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In-Plant Training Workshop on
the Production of Refractories

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REFRATORIES INDUSTRIES IN INDIA^{1/}

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We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

Introduction:

Refractories constitute an essential feeder industry for steel, aluminium and other metal industries as well as cement, glass and diverse chemicals since they provide the basic material for construction of the furnaces used in these industries. 70% to 75% of the output of refractories is consumed in the steel industry itself. Refractories are required not only in the primary construction of the furnaces but also in their repair and maintenance. There is no substitute for refractories from the point of view of the consuming industries. In the choice of refractories, there is a significant degree of selectivity depending upon the specific conditions in the furnaces and the scope for interchangeability between one type of refractories and another is somewhat limited. Quality is an important factor in the production of refractories as it determines the life and efficiency of furnaces.

The major types of refractories are:-

Firebricks (made from fireclay and bauxite)

High Alumina (made from fireclay, bauxite, kyanite and sillimanite)

Silica (made from quartzite)

Basic (made from magnesite and/or chromite)

Insulating (made from diatomite, mica, etc.)

Specials (made from Silicon Carbide, Silicon Nitride etc.)

Refractory cements and mortars used for cementing the bricks together in furnace construction are made from compositions identical to the bricks themselves.

Present Status in India:

Refractories Industries in India are fairly developed under the organised sector. The raw-materials required for these industries e.g., Refractory clays, fire-clays, bauxite, Siliminite, Kyanite, Magnesite, Chromite etc. are available in the country. The quality of these raw-materials is quite good and is suitable for the manufacture of quality refractories. The position of the industry in the country, as compiled from various Government publications is given below:-

1. The growth of this industry has been rapid during the last 15 years and has generally synchronised with that of the steel industry. The present manufacturing potential covers most of the types referred to above with the exception of specials, electrocast

high alumina, castables, monoliths and super refractories. High quality firebricks, Silica and Basic refractories constitute the bulk of the products in demand. These are also the types generally described as the metallurgical grade of refractories. General purpose grade refractories include firebricks of less stringent specifications.

ii. There are 48 factories with a total installed capacity of 1,300,000 tonnes per annum which covers several types of refractories. Of this a capacity of about 700,000 accounts for metallurgical grade. Production of this type is confined to less than a dozen factories and is generally based on foreign collaboration. The rest of the capacity is of general purpose grade, catering to industries other than those of primary metals.

iii. Firebricks, Silica and basic are the more generally used varieties. Position regarding the installed capacity for these three types of refractories of the metallurgical grade and the general purpose grade is as follows:-

	Metallurgical grade (tonnes)	General purpose grade (tonnes)
Firebricks	512,000	457,000
Silica	87,000	-
Basic	98,000	-
	<u>697,000</u>	<u>457,000</u>

Production of refractories (both grades) during 1972 has been as follows:-

Firebricks	429,000 tonnes.
Silica	65,000 "
Basic	90,000 "

iv. As indigenous production falls short of demand, imports of refractories during 1970-71 and 1971-72 amounted to Rs.42 million and Rs.64.5 million respectively. The imports were essentially of the metallurgical grade but included types being manufactured indigenously. The constructional requirements of refractories for the Bokaro Steel Project as well as for coke ovens accounted for a large part of the increase in imports. The Minerals and Metals Trading Corporation is the agency through which the imports are channelised.

v. Owing to improvements in process technology in the iron and steel industry as also the refractories industry, there has been a progressively downward trend in the quantity of refractories consumed per tonne of steel production. This has also resulted in considerable diversification in the refractories industry towards production of quality refractories and modified types.

Future Prospects:

The need for establishment of additional capacity for refractories is basically linked to the programme of expansion of steel industry. Accordingly, it is important that additional capacity for refractories is brought in position somewhat ahead of the commissioning of the steel capacity, so that the steel projects are met from indigenous sources.

Production of general grade of refractories does not involve any significant degree of mechanisation or technological sophistication and the expansion of capacity in this sector presents no problem. Entrepreneurs may plan for additional capacity of general purpose grade according to their own assessment of demand and the existing position regarding supplies. Such expansion will not involve any major expenditure of foreign exchange for import of capital equipment.

In regard to the metallurgical grade, development of further capacity needs to be considered. Taking into account the potential for utilisation of existing capacity and the estimated demand by 1978-79 for metallurgical grade refractories, the Task Force on refractories industry has identified the scope in the following terms:

Sl.No.	Estimated Demand	Production envisaged from existing units	G A P	Production capacity

Fireclay Refractories		(in thousand tonnes)		
High grog/high	262	203	59	-
Low grog	211	152	59	157
Plastic process	203	350	-	-
	<u>676</u>	<u>705</u>	<u>118</u>	<u>157</u>
Silica Refractories				
Coke Oven	32	40	-	12
Others	<u>55</u>	<u>40</u>	<u>9</u>	<u>-</u>
	<u>37</u>	<u>86</u>	<u>9</u>	<u>12</u>
Basic Refractories				
Burnt	117	88	29	37
Chemically blended	<u>40</u>	<u>48</u>	<u>-</u>	<u>-</u>
	<u>157</u>	<u>136</u>	<u>29</u>	<u>37</u>
Grand Total:	920	927	156	206

Proposals in respect of following additional capacity have also been approved. On this basis, the capacity which holds out clear prospects for implementation is as follows. Further, proposals are also under Government's consideration.

	Capacity	Capacity likely to materialise (in thousand tons)
Fire-clay, including high grog/ high alumina and low grog	198	52
Silica, including coke oven and others	40	20
Basic Chemically bonded	20	20
Burnt	110	60
<u>Specialities</u>		
Electrocast	3	3
Castables, ramming masses, Monoliths etc.	42	32
Fused refractory, oxides	14	12
Super refractories	2	1
Zirconia products	5	1

Consumers, in particular steel industry, have a clear responsibility to ensure that placement of orders for refractories is undertaken sufficiently in advance so as to facilitate timely indigenous supplies and to obviate imports. The tendency for rush orders as distinct from a more rational prior assessment of likely requirements and easier time-bound supplies within the existing installed capacity of refractories industry has been a matter of serious concern as such actions have resulted in imports on grounds of urgency. A detailed and demand-phased programme needs, therefore, to be worked out between the consumers, particularly the steel industry, and the producers of refractories, well in advance.

In the further expansion of this industry, attention is also invited to the following:-

1. Establishment of additional capacity should be undertaken, as far as practicable, in the vicinity of steel plants.
2. The public sector will have a leading role to play in such expansion. Several State Government schemes have already been approved in this context.
3. Expansion of existing factories to economic levels or production, diversification and improvements in quality will be encouraged.
4. Development of newer products such as castables, monoliths, tar-bonded magnesite and dolomite, pouring refractories, high alumina refractories, super refractories, high alumina refractories, super refractories and speciality products will also be encouraged.

5. There is particularly need for development of additional capacity for the types of refractories which are in short supply with reference to the requirements of the iron and steel industry and other major consumers.

6. Proposals for additional capacity should preferably be outlined on the basis of detailed project and feasibility studies. In particular, the studies should pertain to assured availability of magnesite, sillimanite and chromite etc., since some of these raw-materials are of limited occurrence in some States.

7. Proposals for foreign collaboration will be considered on merits.

8. Fabrication of furnaces is being undertaken indigenously on the basis of import of drawings and designs. While general items of plant and equipment are also available indigenously, special items such as heavy-duty presses may need to be imported for production of metallurgical grade refractories.

Conclusion

In the end it may be stated that as far as the Small Scale Sector of the Refractories Industries is concerned, this sector is comparatively not as well organised because of lack of adequate finance, need for improved technical know-how and sound management. The definition of a small scale industry limits the investment on plant and machinery to the extent of Rs.7.5 lakhs. Hence the small scale sector of the Refractory industries in India, with their limitations stated above have confined their production to the following items:

1. Fire-bricks of all types, including high alumina bricks.
2. Silica Bricks
3. Fireclay cements and mortars.

The quality of the products manufactured under this sector is fairly good but it needs up-grading in some cases. The plant and equipment used by these units, though conventional, is not adequate many times. The furnaces used are mostly round or rectangular draught furnaces of sizes between 12' dia to 22' dia., either coal or oil fired.

These units hence need technical information & guidance on the following points:-

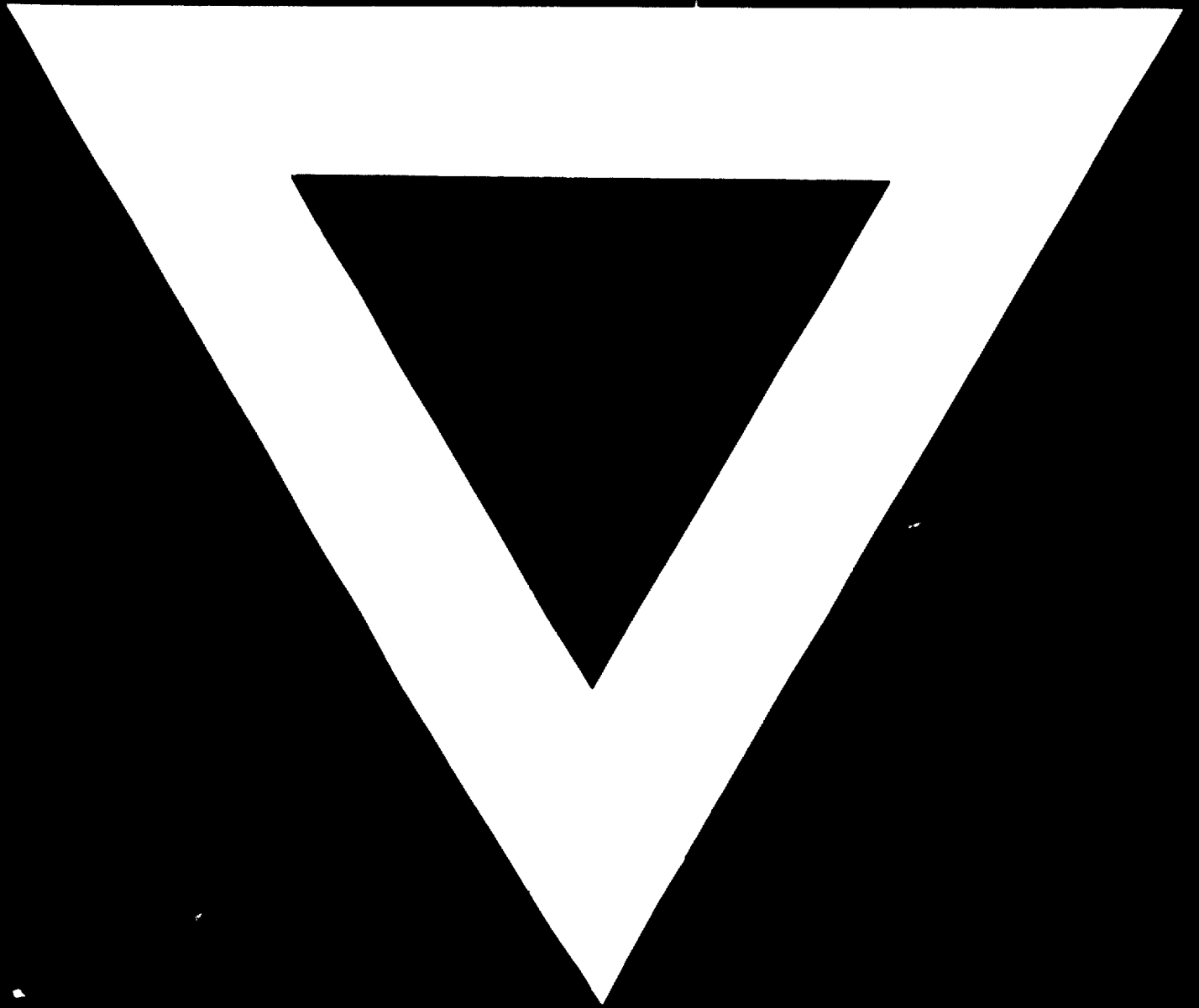
1. Improved type of kiln designs giving uniform high temperature & economy in fuel consumption.
2. Improved type of processing & shaping equipment.
3. Guidance regarding quality control

This Sector, therefore requires technical guidance and assistance to improve the quality of their products. In order to accomplish this, they have to be acquainted with the modern techniques of manufacture, sophisticated machinery and equipment etc.

The Small Industries Development Organisation is rendering this consultancy service free of cost through its Small Industries Service Institutes all over the country.

It is hoped that the Inplant Training workshop that has been organised under the U.N.D.P., would enable the participants to have an opportunity to see some modern factories and to discuss all the technical aspects of development and introduction of modern technology in the various fields of refractories industries in India.





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