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Workshop on Case Studies of Aluminium Smelter  
Construction in Developing Countries

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**INDONESIAN ASAHAN ALUMINIUM SMELTER PROJECT <sup>1/</sup>**

by

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## 1. The history of the Project.

The power potential of the east flowing river in North Sumatera first studied by the Dutch engineer in 1908.

In 1919 more comprehensive study prepared by several companies together with the Netherlands Indische Government.

It is the only river flowing from the Lake Toba which is not, only Indonesia's largest but one of Asia's largest lake.

Lake Toba is a great collapse caldera lake on the mountain range. It has a water surface area of 1.100 square kilometer and its water surface is kept at around El. 905. Formed by tectonic shifts of the earth and the eruption of Toba Volcano.

The river flows in a generally northwesterly direction to its estuary on the Straits of Malacca, a distance of about 150 km, and of its total fall of 900 meter about 600 m are concentrated in a section between 15 and 30 km from the Lake, on which the two great Sigura-gura and Tangga waterfalls are found. Totally there are 7 waterfalls along the Asahan river that could generate power of approximately 1.050 MW, able to produce annually over 6.800 GWH of energy.

Although initial studies of the harnessing of the Asahan river were made before the first World War, it was only in 1939 that the MEWA enterprise, jointly established by Biliton Maatschappy, Gemeentelijke Mijnbouw Maatschappy Biliton and The Netherland Indische Government, seriously considered the possibility of utilizing the Asahan river as a source of Hydro-Electric energy for the production of Aluminium. Although MEWA acquired the right to construct the aluminium project in 1940, little progress was made because of the War.

During the second world war (between 1942 - 1945), Mr. Y. Kubota with several Japanese engineers, conducted several surveys with an aim to utilize the huge potential of the river.

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But again this project was discontinued with the end of the war.

Since then, a number of reports were prepared on various aspects of the Project between 1952 and 1959, but it was not until the study carried out under the second Indonesian - Soviet Economic and Technical Cooperation Agreement between 1960 and 1966, that a comprehensive survey of the Asahan Project was undertaken.

At the end of 1966 almost all design of the Power Plant was completed. But late that year, the Government decided to postpone the development of the Project.

In 1968 Japanese Company, Nippon Koei lead by Mr. Y. Kubota (the same person as in 1942), conducted another survey and one year later (1969) he submitted his feasibility report concerning the Hydro-electric Development of the Asahan River. Based on that report the Government of Indonesia requested Nippon Koei to continue their detailed investigation and instructed them to finalize the design of the Power plant.

But because of the difficult financing situation at that time, the Government decided not to build the project by himself, but offer to prospective foreign investor.

In February 1972, the Indonesian Government issued an Invitation to Bid. After some delay, a confirmation of interest, in the form of a preliminary proposal was received from the Japanese Investor.

After a very long negotiation 3 years the Government concluded an agreement with 12 Japanese companies and the Government of Japan, to establish a joint venture company to develop :

- The Asahan Hydro-electric power plant.
- An Aluminium Smelter.
- Other infrastructures such as harbour, road and bridges, town etc.

## II. Overall concept.

It is the fundamental purpose of the Government of Indonesia to accelerate the economic development of the country through industrialization of the rich and remote region as Sumatra island.

As known for many years, the Asahan river located in North Sumatra possesses a rich and still untapped potential in hydroelectric power. The Asahan River Basin is considered to have great potentiality to generate approximately one million kilowatts. It is one of a few remaining hydro electric resources in Asia, where very cheap electric power will be available.

The Project, will bring together the power development and aluminium smelting industry which utilizes the power generated by the Project. The realization of the Project will contribute greatly to the development of natural resources, because Indonesia is one of the bauxite producing country since many years, therefore domestic production of alumina is very desirable from the viewpoint of the efficient use of natural resource, to utilize the huge amount of lower grade bauxite.

The concept for the realization of the power supply will be connected to the context of the overall hydro power potential of the river. In this regard the power should not be monopolized by the aluminium smelter, but should be shared with the public and economic sectors as well.

The significance impact of the realization of the aluminium industry in Indonesia is not only producing metal domestically, but has a profound impact on the social and economic aspects of the country.

Notwithstanding the fact that basic facilities such as housing, power, water, sanitation, sewerage, transportation, communication will have to be provided provided to serve the working community, but also many other services will follow as the natural consequence of the Project. The social and economic impact of the development will be felt not only in the Project Area, but in the region as a whole.

The establishment of a new town of 200 ha, induce the general population to move into the city, to serve the daily activities and needs of the town.

But the most important aspect to be taken into consideration, in the context of constructing the Project is the social and economic impact such as the possibilities to open new lands for transmigration of people from other overcrowded parts of the country.

On the bright side of the Project is the fact that the rural community around the Project site will find a ready market for their products. Today, a new generation of workers, engineers and managers has been born, but opportunity lacks. Limiting factor is the inexistence and inadequately skilled and experienced man power in an aluminium industry.

Therefore, the establishment of such integrated project in Indonesia has a multiplier effect on the economy of the country and skill of the manpower.

As the conclusion the establishment of the aluminium smelter in Indonesia has the following significances :

1. Indonesia is a bauxite producing country, therefore, it is desirable that all alumina necessary for the project should be supplied from the existing mine. A large volume of lowgrade bauxite not exportable, could be utilized by the alumina plant, thereby giving newly an economic value to the low grade bauxite.
2. The realization of an aluminium industry of such magnitude associated with the construction of other infrastructures such as harbour, road, communication will have a profound impact on the social and economic aspects of the region.
3. The project will increase the job opportunity for the people and will raise the skill of the manpower.
4. The establishment of the aluminium smelter, will induce the establishment of other industries for supplying raw materials to the smelter, and aluminium fabricating industries.

It is anticipated that a large industrial area will be developed around the smelter site, with the aluminium smelter industry as a core of the activities.



... saving of foreign currency ... for the importation of the  
aluminum metals.

C. Etc.

### III. Outline of the Company.

#### 1. Structures of the Company

After three years continuous negotiations between the Government of Indonesia and the Japanese Investors, an agreement was finally signed, to establish a new joint venture company incorporated in Indonesia, to undertake and finance an Aluminium smelter, Power plant and it's Ancillary Facilities. For the purpose of establishing one organization to face the Indonesia Government, the twelve Japanese Investors, specifically set up a new incorporated Company in Japan called "Nippon Asahan Aluminium".

The new joint venture between "Nippon Asahan Aluminium" and the Government of Indonesia called "Indonesia Asahan Aluminium"

The shareholders of Nippon Asahan Aluminium are twelve companies namely;

1. Sumitomo Chemical Co. Ltd	15%
2. Showa Denko K.K.	15%
3. Mitsui Aluminium Co. Ltd.	15%
4. Mitsubitshi Chemical Industries Ltd.	15%
5. Nippon Light Metal Co. Ltd.	5%
6. Sumitomo Shoji Kaisha Ltd	5%
7. C. Itoh & Co. Ltd.	5%
8. Nichimen Co. Ltd.	5%
9. Marubeni Corp.	5%
10. Mitsubitshi Corp.	5%
11. Mitsui & Co. Ltd.	5%
12. Nissho Iwai C. Ltd.	5%

#### 2. Capital.

The authorized capital of the "Indonesia Asahan Aluminium" is US \$ 261.000.000.00 (two hundreds and sixty one million), divided into two hundred and sixty one thousand shares.

Commencing from the date of incorporation of the Company, the Government will subscribed for 10% of the total issued and outstanding shares and "Nippon Asahan Aluminium" will subscribed for 90%.

On each of ten successive anniversaries beginning from the second anniversary of the commencement of operation, the Government will gradually purchase 1.5% of the issued and outstanding share of the company, until the ratio of 25% has been achieved.

In this respect both parties will assume full responsibility to make available equity and loan to the company, equal to the ratio of shares subscribed by both parties.

Because of huge amount of capital should be invested, spread in several years, it is essential to ensure an adequate supply of financial resources to finance the Project and continuously available during the construction time.

Owing to the international economic situation after the oil crisis, it is very difficult for the shareholder to raise fund from their own sources.

As far as the bank credit is concerned several companies are suffer from certain handicaps, such as colaterals securities and high interest rates.

To cope with those accumulated problems, the company compelled to turn to both Government of Japan and Indonesia to seek the possibility of access to the Government financial assistance, such as soft loan of lower rates of interest and longer maturities.

The consensus has been reached between both Governments and the company, that Governments will assist in raising fund, or in other words the company will be accessed to larger sources of capital and foreign exchange.

To ensure an adequate supply of funds to finance the Project, the following structures of financing was organized.

The Government of Indonesia will provide direct loan of 10% to the company, as the initial loan requirement.

Additional loan of 15% will be obtain from the Government of Japan channeled through the Government of Indonesia.

Onother 20% of the total amount of loan required, will be provided by twenty odds Japanese Commercial Banks.

And the rest of the loan will be raised by Japanese Government Financial Institutions such as The Export Import Bank of Japan, Japan International Cooperation Agency (J.I.C.A.) and The Overseas Economic Cooperation Fund (OECF) Japan.

In case additional financing is required to cover the escalation cost of the Project, both Governments and the Company will consult each other concerning how to finance such additional cost. The total investment required for the realization of the Project, including all expenses during the initial development, working capital but excluding price escalation would amount approximately to the equivalent of two hundred and fifty billion yen (Yen 250.000.000.000).

The breakdown of the costs are the following :

Smelter : Yen 143 billion (US \$ 485 million)

Power plant : Yen 80 Billion (US \$ 271 million)

Infrastructure : Yen 27 billion (US \$ 92 million)

Total investment cost Yen 250 billion or US \$ 848 million

(Rate : US \$ = Yen 295)

3. Licence and right of the Company.

a. The Government licenced the Company for 30 years following the commencement of operation of the smelter, to construct, operate and own an aluminium smelter of 225.000 MT/year capacity, and the Hydro Power Station of 600 MW installed capacity with it's ancillary facilities.

The Company also has the right to expand the rated production capacity of the smelter from 225.000 MT/year to 360.000 MT per annum, but should be completed within a period of fifteen years starting from the commencement of operation of the first stage smelter.

b. The Company shall put in operation the Power plant and the smelter not later than 8 years after the signing of the agreement.

c. The Company has the right to construct other ancillary facilities needed to implement the project such as :

1. Port.

A new port will be built adjacent to the smelter site, with three berths having the capacity of the first and second berths of 16.000 dwt each and the third of 1,000 dwt.

The pier will be extended into the sea about 2 km from the shore.

2. Township.

To accommodate the need of housing for the employee of the smelter and the Power plant, the Company will build a new town of 200 ha located about 16 km of the smelter plant, and another 80 ha permanent operator's campsite will be build in the Power vicinity site, equipped with all facilities as schools, shops, recreation facilities etc.

3. The Company is also entitled to construct road, water supply, telecommunication system, hospital etc.

d. During the term of the Agreement, the Company may import and use in Indonesia free of import duties, sales taxes and other levies all machineries, equipment, building materials etc. required by the Company for the construction, operation and maintenance the Project.

e. The Company may import and reexport free of import duties all personal effects for their expatriate employee and their dependents including house hold and living equipments.

f. The expatriate employee may be imported clothing, foodstuffs, medicine and other consumption goods up to the certain value as permitted by the regulations.

g. During the term of the agreement the Company has the exclusive right to export at its own discretion all the products of the smelter including by products and carbon products.

h. The export of products of the Smelter including by products will be exempted from export duty, excise or any other taxes levies of any kind.

4. Company Obligations

a. Employment.

Success in industrial development depends in large part on the availability at the appropriate time of workers with certain skills.

Since Aluminium smelting process involves sophisticated technology, so there will be a substantial corps of expatriate technicians will be employed during the early beginning of construction and operation period.

To expedite the transfer of technology from the expatriate to the local technician the company has to train its local national employee in accordance with the detailed and comprehensive training program as approved by the Government.

As stipulated in the agreement the training period should be initiated at the latest one year after the effective date of the Agreement consist of 2 types of training :

- Training for the need during the construction period and
- Training to operate the plant.

Training consists of manual and skilled workers, including lower level clerical work, the second of foremen, supervisors, instructors and technicians and the third of engineers, administrators and middle range executives.

Since unskilled labour is normally available throughout the national territory, the Company may not import unskilled labour, but shall employ suitable and qualified Indonesia nationals to the maximum extent possible.

The Government obliged the Company within five years after the commencement of operation of the smelter, not less than 75% of all employee in each employment classification shall be held by Indonesian nationals.

The classification of employment in this purpose are : managerial, technical, administrative, clerical and other skilled labour.

b. Local Materials and services.

It is one of the objective of the Government to promote its local materials produced domestically and also local services to the extent they are available on a reasonably competitive cost, time, quality and quantity basis.

To materialise this concept the Government obliged the Company to give first priority to local services and materials and to the maximum extend possible utilize Indonesian services and local products manufactured in Indonesia and also give preference to local contractors or importers, vessels and insurance.

If the Company imported goods the equivalent of which are being manufactured or produced locally and available to the Company on a competitive basis, then the Government may require the Company to pay appropriate import duties.

c. Local aluminium market.

Significant progress in aluminium fabricating business has been achieved in Indonesia, several aluminium extruders and sheet maker plants are in operation.

Increased imports of raw materials for their plants proved to be in themselves an obstacle to smooth industrial growth.

Moreover, the shortage of foreign exchange and the tendency of continuous increase of import price appeared more and more to be a permanent obstacle for the local manufacturer.

To cope with all these problems, policies of import substitution have normally been implemented. To serve the existing local aluminium fabricator the Government obliged the Company that one third of the aluminium produced by the smelter should be sold domestically. When the plant reach full capacity by - 1982, the smelter will produce 225.000 MT/year, and 75.000 MT of it should be allocated for domestic market.

IV. Climate and incentives for investment.

The essential factors to determine objectively whether a particular Aluminium smelter project is feasible in the particular developing country, not only the technical feasibility of the project or the amount of foreign exchange that can be allocated by the developing country, but also the climate and stability of the host country. On the other hand the project must be not only feasible to the investor but also consistent with the country's over-all industrial programme.

A typical problem faced in developing countries is that the limited size of the domestic market which does not permit the construction of plants large enough to lower its unit production cost so that the goods produced can compete with the imports.

Since domestic markets are often too small to justify an economic size of the smelter, the possibility of exporting some of the products should be investigated.

The extent to which emphasis is to be placed on export-oriented industries is fundamentally determined by the policy of the host country.

An export development policy also influences the attitude towards foreign investment, because a large number of developing countries suffering from foreign exchange to finance large scale of aluminium smelter plant.

To overcome this problem, Government of Indonesia has invited foreign investor to establish a joint venture company with the Government, to build an integrated project consist of an aluminium smelter, hydro power plant and its ancillary facilities.

Measures has been taken by the Government to stimulate and to make this project more attractive to the foreign investor, by offering several more favourable incentives compared to other projects permitted under the Foreign Investment Law.



More export incentives has been offered, to allow the Company to compete internationally without the hindrance of other financial burdens and taxes.

Several tax and financial facilities are given on top of the facilities offered, by the existing regulations.

Fiscal and financial policies in central and regional Government have to be coordinated.

Those facilities are particularly offered because of the size and huge amount of capital that should be invested in the remote area.

#### Finance

To foster the smooth implementation of this project the following financial condition was offered to the company :

1. The Company is granted the right to receive and hold at a bank in foreign countries, foreign currencies obtained as a proceeds of export sales amounting 60% of total sales of the Company. If at a certain time the above mentioned 60% is not enough to cover importation of raw materials or to pay other foreign currency obligations, the Government will give it's approval to retain additional 25% to above mentioned 60%.
2. The Government also granted the right to receive and hold at a bank in foreign countries capital shares paid in by the Investor
3. The Company is permitted to transfer foreign exchange abroad, for the following purposes :
  - a. to pay dividends to foreign share holder.
  - b. to pay salaries and expenses of the expatriate.
  - c. repayment of principal and interest on foreign loans.
  - d. proceeds from sales.
  - e. to pay import and expenses.
  - f. repatriation of capital.

And as far as the taxes and duties are concerned, the following stipulations were offered to the Company.

1. During the first ten years from the commencement of operation, the corporation tax of the Company shall be 37,5% of the taxable income and thereafter shall be 45%
2. The company will be exempted from the payment of withholding tax on interest payable on loans from the Government of foreign countries.
3. The Company will be exempted from the sales tax on machineries, tools, supplies etc. required for the construction, operation and maintenance of the Project.
4. The Company will be exempted from capital stamp duty.
5. Expatriate personnel engaged or rendering service for the Company shall pay personal income tax 50% of the tax payable by such personnel in accordance with the provisions of the Income Tax Ordinance.
6. The rate of withholding tax on interest, dividends, royalties and other fees shall be 50% of the rate of prevailing laws and regulations.

Coordination.

One of the greatest difficulties and a mayor block in implementation project, is to achieve inter sectoral coordination, because of the fact that different ministries and agencies of the Government are responsible for the development of different sectors, when the project must receive Government approval, very often many different agencies are involved, and the Company has to make the round hurdling.one barrier after another.

For example approval to build the Aluminium Smelter must be obtained from the Ministry of Industry, licence to Construct and operate the Hydropower will be issued by the State Electric Company and for the construction of harbour and telecommunication must be obtained

from the Ministry of Transportation and Township, road and water-supply from the Ministry of Public Works etc.

The reduction of the amount of red tape make it simpler for the Project to obtain approval and consent of the Government.

It is true that the controll of implementation should be handled by the Government, either directly or through various types of Government agencies. The main need is to design appropriate mechanism suitable to perform Government function but efficient in it's performances.

For the purpose of facilitating and ensuring the prompt and successful implementation of the Project, and maintaining good coordination and cooperation between the Project and all Government Agencies having the function and responsibilities to perform all the function and obligation of the Government, a new Public Authority was specifically established by the Government, as a sole representative of the Government to exercise all power, right, and privileges of the Government with the principal responsibilities for maintaining liason between the Company and the Government with a view to simplifying relevant administrative procedures.

Ofcourse the efficiency with which these functions are performed will depend on the number, quality and cabibre of the individuals selected to perform it's duties.

The successful operation of the project will depend in part on Government policy, and to some extent on the conditions and basic industrial policies and last but not least on mutual understanding and cooperation between the Investor and host country.

V. General Description of the Project.

1. Location of the Project.

The site for the Smelter plant will be located at Kuala Tanjung, in North Sumatra. And the Hydroelectric Power situated about 120 km straight from the Smelter, located along the Asahan river.

The Power stations will be located at Sigura-gura and Tangga waterfalls. The transmission lines will be extended to the substation to be constructed at the Aluminium Smelter site from both power stations.

2. Power plant.

Lake Toba :

Catchment area at lake outlet : 3.450 km<sup>2</sup>  
 High water level : El. 905 m  
 Available lake capacity : 2,860 x 10<sup>6</sup> m<sup>3</sup>

PRINCIPAL FEATURE OF THE POWER STATION

Items	Sigura-gura	Tangga	Remarks
<u>1. Water level &amp; heads</u>			
Average gross head	230.4 m	237.4 m	
Normal peak discharge	126.8 m <sup>3</sup> /s	135.2 m <sup>3</sup> /s	
Normal firm discharge	105.4 m <sup>3</sup> /s	111.9 m <sup>3</sup> /s	
Turbine discharge cap.	150.6 m <sup>3</sup> /s	161.1 m <sup>3</sup> /s	installed
<u>2. Power plant.</u>			
Power house type	underground	above ground	
Capacity of Generator unit	78.300 KVA	87.200 KVA	
Turbine type	4 units	4 units	
Frequency	Vert. Francis	Vert. Francis	
Turbine capacity	50 c/s	50 c/s	
	72.200 kw	80.400 kw	

Items	Sigura-gura	Tangga	Remarks
<b>3. <u>Transmission line</u></b>			
Voltage	275 KV	275 KV	
Number of circint	2	2	
Route length	125 Km	120 Km	
<b>4. <u>Energy</u></b>			
Annual output	1,868 x 10 <sup>6</sup> Kwh	2,054 x 10 <sup>6</sup> Kwh	Total : 3,922 x 10 <sup>6</sup> Kwh

**3. Aluminium Smelter.**

Aluminium smelter of the project consists of

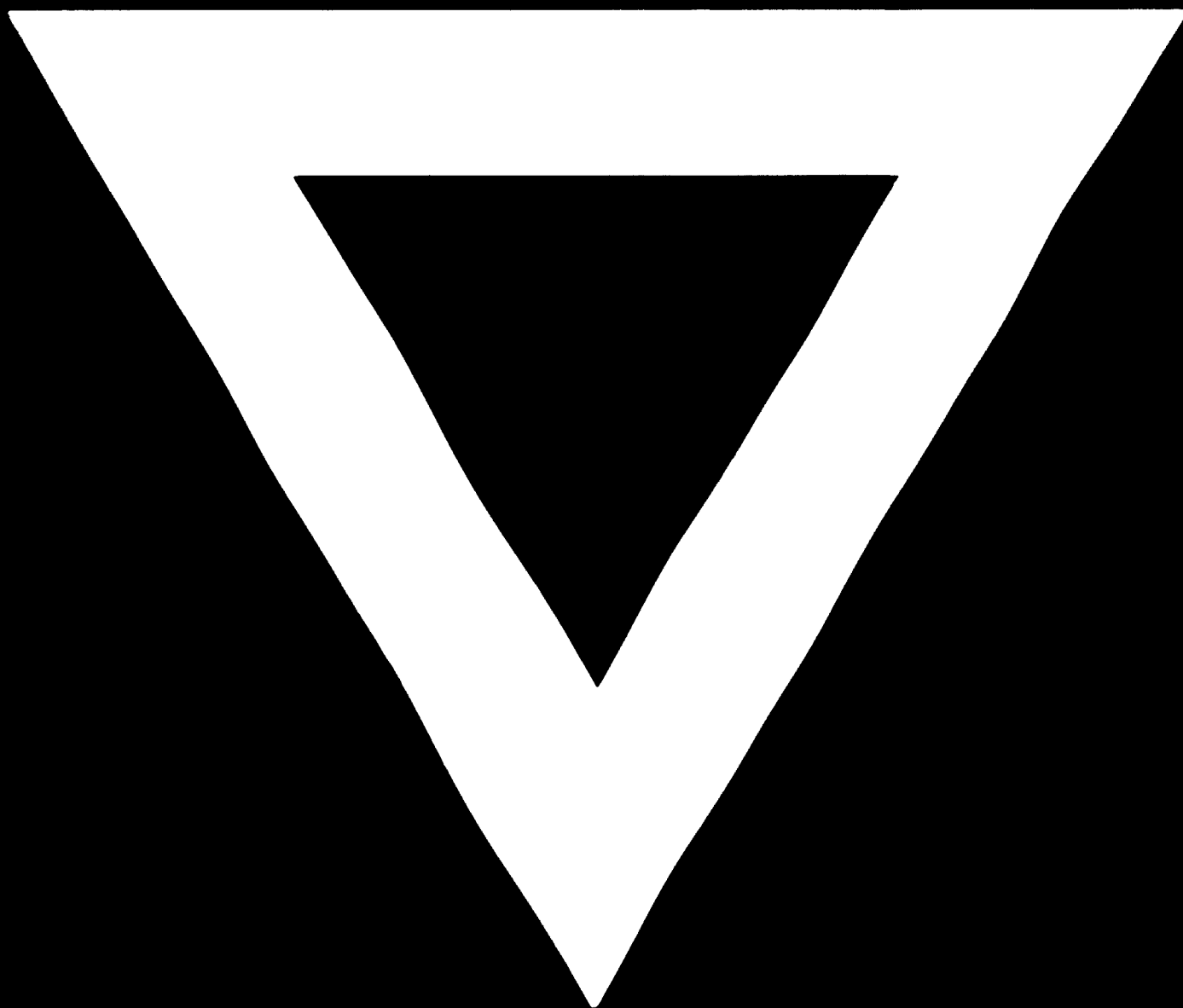
- Reduction plant
- Carbon plant
- Casting shop
- Gas cleaning and
- other auxiliary facilities

**Description of the smelter :**

1. Potroom building
  - Size of the building : 640 x 52 m
  - Number : 3 units
2. Reduction cells :
  - Number of cells : 170 reduction cells in each building or total 510 cells.
  - Type of furnace : Prebake anode
  - Current cap. : 175.000 A
  - Operation voltage : 4.25 Volt per cell
3. Products
  - Annual capacity : 225.000 MT
  - Type of products : 75% of Ingot  
25% of sow



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