRIMARY PETROCHEMICALS

Analytical method and criteria utilized.

Given that this is a centralized, State activity, demand estimates for products were not required in order to calculate the growth of supply, nor was it necessary to program the works to be carried out in order to estimate the demand for capital goods.

Calculations were based on the plans proposed by Petroleos Mexicanos (PEMEX), principally composed of the estimate of internal demand for oil and petroleum products and of proposals for exports of gas, oil, petroleum products and petrochemicals.

The major topics considered in the analysis being described, were:

1. *The present situation and future prospects for Mexico's petroleum sector:*

   1.1 Historical evolution (1965-1977)

   1.2 Present situation

   1.3 Prospects for the sector in the period 1977-1986

2. *The Investment Program, programmed for the periods of 1977-1982 and 1983-1986.*

3. Methodological aspects of the study.

3.1 Classification of capital goods required in the development phases of the petroleum industry.

3.2 Characteristics of some of the selected capital goods.

3.3 Determination of the manufacturing origin of the selected goods.

3.4 Definition of PEMEX's projects.

3.5 Determination of the value of the demand for required capital goods.

3.6 Characterization of the demand.

3.7 Weight functions.

3.8 Price functions.

3.9 Definition of a model refining plant.

3.10 Definition of a petrochemical model with its model plants.

4. A comparison of the prices of equipment and machinery produced in Mexico and in the U.S.A.

- *Materials.*
- *Equipment.*

5. Formulation of the total demand for capital goods in oil refining.

5.1 Value of equipment and machinery demand per production unit.

5.2 Calculation of total demand for equipment and machinery for the period 1977-1986.

5.3 Characteristics of materials and equipment.

6. Capital goods demand for Primary Petrochemicals.

6.1 Value of demand.

6.2 Characteristics of materials and equipment.

7. Capital goods demand for the transport and distribution of hydrocarbons.

8. Summary of total equipment and materials demand for the petroleum industry (refining, transport and distribution of hydrocarbons, and primary petrochemicals.)

1. The present situation and future prospects of Mexico's petroleum sector.

1.1 Historical evolution (1965-1977).

Certain major characteristics define the historical behaviour of the sector:

The annual growth rate of the gross national product of the petroleum industry during 1965-1977 was close to 9% higher than the GNP of the economy as a whole which only reached 5% yearly; likewise, the industry's share in the GNP increased from 3.5% in 1965 to 5% in 1977.

Petroleum production (and liquid gas) during the 1965-1977 period grew by 9.5% annually, thanks to the discovery of new petroleum and gas reserves in the southeast of the country, this made it possible to supply the growing market which was expanding to cover greater industrial and transport demands.

Natural gas production increased but not with the same dynamism shown by oil, as wells with a lower gas-oil ratio were incorporated into production.

Production of refined petroleum grew at an annual average rate of 6.9%.

PEMEX investments, in millions of pesos, increased from 4 573 in 1967 to 34 169 in 1977, the main increases having been produced in and after 1975.

1.2 Present situation.

In keeping with the aforementioned data, the present situation of the enterprise can be summarized as follows:

- GNP in 1977 (1960 prices)	*20 400 MM$*
- Petroleum share in GNP in 1977	*5%*
- Capital invested during 1967-1977	*114 500*
- Personnel employed in direct activities	*17 000 people*
- Estimate of personnel employed in industrial activities	*102 000*
- Production of petroleum and liquids (1977)	*396.2 MMbbl/yr.*
- Natural gas production (1977)	*21 148 MMbbl/yr.*
- Refining capacity in a total of seven refineries (1977)	*935 000 bbl/day.*

1.3 Prospects for the sector in the 1977-1986 period.

1.3.1 Oil and gas production.

The prospects for the 1977-1986 period are based on the basic oil and gas production programs and their corresponding exports. The data for the period 1977-1982 are the following:

(in thousands of barrels per day and millions of cubic feet per day):

		1977	1982
Oil production		*453*	*2 242*
Natural gas production		*2 183*	*3 630*
Exports:	*crude*	*153*	*894*
	refined	*-*	*211*
	gas (not determined yet)		

1.3.2. Refinery production.

In order to satisfy increased internal demand and to export both crude and refined oils and eventually gas, crude processing capacity and by-product production will be increased. In synthesis, the program is the following:

Increase in capacity of existing plants

(bbl/day) 1978/1979

(Three plants)

Naphtha hydrodesulfurization (HDS)	*50 000*
Naphtha reforming	*36 000*
Hydrodesulfurization of middle destillates	*50 000*
Fluidized catalytic cracking (FCC)	*68 000*
Sulfur	*85*
Lubricants	*2 000*

Increases through incorporation of new plants

(Thousands of barrels/day) 1977-1985

(Six plants)

Crude processing capacity	*1 205*
Crude distillation	*1 070*
Vacuum distillation	*610*
Naphtha hydrodesulfurization (HDS)	*205*
Kerosene hydrodesulfurization (HDS)	*150*
Diesel hydrodesulfurization (HDS)	*150*
Catalytic reformation	*140*
Fluidized catalytic cracking (FCC)	*240*
Lubricants	*10*

2. *Investment program for refining, petrochemicals and transport and distribution of hydrocarbons.*

2.1 Total investments

First, it must be pointed out that the investment program presented here is only valid until possible future variations modify it, the following is a synthesis of the major figures in the program (in millions of 1977 pesos):

Investments to be carried out in the 1977-1986 period.

Refining	*77 627*	*37 %*
Primary petrochemicals	*69 878*	*33.3%*
Transport and distribution	*62 200*	*29.7%*
Total	*209 705*	*100.0%*

At the time when this general investment program was formulated, the idea was that investments, with a slight variation between 1984 and 1985, should be more concentrated in the early years and gradually taper off toward the end of the period.

2.2 General Program of Works and Investments in Primary Petrochemicals 1977-1986.

The petrochemicals program consists of 14 plants, six of which take up 91.3% of total investment.

In contrast to the geographical distribution of the refining plants, which apart from those in the Federal District are located in 6 states in various areas of the country, petrochemical plants are mainly concentrated in 8 of the southeastern states where 63% of total investment will be used, according to the definitions adopted up until now, since one remaining plant which constitutes 32.8% of investment has not yet been defined.

2.3 Program for works and investments in transport and Distribution of Hydrocarbons (1977-1986)

This program covers major works and investments in oil and gas pipelines: 20.6% and 54.5%, respectively, of the program total; pipelines for refined products and petrochemicals have less importance, 12.3% and 1.9% respectively. Storage centers constitute a total investment of 10.8%.

3. *Methodology for the classification of capital goods.*

Definition of materials and equipment

The equipment and materials required by the sector were defined and listed as follows:

Classification of Capital Goods for the Petroleum industry, by major categories.

3.1. Heat exchangers

2. Air coolers (soloaire)

3. Heaters

4. Pressure vessels

5. Pumps and drives

6. Compressors

7. Blowers

8. Steam turbines

9. Diesel engines

10. Instrumentation

11. Motors

12. Transformers

13. Distribution panels

14. Motor control centers

15. Electrical materials

16. *Boilers*

17. *Turbogenerators*

18. *Cooling towers*

19. *Water treatment equipment*

20. *Flares*

21. *Special and miscellaneous equipment*

22. *Storage tank materials*

23. *Piping*

24. *Structural steel*

25. *Electrical conductors*

26. *Spare parts*

3.2 Selection of some typical goods and their characteristics.

From the above list, the following typical goods were selected: heat exchangers, air coolers, pumps and drives, turbines and motors, instrumentation, boilers, water treatment equipment, special and miscellaneous equipment, storage tank materials, piping, electrical conductors, spare parts in general. A description was made of the general characteristics, parts and materials of each of these groups of goods.

3.3 Classification of goods by manufacturing origin.

Made-to-order goods (pressure vessels, heat exchangers, air coolers, structural steel) were differentiated from catalogue goods.

3.4 Definition of PEMEX projects.

At the time this study was made, while refining projects had been formulated by PEMEX, petrochemical projects had not, and it became necessary to theorize on the basis of information provided by the Mexican Petroleum Institute (Instituto Mexicano del Petróleo, IMP), for the 1982-1986 period especially.

In regard to transport and distribution projects, information was based on proposals from the IMP in conjunction with PEMEX.

In many cases, project investments were estimated and schedules for investment and execution were reconstructed on the basis of information from PEMEX and the IMP.

3.5 Determination of the value of capital goods demand.

In order to determine the value of capital goods these steps were followed:

- *Design of models for refining and petrochemicals in the projects or models defined.*
- *Determination of the components.*
- *Calculation of the value share of capital goods in the defined projects or in the refining and petrochemical models.*

3.6 Characterization of demand by equipment types:

The calculation of quantities of equipment according to major characteristics (size, kind and material composition) was necessary in order to plan future manufacturing projects to complete equipment supply.

3.7 Weight functions.

The calculation of equipment weights was necessary in order to program plant capacities and dimensions, by tonnages to be produced in piping, plate, castings, etc.

3.8 Price functions.

This analysis made it possible to determine prices per unit of weight for each kin of equipment. Examples, heat exchangers, pumps, pressure vessels t was found that the price-weight ratio was inverse, that is, when weight increased price per unit decreased.

3.9 Refining model.

On the basis of a chosen refinery (Salina Cruz II) which was considered as a representative model of the refineries to be installed by 1986, the capital goods required for such plants were determined.

Technical specifications were supplemented with information from other refineries already operating in the country or whose equipment

is being acquired for installation in the near future. escalating and de-escalating capacities in relation to the model.

3.10 Petrochemical model

In order to define this model, plants were organized into groubings according to the processes to be carried out:

Group No. 1 *Olefins type processes*

(A breakdown of equipment values for an ethylene plant was used for this type of processes.)

Group No. 2 *Gas synthesis-type processes*

(The percentile structure of an ammonium plant was applied in its entiretly for this group.)

Group No. 3 *Aromatics-type processes*

(The percentile structure of an ethylbenzenestyrene plant was applied for this group.)

Group No. 4 *Gas processing*

(For the breakdown of plant values, data from existing cryogenics and sweetening plants was used.)

Group No. 5 *Refining type processes (complementary to the petrochemical plants.)*

(The percentile breakdown of equipment values was based on the model plants in the refining model.)

4. Comparison of prices for equipment produced in Mexico and in the U.S.A.

A comparison was made of: the prices for "the total cost of direct labour" in the U.S.A. and in one of the Mexican capital goods industries; of the price of carbon steel plate in Mexico, the U.S.A. and Japan; and of the prices of certain equipment used in refineries (pumps, motors, etc.) in Mexico, U.S.A. and the United Kingdom.

In the "total cost of direct labour" the difference in favour of Mexico was 8.03%.

In carbon steel, the price as of October 1977 in Mexico was 1.5% lower than the price in Japan and 19.7% lower than the price in the U.S.A.

In terms of equipment, it was observed that for three kinds of pumps, (105-108 BHP, 4.5 BHP and 160-170 BHP) against 13 bid prices (11 from the U.S.A. and 2 from England), Mexican bid prices were better in 11 cases. In regard to motors (125 HP, 7.5 HP and from 200 to 250 HP) the situation was similar.

The same is true of control valves, pressure vessels and instruments, with different percentages of difference, the largest difference being in pressure vessels.

The final conclusion was that the Mexican capital goods industry has an advantageous situation in prices, as long as demand can be programmed and a smooth and constant supply of steels and alloys as basic materials can be counted on.

5. Formulation of the total demand of capital goods for petroleum refining.

5.1 Value of demand per plant and total demand of equipment and materials.

The refining model involves nine units:

1 Crude distillation (200 000 Bbls/day)

1 Vacuum distillation (100 000 Bbls/day)

1 Naphtha HDS (25 000 Bbls/day)

1 Catalytic reformer (25 000 Bbls/day)

2 Gasoil and Kerosene HDS (25 000 Bbls/day)

1 Fractionation and treatment (25 000 Bbls/day)

1 Fluidized catalytic cracking (FCC) (40 000 Bbls/day)

1 Service unit.

The total for these units was summarized in Tables 1 and 2, as the "Total value of equipment demand" and the "Value of demand for materials".

5.2 Calculation of total demand for equipment and materials 1977-1986.

The demand for equipment and materials calculated for the Refining Model is the following (in 1977 Mexican pesos).

Equipment	*3 250 199 580*	*56%*
Materials	*2 546 898 526*	*44%*
Total	*5 806 098 106*	*100%*

Since the investment for the model constitutes 21.3% of total investment for refining materials and equipment during 1977-1986, the total value would be 4.7 times the figure of 5.806.098.106 pesos, that is, 27.300 million 1977 pesos.

An equipment breakdown is presented in Table 3.

Table 1

Refining model: Total value of equipment demand

(1977 pesos)

Crude distillation	*318 207 162*
Vacuum distillation	*255 715 278*
Naphtha HDS	*173 311 138*
Gas oil HDS	*283 843 924*
Fractionation and treatment	*28 679 014*
FCC	*661 643 528*
Services	*1 263 356 640*
T o t a l	*3 259 199 580*

Table 2

Refining model: Value of demand for materials

(1977 pesos)

Classification of materials	*Description*	*Value*
10	*- Instrumentation*	*275 857 400*
15 and 25	*- Electrical materials*	*170 807 000*
23	*- Piping*	*1 460 422 600*
	23.1 pipes	*809 073 720*
	23.2 valves	*400 152 120*
	23.3 connections	*251 192 760*
24	*- Structural steel*	*129 915 140*
26	*- Spare parts acquired with the original equipment*	*162 269 380*
	- Total average of spare parts for the refining model	*509 996 396*
T o t a l		*2 546 898 536*

Table 3

Value of total capital goods demand for petroleum refining, 1977 - 1986

(millions of 1977 pesos)

Equipment Classification	Description	Value
1	Heat exchangers	2 416
2	Air coolers	204
3	Heaters	1 311
4	Pressure vessels	2 505
5	Pumps and accessories	1 174
6	Compressors	1 459
7	Blowers	400
8	Steam turbines	(Included in rotary machines)
9	Diesel engines	18
10	Instrumentation	1 297
11	Motors	(Included in rotary machines)
12	Transformers	223
13	Distribution panels	502
14	Motor control centers	151
15 and 25	Electrical materials	803
16	Boilers	1 911
17	Turbogenerators	892

Equipment Classification	Description	Value
18	Cooling towers	234
19	Water treatment equipment	118
20	Flares	4
21	Special and miscellaneous equipment	68
22	Storage tank materials	1 728
23	Piping	6 864
23.1	Pipes	3 803
23.2	Valves	1 881
23.3	Connections	1 181
24	Structural steel	610
26	Spare parts	2 474
Total		27 366

5.3 Characteristics of equipment and materials.

Twenty-four classes of equipment and materials were considered, as seen in Table 3, not counting spare parts.

For these 24 classes, complete technical definitions were made including metals used in their make-up, weight, price, power, (in the case of motors), kind (in the case of pumps and drives), capacity and power (in the case of transformers), capacity (for boilers and storage tanks) and specifications of weight, diameter and wall thickness (for pipes and connections).

6. Capital Goods Demand for the Petrochemical sector.

6.1. Value of demand.

The value of capital goods demand for primary petrochemicals was calculated from the value structure of the equipment in the model units.

In the case of existing plants (ethylene, styrene-ethylbenzene, cryogenic and sweetener plants) purchase orders were used, escalating prices on the basis of 1977 values. For the equipment demand in hydrocarbon refining units information was taken from the refining model.

The major plants considered in the analysis were ethylene, ammonia, styrene, sweeteners, cryogenic, crude destilling, HDS, reformer and fractionation-treatment plants.

The value of equipment for those plants was the following (in 1977 pesos):

Model plant	*C a p a c i t y*	*Value*
Ethylene	*182 000 tons/year*	*898.5*
Ammonia	*445 000 tons/year*	*377.3*
Estyrene	*150 000 tons/year*	*163.8*
Gas sweetening	*500 million cu.ft./day*	*58.6*
Cryogenic		*351.4*
Crude distillation	*200 000 Bbls/day*	*320.9*
HDS	*85 000*	*302.9*
Reformer	*45 000*	*372.5*
Fractionation and treatment	*100.00*	*24.7*
Service Plants		
Of the ammonia plant		*57.7*
Service plant		*463.8*
T o t a l		*31 752.0*

The breakdown for equipment and materials in primary petrochemicals, excluding spare parts, is similar to that mentioned for the refining model, that is, it is made up of 24 groups.

The scheduled supply of equipment and materials, expressed in partial values and percentages of total value is the following (in 1977 pesos):

1977/79	*1980/83*	*1983/86*	*Total*
17.178	*6.301*	*8.273*	*31.752*
54.1%	*19.8%*	*26.1%*	*100%*

6.2 Characteristics of the equipment and demand.

The technical characteristics of only a few plants were available (ethylene, ammonia and sweeteners) due to lack of information and the confidential nature of such data.

In general terms, the major differences between the equipment for the refining model and the petrochemical model were specified in order to define the need for establishing specific manufacturing projects for one or the other of these activities.

7. Capital Goods Demand for Transport and Distribution of Hydrocarbons.

This section in mainly concerned with pipelines which were considered separately according to the fluids they transport and their accessories.

The information was obtained from PEMEX and some engineering firms: the first case examined included: a pipeline (Cardenas-La Venta-Pajaritos) 20 in. in diameter and 123 kilometers long, with one pumping station, and two gaslines 24 inches in diameter and 113 kilometers long each, with two compression stations.

In these cases, the equipment and materials represent 58% of total investment and they present a structure in which piping predominates:

Equipment and materials for pdy-ducts	*Liquids*	*Gases*
Piping	*77.5*	*79.8*
Valves	*11.1*	*48*
Connections	*6.0*	*2.6*
Pumps and drives	*5.0*	*-*
Compressors and drives	*-*	*11.8*
Instruments	*0.3*	*1.0*
	100.0	*100.0*

If storage tanks are included, the tanks constitute only 7% of the investment in poly-ducts.

The analysis of equipment and materials demand for transport and distribution of hydrocarbons can be seen in the following Tables:

Table 4

Value of equipment and materials demand for pipelines, 1977-86

(millions of 1977 pesos)

	Investment	*Equipment and materials*
Pipelines for liquids	*21 610*	*12 533*
Pipelines for gas	*33 877*	*19 649*
T o t a l	*55 487*	*32 182*
	100%	*58%*

Table 5

Value of the demand for pipes, valves, and connections for the transport and distribution of hydrocarbons, 1977-86

(millions of 1977 pesos)

	Value	*Structure (%)*
Pipes	*26.2*	*83.9*
Valves	*2.4*	*7.7*
Connections	*1.3*	*4.2*
Steel plate (tanks)	*1.3*	*4.2*
T o t a l	*31.3*	*100.0*

Table 6

Volume of steel for transport and distribution of hydrocarbons, 1977-86

(million of tons)

	Weight	Structure (%)
Piping	*2 519*	*92.*
Steel plate	*220*	*8*
T o t a l	*2 739*	*100.*

Table 7

Value of demand for pumps, compressors, drives and instruments for transport and distribution of hydrocarbons, 1977-86

(million of 1977 pesos)

	Value	Structure (%)
Pumps	*643*	*30,1*
Compressors	*2 376*	*72.9*
Instruments	*226*	*75*
T o t a l	*3 205*	*100.0*

8. Total demand for equipment and materials for the petroleum industry: refining, primary petrochemicals and transport and distribution, 1977-1986.

A summary of the previous sections, consolidating the volume and value of the detailed equipment and materials demand for each one of the phases examined, give a total of 4 246 400 metric tons and 93 500 million 1977 pesos.

In both value and volume it can be seen that the most significant category is that of piping, with 74.2% of the total weight and 44.7% of total value.

Table 8

Volume of equipment demand for the petroleum industry (refining, primary petrochemicals, transports and distribution)

1977 - 1986

	Weight	Structure (%)
1. Heavy platework and machining	304 000	7.2
2. Pipes	3 151 000	74.2
3. Steel plate for tanks	540 000	12.7
4. Structural steel	251 400	5.9

Table 9

Value of the total capital goods demand for the petroleum industry (refining, primary petrochemicals, transport and distribution, 1977 - 1986.

(Million of 1977 pesos)

Equipment classification	Description	Refining	Primary Petrochemicals	Transport and Distribution	
1	Heat exchangers	2.416	5.008	-	7.42
2	Air coolers	201	112	-	31
3	Heaters	1.311	1.701	-	3.01
4	Pressure vessels	2.505	4.798	-	7.30
5	Pumps and drives	1.174	2.007	643	3.82
6	Compressors	1.459	4.967	2 336	8.76
7	Blowers	400	92	-	49
8	Steam turbines	-	-	-	-
9	Diesel engines	18	31	-	4
10	Instrumentation	1.297	1.086	226	2.60
11	Motors	-	-	-	-
12	Transformers	223	299	-	52
13	Distribution panels	502	571	-	1.07
14	Motor control centers	151	103	-	25
15	Electrical materials	803	260	-	1.06
16	Boilers	1.311	1.662	-	3.57
17	Turbogenerators	892	1.234	-	2.12
18	Cooling towers	234	359	-	59
19	Water treatment equipment	118	161	-	27
20	Flares	4	2	-	6
21	Special and miscellaneous equipment	68	59	-	12
22	Storage tanks materials	1.728	211	1.342	3.28
23	Piping	6.865	5.008	29.925	41.79
23.1	Pipes	3.803	2.774	26.241	32.81
23.2	Valves	1.881	1.373	2.390	5.64
23.3	Connections	1.181	861	1.294	3.33
24	Structural steel	610	898	-	1.50
26	Spare parts	2.474	1.123	-	3.59
	T o t a l s:	27.366	31.752	34.472	93.59

THE STEEL SECTOR

At the time the study of the steel sector was carried out, in mid-1977, there was no official plan for expansion of production in the para-state steel industries which, that year, covered 67.3% of the country's total installed capacity for steel production. This percentage became even larger in the following years.

The study of the sector was based on the demand for steel and rolled products projected by the Steel Industry's Coordination Commission for the period 1978-1985. According to that forecast, the demand for steel in 1985 will be some 14.7 million tons which, expressed in terms of rolled products, comes to 10.8 million tons.

In order to make the forecast, the Commission elaborated a milled-products consumption matrix divided into two groups defined by their production processes: non-flat products (bars, wire rods, profiles, etc.) and flat products (plate, sheet, etc.)

It was known that in the private sector, the enterprises HYLSA and TAMSA plan to increase their steel production capacity by 1.2 million tons for 1985. If this plan is fulfilled, the remainder of the demand to be satisfied would be 13.5 million tons.

The Economic Studies department of the National Chamber of Iron and Steel Industries estimated the 1977 production capacity

at 9.9 million tons, which would mean that the increase in installed capacity for 1985 would be at least 13.5 - 9.9 . 3.6 million tons.

In order to cover this deficit, two steel plants were selected as models for developing a methodlogy for subdividing and classifying the equipment making up a steel plant, along with the approximate weights of such equipment.

Annex 1 presents a detailed subdivision of equipment for steel installations in the following capacities:

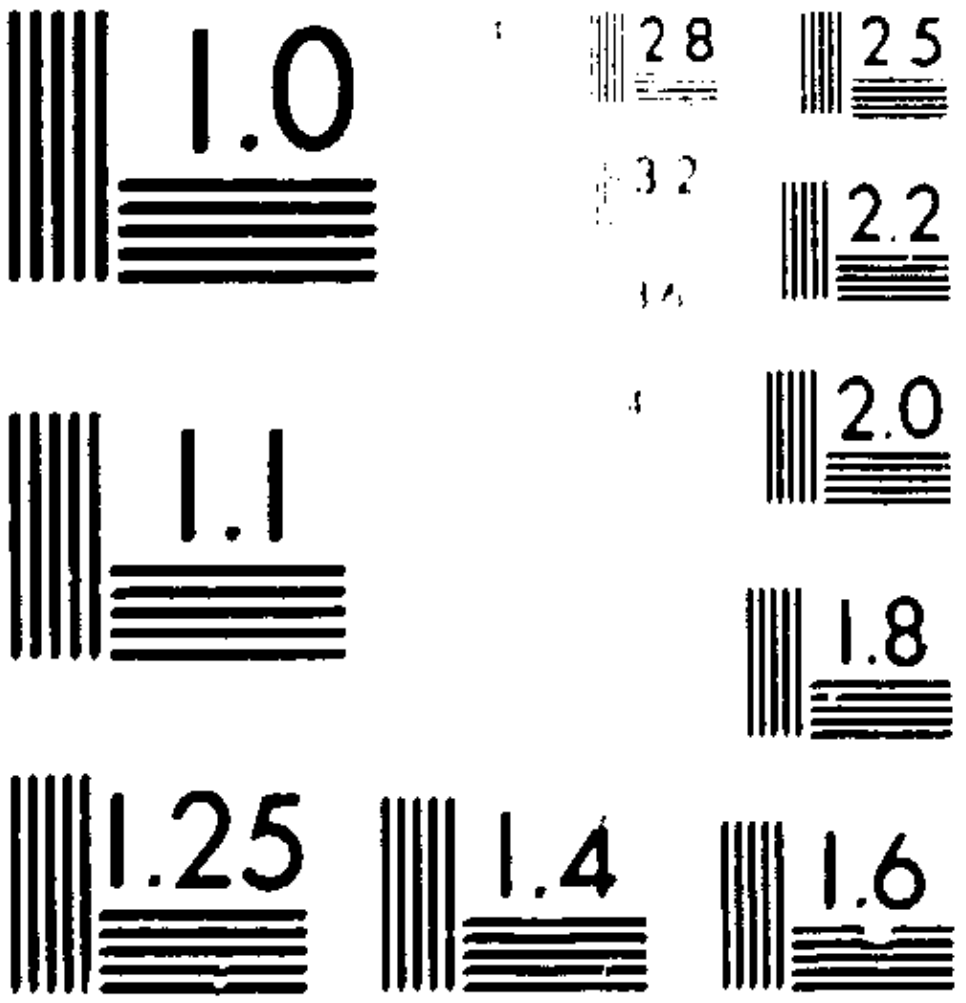
Coke plant and by-products 1/	*500,000 tons/yr*
Pelletization plant	*1,800,000 tons/yr*
Blast furnace	*1,000,000 tons/yr*
BOF Plant	*1,200,000 tons/yr*
Continous casting of billets	*1,200,000 tons/yr*
Oxygen plant	*460 tons/day*
Bar and light section mill	*1,200,000 tons/yr*
Hot strip mill	*1,200,000 tons/yr*

Apart from the equipment subdivision, the tables indicate the shop having the greatest share of the work in the manufacture of each equipment item.

1/ *The byproducts are: plants for tar, ammonium sulphate, benzol and hydrogen sulphide removal.*

The table's columns show requirements in terms of basic processes such as forge, foundry, platework and machining. There is also a column indicating equipment "ordered from other suppliers" which shows which equipment can be bought directly within the country (e.g. conveyor belts) and which must be bought abroad, as well as those units or parts that are relatively easy to manufacture within existing shops.

Equipment classified as imported are highly specialized items such as some regulation and control instruments and very heavy units whose small demand would not justify the investment necessary to manufacture them locally.


1.0
2.8
2.5
3.2
2.2
1.1
2.0
1.8
1.25
1.4
1.6

APPENDIX - A

1 Yen = 0.05 pesos
100 Yen = 5 pesos

COKE OVENS PLANT

Sumary of Heavy Mechanical Equipment Manufacturing Details.

in January 1974

No.	Description	Total Wt.	Heavy Plate - work & heavy machining	Heavy Plate-work	Mech. Work-shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue equipment	Imported items	Cost in Y x 10^6	Cost in M.N x 10^6
(ia)	Coal handling plant.	1419		743	186					490			
(ib)	Coke breeze grinding plant.	434		72						172	190	359.979	4.826
(ii)	Coke Ovens	1471	40	529				722		180		1604.358	9.907
(iii)	Coke Ovens machines	1206	1206									1428.753	0.500
(iv)	Quenching Station	62	62									45.675	1.599
(v)	Coke Wharf	242		92						50	100	101.265	0.727
(vi)	Coke handling plant	335	28	125	15					155	12	109.041	0.640
(vii)	Tar removal plant	509	69	332						24	84	332.061	4.365
(viii)	Ammonium Sulphate plant	100		96						4		288.751	1.140
(ix)	Benzol & Naphthalene plant	278		234						44		191.174	3.571
(x)	Desulphurisation plant	129	54							17	58	264.563	2.476
(xi)	Effluent Treatment plant	106		89						17		66.903	0.790
(xii)	Fluid Pipe-work system	511				511						102.728	8.349
(xiii)	Gas mains	539		539								163.455	0.737
(xiv)	Structures Coal, Coke, batteries, etc.	1638		1638								67.066	5.240
(xv)	Structures by-product plant.	660		660									6.300
	Grand Total	9639	1459	5149	201	511		722		1153	444	5125.772	51.000

1 Yen = 0.05 pesos
100 Yen = 5.00 pesos

COKE OVENS PLANT

Heavy Mechanical Equipment - Coal Handling Plant

in January 1974.

1	2	3	4	5	6	7	8	9			10	11	12
								FOUNDRY					
Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate work & machining	Heavy Plate - work	Mech. shop	Piping & valves	Steel	Iron	Non-Ferrous	Catalogue Equipment	Imported Items	Cost in Yen x 10^6 M.N. x 10^6
Coal Handling Plant													Y 359,979 M.N. 4,826
Coal bin - 25 mm pl	2	42	84		84								
Lining material	basalt												
Constant weight feeders	2	3.0	6.0								6.0		
Hammer Mills Rotor dia 71" width 63	2	32	64			64							
Outlet Conveyor B&B B_1 Cap. 400 t/hr 1000 mm x 19.5 m long	1	27	27								27.0		
B_2 Cap. 400 t/hr 1000 mm x 30 m	1	40	40								40.0		
Supporting structures	1	69	69		69								
Reversible belt conveyor B_3 1.2 wide x 16 m. long cap. 400 t/hr	1	20	20								20.0		
B_7 Breeze Conveyor cap 25 t/hr 0.6 wide	1	7	7								7.0		
Coal Mixers Drum 2.7 m dia x 5.5 m long	2	27.5	55			55							

COKE OVENS PLANT

Heavy Mechanical Equipment :- Coal Hauling Plant

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
Belt conveyor B-5 400 t/hr x 1.0 m wide x 873m. long.	1	280	280								280		
Tripper Car on B-5 Conv.	1	2.0	2.0								2.0		
Main Coal bunkers 500 tons. cap. each	4	Concrete											
Belt Feeders cap. 135 t/hr 1.5m. x 5m. long	4	1.5	6.0								6.0		
Belt Conveyers B-12 & 13 each 400 t/hr 1.0m x 140 m. long	2	45.5	91.0		74						17		
Gate valves, structures platforms main coal bunkers	4	12	48		40	8							
Larry Car charging hoppers 150 tons. cap. each	8	22	176		176								
Gate valves, load cells pneumatic equip. & structures	1	359	359		300	59							
Conveyors B-16, 17, 18 & 19 400 t/hr, 1 m. x 12 m. long 1m x 25m long	2												
	2		85								85		
(ia) Sub-Total for coal Handling Plant			1419		743	186					490		Y 359.979 M.N. 4.823

COKE OVENS PLANT

Heavy Mechanical Equipments - Coke Breeze Plant

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate - work & machining	Heavy Plate - work	Mech Shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen x 10^6 M.N. x 10^6
Coke Breeze grinding													
Coke breeze conveyor B-65, 30 t/hr 0.6 m x 30 m.	1	73	73.0								73.0		
Coke breeze bins cap 100 tons each.	3	24	72.0		72.0								
Belt feeders 12 t/hr, 60 mm x 5 m. long	2	12	24								24.0		
Rod Mills	2	95	190									190	
Discharge Conveyors B-73 24 t/hr 0.6mm x 15.3 m	1	37.0	37.0								37.0		
B-74 25 t/hr 0.6mm x 5.6 m	1	14.0	14.0								14.0		
Bucket Elevators	1	5.75	5.75								5.75		
B-7 Belt Conveyor to conveyor B-2 25 t/hr 0.6mm x 5m. long	1	19.0	19.0								19.0		
(ib) Sub-total for Coke breeze grinding Plant.			434.75		72.0						172.75	190	

COKE OVENS PLANT - OVENS

Heavy Mechanical Equipments - Coke Ovens Plant

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate work & machining	Heavy Plate-work	Mech shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items.	Cost in Yen & Pesos x 10^{0}
Coke Ovens - two blocks @ 30 ovens each = 60 ovens													Y 1604,358 M.N. 9,907
oven doors	120	3.9	468						468				
door frames	120	1.30	156						156				
Charging hole frames & lids	240	0.133	32						32				
Back stays	104	2.192	228		228								
Ascension pipes	60	0.84	50.5						50.5				
C.I. Elbows	60	0.27	16.2						16.2				
Upper Bottom Cross, tie rods, bracings, thurst plates, wall protecting plates	120 sets	1.825	219		219								
tracks		180	180								180		
Collecting mains	2	41	82		82.0								
Gas cleaning system	1	40	40	40									
(ii) Sub-total for Coke ovens			1471.7	40	529				722.7		180		

COKE OVENS PLANT - OVENS

Heavy Mechanical Equipments - Coke Oven Machines

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & Machining	Heavy Plate-work	Mech shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
Coke Oven Machines													Y 1428.753 M.N 0.500
Pusher Machines	2	253	506	506									
Larry Cars	2	127.5	255	255									
Guide Cars	2	96	192	192									
Coke Cars	2	101.5	203	203									
Locomotives	2	25	50	50									
(iii) Sub-total for Coke Oven Machines			1206	1206									
(iv) Coke quenching station: mechanical equipment	1	62	62	62									Y 45.675 M.N 1.500
(v) Coke Wharf conveyor B-24 250 t/hr 1200 mm x 119 m long	1	50	50								50		Y 101.265 M.N 0.727
structures	1	92	92		92								
Bucket wheel reclaimer	2	50	100									100	
Sub-total for Coke Ovens & its equipments			2981.7	1308	621				722.7		230	100	Y 3180.051 M.N 12.634

COKE OVENS

Heavy Mechanical Equipments - Coke Handling Plant

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate - work & machining	Heavy Plate - work	Mech Shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & M.N. x 10⁷
Coke handling plant													Y 109.041 M.N 0.640
Hoppers 50 Tons cap. each	2	25	50		50								
Belt feeders B-28, 29 100 t/h 1500 x 5 m	2	30	60								60		
Primary Screens	2	3.5	7.0								7.0		
Coke Cullers	2	6.0	12.0									12.0	
Belt Conveyor B-40, B-41 100t/h each 1000 x 10m	2	40.5	81.0								81.0		
Secondary Screens	2	3.6	7.2								7.2		
Dust Collector system	1	28	28	28									
Load Cells, Gate valves & structures	1	90	90		75.0	15.0							
(vi) Sub-total for coke handling plant			335.2	28	125.0	15.0					155.2	12.0	Y 109.041 M.N. 0.640

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipments - Tar Removal Plant.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate - work & machining	Heavy Plate work	Mech shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^3
Tar Removal Plant													Y 332.061
													M.N. 4.365
Decanters width 2.4 height 3.75m 14.8m length (carbon steel	2	17.5	35	35									
Scrapers	2	12.0	24	24									
Tar storage tanks Cap.291 m^3 4.8mm pl. dia 7.74 m x 6.12 ht	2	15	30		30								
Condesate tank 3 m x 2m x 2 m ht 6.4 mm pl	1	1.6	1.6		1.60								
Ammonia Liquor tank 3.5 m dia 3.0m ht. 6.4 mm pl	1	3.1	3.1		3.10								
Centifugal, 4 m^3/hr 30 m head, tar pump	2	0.1	0.2								0.20		
Pumps flushing liquor centrifugal 500 m^3/hr 63m head 130 kw.each	2	2.15 + 1.55	3.7								3.70		
Condesate Pumps centrifugal, cap 80 m^3 hr, 30m, 22 kw	2	0.32	0.64								0.64		
Primary Coolers 2.5m x 3m x 12.8ht x 19mm pl (1S90 piping 76.3mm. dia)	3	79	237		237.0								

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Tar Removal Plant.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
Exhausters 23000m^3/hr Inlet pr - 300mm Outlet pr - 1700 mm Hg	2	10	20.0								20.0		
Exhauster house Crane 10 tons.	1	10	10.0	10									
Steam Turbines 406 kw	2	3.0	6.0									6.0	
Electro-Static precipators	3	26.0	78.0									78.0	
Tanks & vessels	6	10.0	60.0		60.0								
(vii) Sub-total Tar Removal Plant			509.24	69	331.70						24.54	84.0	Y 332.061 M.N. 4.365

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Ammonium Sulphat

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Mech. shop	FOUNDRY Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
Ammonium Sulphate Plant													Y 288.751 M.N. 1.140
Ammonia liquor storage tank	1	9.6	9.6		9.6								
Lime Hopper	1	8.8	8.8		8.8								
Lime Slurry tank	1	2.0	2.0		2.0								
Head tank	1	0.2	0.2		0.2								
Lime leg stills	2	0.6	1.2		1.2								
A.S.Sump tank	1	0.6	0.6		0.6								
Sulphuric Acid Storage tank	1	5.7	5.7		5.7								
Sulphuric Acid Feed Tank	1	1.5	1.5		1.5								
Saturators 5.5m dia x 3000 + 2500 cone Carbon steel 9.5mm pl.	2	13.8	27.7		27.7								
Cyclones	2	1.6	3.2		3.2								
Suspension tank	1	0.3	0.3		0.3								
Slurry Feed tank	1	7.0	7.0		7.0								
A.S. Cyclone Separator	1	0.3	0.3		0.3								
C.O.G Cyclone Circulation tank	1	0.2	0.2		0.2								

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Ammonium Sulphat Plant.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Mech. shop.	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
A.S. Sump tank	1	0.2	0.2		0.2								
Towers	2	1 + 21.0	22.0		22.0								
Pumps	15	0.22	3.3								3.3		
Heat Exchangers	4	1.1	4.5		4.5								
Drying furnace-blowers	1 + 2	0.5 + 1	1.5		1.5								
Bagging Machine	1	0.5	0.5								0.5		
(viii) Sub-total for Ammonium Sulphate Plant			100.5		96.7						3.8		Y 288.751 M.N 1.140

COKE OVENS BY PRODUCT PLANT

Heavy Mechanical Equipment - Benzol Plant.

Description	Nos.	Unit Wt. in tons	Total Wt. in tons	Heavy Plate-work & machining	Heavy Plate work	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10⁶
Benzol Plant													Y 191.174 M.N. 3.571
Slop tank	2	0.1	0.2		0.2								
Condensate receiver	1	0.1	0.1		0.1								
Pitch Oil tank	1	1.7	1.7		1.7								
Slurry tank (sump)	1	0.2	0.2		0.2								
Benzolized Oil Storage tank	1	6.4	6.4		6.4								
Debenzolized Oil Storage tank	1	7.4	7.4		7.4								
Waste Water receiver tank	1	0.7	0.7		0.7								
Reflux tank	1	27.6	27.6		27.6								
Fresh Wash Oil storage tank	1	6.2	6.2		6.2								
Light Oil storage tank	2	7.8	15.6		15.6								
Pumps	23	0.252	5.8								5.8		
Heat Exchangers	13	4.78	62.2		62.2								
Towers	5	21.3	106.5		106.5								
Oil heater	1	35.0	35.0								35.0		
Air blowers	2	1.5	3.0								3.0		
(ix)Sub-total for Benzol Plant			278.6		234.8						43.8		Y 191.174 M.M. 3.571

Heavy Mechanical Equipment - Hydrogen Sulphide Removal Plant

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10⁶
H.S. Removal Plant													Y 264.565. M.N. 2.476
Hydrogen Cyanide Reagent tank	1	1.7	1.7		1.7								
Poly Sulphide generator	1	0.6	0.6									0.6	
Oxidisers	2	8.2	16.4		16.4								
Pumping tank	1	7.6	7.6		7.6								
Sulphur slurry tank	1	4.8	4.8		4.8								
Reagent Mixing tank	1	1.2	1.2		1.2								
Filtrate receiver	1	0.2	0.2		0.2								
Autoclave	1	4.1	4.1									4.1	
Product sulphur pit	1	1.8	1.8		1.8								
Product sulphur silo	1	8.6	8.6		8.6								
Untreated effluent tank	1	5.1	5.1		5.1								
Balance tank	1	2.1	2.1		2.1								
Sump pump tank	1	0.7	0.7		0.7								
pumps	16		5.5								5.5		
Heat exchanger	3	1.3	3.9		3.9								
blowers	5	1.3	6.5								6.5		

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Hydrogen Sulphide Removal Plant

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work.	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
Rotary vacuum filters	2	4.5	4.5								4.5		
vacuum pump	1	0.5	0.5								0.5		
sulphur flaker	1	20.9	20.9									20.9	
Reaction Incinerator	1	33.0	33.0									33.0	
(iv)Sub-total for Gas desulphurisation plant			129.7	54.1							17.0	58.6	Y 254.563 M.N 2.476

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Effluent Treatment Plant.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work.	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10^6
Effluent Treatment Plant													Y 66.903 M.N 0.702
Raw Waste tank	1	17.5	17.5		17.5								
Coke Filters	2	16.4	32.8		32.8								
Neutralizer tank	1	1.5	1.5		1.5								
Aeration tank	2	5.2	11.3		11.3								
Settling tank	1	15.1	15.1		15.1								
Sand Filters	2	1.0	2.0		2.0								
Reverse cleaning tank	1	Concrete											
Clear Well	1	Concrete											
Sludge Concentration tank	1	5.5	5.5		5.5								
Concentrate sludge tank	1	0.6	0.6		0.6								
Centrifuge	1	1.3	1.3								1.3		
Filtrate Water tank	1	0.45	0.45		0.45								
Coagulant Storage tank	1	0.50	0.50		0.50								
Tar Well	1	0.1	0.10		0.10								
Phosphonic Acid storage tank	1	Polyethylene & PVC											
Effluent liquor tank	1	Concrete											

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Effluent Treatment Plant.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work.	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10⁶
Sulphuric Acid tank	1	2.10	2.10		2.10								
Pumps Assorted sizes	19		2.5								2.5		
Pumps Water cooling	4	2.2	8.8								8.8		
Drainage pumps	12		4.4								4.4.		
(v) Sub-Total for Effluent treatment Plant			106.45		89.45						17.0		Y 66.903 M.N. 0.702

COKE OVENS - BY PRODUCT PLANT

Heavy Mechanical Equipment - Fluid Pipe-work System Gas, Mains & Structures.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work.	Mech. shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Yen & Pesos x 10⁶
Fluid Pipe work system.	1	511	511				511						Y 102.728 M.N. 8.349
Gas Mains	1	539	539		539								Y 163.455 M.N. 0.737
Structures													
Coal & Coke breeze Crushing house	1	776	776										
Coke cutting house	1	237	237										
Coke Oven batteries	1	625	625										Y 67.066 M.N. 5.269
By Products Plant	1	660	660										M.N. 6.300
Grand total for Coal Handling, Coke Ovens Coke Handling, Conveyors machines and By-products plants complete.			9639	1459	5149	201	511		722		1153	444	Y 5125.772 M.N. 51.000

Pesos — Oct. 1975.

18.5 1 A$ = Australian dollars = 561,561
12.5 = 1 US = U.S. $ = 775,440
30.0 = 1 £ = £ Sterling = 2,631,163
4.5 1 DM = Dutch Marks = 16,761,612
2.5 1 FF = French Franc = 6,044,400
M.N. = Mexican = 77,001,496

PELLETISATION PLANT

Summary of Heavy Mechanical Equipment Manufacturing Details

No.	Description	Total Wt. in tons.	FOUNDRY			Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	Catalogue Equipment	Imported items	Cost in Foreign currency x 10^6	Cost in M.N. x 10^6
			Steel	Iron	Non Ferrous								
(i)	Concentrate tanks, distributors & vacuum filters	87.1					41.8			40.3	2.9		
(ii)	Mixer and Pelletisation machines & auxiliaries	385					13.5			97.5	274.0		
(iii)	Induratin section and heating system	2879.4					120	330	150	99.4	2180		
(iv)	Additive bins, ball mill, dust collection system & structures	3947					3439	23.4		192.5	292.1		
	Grand Total for Pelletisation Plant	7298.5					3617.3	353.4	150	429.7	2748.1	A.$ 0,561,561 U.S. 0,775,440 £ 2,631,163 DM 16,761,612 FF 6,044,400	77,001,496

* The cost is based on total equipment supplied by each country. (Detailed breakdown not available)

PELLETISATION PLANT

Concentrate tanks, distributors & Vacuum Filter System.

Pesos		Oct. 1972	
18.5	= 1 ,,	= Australian dollars	= 561,041
12.5	= 1 U.S.	= U.S. $	775,810
30.0	= 1 £	= £ Sterling	2,631,163
4.5	= 1 DM	= Dusch Marks	16,782,012
2.5	= 1 FF	= French Frank	6,011,498
	= M.N.	= Mexican	77,661,496

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies
Wet Section													
Distributor - 12mm plate	1	0.50	0.50		0.50								M.N.
Concentration tank dia. 30.5 m. x 2.5 m. high	1	(concrete)											M.N.
Distributor - vol. 3 m^3	1	0.80	0.80		0.80								M.N
Agitator tanks	2	21.0	42.0		42.0								M.N.
Emergency tank	1	(concrete)											M.N.
Distributor - vol. 2.2 m^3	1	0.50	0.50		0.50								M.N.
Oliver Vacuum Filters 2.7 m. dia.	4	3.0	12.0								12.0		M.N.
Oliver Vacuum Pumps	4	0.5	2.0									2.0	D.M
Oliver Compressors	2	0.4	0.8								0.80		M.N.
Agitator tank 12 m^3 2.5mm. dia. 2.5m. high, plate thickness 8mm.	1	1.0	1.00		1.00								M.N.
Belt Conveyor Cap 250 t/h, 1200mm wide x 59 m. long -	1	13.5	13.5								13.5		A.S
Belt Conveyor Cap 320 t/m, 1000 mm. x 3 m. long.	1	4.8	4.8								4.8		A.S

PELLETISATION PLANT

Concentrate tanks, distributors & Vacuum Filter System.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY						Catalogue Equipment	Imported items	Cost in various currencies
				Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	Steel	Iron	Non Ferrous			
Belt Conveyor Cap. 320 t/h, 1000 mm. x 33 m. long	1	9.2	9.2								9.2		A.$
(i) Sub Total for concentrate tanks, distributors & vacuum filters (wet section)			87.1		41.8						40.3	2.0	

PELLETISATION PLANT

Mixers and Pelletisation Machines & Equipment

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	FOUNDRY: Heavy Plate work	FOUNDRY: Machine shop	FOUNDRY: Piping & valves	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies
Mixers "Lodige" Cap 337. ton/hr., 1.81 mt. dia. x 50 m. long.	2	5.0	10.0									10.0	D.M
Conveyors 320 t/hr 1000 mm. wide 13.5 to 75 m. long	6	50.0	50.5								50.5		A $
Bins for mixed matls.	3	4.5	13.5		13.5								M.N.
Belt Conveyors & scales cap 105 t hr. 1.2 m. wide x 2.7 m. long	3	4.0	12.0								12.0		A.$
Pelletising discs & auxiliaries 7.5 m. dia. cap. 135 tons/hr. 5.2 & 2.4m - 150 kw. motor	3	88.0	264.0									264.0	£ Sterling.
Conveyors 105 t hr. 800 mm. wide 8m. long each.	3	3.7	11.0								11.0		A.$
Conveyors t/hr wide length 320 1200 55m - 24 600 57 m 24 600 12.5 m.	3	8.0	24.								24.0		A.$
(ii) Sub-Total for Mixer and Pelletisation machines & auxiliaries			385.0		13.5						97.5	274.0	

PELLETISATION PLANT

Induration Section and Heating System

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & tubes	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies
Induration Section													
Oscillating Conveyor Cap. 320 t/h, 1500 mm. wide x 5.5 m. long	1	2.0	2.0								2.0		D.M.
Weighing conveyors (green pellets under size)	3	2.1	6.3								6.3		A.S
Induration Machine	1	1600	1600.0									1600	D.M.
Multi-cyclones	6	9.1	55		55.0								D.M.
Clean Conveyors	1	7.0	7.0		7.0								D.M.
Blowers & Hoods													D.M.
Roller Screen	1	4.0	4.0									4.0	FF 6,611,400
Pallets & Grate Bars etc.	129	3.0	387.0									387.0	
Burners & accesories	12	1.0	12.0									12.0	US $ 775,840
Double damp valves	28	0.5	14.0									14.0	
Cooling air fan	1	12.0	12.0									12.0	D.M.
Updraft drying fan	1	45.0	45.0									45.0	D.M.
Windbox recuperation fan	1	45.0	45.0									45.0	D.M.
Windbox exhaust fan	1	45.0	45.0									45.0	D.M.
Chimney	1	(Concrete)											M.N.
Sidedraw hopper	1	20.0	20.0		20.0								M.N.
Receiving hopper	1	30.0	30.0		30.0								M.N.
Ducts and gate valves	15	22.0	330.0			330							D.M.
Vibrating feeders	2	5.9	11.8								11.8		M.N.
Vibrating screen	1	1	13.5								13.5		£ Sterling
Wet Scrubbers	1	10	10								10.0		D.M.
Heat exchanger	1	6.0	6.00									6.00	
Conveyor 1000 mm. width, 480 t/hrx 175 long.	1	33.9	32.9								32.9		A.S

PELLETISATION PLANT

Induration Section And Heating System

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies
Screen- Single deck 5 x 2.2 mts. src.	1	4.0	4.0								4.0		D.M
Hopper fines cap. 75 m^3	1	8.0	8.0		8.0								
Conveyors 15.8 mt. lenght cap 265 t/hr. 1000 mm wide	3	6.3	18.9								18.9		D.M. A.S
Fluid Network Piping, valves etc.	1	150	150				150						
Wet Scrubbers	1	10.0	10.0									10.0	M.N
(iii) Sub-Total for Induration Section and heating system			2879.4		120	330	150				99.4	2180	£ Sterling

PELLETISATION PLANT

Additive bins, conveyors and ball mill

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	FOUNDRY: Heavy Plate work	FOUNDRY: Machine shop	FOUNDRY: Piping & valves	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies
Dry Section													
Slacked lime bin (2 outlets) 90 m^3 cap 10mm pl	1	25	25		25								M.N.
Additive bins (fines-pellet and auxiliaries 250 m^3 cap 210 m^3 cap	2	57	114		114								M.N
Weigh scales	4	0.5	2.0								2.0		D.M.
Additive bins (course materials)	2		123		123								M.N
Limestone bin	1												
Weigh scales	4	0.5	2.0								2.0		D.M.
Conveyor cap. 75 t/hr 500mm wide x 56m. long	1	10.3	10.3								10.3		A.S
Ball Mill & its accesories 75 t/hr cap. 2400 Kw. 900 rpm	1	200	200									200	£ Sterling
1st compartment 2", 2 1/2", 3" dia. balls	1	48	48								48		£ Sterling
2nd compartment 1", 1 1/4", 1 1/2" dia. balls	1	96	96								96		£ Sterling
Hot gas generator, burner blowers	1	5.0	5.0									5.0	£ Sterling
Screen Vibrating cap. 75 t/h	1	3.0	3.0								3.0		D.M.
Pneumatic Conveyor 75 t/hr 250mm wide x 13.6m	1	2.0	2.0								2.0		£ Sterling
Bucket elevator 75 t/hr 39 m. long 11 kw. 800 rpm	1	23.4	23.4			23.4							D.M.

PELLETISATION PLANT

Additive bins, conveyors and ball mill

Description	Nos.	Unit Wt. in tons	Total Wt. in tons	Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies
Pneumatic Conveyors 75 t/hr 250mm x 15.3M	1	9.6	9.6								9.6		£ Sterling
Pneumatic Conveyors 75 t/hr 250mm x 5.5 m	1	3.6	3.6								3.6		£ Sterling
Cyclone dia. 2000 mm. x 7.5 m	2	4.5	9.0		9.0								£ Sterling
Discharge feeder	2	0.5	1.0								1.0		D.M.
Dry Dust Collection system (5 000 m^3/hr	1	74.6	74.6									74.6	£ Sterling
Chimney	1	2.0	2.0		2.0								M.N.
ID blower 72000 m^3/hr	1	12.5	12.5									12.5	D.M.
Lift	1	15	15								15		M.N.
Structures	1	3166	3166		3166								D.M.
(ic) Sub-total for additive bins ball mill, dust collection system & structures			3947		3439	23.4					192.5	292.1	

BLAST FURNACE PLANT

Summary of Heavy Mechanical Equipment Manufacturing Details.

1 - Sterling 30,1475 pesos
1 - Lira 0,0234 pesos
1 - U.S.$ = 12,5 pesos
Prices in September 1977.

No.	Description	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	FOUNDRY: Heavy plate-work	FOUNDRY: Machine shop	FOUNDRY: Piping & valves	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items		Cost in Italian Lira x 10^6	Cost in Mexican Pesos x 10^6
(i)	Stockhouse, bunkers & feeders	1940,2		604			1296,4			39,8			946,400	3,600
(ii)	Stockhouse conveyors, structures	856,0		270						586				
(iii)	Weigh hoppers & screen house	1676,5	228	1250			136			62,5				
(iv)	Blast Furnace Structure	2059,8		2038		17			4,8					
(v)	Blast Furnace Cooling system & charging system	1977,4		575,4	26,6	87	15,3	1180	6,6	80,5			2705,180	-
(vi)	Cast Houses	641,3		625						8,7	10,6			
(vii)	Cast Control Equipment	182,3		158						24,3			613,100	2,400
(viii)	Stoves, valves & piping	2160,3		1797				200		130,6	32,7		2289,980	6,560
(ix)	Gas cleaning plant & water plant	592,0		563						10	19		927,30	
(x)	General Items.													
	a) Torpedo Ladles & bogies	784	784									£	0,857	2,820
	b) Torpedo Ladles repair shop and clay preparation shop	292		292									349,060	
	c) Oil injection System, elevators slag pits.	115,6		10		26				79,6			205,100	1,000
	GRAND TOTAL	13273,4	1012	8782,4	26,6	130	1447,7	1380	11,4	1022	62,3	£	0,857 7936,120	16,32

1 - Sterling 30,177 pesos
1 - Lira 0,0214 pesos
1 - U.S.$ = 12.5 pesos

BLAST FURNACE

Heavy Mechanical Equipment - Stock House

Prices in September 1973

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10^6	Cost in Mexican Pesos x 10^6
Stock House													846,400	3,600
Bunkers for pellets	4	37.0	148		148									
Bunkers for Lump Ore	4	37.0	148		148									
Bunkers for Coke	4	40.0	160		160									
Bunkers for additions	4	37.0	148		148									
Lining Plates for bunkers														
Lining plats for sinter, pallet ore	12	57	648					648						
Lining plates for coke	4	94	376					376						
Lining plates for additions	4	57	228					228						
Discharge Feeders (Electromagnet)														
5mm. trough sinter, ppale & ore 800mm x 2500 mm.	18	1.75	31.55								31.55			
5mm. trough coke	4	1.55	6.22								6.22			
5mm. trough additions	6	0.35	2.10								2.10			
Lining plates for feeders														
Sinter, pallet & ores	18	0.3	5.4					5.4						
Sinter pallet Coke	4	0.3	1.2					1.2						
Sinter pallet additions	6	0.3	1.8					1.8						
(i) Sub-total for bunkers & feeders.			1940.27		604.0			1294.40			39.87			

Heavy Mechanical Equipment - Stock House Conveyors & Structures

Description	Nos	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining.	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10^6	Cost in Mexican Pesos x 10^6
Stockhouse Conveyors														
Sinter, pellet & Ore each 800mm. wide x 234 long cap. 300 t hr 15 kw motor	6	38.33	230								230			
Coupling & reduction drive	6	0.70	4.2								4.20			
Coke conveyors 1500mm x 277m long cap. 150 t hr. 11 kw motor	2	70	140								140			
Coupling & reduction drive	2	0.70	1.40								1.40			
Addition materials conveyors 600mm x 236m long cap 100 t hr, 7.5 kw motor	2	34.5	69.0								69.0			
Coupling & reduction unit	2	0.70	1.40								1.40			
Metallic burden gathering conveyors 1200mm x 207 m long Cap 1000t hr, two 90 kw motors	1	58	58								58.0			
Coupling & red. units	2	4.0	8.0								8.0			
Coke gathering conveyor 1200mm x 207 m long 300 tons hr two 37 kw motor	1	58	58								58			
Coupling & red units	2	4.0	8.0								8.0			
Metallic burden fines conveyor 600 mm x 67 m long 150 t hr, 15 kw motor.	1													
Coke fines conveyor 600mm x 79 m long 60 t hr 7.5 kw motor	1													
Coupling & reduction units	2	4.0	8.0								8.0			
Structures for belt conveyors	1	270	270		270									
(ii) Sub-total for stockhouse Conveyors & Structures			856.0		270						586.0			

BLAST FURNACE

Heavy Mechanical Equipment - Screens, weigh-hoppers structures & lubrication

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported Items	Cost in Italian Lira x 10^6	Cost in Mexican Pesos x 10^6
Screens														
Sinter, pallets & ore 1900mm x 6000mm coke	6 2	7.5 7.5	45.0 15.0								45.0 15.0			
Weigh hopper feeders * 29, 30, 31 & 32	8	10.0	80.0	80.0										
Weigh hoppers														
Pallets, sinter & ore	6	11.0	66.0	66.0										
Coke	2	16.0	32.0	32.0										
Misc. materials	2	9.0	18.0	18.0										
Surge bunkers	2	16.0	32.0	32.0										
W.H. Lining materials 12mm thick steel T.I.A	10	13.6	136					136.0						
Platforms & Structures for feeding	1	1250	1250		1250									
Lubrication system for belt conveyors (Centralized) (FARVEL SYSTEM)	1	2.5	2.5								2.5			
(iii) Sub-total for Screens, weigh hoppers, structures lubrication, etc.			1616.5	228	1250			136			62.5		* 846,400	* 3,600

*Total for (i)(ii) & (iii)

BLAST FURNACE

Heavy Mechanical Equipment - Furnace Structure

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining.	Heavy Plate work	Machine shop	Piping & tubes	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY NON Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10^7	Cost in Mexican Pesos x 10^7
Furnace Shell													2705.180	
Hearth baseplate 15mm. thick	1	14.0	14.0		14.0									
Hearth jacket 50mm	1	185	185		185									
Tuyer jacket 50 mm.														
Bosh jacket 70mm.	1	65.0	65		65									
Stack -Circular 60mm.	1	50	50		50.0									
Stack - conical 32mm		137	137		137.0									
Upper Cone	1	26.0	26.0		26.0									
Uptakes	4	32.0	128		128									
Refractory holding ring	5	6.0	30		30									
Under hearth cooling plates & beams	1	113.0	113.0		113.0									
Pipes, miscellaneous items	1	17.0	17.0				17.0							
Total shell weight														
Bustle Pipe	1	75	75		75.0									
No of tap holes	2													
No of slag notches	1													
No of tuyeres	24	0.2	4.8							4.8				
Downcomer and support structures	1	110	110		110									
Blast Fce Structures	1	1010.0	1010.0		1010.0									
Bleeder Stack	1	95	95		95									
(iv) sub-total for B.F. shell, bustle pipe, downcomer, structures, etc.			2059.80		2038.00		17.0			4.8				

BLAST FURNACE

Heavy Mechanical Equipment - Cooling System & Charging System

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate work & machining	Heavy Plate work	Machining shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10^9	Cost in Mexican Pesos x 10^9
Furnace Cooling														
Evaporative Cooling	532	2.2	1180						1180					
Cooling plates-copper	72	0.92	6.6							6.6				
Furnace tope emergency water supply														
Piping for steam compressed air, nitrogen, oxygen, etc.	1	24	24				24.0							
Filters, valves, water supply etc.	1	63	63				63.0							
Furnace charging														
Main conveyor 1500mm x 277 m. long 102m mm. 1500 t/hr. 2 x 350 kw motors	1	70	70								70			
Coupling & reduction drive	2	4.0	8.0								8.0			
Bridge structure	1	520	520		520									
Paul Wurth Bell Less Top														
Receiving hopper	1	7.2	7.2		7.2									
Main Hopper	2	17.0	34.0		34.0									
wearing plates (all hoppers)	-	15.3	15.3					15.3						
Cone, Chute & revolving chute	-	14.2	14.2		14.2									
Upper gear box	1	26.6	26.6			26.6								
Lower gear box	1													
Lubrication system, piping (FARVEL SYSTEM)	1	2.5	2.5								2.5			
(v) Fce. Cooling, charging & Paul Wurst System			1971.40		575.40	26.6	87.0	15.3	1180	6.6	80.5		* 2705.180 --	

* Total for Item(iv), (v)

BLAST FURNACE

Heavy Mechanical Equipment - Cast Houses & Dust Collection System

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY					Catalogue Equipment	Imported items	Cost in Italian Lire x 10^9	Cost in Mexican Pesos x 10^9
				Heavy Plate work & machining	Heavy Plate work	Machining shop	Piping & valves	Non Steel Iron Ferrous				
Cast Houses and Pollution Control.											613.000	2.400
Clay guns 2-45 Kw motors	2	4.0	8.0							8.0		
Taphole drills	2	0.5	1.0							1.0		
Slag notch stopper	1	1.6	1.6							1.6		
Slag pits 22 m x 34m each	2	5	10.0		10.0							
Cast House Structure	1	585.0	585.0		585.0							
Pouring points- runners 52m long each (plates 12 mm)	2	15.0	30		30							
Tuyere changing equipment	2	1.6	3.2						3.2			
Pan Mill	1	5.5	5.5						5.5			
(vi) Sub-total for Cast Houses			644.3		625.0				8.7	10.6		

BLAST FURNACE

Heavy Mechanical Equipment - Cast Houses & Dust Collection System

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY Heavy Plate work & machining	Heavy Plate work	Machining shop	Piping & valves	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10^9	Cost in Mexican Pesos x 10^9
Pollution Control Equipment														
Stockhouse dust Collection														
Low Pressure Venturi	1	3.0	3.0		3.0									
Centrifugal Separator 8mm	1	13.0	13.0		13.0									
Suction duct Suction Cone & piping	1	62.0	62.0		62.0									
Centrifugal fan 515 Kw, 130 000m^3/h capacity 18.6" H20	1	8.0	8.0								8.0			
Clear Air Stack	1	7.2	7.2		7.2									
Vacuum cleaning system	1	10	10		7.5						2.5			
Cast House														
Filter Units cap (150 000m^3 h)	1	50	50		40						10.0			
Chimney	1	7.8	7.8		7.8									
Ducts	1	9.5	9.5		9.5									
Structures	1	8.0	8.0		8.0									
Centrifugal fan cap 75 000 m^3/hr	2	1.9	3.8								3.8			
(vii) Sub-total for Dust collection equipment.			182.30		158.0						24.3		13.100 *	2.400 *

* Total for items (vi) & (vii)

BLAST FURNACE

Heavy Mechanical Equipment - Hot Blast Stoves

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate work & machining	Heavy Plate work	Machining shop	Piping & valves	FOUNDRY Nos Steel	Iron	Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10⁶	Cost in Mexican Pesos x 10⁶
Hot Blast Stoves													2,239.980	6.500
Stove Shell 42mm	3	240	720		720									
Stove Shell 30mm	3	85	255		255									
Stove dome 30mm	3	25	75		75									
Base plate 42mm	3	28	84		84									
Hot Blst Mains	1	95	95		95									
Structures around stoves	1	330	330		330									
Piping around stoves	1	210	210		210									
Lift around stoves	1	65	65								65.0			
Metallic cast supports (for checkers)	3	66.6	200					200						
Gas burners	3	2.0	6.0								6.0			
Combustion Air Fans	3	2.5	7.5								7.5			
Hot blast valves	3	8.33	25									25.0		
Hot Blast valves	1	7.7	7.7									7.7		
Expansion joints	20	1.4	28		28									
Cold blast valves	3	1.86	5.6								5.6			
Gas valves	3	1.5	4.5								4.5			
Butterfly valves	3	0.5	1.5								1.5			
Safety valves	3	1.5	4.5								4.5			
Gate valves	3	2.8	8.4								8.4			
Mixer valves	3	1.9	5.7								5.7			
Air regulating valves	3	0.7	2.1								2.1			
Waste gases valves	6	2.66	14.0								14.0			
Short valves	1	2.00	2.0								2.0			
Short silencer valves	1	3.8	3.8								3.8			
(viii) Sub-total Stoves; Valves & Piping.			2160.30		1797.0			200			130.6	32.7	2,289.980	6.500

BLAST FURNACE

Heavy Mechanical Equipment - Gas Cleaning Plant & Water Plant.

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machining shop	Piping & valves	FOUNDRY Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items.	Cost in Italian Lira x 10^9	Cost in Mexican Pesos x 10^9
													927.30	--
Gas Cleaning Plant														
Goggle valve	1	19.0	19.0									19.0		
Dust Catcher 19-25-mm	1	145	145		145									
Dust Catcher Structure	1	75	75		75									
Dust Catcher Pig mill	1	10	10								10			
Venturi Scrubber (bischoff system)	1	111	111		111.0									
Demister	1	34	34		34									
Structures	1	41	41		41									
Expansion joint	2	1.0	3.0		3.0									
Gas Piping in G.C.P.	1	124	124		124									
Gas Piping supports		30	30		30									
(ix) Sub-total for G.C. Plant & water plant.			592.0		563.0						10	19.0	927.30	--

BLAST FURNACE

Heavy Mechanical Equipment - General Items.

Description	Nos	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machine shop	FOUNDRY: Piping & valves	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items	Cost in Italian Lira x 10^6	Cost in Mexican Pesos 10^3
Torpedo Ladles & Bogies	7	112	784	784									£ 0,857	2,820
Torpedo ladles repair shop	1	240	240		240								{ 349,060	-
Clay preparation shop	1	52	52		52									
Auxiliary Equipments													205,100	1,000
Oil injection system	1	40,6	40,6				26,0				14,6			
Elevators	1	65,0	65,0								65,0			
Slag pits etc.	1	10,0	10,0		10,0									
(x) Sub-Total for General items.			1191,6	784	302		26,0				79,6		£ 0,857 554,160	3,820
Instrumentations & Computer													1056,200 £ 0,034	1,000
Electrics													246,35	1,200
Refractories													1131,650	12,000

BASIC OXYGEN FURNACE (BOF) SHOP (IST-STAGE)

Summary of Heavy Mechanical Equipment and Cost.

1 Austrian Shilling = 0,6091 Pesos

cost in January 1974

No.	Description	Total Wt. in tons	Heavy Plate-work & machining	Heavy Plate-work	Machining shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue	Imported	Cost in Austrian Shilling x 10^6	Cost in Mexican Pesos x 10^6
(i)	Hot metal system, Dust Collection & scrap handling system.	681.3		511.0	97					54	19.3	99.690	1.827
(ii)	Vessels, lances & addition system.	1307.2	206	619.2	143	37				302		73.741	0.676
(iii)	Waste gas cooling & cleaning system	898.1		574.9	29	207				87.2		71.728	0.560
(iv)	Steel ladles, slag pots & transfer Cars	849.8	151	480.7	17.2			200		0.9		23.634	1.484
(v)	Wrecking & relining equipment	91.2								69.5	21.7	9.144	--
(vi)	Services & Steel structures	11527		11000		527							
(vii)	EOT Cranes and hoists	2202.2	507.4							44.8	1650.	78.822	74.287
	Grand Total BOF Shop	17556.8	864.4	13185.8	286.2	771		200		558.4	1691	356.759	78.834

BOF SHOP (1st. Stage)

Hot Metal, Dust Collection and Scrap Handling Systems

1 AS = 0.6091 Pesos.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Mech Shop	Piping & valves	Steel	Foundry Iron	Foundry Non Ferrous	Catalogue Equipment	Imported items	Cost in Austrian Shillings x 10⁶ (in January '74)
Hot Metal System:													38.15
Hot metal charging ladles Plate thickness 50-40-30 mm.	5	29.4	147		147								
Hot metal transfer Car and weighing System.	2	45.0	90		45	45							52.00
Dust Collection System:													
Filter unit.	1	97	97		97								
Suction hoods, ducts, supports, Miscellaneous	1	56	56		56								
Fan, 520 K.W. 200,000 m^3/hr (crude gas blower) 350 mm head	1	2.0	2.0			2.0						15	
Pneumatic Conv. System.	1	15	15										
Spark trap.	1	20	20		20								
crude gas mains 4 mm pl.	1	18	18		18								
Emergency stack	1	16	16		16						1.0		
Scavenging air fan 110 K.W.	1	1.0	1.0									4.3	9.51
Deslagging mill.	1	4.3	4.3										
Scrap Handling System:													
Scrap Chutes	2	26	52		52								
Scrap Chutes	4	15	60		60						53		
Bridge Scale on rails	2	26.5	53										
Scrap tansfer cars	2	25.0	50			50							
(i) Sub-total for hot metal, dust collection, & Scrap handling systems.			681.3		511.0	97.0					54	19.3	99.69

'mam.

BOF. SHOP - 1st Stage. - L. D. Vessels.

Description	No.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work Shop.	Mech Shop.	Piping & valves	Steel	Foundry Iron	Foundry Non Ferrous	Catalogue Equipment.	Imported items	Cost in Austrian Shillings X 1000
L. D. Vessel Units (30-90 mm plates)	1	234	468		468								19.916
L. D. Vessel drives	2	52	104			104							14.539
Heat Shields	2	49	98	98									2.480
L. D. Lance Equipment:													
Lance Units	2	54	108	108									18.890
Lances	10	3	30			30							
Lances repair stand	1	4.2	4.2		4.2								
Valve stations	2	18.5	37.0				37.0						
Vessel Addition System.													
Ground bin & elevated bin charging system:-													17.886
Ground bins-200 m^3 (concrete)	6	-	-										
Vibrating feeder	6	1.0	6.0								6.0		
Bin Cover grates	6	15	90		90								
Belt Conveyor 800 mm X 336 m 220 t/hr. (inclined conveyor 37 KW.	1	271	271								271		
Top conveyor 800 mm X 87 m 220 t hr., 11 KW.	1	25	25								25		
Vessel charging system 7 bins, 9 needle valves, 4 chutes		39	39		30	9.0							
Dust Collection System, Filter unit.	2	11.5	23.0		23								
Platforms, fans, pipeline			4.0		4.0								
(ii) Sub-total for Vessels, lances & addition system, etc.			1,307.2	206	619.2	143	37				302		73.741

'mam.

BOF. SHOP - 1st Stage - Waste Gas Cooling & Cleaning System.*

Description	No.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work shop.	Mech shop.	Piping & valves	Steel	Foundry iron	Non Ferrous	Cata-logue Equip-ment.	Imported items.	Cost in Austrian Shillings. X 10⁶
Waste Gas cooling Systems & insulation													* 71.728
Movable hood	2	9.0	18.0		18.0								
Stationary Cooling stack I. D. 2.500 mm X 40 m long.	2	47	94.0		94.0								
Water Seal	2	3.5	7.0			7.0							
Deflection box	2	10	20		20								
Stacks	2	46	92		92								
Expansion tank	2	12	24		24								
Supporting Structure & Expansion chamber.	2	30	60		60								
Pipelines & Fitting	2	66	132				132						
Pumps (water circulation) 1265 m^3/hr-5.5 m X 220 KW	4	1.5	6								6.0		
2 - Heat Exchanger Systems	4	13.5	54								54.0		
Platforms, Stairs, ladders.	2	22	44		44								
W. G. Cleaning Systems:-													
Filter Tower	2	38.7	38.7		38.7								
Accesories	2	18.7	18.7		18.7								
I. D. Fan	2	5.5	11.0								11.0		
Swirl vane with pneumatic adjusting devices	1	6.2	6.2								6.2		
Gas stack	2	12.5	25		25								
Gas burner head	2	5.0	10								10		
Operting platforms	2	2.75	5.5		5.5								
Pipes for liquids	1	75.0	75				75						

*nam.

BOF SHOP - 1st Stage - Waste Gas Cooling & Cleaning System.

Description	No.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work shop.	Mech shop	Piping & valves	Steel	Foundry Iron	Foundry Non Ferrous	Catalogue Equipment.	Imported items	Cost in Austrian Shillings. X 10⁶
Skirt and hood shifting equip.	2	33	66		50	16							
2-Secondary gas exhaust systems with suction hoods.	2	27.5	55		55								
2-Wash water clarification system	2	18.0	36		30	6							
(iii) Sub-total for W.G. cooling & cleaning systems.			898.1		571.9	29	207				87.2		71.728

Steel Teeming Ladles, Slag pots, Steel ladle transfer cars. *

Description	No.	Unit Wt. in tons.	Total Wt. in Tons.	Heavy Plate-work & machining	Heavy Plate-work Shop.	Mech Shop	Piping & valves	Foundry steel	Foundry Iron	Foundry Non Ferrous	Cabalogue equip ment	Imported items	Cost in Austrian Shillings x 100
Steel teeming ladles	14	28.3	396		396								* 23,634
Slag pots	8	25	200						200				
Steel ladle transfer cars with winches.	3	38	114	114									
Slide gate & spout exchanging stands.	2	5.3	10.6			10.6							
Ladle drying stands	5	7.7	38.5		38.5								
Ladle slide gate	14	0.47	6.6			6.6							
Slag handling Cars	2	18.5	37.0	37.0									
Ladle additions systems:-													
Bottom discharge hoppers	4	0.95	3.8		3.8								
Day bins 10 m^3/5-15 mm pl.	6	5.67	34.0		34.0								
Discharge units	6	0.80	4.8		4.8								
Movable weigh hopper (8 mm pl)	1	0.9	0.9								0.9		
Ladle charging units	4	0.9	3.6		3.6								
(iv) Sub-total for Steel ladles, Slag pots and transfer cars.			849.8	151.0	480.7	17.2			200		0.9		23,634

'mam.

BOF Shop (1st Stage)

Vessel Wrecking & Relining Equipment, Lifts & Ladle Spraying units.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work Shop.	Mech. Shop	Piping & valves	Steel	Foundry Iron	Foundry Non Ferrous	Cabalogue Equipment	Imported items	Cost in Austrian Shillings x 10⁶
Vessel Wrecking & Relining Equipment:													3.901
Vessel Wrecking M/C	1	8.0	8.0									8.0	
Fresh air blower	1	2.0	2.0								2.0		
Cutters	2	0.6	1.2									1.2	
Relining Unit	1	6.5	6.5									6.5	
Vessal Cooling fan	1	4.0	4.0								4.0		
C.O. gas burner	1	3.5	3.5								3.5		
Passenger & Freight Lifts.													5.343
Passenger Lift	1	16.0	16.0								16.0		
Freight "	1	44.0	44.0								44.0		
Ladle Spraying units	2	3.0	6.0									6.0	
(x) Sub-total for wrecking & relining equipment & lifts			91.2								69.5	21.7	9.144

BOF SHOP (1st Stage)

Services & Structures

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work Shop.	Mech Shop	Piping & valves	Steel	Foundry Iron	Foundry Non Ferrous	Catalogue Equipment	Imported items	Cost in Austrian Shillings X 100
													A.S. 7.726 M.N. 6.367
Services.													
C.O. gas Supply			20.8				20.8						
Steam Supply			27.5				27.5						
Compressed air			22.0				22.0						
Oxygen Supply			34.2				34.2						
Nitrogen Supply			8.9				8.9						
Softened water Supply			9.1				9.1						
Industrial " "			318.5				318.5						
Fire-extinguishing water Supply			26.0				26.0						
Drinking " "			6.0				6.0						
Sewer lines													
Ventilation & Air-Conditioning			51.0				51.0						
Steel Structures			11,000		11,000								A.S. 71.096 M.N. 67.920
(vi) Sub-total for services & Steel structures.			11,527		11,000		527						A.S. 78.822 M.N. 74.287

'000 TON.

BOF SHOP Cranes & Hoists.

Description	Nos.	Unit Wt. in tons.	Total Wt in tons	Heavy Plate-work & machining	Heavy Plate-work Shop.	Mech Shop	Piping & valves	Steel	Foundry Iron	Foundry Non Ferrous	Catalogue Equipment	Imported items	Cost in Austrian Shillings
Scrap yard Cranes cap. 15 tons span - 30 m	2	98.4	196.8	196.8									
H.M. Charging Crane cap. 180/60/20 span- 17 m	1	550	550									550	
Ladle preparation Crane cap. 80/20 span- 17 m	1	118	118	118									
Steel Ladle handling Crane cap. 180/60/20 span- 17 m	2	550	1,100									1 100	
Scrap charging Crane cap.65/20 span- 17 m	1	155	155	155									
Lance charging Crane cap. 15 tons., span- 7 m	1	7.6	7.6	7.6									
Hoists upto 5 tons capacity	17	Assorted	3.2								3.2		
" above 5 tons-10 tons	5	Assorted	11.2								11.2		
" 15 tons cap.	4	7.6	30.4								30.4		
(vii) Sub-total for Cranes & hoists.			2 202.2	507.4							44.8	1 650	

'mam.

OXYGEN PLANT - 150 TONS CAPACITY

1 DM = 5.19 Pesos
1 £ Sterling = 30.1475 "
1 Swiss Franc = 4.171 "

Summary of Heavy Mechanical Equipment - Manufacturing Details — *Prices are in Jan. 1971.* — 46.

No.	Description	Total Wt.	Heavy Plate-work & machining	Heavy Plate-work	Mach. shop.	Piping & valves	FOUNDRY Steel	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies in January 1971 x 10^6	Cost in Mexican Pesos
(i)	Air Filters, direct cooler, Pumps Air separator unit, Reversal Heat Exchangers, Adsorbers (CO_2 & liquid O_2), Expansion Turbines & generators, etc.	412		214					203.2	24.8	SF 0,074,500 DM 3,027,910 1,483,116	1,720,400
(ii)	Liquid Oxygen & Gas System,	615.9		239		250		4.9		122	£ 0,128,079 SF 0,619,300	3,852,300
	Grand Total For Oxygen Plant	1057.9		459		250		4.9	203.2	146.8	£ 1,611,195 DM 3,027,910 SF 0,693,800	5,572,700

CAYCE'S PLANT - 100 TONS CAPACITY

Heavy Mechanical Equipment - Air Filter, Cooler, Adsorbers & Expansion Turbine

47.

1 £ Sterling 30.1177 Pesos
1 Swiss Franc 4.171 "
1 DM 5.19 "

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & Mach.	Heavy Plate-work	Machine shop	Piping & valves.	FOUNDRY Steel from Ferrous	FOUNDRY Non Ferrous	Catalogue Equipment	Imported various items	Cost in various currencies in January 1974 x 10⁶	Cost in Mexican Pesos
Air Filters	2	1	2.0		2.0								
Air turbo-compresor cap. 45000m³/hr 4000 kw sincronous motor, discharge pressure 7 kg/cm²	2	58	116							116	DM 3.027,940		
Direct cooler with water spray 2267mm dia. x 10.68 m x 11 mm. (stainless steel)	2	12.5	25		25								
Direct cooler pump centrifugal 51.8 m³/hr, 300 mm impeller (bronze)	4	0.3	1.3							1.2			
Air separation unit boxes (distillation unit) dia. 2.5m x 18m x 1.6mm. (16 mm & 8 mm. col. thick)	2	69	138		138								
R.H.E. Unit boxes (Reversal Heat Exchangers) aluminum	2	43	86							86			
Rich liquor adsorber boxes to absorb CO_2 (stainless steel) 915mm. dia. x 2650mm	2	13	26		26								
Liquid Oxygen Adsorber boxes dia. 495 mm. x 1440 mm. (stainless steel)	2	4	8		8								
Turbine trunkings (aluminum alloy)	4	1.2	4.8							4.8			
R.H.E. Pipe ducts (aluminum)	2	7.5	15		15								
Expansion turbines-generators(impluse type) 100 kw each	4	5.0	20							20			
(1) Sub-Total Air Filter, Cooler, Adsorbers & Expansion Turbines			442		214					203.2	24.8	£ 1,483,116 SF 0,071,500 DM 3.027,940	1.720,400

Heavy Mechanical Equipment - Liquid Oxygen & Gas System, Storage, Cooling towers, etc.

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & mach.	Heavy Plate work	Machine shop	Piping & valves	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies in January 1971	Cost in American Pesos x 10^6
Liquid oxygen circulation & transfer pump centrifugal, 2 stage 31.0 kg/cm² 56 kw. casing & imp. (bronze)	4	0.3	1.2							1.2				
Waste Nitrogen silencers	2	17	34		34									
Oxygen compressor, 3 stage reciprocating type	3		108									108 SF	0.619,300	
Liquid oxygen-transfer pump to vaporizer	2	0.3	0.6							0.6				
L.O.-T.P.V. (bronze)	2	1.25	2.5							2.5				
L.O.-Cylinder filling pumps	2	0.3	0.6							0.6			£ 0.060,525	
L.O. Storage tanks capacity-1000 tons (double wall) inner 11 m. dia. x 9.5 m high x 11 mm. pl. (stainless) outer 13.5 m. dia x 12.25 m. high x 6mm. pl. (m.s.)	1	100	100		100									
													£ 0.644,700	3.141,300
Oxygen gas storage vessels dia. 2000mm. x 20 m long 25-35mm. plate thickness	5	21	105		105									
Air compresor & drier	1	3	3									3	£ 0.011,538	
Air receivers	1	2	2									2		
													£ 0.004,390	0.691,000
Cooling tower-3 cells (wood)	1	wood												
Induced draft fans 4 m. dia. impeller x 37 kw each, 508 m³/hr of water cooling/cell	3	Fibre glass												
Pipework	1		250				250							
Circulating water pumps	4	0.75	3.0									3.0	£ 0.006,926	
Industrial Cylinders	50	0.12	6.0									6.0		
(ii) Sub-Total Liquid Oxygen & gas systems, storage, cooling towers, etc.			615.9		239		250			4.9		122.0	£ 0.128,079	3.832,300
													SF 0.619,300	

Prices are for October 1971
1 U.S.$ $12.49 = 1 Can.$

Sumary of Heavy Mechanical Equipment - Ladle Turret, Tundish & Other Machines.

No.	Description	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Mach. Work-Shop	Pipes & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in Canadian Dollars x 10^6
(i)	Support structure, Ladle Turret	1220	400	820								0,909
(ii)	Tundish, Tundish Cars & Heating Equipment	588			586					2,0		0,723
(iii)	Mould Jacket, Guides & oscillator & Lubrication system	229,8		114,8	106,6					7,0	1,4	0,698
(iv)	Spray Chamber, Spray aprons & Guides	98,5		98,5								0,164
(v)	Withdrawal Straightner unit	150,0		144,24		5,76						0,555
(vi)	Torch approach table, Torch cut off units & Run out table	469,0			334					135		1,360
(vii)	Dummy bars, racks and heads	133,6		130				3,6				0,115
(viii)	Cross transfer mechanism cooling bed, pusher storage bed	540	27	463	50							1,128
(ix)	Casting & Pusher machine hydraulic Systems	25			12,4					12,6		0,185
(x)	Piping & valves	455				455						0,313
(xi)	Aluminium wire feeders walkways & Misc. items	132,5		52	62,5					18		0,179
	Grand Total for Continuous Casting Plant	4041,4	427	1822,54	1151,6	460,76		3,6		174,5	1,4	6,349

Prices are for October 1973
1 U.S. $ = $ 12.49 = 1 Can. $

CONTINUOUS CASTING PLANT

Heavy Mechanical Equipment - Ladle Turret, Tundish & Other Machines

Description	Nos.	Unit Wt. in tons	Total Wt. in tons	FOUNDRY Heavy Plate-work & machining	Heavy Plate-work.	Machine shop	Piping & valves	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items	Cost in Canadian Dollars x 10⁶
Support Structure	1	820	820		820								0.296
Ladle Turret	3	134	400	400									0.613
Tundish Car	6	64.5	387			387							0.374
Tundish & 30 Covers	20	7.5	150			150							0.211
Tundish heating	9												
Tundish drying	6	8.5	51.0			49					2.0		0.138
Nozzle heating	6												
Mould Jackets	72	1.5	108			106.6						1.4	
Extended Guides	72	0.9	64.8		64.8								0.638
Mould Oscillatero	18	3.0	54.0		50.0						4.0		
Mold Lubrication System & Grease Lubrication system	3	1	3.0								3.0		0.060
Spray Chamber	3	1.5	4.5		4.5								0.023
Spray aprons & guides	18	5.2	94		94								0.131
Straightner Withdrawal	18	8.32	150		144.24		5.76						0.535
Torch approach table	18	3.66	66.0			66.0							Included in mount table
Torch cut-off units	18	8.32	150			15.0					135.0		0.524
Run out table	18	14.10	253			253.0							0.856
(i) Sub-Total for Ladle Turret, tundish, mould equipment & other machines.			2755.3	400	1177.54	1026.6	5.76				144.0	1.4	4.429

Heavy Mechanical Equipment - Dummy bars, Transfer Mechanism

FOUNDRY

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & tubes	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items	Cost in Canadian dollars x 10^6
Crop removal system	6	6.16	37		37								Misc. Equipment
Slag boxes & launders (13" x 4" channels) 19 mm. plate	9-18	2.5	22.5			22.5							" "
Dummy bars	18	7.22	130		130								0.115
Dummy bars storage racks	18												
Dummy bars heads	36	0.1	3.6						3.6				
Disappearing stops	36	0.25	9.0			9.0							Misc. Equipment
end stops	18	0.33	6.0			6.0							Misc. Equipment
Cross transfer mechanism	3	12	36		36								
Rake type cooling bed	3	150	450		400	50							1.128
Pusher Mechanism	3	9.0	27	27									
Storage bed	3	9.0	27		27								
Casting machine Hyd. system	3	5.33	16.0			8.0					8.0		
Pusher machine Hyd. system	3	3.0	9.0			4.5					4.5		0.185
Tundish Interbay transfer car	1	25	25.0			25.0							Misc. Equipment
Spray chamber exhaust fans	6	2.0	12.0								12.0		Misc. Equipment
													Total of misc. eqipment 0.067
Piping	3 sets	151.67	455				455						0.313
Aluminium wire feeders	18	0.33	6.0								6.0		0.046
Walkway over runout table	3	5	15		15								0.066
(ii) Sub-Total Dummy bars Transfer mechanism, & Misc. Equipment.			1286.1	27	645	125	455		3.6		30.5		1.92

BAR & LIGHT SECTION MILL

Summary of Heavy Mechanical Equipment.

No.	Description	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currie's x 10^6	Cost in Mexican Pesos x 10^6
(i)	Billet handling & heating	890.8	293.3	471.3						7.2	119	Y 81.120 DM 0.851 L 0.472	3.201
(ii)	Equipment between furnace and roughing mill	71.9		16.5	52.9			2.5				Y 35.900 DM 0.159	0.357
(iii)	Roughing & Intermediate trains	648.4									648.4	Y 273.250 DM 1.468	0.246
(iv)	Finishing train & shears	520.2		20	22.5		85.8				391.9	Y 279.840 DM 2.004	1.814
(v)	Cooling beds & shears (finishing)	1452.2	1277.6	24	142.8					7.8		Y 639.160 DM 3.434	0.940
(vi)	Finishing equipment	809.4	297.9	74.1	254.2					13.2	180	FF 9.813 DM 3.959	2.369
(vii)	Roller tables, lubrication, Hydraulic systems, etc.	1009	406.6	392.4		66				144		Y 2.200 FF 0.667 DM 7.657	9.485
	Grand Total	5401.9	2265.4	998.3	472.4	66	85.8	2.5		172.2	1339.3	Y 1302.470 FF 10.480 DM 19.752 L 0.472	18.412

Heavy Mechanical Equipment - Billet Stocking, Handling & Re-Heating.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining.	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Scale for billets	1	7.2	7.2								7.2		DM 0.136	
Billet Grids	1	60.6	60.6		60.6								Y 81.120	1.048
Furnace charging roller table	1	46.0	46.0	46.0									DM 0.715	
Ejector for Rejected billets	1	6.5	6.5	6.5										
Billet ejecting machine	1	13.8	13.8	13.8										
Furnace charging-walking beam conveyor	1	162.	162	162									£ 0.087	
Billet reheating furnace door & combustion equipment cap. 170 t hr - 1250° c. width 15m x 27m long c.o.gas & oil 29 burners	1	378.7	378.7		300.7							78	£ 0.221	
Waste gas recuperator & chimney	1	139	139		110							29	£ .049	2.153
Furnace hydraulic equipment & lub.	1	6	6									6	£ .043	
Fce. oil & gas combustion system and piping	1	36	36	30								6	£ .045	
Billet pushing & discharge	1	35	35	35									.027	
(i) Sub-total for equipment for billet handling heating and discharge			890.8	293.3	471.3						7.2	119	Y 81.120 DM 0.851 £ 0.472	3.201

Heavy Mechanical Equipment - Equipment between Furnace & Rolling

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work.	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6.	Cost in Mexican Pesos x 10^6.
Equipment between furnace & roughing mill														
Billet pull-out Pinch rolls (reversible type)	1	10.3	10.3			10.3								
Drum type billet switch	1	5.5	5.5			3.0			2.5					
Edge pinch rolls gear box, hydraulic system.	1	14	14.0			14.0								
Pendulum shear	1	21.5	21.5			21.5								
Scrap chute & bucket	1	11.5	11.5		11.5									
De-scaling box	1	4.1	4.1			4.1								
Base frame	1	5.0	5.0		5.0									
(ii) Sub-total for equipment between furnace and roughing mill			71.9		16.5	52.9			2.5				Y 35.900 DM 0.159	0.357

Heavy Mechanical Equipment - Rolling, Roughing & Intermediate Trains

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Non Ferrous from	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Roughing Trains													
Roughing stands 1 &2 (horizontal); spur gear pinion drives; couplings & driving spindles. Roll dia. 550mm. x 1250mm. long	2	53.5	107.1								107.1	Y 273.250 DM 1.668	0.246
Horizontal Roll stands 3,4,5,6; spur gear drives; coupling, spindles, supports roll stands; bed plates etc. Roll dia. 460 x 1050mm. long.	4	40.2	160.8								160.8		
Stands 7 & 8 (horizontal) Roll dia. 390mm x 1050mm long.	2	29.75	59.5								59.5		
Stand *7 vertical (between 6H & 7H) Roll dia 400mm. x 850mm. long	1	54.1	54.1								54.1		
One dual rotary shear	1	14.8	14.8								14.8	*Cost includes in "shears"	
Intermediate Train													
Stands *9H & 10H Roll dia. 390mm x 1050mm long.	2	33.4	66.8								66.8	Y 173.720.000 DM 1.098.400	369.000
Stands *11,12,13 & 14 Roll dia. 360mm x 850mm. long.	4		127.2								127.2		
Stands *12 (vertical) Roll dia.400 x 850mm. long	1	54.1	54.1								54.1		
Two snap shears	2	2.0	4.0								4.0	*Cost includes in "shears"	
(iii) Sub-total for roughing train, intermediate train			648.4								648.4		

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10⁶	Cost in Mexican Pesos x 10⁶
Two Finishing Trains														
Roll stands # 15 vertical Roll stands # 17 vertical Roll dia. 360mm x 850mm long.	2 2	48.15 48.15	96.30 96.30									96.30 96.30	Y 214.510 DM 1.604	0.246
Roll stands # 16 horizontal	2	28.075	56.15									56.15		
Roll stands # 18 horizontal Roll dia. 360mm x 850mm long.	2	28.075	56.15									56.15		
Roll & stand changing equipment	1 set	70.5	70.5									70.5	Y 13.010 DM 0.139	0.744
Guide equipment (twisting stand & guides loopers)	1 set	85.8	85.8					85.8					Y 16.240 DM 0.098	0.533
One combination two crank & rotary shear (in heavy finishing train #1)	1	16.5	16.5									16.5	Y 36.080 DM 0.163	0.271
One rotary shear (in light finishing train #1)	1	7.5	7.5			7.5								
Scrap chute, buckets & inclined roller table	1	35	35		20	15.0								
(iv) Sub-total for finishing trains and "shears"			520.2		20	22.5		85.8				391.9	Y 279.849 DM 2.004	1.814

BAR & LIGHT SECTION MILL

Heavy Mechanical Equipment - Cooling Beds & Shears (finishing)

Description	No.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining.	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^3	Cost in Mexican Pesos x 10^3
Two Cooling beds,														
approach troughs 2 Pinch roll ser 1 running troughs 2	2	171.6	343.2	343.2									Y 477.440 DM 2.558	0.470
Straightening grid cooling area Rake-type cooling area Aligning devices	2 2 2	321.75	643.5	643.5										
Chain type discharge devices	2	96.2	192.4	192.4										
Man cooler	2	3.9	7.8								7.8			
Shears in finishing line														
Cold shears & end pushers	3	47.6	142.8			142.8							Y 152.720 DM 0.876	0.470
Scrap chute & buckets	3	8	24.0		24.0									
Girder type gauge	3	32.8	98.5	98.5										
(v) Sub-total for cooling beds & shears (finishing)			1452.2	1277.6	24	142.8					7.8		Y 630.160 DM 3.434	0.940

Heavy Mechanical Equipment - Finishing Equipment

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	Heavy Plate work	Machine shop	Piping & valves	Non Steel Iron Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6		Cost in Mexican Pesos x 10^6
Finishing Equipment													
Chain discharge device	1	25.5	25.5			25.5					DM	0.227	
Chain discharge device	1	50.0	50.0			50.0					DM	0.422	
Chain cross transfer	2	26.9	53.8			53.8					DM	0.494	
Collecting pocket & hand piling tables 21m. long	2	7.85	15.7		15.7								0.339
Strapping equipment	2	6.6	13.2						13.2		DM	0.079	0.369
Botalem binding installions	2	190	380	200						180	FF DM	9.813 0.675	0.376
Pack take off stations & collection grid	2	23.4	46.8	46.8							DM	0.333	0.125
Two depositing grids troughs & entry pinch roll set	2	19.2	38.4		38.4						DM	0.098	0.382
Guide trough, straightening machines, roller, swivel train	2	14.45	28.9		20.0	8.9					DM	0.598	
Roller table frames Push-off devices collecting pockets apron plates	2	20.55	41.1	41.1							DM	0.242	0.241
Chain delivering devices	3	27.4	82.4			82.4					DM	0.587	0.244
One rebar bending device	1	22.6	22.6			22.6					DM	0.145	0.290
One transfer car	1	11.0	11.0			11.0					DM	0.059	
(vi) Sub-total for finishing equipment.			809.4	287.9	74.1	254.2			13.2	180	FF DM	9.813 3.959	2.369

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining.	Heavy Plate work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6		Cost in Mexican Pesos x 10^6
Cooling bed run-off roller tables roller tables frames apron plates	2	71	142	142									DM	0.223	1.372
Shear roller table	2	57.6	115.2	115.2									DM	0.265	1.035
Loading roller table	2	30.5	61.0	61.0									DM	0.186	0.588
One roller table	1	36.8	36.8	36.8									DM	0.100	0.322
Stops, disappearing security	21	2.45	51.6	51.6									DM	0.327	0.180
Lubrication System															
Central Oil lubrication	1	29.4	29.4								29.4				
Central grease lubrication	1	29.4	29.4								29.4		DM	0.824	0.860
Hydraulic System for mills	1	85.2	85.2								85.2				
Scrap Coilers	2	8.7	17.4		17.4										
Pipes lines & valves for service water & compresed air	2	35 31	66				66						DM	1.194	
Structures used in mill			375		375								Y DM FF	2.200 4.338 667	5.128
(vii) Sub-total for roller tables, lub.& hydraulic systems, etc.			1009	406.6	392.4		66				144.0				

1525mm. HOT STRIP MILL - MECHANICAL PLANT
Summary of Heavy Mechanical Equipment Manufacturing detail and Cost

1 U.S. $ = 12,5 Pesos
1 F.F. = 4,50 Pesos
Prices are in February 1970.

No.	Description	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
(i)	Slab handling & charging system.	863,1	215,2	244	378,7			25,0		0,20		U.S. $ 0,682 F.F. 10,235	1,426
(ii)	Slab extraction and reject system, approach roller tables & sideguides.	579,1	120,0	102,7	356,4							F.F. 9,025	1,255
(iii)	Vertical scale breaker	320,77		10,5	17,8						292,47	F.F. 8,538	0,660
(iv)	Roughing Mill De-scaling unit & approach tables.	142,3	3,7	35,68	102,52	0,4						F.F. 2,032	0,403
(v)	Rough Mill Roller tables.	275,67	3,7	66,83	205,14							F.F. 3,513	1,123
(vi)	Four high reversing roughing mill	770,07		23,5		12,5					734,07	U.S. $ 0,260 F.F. 14,175	0,023
(vii)	Vertical Edger No. 1	225,16		7,8	18,46	5,7					193,2	F.F. 7,000	0,057
(viii)	Non Reversing Roughing Mill approach table complex	426,97		115,17	311,8							F.F. 5,576	1,605
(ix)	Non-reversing rough mill & vertical Edger # 2	1009,73		17,8	34,68	9,5					947,74	U.S.$ 0,260 F.F. 20,809	0,068
(x)	Delay table complex & rotary crop shear.	922,7		471,3	265,4						186,0	F.F. 11,205	2,649
(xi)	Cobble pusher & skids & Descaling unit	139	57	48,3	32,6	1,1						F.F. 2,819	1,137
(xii)	Finishing train	5083,94		13,1	1185,69	34,05					3851,1	U.S.$ 24,640	1,525
(xiii)	Run out-table system & Laminar cooling system	688,18	243,88	290,9		120,4					33,0	U.S.$ 1,690 F.F. 9,779	5,549

1525mm. HOT STRIP MILL - MECHANICAL PLANT

summary of Heavy Mechanical Equipment Manufacturing detail and Cost

No.	Description	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10⁶	Cost in Mexican Pesos x 10⁶
(xiv)	Pinch rolls, down coiler complex & auxiliaries	860	47.5	49.5	61.4						701.6	F.F. 22.528	0.534
(xv)	Coil Transfer system & de-scaling system	1380		1153.1	10.0	21.8				219.5	145.6	U.S.$ 6.524 F.F. 0.147	0.148
(xvi)	Roll cooling system & Roll Turning shop	1197.94	560.8	400.7		65.6				164.84		U.S.$ 5.778 F.F. 0.719	20.264
	Grand Total	15084.62	1257.78	3050.88	3010.59	271.05		25.0		384.54	7084.78	U.S.$ 39.834 F.F. 128.099	37.817

1 U.S.$ = 12.50 Pesos
1 French Franc = 1.50 Pesos
Price in February 1976.

Heavy Mechanical Equipment - Slab Handling and Charging System.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining.	FOUNDRY: Heavy Plate work.	FOUNDRY: Machine shop	FOUNDRY: Piping & cables	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^3	Cost in Mexican Pesos x 10^6
Slab Charging System														
Transfer Cars Cap. 150 tons. Helical gear reducer D.C. motor 37 kw.	2	96.5	193	193.0									$ 0.682	
Furnace Approach Roller tables														
Furnace approach roller tables 4 sections 12m long each.													F.F. 8.557	0.771
Rollers 455mm dia. x 1575mm	68	2.794	190			190								
Table frames	4	21.0	84		84									
Gear reduction units	4	5.0	20			20								
Curb plates 4-D.C. motors 52 kw each	8	2.25	18		18									
Slab weigher (35 tons capacity) hydraulic lift.	1	0.20	0.20								0.20			
Disappearing & Stationary stops	2	11.1	22.20	22.2										
Furnace Charging Roller tables - two 12m long each sec.													Price included in Furnace approach roller tables.	
Roller 455mm dia. 1575 barrel	36	2.794	95			95								
Table frames	2	21.0	42		42									
Gear reduction units	2	5.0	10.0			10								
Curb plates 2-D.C. motors 104 kw each.	4	2.25	9.0		9.0									

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10	Cost in Mexican Pesos x 10⁶
Furnace Inter-Connecting table 11.2m long.													Price includes in Furnace approach roller tables.	
Roller 455mm. dia. x 1575mm barrel	16	2.81	45			45								
Tables frames	1	20.0	20		20									
Gear reduction unit	1	5.0	5.0			5.0								
Curb plates 1 DC motor 104 kw	2	2.25	4.5		4.5									
Slab Pushers & entry skids													F. F. 1.678	0.665
Gear boxes (helical gears)	2	6.85	13.70			13.70								
Rams	2	18.8	37.60		37.60									
Pusher frames	2	6.80	13.60		13.60									
Covers	2	7.65	15.30		15.30									
Skids 4-motors D.C. 44 kw. each	2	12.50	25.00						25.00					
(i) Sub-total for slab handling & charging system			863.1	215.2	244	378.7			25.00		0.20		$ 0.682 F. F. 10.235	1.426

Heavy Mechanical Equipment - Slab Extraction System & Delivery Tables.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items.	Cost in various currencies x 10^3	Cost in Mexican Pesos x 10^3
Slab Extraction System														
Two slab extractors (and lifting)													F.F. 3,906	0,047
Gearboxes (helical type)	8	2.5	20.00			20								
Extractor arms	8	9.66	77.3	77.3										
Extractor frames	8	5.34	42.7	42.7										
Shafts	16	1.84	29.4			29.4								
4-Motors 37.5 Kw D.C.														
4-Motors 37.5 D.C.														
Furnace delivery tables, two 12.5 m. each (2 sections)													F.F. 5,119	1,209
Rollers 455mm. dia x 1575 barrel	34	2.97	101			101								
Table frames	2	12.0	24.0		24.0									
Curb Plates,	4	1.125	4.5		4.5									
34 D.C. motors 5.5 kw each.														
One intercommecting table 11,25m. long.	1												Price included in Furnace delivery tables	
Rollers	16	2.81	45			45								
table frames	1	11.0	11		11									
Curb plates	2	2.15	4.3		4.3									
Slab Ejecct Table 21m long.													Price included in Furnace delivery tables	
Rollers 455mm dia x 1575 mm.	33	2.77	91.4			91.4								
Table Frames	2	11.1	22.2		22.2									
Curb plates	2	4.4	8.8		8.8									
33 DC motors 5.5 kw each														

Heavy Mechanical Equipment - Slab Extraction System & Delivery Tables.

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY Heavy Plate-work & machining	Heavy Plate-work.	Machine shop	Piping & valves	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items.	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Approach Roller Table														
12.75 m long													Price included in Furnace delivery tables.	
Rollers 455mm x dia. x 1575 mm. long	18	3.8	50.4			50.4								
Table frames	1	12.0	12.0		12.0									
Aprons	2	0.6	1.2		1.2									
Adjustable Entry Sideguides-two														
7m long, rack & pinion, centering type.													Price included in Furnace delivery tables	
Gear boxes	2	2.1	4.20			4.20								
Pusher bars	2	1.85	3.70			3.70								
Head assembly	2	4.85	9.70		9.70									
Covers & frames	2	2.5	5.0		5.0									
Pinion assembly	2	5.65	11.3			11.3								
Motors 15 kw D.C. -two														
(ii) Sub-Total for Slab Extraction & reject system, approach roller tables & sideguides.			579.1	120	102.7	356.4							FF 9.025	1.255

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining.	FOUNDRY: Heavy Plate-work	FOUNDRY: Machine shop	FOUNDRY: Piping & cables	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Vertical Scale breaker													F.F. 8.538	0.060
Bedplates & housing.	1 set	110	110									110		
Rolls 1150-1035mm. dia. x 430 mm. barrel	2	8.9	17.8			17.8								
Main drive gear box	1	21.76	21.76									21.76		
Main drive shaft assy.	1	5.0	5.0									5.0		
Lead spindle assy.(univ. type)	1	12.6	12.6									12.6		
Bevel gear drive	1	59.6	59.6									59.6		
Coupling boxes	1	3.4	3.4									3.4		
Carrier assemblies	1 set	2.5	2.5									2.5		
Screw assemblies	1 set	13.0	13.0									13.0		
Cylinder 1	1	0.9	0.9									0.9		
Screws	1 set	32.0	32.0									32.0		
Screw gear assy.	1 set	8.8	8.8									8.8		
Feed Rollers	1 set	21.0	21.0									21.0		
Main drive Coupling	1	0.35	0.35									0.35		
Couplings	1	1.56	1.56									1.56		
Stairways, platform	1 set	8.00	8.00		8.00									
Water Cooling headers	1	2.50	2.50		2.50									
(iii) Sub-total for vertical Scale Breaker			320.77		10.50	17.8						292.47	FF 8.538	0.060

Heavy Mechanical Equipment - Roughing Mill De-scaling, Unit & Approach tables

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
De-Scaling Unit and Roller Tables													FF 1.864	0.403
Approach roller table and filler table To 5m. long														
Rollers 455mm. dia x 1575 barrel	23	2.74	63.0			63.0								
Table frames	1	15.6	15.6		15.6									
Aprons	22	0.055	1.2		1.2									
Curb plates	2	2.35	4.7		4.7									
23 DC motors 5.5 kw each														
Two Adjustable entry Sideguides. Rack & pinion centering type 5.93 m long.														
Gear boxes (helical gear reducer)	2	2.1	4.2			4.2								
Pusher bars	2	1.85	3.7	3.7										
Head assy. complete	2	4.87	9.74			9.74								
Covers	2	2.54	5.08		5.08									
Pinion assembly	2	5.64	11.28			11.28								
2 DC motors 7.5 kw each														
De-Scaling Stand 3.75 m. long													FF 0.168	
Frame	1	3.5	3.5		3.5									
rollers 455mm dia. x 1575mm barrel	5	2.86	14.3			14.3								
Headers, valves & piping	1 set	0.4	0.4				0.4							
Covers & hoods	1 set	5.6	5.6		5.6									
5 motors 5.5 kw D.C.														
(iv) Sub-total for DeScaling unit and approach tables.			142.3	3.7	35.68	102.32	0.4						FF 2.032	0.403

Heavy Mechanical Equipment - Roughing Mill, Roller tables, filler tables & entry Sideguide complex

08.

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work.	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10[3]	Cost in Mexican Pesos x 10[3]
Delivery roller table 12.75 m. long.													FF 3.513	1.123
Rollers	18	2.78	50.0			50.0								
Table Frames	1	12.1	12.1		12.1									
Aprons	17	.07	1.2		1.2									
Curb plates	2	2.35	4.7		4.70									
18 motor D.C. 5.5 kw each														
Approach Roller Table 18 m. long														
Rollers 455mm. dia. x 1575 long.	25	2.8	70			70.0								
Table Frame.	1	16.55	16.55		16.55									
Curb plates	2	3.20	6.40		6.40									
25 motor 37.5 kw each														
Exit Roller & Future front Exit filler table 13.5 long														
Rollers 455mm dia. x 1575mm long.	19	3.158	60.0			60.0								
Table Frames	2	9.8	19.6		19.6									
Aprons	18	0.067	1.2		1.2									
52. kw D.C. motor														
Adjustable Entry Sideguides 8.03m long.														
Gear boxes	2	2.06	4.12			4.12								
Pusher bars	2	1.85	3.70	3.70										
Lead assy. complete	2	4.87	9.74			9.74								
Cover & frames.	2	2.54	5.08		5.08									
Pinion assy	2	5.64	11.28			11.28								
(v) Sub-Total for Roughing Mill Roller tables, filler tables & Sideguide Complex			275.67	3.7	56.83	205.14							FF 3.513	1.123

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	Heavy Plate work	Mechanical shop	Piping & valves	Steel	Iron	Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Four H. reversing Roughing Mill													U.S. 0,260 F.F. 14,175	0,623
Housing & Bedplates incl. roll balance	2	129,65	259,3									259,3		
Spindle & carriers	2	75,8	151,6									151,6		
Chock assy. complete	4	19,97	79,9									79,9		
Back up & work rolls	4	26,85	107,4									107,4		
Screwdown worm and wheel assy.	2	2,74	5,48									5,48		
Screwdown gear drive assy.	2	8,295	16,59									16,59		
Screwdown & nut assy	2	6,965	13,93									13,93		
Feed roller assy	1	18,67	18,67									18,67		
Roll changing equip.	1	81,2	81,2									81,2		
2 D.C. motor 5000kw each 0/50/100 rpm.														
Stairways, platforms	1 set		10,0		10,0									
Piping & valves	1 set		12,5				12,5							
Entry & delivery guide	1 set		13,5		13,5									
(vi) Sub-total 4-High reversing roughing mill			770,07		23,5		12,5					734,07	U.S. 0,260 F.F. 14,175	0,023

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work	Mechanical shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items.	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Vertical Edging Mill													F.F. 7.000	0.057
Housing & bedplates	2	44.05	88.1									88.1		
Rolls with roller bearing	4	2.82	11.3									11.3		
Main drive coupling	2	0.7	1.4			1.4								
Main Drive gear box	2	5.55	11.1									11.1		
Main drive shaft assy.	2	4.2	8.4									8.4		
Lead spindle assy	2	3.2	6.4			6.4								
Bevel gear drive	2	19.45	38.9									38.9		
Coupling boxes	2	0.43	0.86			0.86								
Carrier assy.	2	1.25	2.50			2.50								
Screw-in assy.	2	6.5	13.0									13.0		
Screw-in gear assy.	2	4.4	8.4									8.8		
Spindles	2	0.15	0.30			0.30								
Chocks	4	3.4	13.6									13.6		
Stairways, platform	1	7.8	7.8		7.8									
Cooling & descaling header & piping on housing.	1	5.7	5.7				5.7							
Guides & strippers	1	3.5	3.5			3.5								
Feed roller assy.	1	3.5	3.5			3.5								
(vii) Sub-Total Vertical Edger #1			225.16		7.8	18.46	5.7					193.2	F.F. 7.000	0.057

Description	Nos.	Unit Wt. in tons.	Total WT. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Mechanical shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Back Roller Table														
11.25m long.													F.F. 5.576	1.605
rollers 455mm. dia.x1575mm	16	3.125	50.0			50.0								
table frames	2	6.5	13.0		13.0									
Apron	15	.08	1.2		1.2									
52kw. D.C. motor														
Adjustable delivery Sideguides														
Gear boxes	2	2.06	4.12			4.12								
Pusher bars	2	1.85	3.70			3.70								
Head assy. complete	2	2.02	4.04		4.04									
Covers & frames	2	2.54	5.08		5.08									
Pinion assy.	2	5.64	11.28			11.28								
Approach Table														
24.75m long.														
rollers 455mm dia. x 1575mm	50	2.8	140			140								
Table frames	2	16.55	33.1		33.1									
Curb plate	2	6.45	12.9		12.9									
Front Table for future non rev. roughing mill 13.5m long														
Rollers 455mm x 1575mm long	16	2.06	49			49								
Table frames	2	6.2	12.4		12.4									
Filler table 4.5m long														
roller 455mm x 1575mm long	6	2.75	16.5			16.5								
Table frames	2	7.4	14.8		14.8									
Curb plates	5	0.36	1.8		1.8									
Front roller table to Non-Rev. Roughing Mill 5.4m long														
Roller 455mm x 1575mm long	7	3.0	21.0			21.0								
Table frames	1	5.45	5.45		5.45									
Aprons	6	0.50	3.0		3.0									

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Mechanical shop	FOUNDRY Pipes & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported Items	Cost in various currencies x 10^3	Cost in Mexican Pesos x 10^3
Entry Sideguides (adjustable) for Non-Reversing Rougher #2														
Gear boxes	2	1.75	3.5			3.5								
Pusher arms	2	1.85	3.70			3.7								
Head assy complete	2	2.66	5.32		5.32									
Cover & frames	2	1.54	3.08		3.08									
Pinion assy.	2	4.50	9.0			9.0								
(viii) Sub-total for Non - Reversing Roughing Mill Approach Table Complex.			426.97		115.17	311.8							F.F. 5,576	1,005

1525mm. HOT STRIP MILL - MECHANICAL PLANT

Heavy Mechanical Equipment - Four-High, Non-Reversing, Roughing Mill & Vertical Edger No. 2

Description	Nos.	Unit Wt. in tons	Unit Wt. in tons	FOUNDRY: Heavy Plate-work & machining	FOUNDRY: Heavy Plate-work	FOUNDRY: Machine shop	FOUNDRY: Piping & valves	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogued Equipment	Imported items	Cost in various currencies x 10⁶	Cost in Mexican Pesos x 10⁶
4H Non-Reversing, Roughing Mill with vertical Edger in front													FF 5.768	.064
*Vertical Edger * 2*												72.6		
Housing & Bedplates	2	36.3	72.6			4.0								
Rolls with bearings	4	1.0	4.0			0.2								
Main drive coupling	2	0.1	0.2			3.9								
Main drive gearbox	2	1.95	3.9			1.9								
Main drive shaft assy.	2	0.95	1.9			6.4						30.9		
Lead spindle ssy.	2	3.2	6.4			1.38								
Bevel gear drive	2	15.45	30.9			2.50						10.1		
Coupling boxes	2	0.69	1.38			0.4						20.6		
carrier assy.	2	1.25	2.50									8.5		
Screw assy.	2	5.05	10.10			0.3								
Pull back cylinder	1	0.4	0.4											
chocks	4	5.15	20.6											
Screw-in gear assy.	2	4.25	8.5											
spindles	2	0.15	0.3											
Stairways-platforms	1 set	7.8	7.8	7.8										
Cooling & descaling headers piping on housing	1 set	2.5	2.5				2.5							
Guides & strippers	1	3.5	3.5			3.5								
Feed roller assy & gear box	1	2.1	2.1			2.1								
Roughing Mill													U.S.$0.260	.004
													FF 15.041	
Housing & bedplates	2	118.75	237.50									237.50		
Roll balance	2	6.85	13.70									13.70		
Spindle & carriers	2	19.95	39.90									39.90		
Pinion Stand & reducers & coupling	2	107.0	214.0									214.0		
Chock assy. complete	4	19.875	79.5									79.5		
Back up rolls & work rolls	1 set	103.0	103.0									103.0		
Screwdown worm & wheel assy	2	2.74	5.48									5.48		
screwdown gear drive assy	2	7.96	15.93									15.93		

Heavy Mechanical Equipment - four High Non Reversing Roughing Mill & Vertical Edger No.2

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machining shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogued Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Screwdown and nut assy	2	6.96	13.93									13.93		
Feed roller assy.	1	2.1	2.1			2.1								
Roll changing equipment	1 set	82.1	82.1									82.1		
Piping & headers	1 set	7.0	7.0				7.0							
entry & delivery guides	1 set	6.0	6.0			6.0								
Stairway & platforms	1 set	10.0	10.0		10.0									
(ix) Sub-Total Non Reversing Roughing Mill and vertical Edger # 2.			1009.72		17.8	34.68	9.5					947.74	U.S. 0.250 FF 20.809	.058

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	Heavy Plate work	Machining shop	Piping & valves	Non Steel	Iron	Ferrous	Catalogue Equipment	Imported items.	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Delay roller Table													FF 5,546	1,512
16m.Sm (10 section)														
Rollers	123	1,90	234			234								
Table Frames	20	21,5	430		430									
Measuring rollers	3	1,0	3,0			3,0								
Housing for wattmeter	2	6,5	13,0			13,0								
Entry Side Guides														
Gear boxes	1	1,4	1,4			1,4								
Pusher arms	4	0,75	3,0			3,0								
Sideguide frames	1	2,3	2,3		2,3									
Guides	2	2,0	4,0			4,0								
Covers	2	1,0	2,0		2,0									
Pivot assy.	4	1,75	7,0			7,0								
Rotary Crop Shear *Housing, cap.*													FF 5,660	0,884
Housing	1	66,2	66,2								66,2			
Drum with roller brgs.	2	12,9	25,8								25,8			
Clock assy.	2	16,6	33,2								33,2			
Gear Box	1	37,7	37,7								37,7			
Drive spindle	1	11,3	11,3								11,3			
Drum changing equipment	1 set	11,8	11,8								11,8			
Crop chutes (bifurcated)	1	21,4	21,4		21,4									
Scrap buckets	2	7.	15,6		15,6									
(x) Sub-Total Delay Table Complex & Rotary Crop Shear.			922,7		471,3	265,4					186,0		FF 11,205	2,649

Heavy Mechanical Equipment - Cobble Pusher, Skids & De-scaling Unit

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work & machining	FOUNDRY: Heavy Plate work	FOUNDRY: Machine shop	FOUNDRY: Piping & valves	FOUNDRY: Steel	FOUNDRY: Iron	FOUNDRY: Non Ferrous	Catalogue Equipment	Imported items.	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
													FF 2,223	1,137
Cobble Pusher & Skids														
Gear Boxes	3	6.0	18			18								
Pusher bar	12	4.75	57	57										
Cobble skids	1	42	42		42									
													FF 0,595	
De-Scaling Unit														
Pinch rolls	2	3.05	6.1			6.1								
Carrier rolls	4	2.13	8.5			8.5								
Covers	2	3.15	6.3		6.3									
Headers, valves & pipelines	1 set	1.1	1.1				1.1							
(xii) Sub-Total for Cobble pusher, skids & De-scaling unit.			139	57	48.3	32.6	1.1						FF 2,819	1,137

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	FOUNDRY: Heavy Plate-work machining	FOUNDRY: Heavy Plate work	FOUNDRY: Machine shop	FOUNDRY: Piping & cables	FOUNDRY: Non Steel Iron Ferrous	Catalogue Equipment	Imported items.	Cost in various currencies x 10⁶	Cost in Mexican Pesos. x 10⁶
Finishing Train 750 m.m. x 1450 x 1525 long											U.S.$24,640	1,525
Stands & Bed plates	6	276,7	1660							1660		
Work rolls & back rolls	6 set	66,18	397,1			397,1						
Chock assy & brgs.	24	17,12	410,8			410,8						
Piston Stands	5	93,97	563,8							563,8		
Spindles	12	10,83	130			130						
Guides, loopers & guides	6	30,67	184			184						
Gear boxes	3	276,6	829,8							829,8		
Roll changing equip.	6	77,95	467,7							467,7		
Screwdown gearbox assy	6	41,33	248							248		
Screwdown worm & worm wheel assy.	12	0,94	11,29			11,29						
Screwdown & nut assy	12	4,375	52,5			52,50						
Roll balance equipment	1 set	81,8	81,8							81,8		
Cooling headers & nozzles	1 set	9,55	9,55				9,55					
Platforms & stairways	1 set	13,1	13,1		13,1							
Piping on Mill-stands	6	4,08	24,5				24,50					
(xii) Sub-Total for Finishing Train			5083,94		13,1	1185,69	34,05			3851,1	U.S$24,640	1,525

Heavy Mechanical Equipment - Run out table System & Laminar Cooling System

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate work & machining	Heavy Plate work	Machine shop	Pipes & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10⁻³	Cost in Mexican Pesos x 10⁻³
Filler Table For Future Finishing stand, 6m long													FF 9.779	5.540
Rollers 305mm. dia. x 1575mm long.	11	0.662	7.28	7.28										
Table frames	1	21.40	21.40		21.40									
Two X-Ray gauges and one width meter														
Structure	1	8.0	8.0		8.0									
Housing	1	5.0	5.0		5.0									
Air conditioning	1	2.0	2.0		2.0									
Rail tracks	1	2.0	2.0		2.0									
Coc Mill Run-Out Table 138.4 m long 14 sections														
Roller 305mm dia x 1575mm long	304	0.778	236.6	236.6										
Table Frames	14	11.41	159.8		159.8									
Curb Plates	28	3.31	92.7		92.7									
Laminar Flow Strip Cooling System													US $1.690	
Top & bottom sprays(32 top headers, 108 bottom headers)	1 set	33	33									33		
Pipework, control vales & ancillary equipment	1 set	120.4	120.4				120.4							
(xiii) Sub-Total Run-out table & Laminar cooling system			688.18	243.88	290.9		120.4					33	US $1.690 FF 9.779	5.540

Heavy Mechanical Equipment - Down Coiler & Auxiliaries

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate work.	Machine shop	Pipes & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10⁻⁶	Cost in Mexican Pesos x 10⁻⁶
Down coiler & Auxiliaries													* Price included in system (xiii)	
Entry sideguides														
Gear boxes	2	3,05	6,10			6,1								
Pusher bars	4	9,65	38,60	38,60										
Head Assembly	4	6,75	27,00		27,0									
Pinion Assembly	4	0,125	0,50			0,5								
Pinch roll stands													FF. 18,447	0,063
Top pinch roll assembly	1	16,4	16,4									16,4		
Bottom pinch roll assy.	1	10,4	10,4									10,4		
Housing & Frames	2	37,55	75,10									75,10		
Gap adjusting equipment	1	2,2	2,20									2,2		
Two retractable downcoilers													Price included in Pinch roll equipment.	
Mandrel assy. complete	2	17,1	34,2									34,2		
Gear boxes	2	15,05	30,10									30,10		
Wrapper rolls frames	2	37,25	74,50									74,50		
Wrapper roll assy.	2	12,85	25,7									25,7		
Base plates	2	150,5	301,0									301,0		
Retracting equipment	2	12,50	25,0									25,0		
Table Over downcoiler # 1 7,4 m. long													FF 0,928	0,471
Rollers 305mm dia. x 1575mm lg.	13	0,685	8,9	8,9										
Table frame	1	11,6	11,6		11,6								Price includes in Table over down coiler;	
Sideguides	2	5,45	10,9		10,9									
Cobble catcher	1	16,2	16,2			16,2								
Two Coil Stripper Cars	2	19,3	38,6			38,6							FF 1,671	
Two Coil Down-coilers	2	53,5	107									107,0	FF 2,077	
(xiv) Sub-Total for Pinch rolls, Downcoilers & auxiliaries			560	47,5	49,5	61,4						701,6	FF 22,528	0,534

Heavy Mechanical Equipment - Coil Transfer System & De-Scaling System.

80.

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	FOUNDRY						Catalogue Equipment	Imported items	Cost in various currencies x 10^6		Cost in Mexican Pesos x 10^6
				Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & cables	Steel	Iron	Non Ferrous					
Coil Transfer System 332m. long												USS	4.985	
Conveyor system	1	213.0	213.0								213.0			
Steel work	1	1013.1	1013.1		1013.1									
2-Coil upenders	2	53.5	107								107			
Gear Boxes	8	5.0				40								
One Coil Bender	1	24.9	24.9								24.9			
Coil weigher Station	1	66.5	66.5		60.0						6.5	F.F.	0.147	
Descaling System-2												USS	1.340	0.148
Water storage systems	2	44.9	89.8		80.0		9.8							
Pumps 155 kg/cm^2	5	1.1	5.5								5.5			
Inter-Connecting pipes	1	12.0	12.0				12.0							
Scrubbing system (in finishing mill stands F&F)	1	8.2	8.2								8.2	USS	0.199	
(xc) Sub-Total for Coil Transfer System & De-scaling system			1580		1153.1	40	21.8				219.5	145.6	USS 6.521 F.F. 0.147	0.148

Description	Nos.	Unit Wt. in tons	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6	Cost in Mexican Pesos x 10^6
Roll Cooling Systems													U.S. $ 0.355	
Pump stations {20kg/cm²	3	0.8	2.4								2.4			
Filters {5520 m³/hr	3	6.8	20.4								20.4			
Piping system {4.5 kg/cm² 2550 m³/hr	1	25.0	25.0				25.0							
Hydraulic Systems- Five													US$ 2.010	10.750
Oil Storage tanks	5	4.94	24.7		24.7									
Pump stations, including valves & piping.	5	17.72	88.6		60.0		28.6							
Air Compresor	2	0.2	0.4								0.4			
Oil Cooler & heaters	5	0.06	0.3		0.3									
Hydropneumatic & weight loaded accumulators	5	79.80	399.0	399.0										
Oil Lubrication Systems - 4													US$ 1.316	6.600
Oil Storage tanks	8	20.36	162.9		162.9									
Oil Mist sprays equip.	9	1.60	14.4								14.4			
Heat-exchangers	4	12.53	50.1	50.1										
Pumps, valve & piping	8	0.25	2.0				2.0							
Grease lubrication System -15													US$ 0.352	
Storage tanks	2	2.75	5.5		5.5									
Pumps & interconneting piping	15	0.76	11.4				10.0				1.4			
Pneumatic Systems- two													US$ 0.166	0.577
Compresors	2	5.07	10.14								10.14			
Steam systems	1	41.5	41.50								41.50			
Roll Turning Shop														
Roll trasfer cars	2	36.35	72.7	72.7									US$ 0.394	
Work Roll bearing extractor Cars.	3	10.65	21.3								21.3		US$ 0.252	
Work Roll Storage Rock	1	23.9	23.9		23.9									0.797

Description	Nos.	Unit Wt. in tons.	Total Wt. in tons.	Heavy Plate-work & machining	Heavy Plate-work	Machine shop	Piping & valves	FOUNDRY Steel	FOUNDRY Iron	FOUNDRY Non Ferrous	Catalogue Equipment	Imported items	Cost in various currencies x 10^6		Cost in Mexican Pesos x 10^6
Back up roll stripping & Ass. unit.	1	49.5	49.5								49.5		US$	0.374	
"C" Hook for edger rolls	1	10.3	10.3	10.3									F.F.	0.222	
Roll handling spreader beam.	4	4.0	16.0		16.0								F.F.	0.345	
Roll handling equipment	1 set	0.4	0.4								0.4		F.F.	0.015	
Maint. shop transfer car	1	4.5	4.5	4.5									US$	0.010	
Fume Exhaust System															
Hoods and ducts	1 set	40.0	40.0		40.0								US$	0.475	1.7
Air Washer unit with moisture	1 set	12.7	12.7	12.7											
Fan house and stack	1	41.3	41.3		41.3										
Back-up roll charging stools	2	4.65	9.3		9.3								F.F.	0.215	
Roller table bridges	6	2.92	17.5	17.5									F.F.	0.405	0.341
Guard protection & safety devices	1 set	16.80	16.8		16.8								F.F.	0.023	0.279
(xvi) Sub-Total for Roll cooling, lubrication systems & roll turning shop			1197.94	566.8	400.7		65.6				164.84		US$	5.778	20.264
													F.F.	0.719