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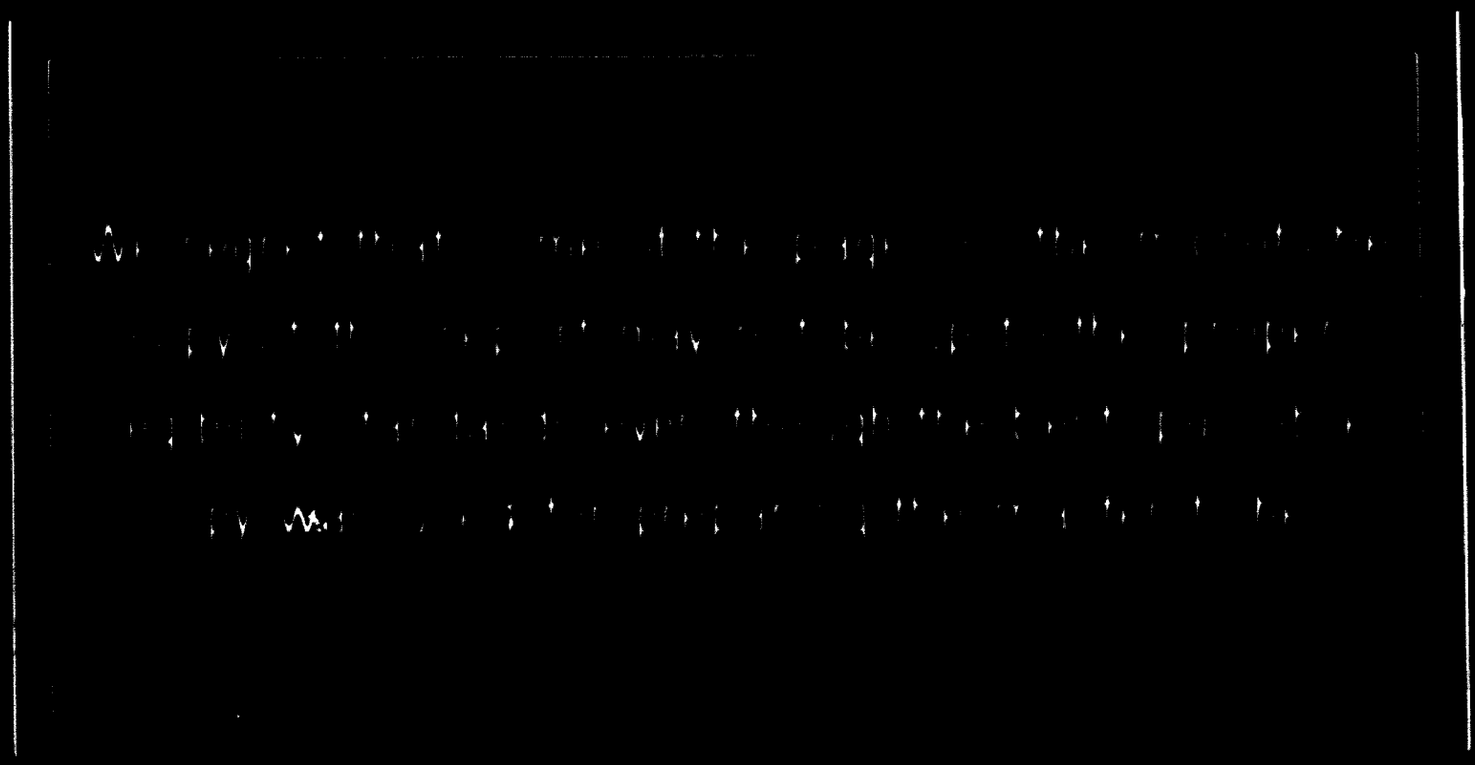

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UNITED NATIONS INDUSTRIAL
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DEVELOPMENT OF APPROPRIATE TECHNOLOGY FOR SMALL-SCALE PRODUCTION OF PORTLAND CEMENT IN LEAST DEVELOPED COUNTRIES AND REGIONS

RP/INT/76/021

Findings and recommendations concerning the newly developed flame-fired push-car kiln

Prepared by the United Nations Industrial Development Organization

Based on the work of Harald C. Boeck, cement consultant

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INTRODUCTION

Since January 1975, Readymix Cement Engineering (RCE) has been developing a small-scale oil-fired kiln. The test kiln, a push-car kiln, has a capacity of approximately 60 t/d. During the expert's first visit to this company in July 1976, the test kiln was not in operation because it was being modified to incorporate further improvements in the REBA (Readymix-Bade) process that it utilizes. Since the process was highly promising, the expert returned to RCE on 25 and 26 November 1976 and was given a demonstration of the test kiln. One advantage of the REBA process is the possibility of burning cement clinker or limestone, which makes this type of kiln especially attractive for developing countries.

I. FINDINGS

The expert inspected the REBA process test plant and was given a demonstration of burning limestone. (It is already known that the REBA process is suitable for clinker and limestone burning.) The process allows for a flame-fired kiln, an innovation which is highly appreciated and the plant can be designed for a capacity of 100-500 t/d.

The weight/capacity ratio is only about 25% of that of a conventional rotary kiln installation, which reduces the investment cost considerably.

The advantages of the REBA process can be summarized as follows:

(a) The capital investment for the kiln installation is low;

(b) It is highly flexible because different materials, such as clinker, lime etc., can be burned;

(c) Since it is flame-fired, oil, gas or coal can be used as fuel;

(d) Since it is a static kiln, it has a high degree of insulation and a long refractory life;

(e) The energy consumption is low (730-760 kcal/kg clinker and 14 kWh/t clinker);

(f) Heat-up time is only 3-4 hours (for conventional pre-heater kilns, it is about 24-36 hours), and therefore switching-off and starting the process does not waste too much time. The kiln can thus be shut down for weekends if required;

(g) The volume and height of the kiln and cooler are low. The costs for civil work are therefore low and the plant is easy to maintain;

(h) The air pollution is low, since all air from the cooler passes through the kiln;

(i) It is easy to operate: no clogging, caking and ring formation. It is therefore also suitable for difficult materials.

Dimensions, weights and land requirements

The approximate dimensions for a 400 t/d push-car kiln and vertical cooler are:

Over-all dimensions (metres)	height x width x length
	5.5 x 2.0 x 7.5

Heights (metres)

Kiln	5.5
Cooler	8.0
Outlet	3.0
Clinker conveyor	2.0
Total height (less nodulizer)	18.5

Weights (tons)

Kiln (without bricks)	70
Brick lining	100
Auxiliary equipment	30
Total weight	200

The total weight of 200 tons is only about 25% of the weight of a conventional rotary kiln with pre-heater.

Land requirements

A compact cement mini-plant using a push-car kiln with a capacity of 400 t/d will require a space of only about 100 x 200 metres.

Test runs

Two thousand t of well-burnt clinker were produced in two months. One thousand t of limestone were burnt in one month. The size of the limestone was approximately 30-50 mm.

The kiln was shut down on every weekend.

Availability of financial resources

The expert was informed that, in spite of the risk of the innovations involved, financial resources would be available for an integrated demonstration mini-plant. However, it was desired that the plant be created in a country that is not too far from Europe.

II. RECOMMENDATIONS

The push-car kiln process, under its trade name REBA process, has a promising future. Because of its flexibility and ease of operation this process would seem to suit the needs of many developing countries. With a view to promoting the construction of such mini-plants in developing countries, the following recommendations are made:

1. An integrated cement mini-plant, equipped with the newly designed push-car kiln, should be put up as a demonstration plant. The capacity of the plant should be about 400 t/d of clinker, corresponding to about 132,000 t/a.

2. The demonstration plant should be erected as soon as possible and investigations should be carried out on how to bring down the total investment cost (TIC). The TIC for an integrated cement mini-plant is still relatively high; the investment cost for the kiln department alone accounts for about 10% of the TIC.

3. Turkey seems to be a suitable country for the erection of such a demonstration plant or even several plants. Especially in the eastern part of the country, where the demand for cement is not very high and the infrastructure for long-distance transportation of cement is insufficient, cement plants using the REBA process should be successful.

4. The Cement Developing and Research Centre of the Cement Manufacturers' Association of Turkey (CDRC/CMAT) could play an important role in investigations, planning and teaching in connexion with the demonstration plant. Furthermore, the demonstration plant, if affiliated with the CDRC/CMAT, could be used as a training plant, not only for the Turkish cement industry, but also for manufacturers from other developing countries.

Annex

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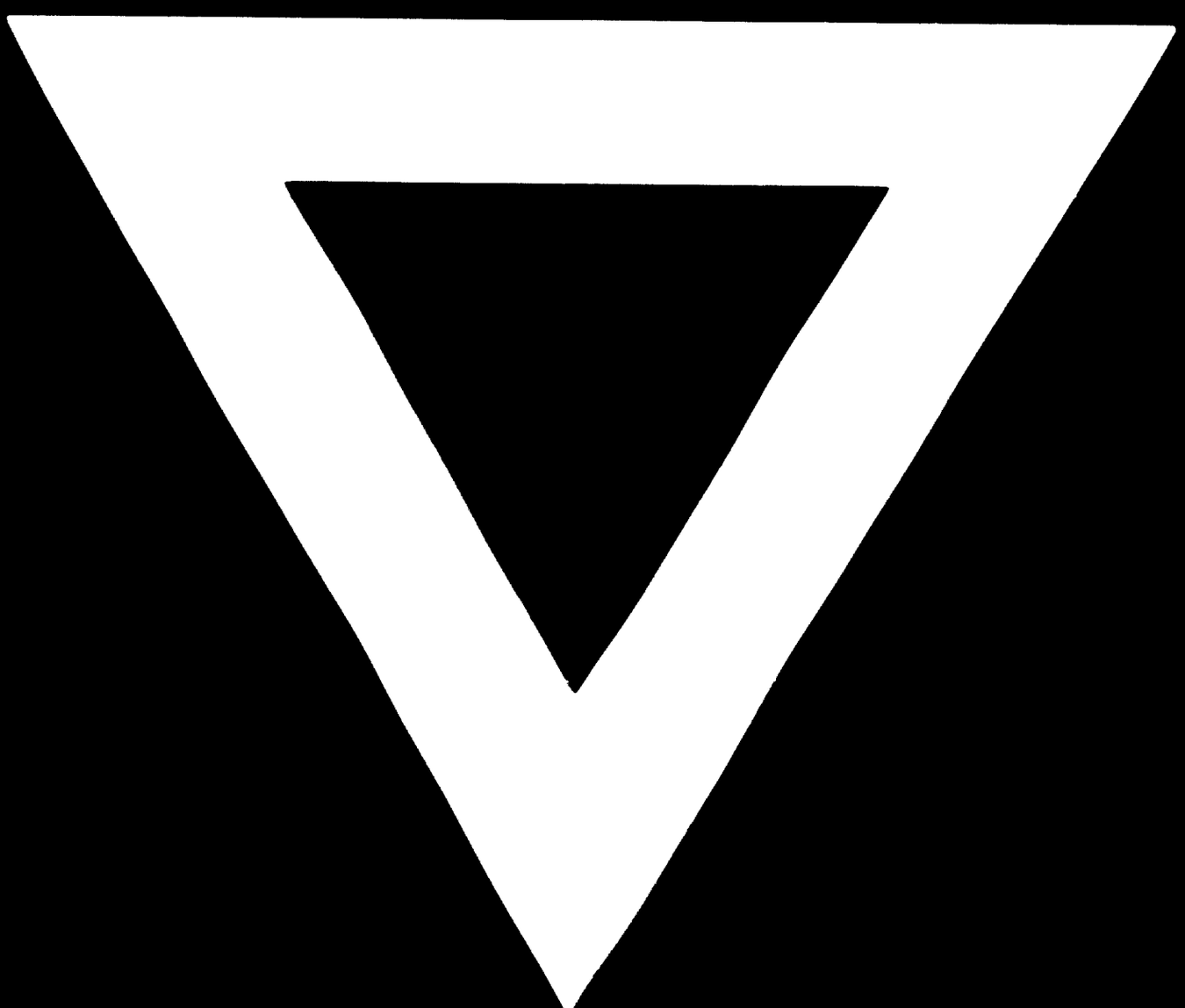

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