OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

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

07510

Distr.
LIMITED

ID/WG.250/13
3 June 1977

ENGLISH

United Nations Industrial Development Organization

Workshop on Case Studies of Aluminium Smelter Construction in Developing Countries

Vienna, Austria, 27 - 29 June 1977

BACKGROUND PAPER ON THE PUERTO MADRYN ALUMINIUM SMELTER ARGENTINA 1/

by

N. Angelucci*

---

* ALUMETAL S.p.A., Milan, Italy

1/ The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

id.77-3783

1. GENERAL

Although officially born 1 November 1973, ALUMETAL is no newcomer as an aluminium producer. In fact, it carries on - after a substantial rehauling of structures - an activity formerly handled by Montedison, Milan.

In addition to being Italy's leading aluminium producer, ALUMETAL places its long experience in engineering, designing and technical assistance at the disposal of customers, both in Italy and abroad.

ALUMETAL's know-how and basic design have contributed in the implementation of major installations in India, Argentina, Brazil and Bahrein.

We should like to mention in this connection the 140,000 tpy smelter recently completed at Puerto Madryn, Argentina.

The smelter in question is described in this paper.

2. DESCRIPTION OF P. MADRYN SMELTER

The smelter was built by a group of Italian firms under a "turn-key" contract with the Argentine company ALUAR.

The group was made up by Alumetal, Italimpianti Genoa and Impresit Turin.

By an agreement signed on 1 Dec. 1971, the Italian group undertook to set up a smelter with guaranteed capacity and controlled product quality.

The plant was scheduled to come into operation by late 1974, while full capacity was to be reached by June 1976, assuming that sufficient power would be available at that time.

The plant location at P. Madryn, Chubut District (in the heart of Argentine Patagonia) about 1,500 Km south of Buenos Aires, was chosen with a view to promoting industrial development and favouring the peopling of this desert area.

The project included a deep-water harbour which made P.Madryn one of the leading ports on the 3,000 km long south coast of the country.

The power was to be supplied by the hydroelectric power station of Futaleufù, located on the Andean Cordillera, 600 km west of P. Madryn.
The power supply to the coast was to be ensured by a 380 - KV long-distance line, rated capacity 280 MW.
However, due to a delay of about 2 years in the implementation of this power station, a second power station consisting of 6 turbogas units with a total capacity of 120 MVA had to be installed within the smelter.
The gas supply was ensured by a gas pipe-line running through the whole Argentine territory up to Buenos Aires.

Thus, the plant could be started in July 1974, even before schedule.

This smelter - the largest in South America - was designed to meet all of the domestic aluminium requirement and export the surplus to other South American countries at a later stage.

As no bauxite is available in Argentina, ALUAR signed a long-term alumina purchase contract with Alcoa, providing for the transportation of Australian alumina to P. Madryn by means of 30,000 - 35,000 meton bulk carriers.

The unloading facilities at P. Madryn are a bucket of 1,000-ton/h capacity, a belt conveyor and two 25,000-ton storage bins.

Before the smelter was set-up, Puerto Madryn was a village of about 6,000 people.
It was correctly estimated that the population would increase to 15,000 people in about 5 years.
The smelter employs about 1,100 people, many of whom come from far away districts.

ALUAR provided for its personnel residential buildings covering a total area of 53,155 m^2. The community buildings include: primary school, post office, sanitation and so on.

The smelter was managed at start-up by local personnel, with the assistance and under the technical supervision of ALUMETAL's and vendors' specialists.
ALUAR operating and maintenance personnel had been trained in ALUMETAL's Italian plants beginning about 18 months before startup. The number of ALUAR technicians thus trained was 25. The training period ranged from 1 to 12 months.

By June 1976 the smelter was entirely operated by ALUAR personnel.

Furthermore, a five-year technical assistance agreement was signed with ALUMETAL in order to cope with any operating problems arising during the initial period.

3. TECHNOLOGY USED

The electrolytic cells installed are of the prebaked-anode, 150-KA type in operation at ALUMETAL plants.

The main characteristics of these cells are given below:

Anodic current density	0.67 A/sqcm
Cathodic current density	0.61 A/sqcm
Number of anode rods	16
Anode size	780x900x600mm
Carbon block cross section	490x410mm
Cell daily output	1,050 kg
Cell average life	1,260 days
Raw materials consumption:	
alumina	1.93 kg/kg of aluminium
anodes (gross)	0.55 kg/kg of aluminium
anodes (net)	0.47
flux	0.045
Power consumption	15.2 kWh per kg of aluminium

The smelter consists of 4 potrooms equipped with 100 cells each, placed end-to-end in two 50-cell rows.

No pollution control equipment was considered when designing the smelter because of: (a) the lack in local legislation on this subject and (b) the plant location in a desert, very windy territory like Patagonia.

However, static aerators ensure adequate potroom ventilation and satisfactory working conditions.

Furthermore, facilities are provided for the possible installation of a fume abatement system at a later stage.

The degree of mechanization adopted - though not exceedingly high in order to avoid the use of sophisticated equipment in the initial stage - is sufficient to produce 1 ton of aluminium in 3 manpower hours.

The main process operations are performed as follows:

- Special vehicles are used for crustbreaking and alumina feeding.

- Metal tapping is carried out every second day using bridge cranes and vacuum ladles.
- During tapping, the metal is weighed using an electronic recording system.
- Consumed anodes are replaced by means of bridge cranes every 32 days.
- The anode block is lifted every 25 days by means of an auxiliary beam.
- Special trucks are used for flux feeding.

The project provided for possible installation of a process computer at a further stage.

The smelter included also the following main units:

- the Cast shop

  where the metal from the potrooms is cast to obtain

  20-kg ingots
  500-kg saws
  extrusion billets
  rolling slabs

- the Anode plant

  providing the prebaked anodes required for cell operation.

  The green-anode plant consists of a moulder for 600-kg anodes. The moulder capacity is 40 anodes/h.

  The green anodes are then calcined in two 36-chamber kilns with a total capacity of about 150,000 anodes/annum.

- the Rodding plant:

  Spent anodes are processed in this plant, where butts are recycled for carbon recovery.

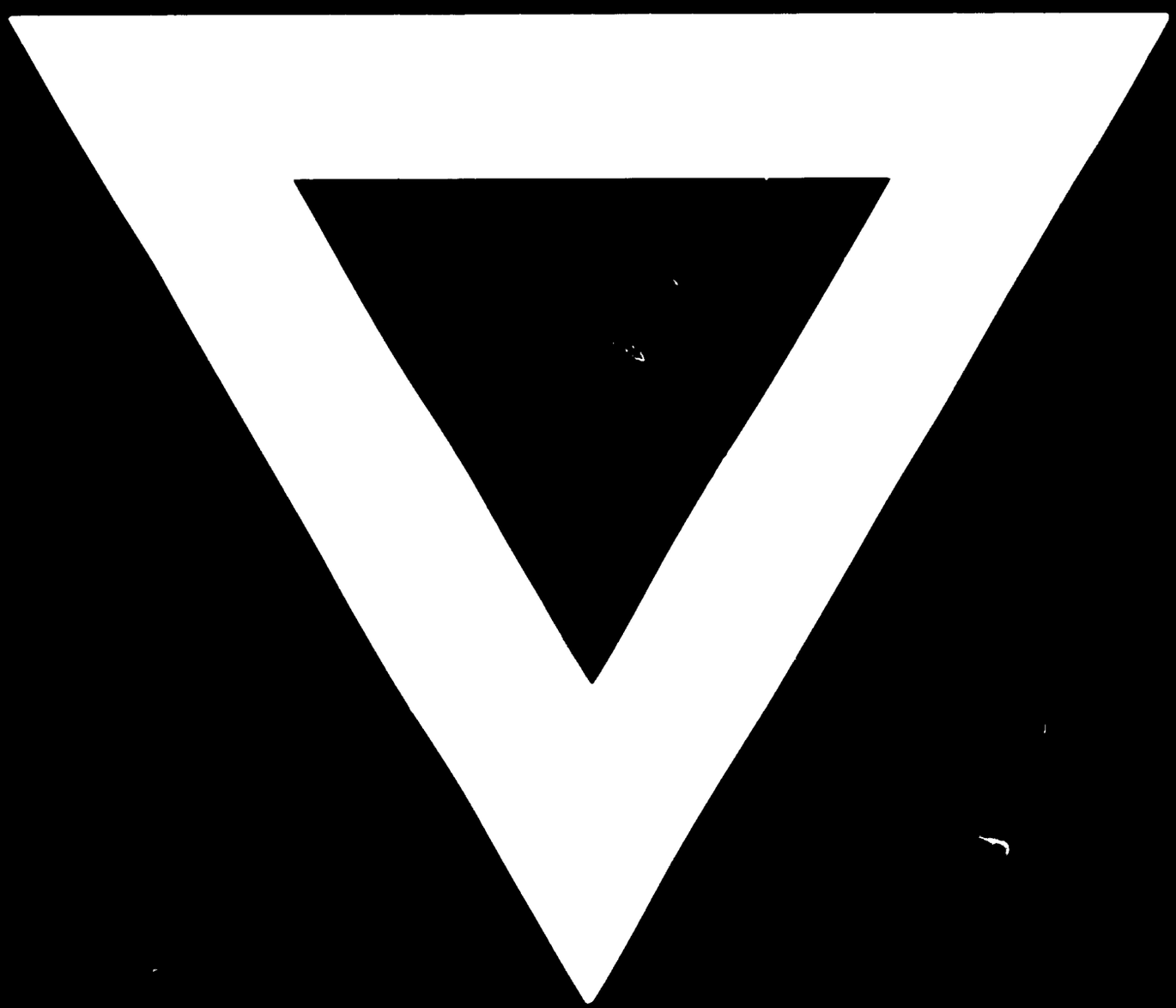
- all the utilities, such as storehouse, electrical and mechanical workshop, ect.

4. CONCLUSIONS

The startup of the smelter, which began in July 1974, was completed after about 18 months.

After the satisfactory outcome of the final testing, carried out in the period Februar/April 1976, the smelter was formally accepted in July 1976 and is now running at a good rate.

G-319



77.09.13