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

05607

Distr.
LIMITED

ID/WG.179/14
19 June 1974

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

In-Plant Training Workshop
on the Production of Refractories

Pilsen, Czechoslovakia

11 - 28 June 1974

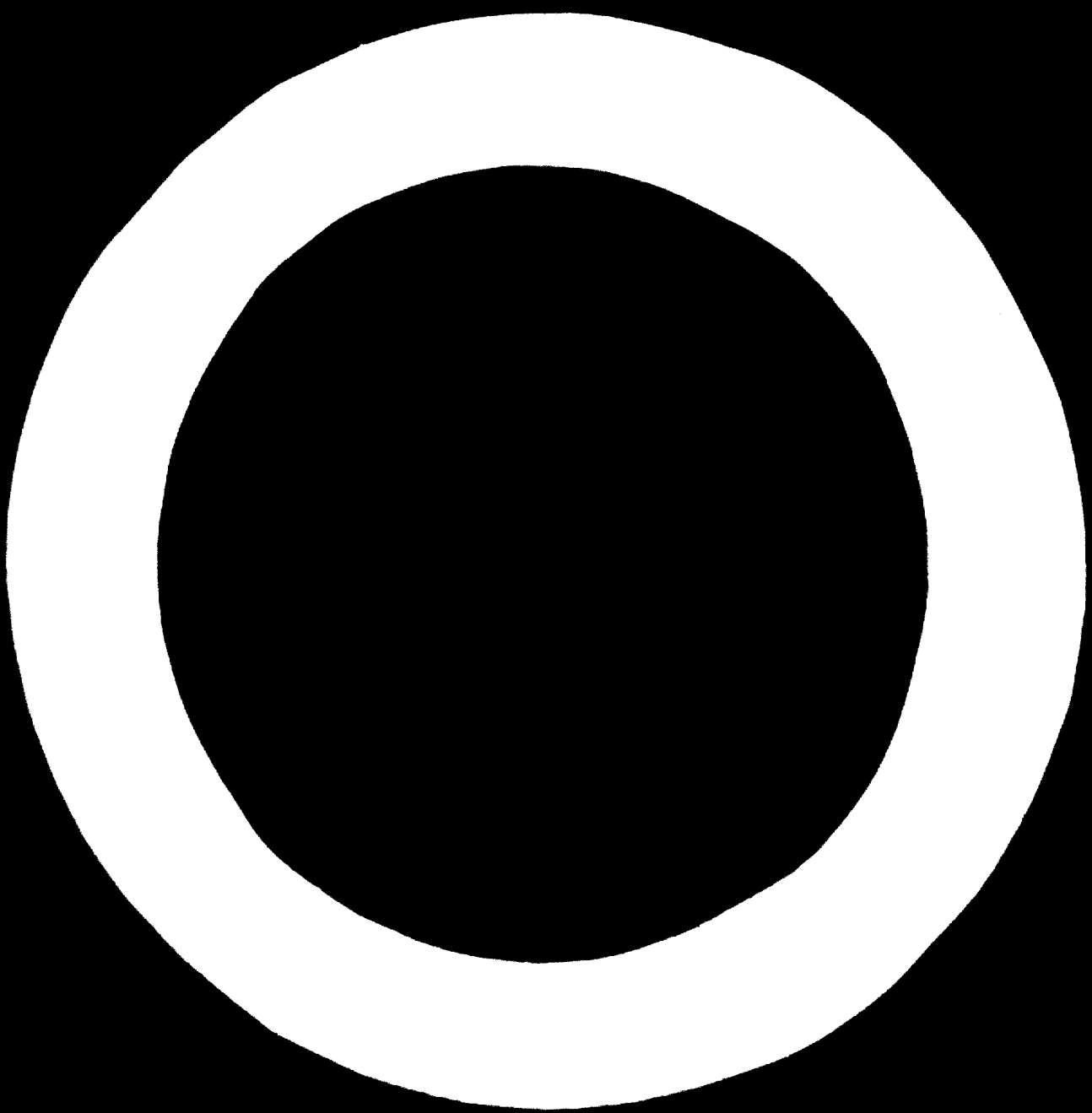
ESTABLISHMENT OF REFRACTORY INDUSTRY IN SRI LANKA 1/

S.P. Gunasekera*

* Ceylon Ceramics Corporation, Piliyandala, Sri Lanka

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.74-4286



INTRODUCTION

The ceramic industry in Sri Lanka was established about 30 years ago. However until very recently it was restricted to white ware ceramics only. This was mainly because the local demand for technical ceramics such as electrical insulators, refractories, etc. was rather low to justify the production of these items locally. However, the new development projects recently undertaken by the Government have increased the demand for technical ceramics very significantly. In view of this, and also in view of the availability of good quality raw materials, Ceylon Ceramics Corporation, the sole producer of ceramics in Sri Lanka, commissioned a new plant in July 1973 to produce electrical insulators. The machinery for this plant was supplied by the N.G.K. Insulators, Japan. This factory is now running smoothly and produces all the country's requirements for low tension insulators and high tension insulators up to 11 KV. This is certainly a tribute to the local knowledge and skills.

Ceylon Ceramics Corporation (C.C.C.) has now decided to set up a refractories manufacturing plant to cater for the local demand for refractories. At present these refractories are being imported. Ceylon Ceramics Corporation produces small quantities of low- and medium-alumina refractories for its own use.

DEMAND FOR REFRACTORIES

Ceylon Ceramics Corporation had the idea of setting up a refractories plant for the past five years. In 1969 Dr. K. Engelthaler, a UNIDO expert then attached to C.C.C., made a survey of the island's requirements for refractories and estimated it to be in the region of 3,500 tons per year. In the following year Dr. R.W. Grimshaw of Leeds University, U.K. studied the feasibility of setting up a refractories manufacturing plant in Sri Lanka. He estimated the requirements for refractories for that year to be 4,000 tons. Since then the demand for refractories has been steadily increasing at a rate of about 6% per year. This is mainly due to the expansion in the steel, non-ferrous metals, cement and ceramics industries. The Mineral Sands Corporation of Sri Lanka has decided to set up a plant to extract TiO_2 from ilmenite and this plant is expected to go into operation by 1976. Annual requirements of refractories for this plant will be 1,100 tons. Based on these facts, the Ministry of Industries has estimated the demand for all types of refractories by 1976 to be 8,000 tons. This includes low-, medium- and high alumina refractories, basic type refractories, insulation bricks, refractory mortars, castables, etc. The estimated requirements of individual types of refractories by 1976 are given in Table I.

TABLE I

Estimated Demand for Refractories in 1976

Type	Demand in Tons
Low alumina	1,107
Medium alumina	983
High alumina	511
Silica	677
Magnesite	3,087
Chrome magnesite	37
Insulator bricks	193
Mortars, mouldables, castables, etc.	1,340

For a refractory factory even an annual production of 8,000 tons is a small quantity. However, it appears from the foregoing discussions that Sri Lanka has good quality raw materials suitable for the manufacture of refractories and it is not difficult to design a small plant to produce the island's requirements of refractories, economically.

RAW MATERIALS

The raw materials available locally which can be used in the manufacture of refractories are as follows:

China Clay

Sri Lanka has several china clay deposits, of which only one is being commercially exploited at present and used in the manufacture of ceramics. The chemical composition of the refined kaolin from this deposit is given in Table II. The PCE of the clay is 34, which is ideal for aluminosilicate refractories.

Ball Clay

At present ball clay for the ceramic industry is being mined from a deposit which is estimated to have 500,000 tons of the clay. The chemical composition of the clay is given in Table II. PCE of the clay is 32.

Dolomite

Sri Lanka has extensive deposits of dolomite. The chemical composition of this mineral obtained from a particular deposit is given in Table II. This could perhaps be used in manufacturing part of the refractory brick requirements of the island.

TABLE II

Chemical Compositions of Some Refractory Materials

	China Clay	Ball Clay	Dolomite
SiO_2	45.9	49.5	2.18
Al_2O_3	37.0	32.3	0.34
Fe_2O_3	0.45	2.15	0.08
MgO	0.63	1.02	19.03
CaO	0.74	trace	33.0
Na_2O	0.09	0.24	-
K_2O	0.33	1.01	-
LO I	13.9	13.4	44.37

Magnesite

Up to now only one small deposit has been found (about 2,000 tons). Therefore at least in the initial stages of the refractory production this mineral will have to be imported.

Zircon

There are large deposits of zircon sand of high purity in Sri Lanka. This mineral is highly refractory.

Minerals needed for the production of high alumina refractories such as sillimanite, bauxite, etc. have not been located in commercially exploitable quantities. Quarzite needed for the manufacture of silica bricks is also not found in Sri Lanka.

DESIGNING OF A REFRACTORY PLANT FOR SRI LANKA

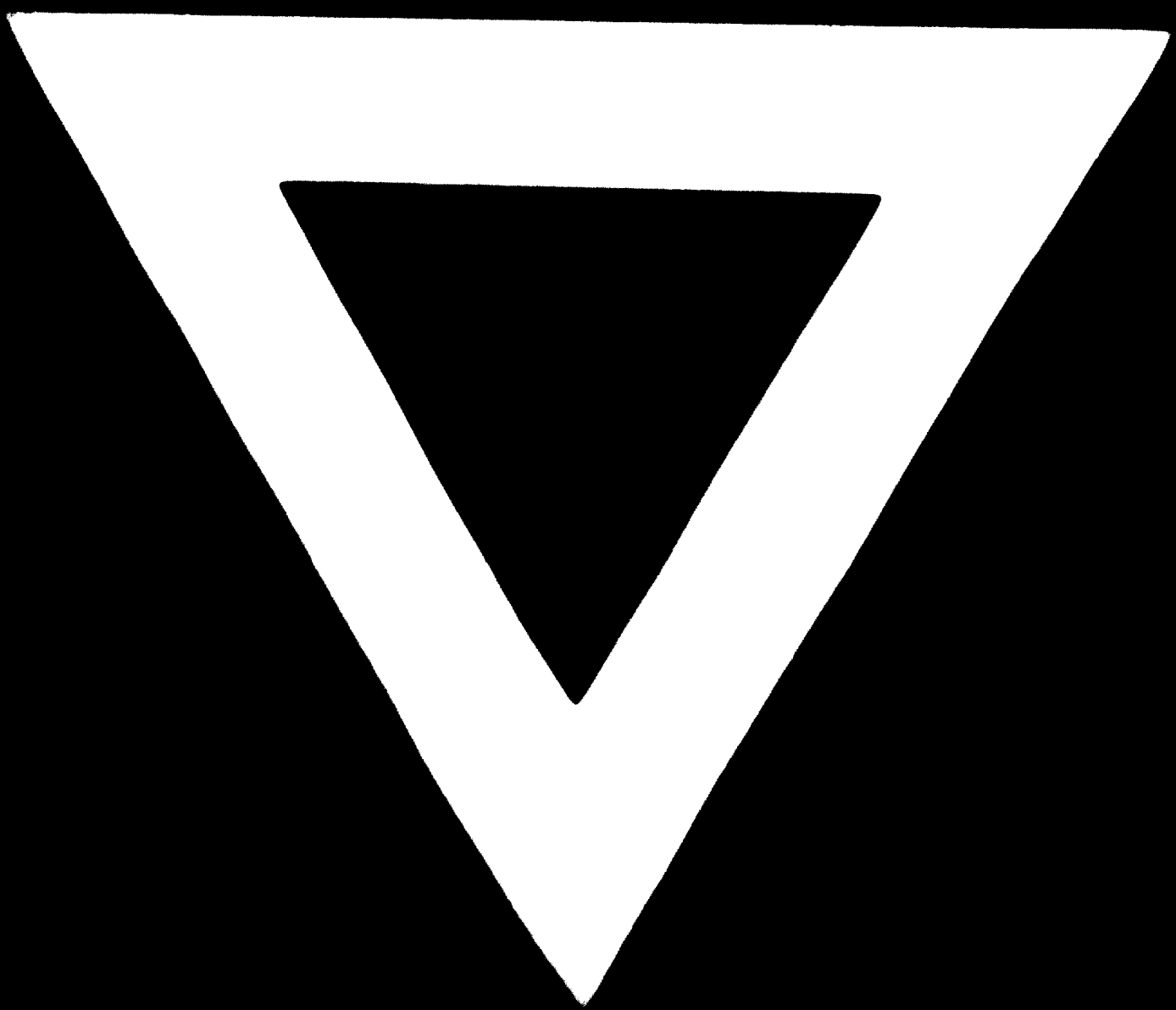
In designing a plant for the manufacture of refractories in Sri Lanka one must take into consideration the demand for different types of refractories and maximum utilization of locally available raw materials to produce them. For example, no zircon refractories are imported to the country at present; however, it is known that stabilized zircon is a suitable substitute for alumina for most of the purposes. Therefore the plant to be designed should have facilities to produce zircon refractories. Part of the high alumina refractories can almost certainly be replaced by refractories made of refined kaolin. In this way the import of bauxite, silimanite, etc. should be minimized, if not eliminated. Similarly the basic refractories should, as far as possible, be made using dolomite. However, even stablized dolomite refractories are inferior to magnesite refractories and hence some magnesite and chrome will also have to be imported.

Silica bricks imported to Sri Lanka are used mainly as arch bricks for kilns and glass tanks. Alumina silicate bricks may be used for this purpose, thus eliminating the production of silica bricks.

It is not normal practice to manufacture alumino-silicate type and basic type refractories in the same plant, but in the case of Sri Lanka this is inevitable. Therefore the plant must be so designed and production so planned as to avoid any contamination of the different body mixes. This need not necessarily mean that there should be separate crushing and body mix preparation units for the two types of refractories. It will be possible to plan the production in such a way that one type of refractories only is produced during a certain period of the year and the other type during the rest of the year. One tunnel kiln should be provided to fire all types of refractories. This would mean the operation of the kiln at different temperature levels up to a maximum of about 1,800°C to suit the different types of refractories.

In designing the plant it must also be taken into consideration that the products of a wide range of shapes and dimensions will have to be made in the new plant. Of course the complicated shapes of which only a small number of pieces may be needed can be hand moulded.

Ceylon Ceramics Corporation will call for world-wide tenders in the near future to supply and instal a refractory manufacturing plant of the sort briefly outlined in this paper.



74.09.30