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IS 14860 (2000): Guidelines on Fuel Saving in Vertical Mixed-feed Lime Shaft Kilns [CED 4: Building Limes and Gypsum Products]



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भारतीय मानक

उर्ध्वाधर मिश्रित फीड चूना शॉफ्ट भट्टी में ईंधन की
बचत के दिशानिर्देश

Indian Standard

**GUIDELINES ON FUEL SAVING IN VERTICAL
MIXED-FEED LIME SHAFT KILNS**

ICS 25.180.01, 91.100.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Building Limes and Lime Products Sectional Committee had been approved by the Civil Engineering Division Council.

These guidelines are limited to the performance of vertical mixed-feed lime shaft kilns for production capacities up to 20 tpd only.

The present guidelines are based on the technical information collected by the Mines and Geology Department, Rajasthan and the normal research and development work conducted at the Central Building Research Institute, Roorkee.

This standard is being formulated to provide necessary guidance to manufacturers and users of these kilns for saving fuel.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 :1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified values in this standard.

Indian Standard

GUIDELINES ON FUEL SAVING IN VERTICAL MIXED-FEED LIME SHAFT KILNS

1 SCOPE

The scope of these guidelines is limited to the performance of vertical mixed-feed lime shaft kilns for production capacities up to 20 tpd (tonne/day) only.

2 FIELD OF APPLICATION

The small to medium scale building, chemical and allied process industries are covered in the present standard.

3 GENERAL

A vertical kiln, constructed in masonry with inner lining of fire bricks, fired with steam coal (bituminous grade) and charged with uniformly mixed proportions of limestone and coal is appropriately termed what is popularly known as a mixed-feed lime shaft kiln. The mix is fed into the kiln from the top and the calcined product lime is withdrawn from its bottom through the discharge doors. The kiln operates basically in three sections, namely, the preheating, the burning and the cooling zones only.

4 DESIGN CONSIDERATIONS

4.1 Limestone shall be of mineral grade, non decrepitating type with calcium carbonate content exceeding 90 percent by weight.

4.2 Fuel shall be steam coal or special low volatile (SLV) coal with calorific values generally in the range of 5 000 to 6 000 k cal/kg.

4.3 The minimum wall thickness of the masonry shell shall be 98 cm, comprising inner lining of fire bricks (23 cm), insulation gap (3 cm) and burnt clay brick masonry (72 cm).

4.4 Expansion joints may be provided in the masonry shaft of the kiln to obviate thermal stresses.

4.5 The internal shape of the kiln shall be double conical in nature for maintaining uniformity of draught.

4.6 The average inner diameters of the kiln shall correspond to the superficial lime output rates in the range of 2.5 to 3.0 t/(m²)(day) based on cross-sectional area of the kiln.

4.7 The height of the kiln may be 10 to 15 m. The height-to-diameter ratio should preferably be in the range of 5 to 6.

5 OPERATING CONDITIONS

5.1 The kiln shall be operated continuously maintaining the three zones. The charging and discharging schedules should be worked out on a 24-hour (three-shift) basis. The bulk average temperature in the burning zone shall be maintained in the range of 900-1 200°C.

5.2 The size gradation of the limestone shall be in the range of 75-125 mm for the lower capacity (up to 10 tpd) and 100-150 mm for the higher capacity (exceeding 10 tpd) kilns.

5.3 The size gradation for coal shall be in the range of 40-60 mm for the lower capacity (up to 10 tpd) and 50-75 mm for the higher capacity (up to 20 tpd) kilns.

5.4 The limestones and coal should be properly mixed before charging into the kiln. The ratio of average size of limestone to average size of coal shall be approximately 2.0.

5.5 The limestone-to-fuel ratio (w/w) in the feed input shall be in the range of 5 to 6.

5.6 The volatile matter content in the fuel should be as low as possible, but the same should not exceed 25 percent by weight. The ash content should also preferably not exceed 25 percent.

5.7 The excess air consumption (based on complete combustion of the fuel) should be negligible.

5.8 The exhaust gas temperature should be as low as possible to support the kiln operation. This may not be allowed to exceed 250°C.

5.9 The carbon monoxide content in exhaust gas should be negligible.

5.10 The hot lime may be withdrawn at a temperature not exceeding 100°C.

5.11 The oxygen content in the exhaust gases should not exceed 2 percent by volume.

5.12 A chimney should preferably be provided at top of the kiln with a hood. It should be subjectable to

pollution control by suction of gases through the hood.

5.13 The kiln should be amendable to instrumentation and effective time-temperature control in the burning zone.

5.14 If the exhaust gases are sufficiently hot then the

same could be partially recirculated in the kiln as secondary draft.

6 ENVIRONMENTAL CONSIDERATIONS

Each coal fired lime kiln should be equipped with a suitable pollution control system.

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BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 323 01 31, 323 33 75, 323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	{ 323 76 17 323 38 41
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Kankurgachi CALCUTTA 700 054	{ 337 84 99, 337 85 61 337 86 26, 337 91 20
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022	{ 60 38 43 60 20 25
Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600 113	{ 235 02 16, 235 04 42 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400 093	{ 832 92 95, 832 78 58 832 78 91, 832 78 92
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