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**REPORT OF THE WORKING GROUP
ON
CEMENT INDUSTRY**

X FIVE YEAR PLAN - 2002-07



**Government of India
Planning Commission**

February 2002



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(औद्योगिक नीति और संवर्धन विभाग)

उद्योग भवन नई दिल्ली-११००११
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(Deptt of Industrial Policy and Promotion)
Udyog Bhawan, New Delhi-110011

PREFACE

The Planning Commission vide Notification No. I&M-3(13)/2000 dated 7.9.2001 constituted a Working Group on Cement Industry for the X Five Year Plan, under the Chairmanship of the Secretary, IP&P. Representatives of the Planning Commission, Ministries of Finance, Urban Development & Poverty Alleviation, Rural Development, Coal, Highways and Road Transport, Environment & Forests, Industrial Development Bank of India, Housing & Urban Development Corpn., Cement Manufacturers' Association, National Council for Cement & Building Materials and All India Mini Cement Manufacturers' Association were associated as members. As cement is a core Industry which plays an important role in infrastructure development and also is a major contributor to ex-chequer, five Sub-Groups were constituted to study various aspects of the industry in detail.

1. Capacity, Demand, Production and Infrastructure.
2. Technology, Energy construction, R&D needs and Manpower
3. Bulk transport, Cement Export, Cement Import and WTO.
4. Limestone Inventory and Mini Cement Plants.
5. Pollution Control and Use of Waste Materials.

The Chairmen and members of the Sub-Groups were drawn from the cement industry and officials in the concerned Government Departments, Organizations and Institutions. The Sub-Groups, have done a commendable job in examining the various issues related with the areas assigned to each of the Sub-Group and have brought out their findings and recommendations in the reports in a very short time available to them.

The Working Group, considered the reports of the Sub-Groups in its final meeting held on 14-12-2001. After detailed deliberations on the issues referred in the reports of the Sub-Groups, covering various aspects for the growth and development of cement industry, including the present approach of the Govt. on globalisation of the industry, the report was finalised. The report contains Executive Summary and Recommendations followed by the Reports of the Sub-Groups.

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The report clearly identifies the issues and concerns of the cement industry and contain recommendations as to how these could be addressed for achieving the projected targets during the X plan period. I am confident that the Planning Commission would find this document useful in preparing the X five year plan document.

I am grateful to the Chairman of the Working Group, Shri V. Govindarajan, Secretary, Deptt. of Industrial Policy & Promotion, for his valuable guidance and direction in preparing this report and the keen interest shown in the deliberations and reviews with various Sub-Groups.

I take this opportunity to express my sincere thanks to all those associated with the main working group and the Sub-Groups. I appreciate the timely and valuable services rendered by the Cement Manufacturers' Association and National Council for Cement and Building Materials, which have helped us in bringing out this valuable document in time.



S Jagadeesan

**Member Secretary, Working Group
on Cement Industry for the X Plan.**

**New Delhi
09 February 2002**

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Government Notifications

WORKING GROUP ON CEMENT INDUSTRY FOR THE X FIVE YEAR PLAN (2002-07)

The Planning Commission has constituted a Working Group on Cement Industry for formulation of X Five Year Plan (2002-2007) with the following terms of reference and composition.

Terms of Reference

1. To review the status of Cement Industry during the Ninth Plan highlighting the achievements and reasons for any shortfall, in the fulfillment of targets.
2. To project production and demand for Cement Industry during Tenth Plan and to recommend measures for achievement of these projections through modernization, expansion, setting up of new cement units etc.
3. To examine state-wise, region-wise and sector-wise requirement of cement and to suggest innovative uses of cement.
4. To evaluate the potential export markets, its demand and competitive sources of supply and to suggest measures to promote cement exports to these markets.
5. To examine cement imports and implications of WTO on cement industry.
6. To review the existing technology and identify the needs for further R&D activities to upgrade technology.
7. To assess availability of skilled manpower, facilities for training and human resource development.
8. To explore energy saving methods and alternate sources of energy like pet coke, LNG, CNG, organic waste materials etc.
9. To suggest measures for pollution control in cement plants.
10. To examine and recommend measures for using industrial waste and effluents in the cement industry and fiscal and other measures for accelerated use of waste products (like fly-ash, slag, effluent from paper industry etc.).
11. To review the performance of mini cement plants and recommend measures for the growth of this sector.
12. To update national inventory of limestone.
13. To examine the status of bulk transportation of cement and recommend measures for increased bulk transportation.
14. To bench mark the indigenous cement industry against international industry and suggest measures for bridging the gaps, where necessary.

Composition

1.	Secretary, Deptt. of Industrial Policy & Promotion	Chairman
2.	Representative of Planning Commission (Industries Division)	Member
3.	Representative of Planning Commission (Transport Division)	Member
4.	Representative of Planning Commission (PP Division)	Member
5.	Joint Secretary, Deptt. of Industrial Policy & Promotion	Member- Secretary
6.	Representative of Deptt. of Expenditure (Plan Finance)	Member
7.	Representative of Ministry of Urban, Development and Poverty Alleviation	Member
8.	Representative of Ministry of Rural Development	Member
9.	Representative of Ministry of Coal	Member
10.	Representative of Ministry of Surface Transport	Member
11.	Representative of Ministry of Environment & Forests	Member
12.	Representative of Railway Board	Member
13.	Representative of National Highways Authority of India (NHAI)	Member
14.	Representative of Central Road Research Institute (CRRI)	Member
15.	Representative of IDBI	Member
16.	Representative of HUDCO	Member
17.	President, Cement Manufacturers' Association	Member
18.	Director General, National Council for Cement and Building Materials (NCBM)	Member
19.	President, All India Mini Cement Manufacturers' Association	Member

Methodology adopted by the Working Group for Finalization of the Report

Five Sub-Groups were constituted to assist the Working Group in formulation of its report. Each Sub-Group was given a specific field for examining the aspects related with the field. The five Sub-Groups had to study the following specific areas related with the cement industry:

- 1 Capacity, Demand, Production and Infrastructure**
- 2 Technology, Energy Conservation, Benchmarking, R&D Needs and Manpower**
- 3 Bulk Transport, Cement Export, Cement Import and WTO**
- 4 Limestone Inventory and Mini Cement Plants**
- 5 Pollution Control and Use of Waste Materials**

The Recommendations of the Sub-Groups have been summarised and presented after the Executive Summary.

EXECUTIVE SUMMARY AND RECOMMENDATIONS



Environment-Friendly Modern Cement Plant

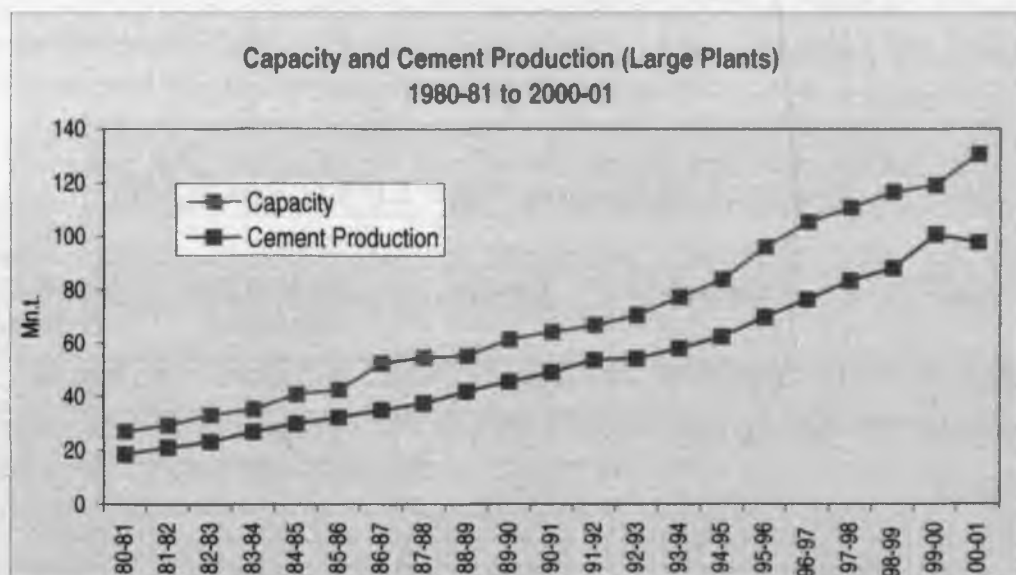
EXECUTIVE SUMMARY

1.0 Capacity, Demand, Production and Infrastructure

1.1 Cement is a basic construction material and plays an important role in the development of social, industrial and commercial infrastructure, which are considered prime engines of economic development. It forms the backbone of infrastructure development of the country.

1.2 Indian cement industry is comparable to the best in the world in respect of use of technology, quality standards, fuel and power consumption, environment norms, and consistent high capacity utilisation.

1.3 Cement manufacturing commenced in India in 1914 and till 1982, cement was regulated, with controls on production, distribution and price, barring a brief decontrol during 1966 and 1967. During 1982-89, the industry was progressively deregulated, with total decontrol in 1989 followed by delicensing in July 1991. Implementation of liberalisation policies enabled the industry, a higher growth trajectory and the industry became truly competitive.



1.4 Cement industry has grown at a Compound Annual Rate of Growth (CARG) of 8.4% over the last two decades. Today, India is the second largest cement producing country in the world, next to China.

1.5 The cement industry has an installed capacity of **140.53 million tonnes per annum (mn.t.)** (Sept 2001); comprising **120 large plants**, with an installed capacity of **129.43 mn.t.** and about **365 mini cement plants** with an installed capacity of about **11.10 mn.t.**

1.6. Cement production was 93.61 mn.t. in the year 2000-01; at an anticipated growth rate of 10% during the X Plan period, cement production is likely to be 165.56 mn.t. with a capacity of 202.64 mn.t. by end of the Plan period.

2.0 Demand

2.1 Cement consumption is estimated to touch 100 mn.t., during the terminal year of the Ninth Plan. During the Ninth Plan, growth in consumption works out to a CARG of 6.03%. The very low per capita cement consumption of 99 kg, in India, as compared to most of the developing countries, is an indicator of huge potential for rapid growth of cement industry.

2.2 Considering the general global economic slowdown and its effect on India, resulting in low growth during the final year of IX Plan, two scenarios for the cement demand have been considered i.e, low growth scenario and high growth scenario. In both the scenarios, the production required and capacity to reach such production levels have been worked out and presented in the two tables below :

Low Growth Scenario - GDP Growth Rate at 5.5%

(Mn.t.)

Year	Domestic Demand	Export	Production Required	Capacity* Needed
2002-03	106.68	3.50	110.18	136.01
2003-04	114.15	3.75	117.90	145.10
2004-05	123.28	4.00	127.28	157.78
2005-06	133.14	4.25	137.39	169.67
2006-07	143.79	4.50	148.29	182.32

High Growth Scenario - GDP Growth Rate at 8%

(Mn.t.)

Years	Demand	Export	Production required	Capacity* Needed
2002-03	109.67	3.50	113.17	139.53
2003-04	120.63	3.75	124.38	152.72
2004-05	132.70	4.00	136.70	168.86
2005-06	145.97	4.50	150.47	185.06
2006-07	160.56	5.00	165.56	202.64

** considering 85% capacity utilization.*

2.3 Based on the regression analysis, the Planning Commission, has estimated a demand of 155 mn.t. by end of the terminal year of the X Plan. However, the Working Group has estimated the demand to reach 160.5 mn.t. by the end of the terminal year of the X Five Year Plan.

3.0 Infrastructure

The core infrastructure for the cement industry are coal, power and infrastructure.

3.1 Coal

3.1.1 Coal is the basic fuel used in Indian cement industry. Of a total consumption of 15.73 mn.t. in 2000-01, 4.40 mn.t. was imported. The imported coal is preferred due to low ash content and high calorific value.

3.1.2 Coal will continue to be the dominant fuel for cement industry. However, petroleum coke, lignite and waste derived fuels also will have a marginal presence. In fact, increased use of pet coke and lignite will be an interesting development in the coming years.

3.1.3 As better quality of imported coal with its low ash content increases the efficiency of cement plants, the import duty on non coking coal needs to be reduced from the present 25% level.

3.1.4 The cement industry is also using washed coal in kilns. Presently, about 1.5 mn.t. washed coal is being used by cement plants in the Bilaspur cluster, which is likely to go-up.

3.2 Power

3.2.1 As on date, over 40 per cent of cement production is from captive power plants using diesel, furnace oil and coal.

3.2.2 Captive power is often cheaper than grid power. The grid power supply system needs urgent overhaul for increased efficiency and lower energy costs through privatization, which is already in vogue but proceeding slowly.

3.2.3 Till grid power is available in adequate quantity/quality and at proper price, generation of captive power and its trading needs to be permitted without any restrictions.

3.3 Transportation

3.3.1 In view of location specific characteristic of cement plants involving movements through long distances both for inward movement of raw materials and cement to the markets, railway is the ideal mode of transportation.

3.3.2 Though the Task Force on Cement Industry for the IX Plan recommended a 60% movement of cement production by rail, only 38% movement is likely to be achieved at the end of IX Plan period.

3.3.3 Railways would need to take further pro-active and customer friendly measures if their share of the traffic in cement movement has to increase in the X Plan period.

3.3.4 Inland water transport is an energy efficient and cheap mode of transport. There is lot of potential for movement of cement/clinker through inland waterways transport, particularly for those plants located near the coastal regions. Further, a part of cement movement by rail and road may be diverted to inland waterways where the minimum navigation width and depth are assured round the year. Multi-nodal transport including inland waterways transport for major part of the cement movement is a viable alternative for cheaper transport and boosting cement export to neighbouring country-Bangladesh.

4.0 Technology, Energy Conservation, Benchmarking, R&D Needs and Manpower

4.1 Cement Production and Modernisation

4.1.1 The production of OPC was about 63%, PPC 26% and PSC 10% and others 1% during the year 2000-01. By the year 2006-07, it is expected that the total cement production from cement plants would be 165.56 mn.t, out of which 50% would be blended cements comprising of 35 % PPC and 15% PSC.

4.1.2 The additional capacity (cement basis) during X Plan would be of the order of 62 mn.t. including 5 mn.t. cement capacity from mini cement plants. Considering the share of various types of cement in total production as above, the enhanced capacity would be of the order of 57 mn.t. (cement basis) and 45 mn.t. (clinker basis) from large cement plants. Around 10 mn.t. capacity (clinker basis) may come from green-field cement plants at a capital investment of Rs.3500 crores. Around 35 mn.t. (clinker basis) may come through modernization and expansion at capital investment of Rs 7000 crores. Another 17 mn.t. capacity (cement basis) including 5 mn.t. from mini cement plants is likely to be created due to in-house technology upgradation/ debottlenecking/ addition of fly ash and slag. In order to cope-up with the total enhanced capacity of 62 mn.t., the power infrastructure of 1125 MW will have to be created by Indian cement industry. The capital investment for new captive power generation will be of the order of Rs.4600 crores. The capital investment for setting up coal washeries of 3 mn.t. capacity would be around Rs 300 crores. The additional 5 mn.t. cement capacity from mini cement plants cost would require an investment of Rs.1000 crores. Further, the investment for developing, supporting infrastructure on railway would be around Rs.1200 crores. Thus the total investment to be made by Indian cement industry during the X Plan is likely to be Rs. 17600 crores.

4.1.3 The cement capacity of 4.5 mn.t. from wet process technology is proposed to be converted to energy efficient dry process by the end of X Five Year Plan. Rs.1100 crores is the financial requirement for this conversion.

4.2 Cement Plant Machinery

4.2.1 A recent development in the area of mining operation is the use of surface miner where the limestone deposit is amenable. All the three operations viz. ripping, crushing and loading are combined and carried out in one machine.

4.2.2 Mobile crushers have come in use in some of the newer plants. Roll crushers/horizontal impact crushers are also being employed as a pre-crusher with the existing ball mills.

4.2.3 Vertical Roller Mills (VRM) have provided the real breakthrough in the area of grinding. VRM draws 20-30% less electrical energy compared to ball mill system. VRMs are now being used in clinker and slag grinding and also as pre-grinder to existing grinding installation.

4.2.4 The application of high pressure grinding rolls led to an increase in capacity upto 200% and power savings by 30-40%, compared to ball mills.

4.2.5 High efficiency separators are now widely used for better classification of product, thus reducing the specific power consumption besides increasing mill capacity.

4.2.6 Traditionally, kilns have been operating at specific volumetric loading of 1.5 to 2.2 tpd/m³ for suspension pre-heater kilns and 3.0 to 4.0 tpd/m³ for precalciner kilns. However, a number of plants have gradually up-rated the kilns capacity with specific volumetric loading upto 6 tpd/m³. The introduction of high efficiency and low pressure-drop-cyclones have led to the increase in pre-heater stages from 4-stage preheater to 5-stage/ 6-stage cyclone preheater, with improved thermal efficiency.

4.2.7 The latest development of controlled flow grate clinker cooler system ensure better clinker distribution, increase in cooler heat recuperation efficiency, decrease in clinker exit temperature and reduced maintenance costs.

4.2.8 The limitations of conventional straight pipe burner have been overcome by highly flexible multi-channel burner. The improved burner enables desired flame shape adjustment and gives rise to entrainment of more secondary air.

4.2.9 The advent of precalciner technology provided an opportunity to the industry to modernize and increase the capacity of existing dry process plants and set up single line kilns of 3000 TPD capacity and even more. The present trend indicates preference of still larger kilns of 6000 TPD capacity and even more.

4.3 Refractory

4.3.1 With the new improved refractory bricks, it is now possible to increase the refractory life and reduce the radiation losses in the kiln. The large scale use of monolithic refractories in preheater, precalcinator, cooler, kiln outlet zone etc. is in practice.

4.4 Automation and Control

4.4.1 In cement industry, conventional analog instrumentation is gradually being replaced with digital instrumentation. Motor controls by relay sequence are being changed to programmable logic controllers. Analog PID controllers are being replaced with multi-loop digital controllers.

4.4.2 The advent of one million tonne and above capacity dry process cement plants has brought into focus automatic kiln control systems based on expert and fuzzy logic systems.

4.5 Fuel

4.5.1 The Indian cement industry is mainly using coal from various coalfields in the country. It is also procuring coal through open market, imports besides using lignite. During the past two years, small quantities of Pet Coke have also been tried by some cement plants. Some combustible wastes are being used in precalcinators, in small quantity.

4.6 Energy Conservation Efforts

4.6.1 Scarce energy resources and rising energy costs have created an awareness all over the world to the need of conserving the same and simultaneously finding alternate cost effective energy sources. The weighted average thermal energy consumption in dry process plants in India has reduced from 780 to 750 Kcal/kg clinker from 1995-96 to 2000-01. Similarly, the weighted average electrical energy consumption in dry process plants during above period showed a reduction from 104 to 91 kWh/t cement. It is expected that the average thermal and electrical energy consumption by the year 2006-07 will further come down to 730 Kcal/kg clinker and 86 kWh/t cement respectively due to further improvement in energy efficiency in the existing plants and new capacity addition with energy efficient technologies and energy conservation efforts. The lowest thermal and electrical energy consumption achieved by the cement plants in India is 677 Kcal/kg clinker and 69 kWh/t cement which are comparable to

the best figures of 650 Kcal/kg clinker and 65 kWh/t cement in a developed country like Japan.

4.6.2 The improvements in energy performance of cement plants in the past few years have been possible largely due to retrofitting and adoption of energy efficient equipment, better operational control and optimisation, up-gradation of process control and instrumentation facilities, better monitoring and Management Information System etc.

4.7 ISO/NABL Certification

4.7.1 So far, 59 cement plants have acquired ISO 9002 certification. In addition, 27 cement plants have also been awarded ISO 14001 certification for environmental protection and improvement which was non-existent earlier. By the end of X Plan (2006-07), it is expected that about 110 plants will have both these certifications. The industry has taken one step further in getting their testing and research laboratories accredited by National Accreditation Board of Laboratories (NABL). Also, industry is fast catching up with OHS-18000 / ISO-15000 certification for health and safety.

4.8 Benchmarking

4.8.1 The Indian cement industry got acquainted with benchmarking system advocated by the Blue Circle Technical Center, UK during IX Plan which basically involved a process for locating best practices and applying them continuously at plants to improve their performance. It is expected that the benchmarking exercise will cover all the existing cement plants by the year 2006-07. Other areas like quality, manpower productivity, spares/consumables, maintenance practices, operating performances etc. of all cement plants will form part of this exercise.

4.9 Manpower

4.9.1 The total direct manpower deployed in the cement industry during 2000-01 was estimated around 1,35,000 which is expected to slightly go up by another 2000 during X Plan period with fresh recruitment. Surplus manpower, if any, after rationalisation, is expected to be absorbed by the additional capacities/redeployment.

4.10 Training

4.10.1 The four Regional Training Centres - Dalmiapuram in the South, JK Nimbahera in the North, Gujarat Ambuja in the West and ACC - Jamul in the

East, conduct training programmes for skill upgradation and productivity enhancement. The National Council for Cement & Building Materials (NCB) also conduct various training programmes for the cement sector both at Ballabgarh and Hyderabad, in addition to special training programmes at cement plants.

4.11 In-house R&D

4.11.1 A number of cement manufacturing organisations and cement machinery suppliers in India have developed their in-house R&D setup and at present, 12 such units are dedicated to cement and allied industries.

5.0 Bulk Transport, Cement Export, Cement Import and WTO

5.1 Bulk Transport

5.1.1 90% of cement production in the developed world is moved in the bulk form; however, this is less than 2% in India.

5.1.2 Moving cement in Bulk provides substantial benefits. Hence it is necessary to promote and encourage transportation, storage and usage of cement in bulk.

5.1.3 It is necessary to provide an impetus to bulk cement through incentives so that demand for bulk cement is created in the market. There is need for setting up bulk terminals – to ensure that the market transformation from Bags to Bulk would be faster.

5.1.4 The growth of bulk cement is dependent upon the development and growth of Ready Mix Concrete (RMC). The RMC industry's growth could not maintain the desired pace and has even started to decline. Many RMC units have closed down as they are unable to compete with site-mix concrete, which unlike RMC, is free from regulations and taxes. The RMC industry is subjected to various taxes and duties on machinery and land. RMC should be treated at par with site mix concrete in regard to excise duty.

5.2 Cement Export

5.2.1 Indian cement industry has potential to double its exports of cement and clinker and thus be a major export player in South-East Asia. In fact, Cement has been identified by the Government as an **extreme focus** item, IX Five Year Plan had set a target of 8 mn.t. for cement/clinker exports. However, the exports of cement/clinker are expected to be of the order of 5.15 mn.t. by the end

of IX Five Year Plan. Certain factors affecting the export of cement/clinker have been:

- Stiff competition offered by the other cement exporting countries because of better infrastructure like availability of power at a very low cost and transportation due to proximity to sea ports and other facilities like lower rates of taxes, duties etc.
- Higher domestic cost of production incurred by the Indian cement industry due to heavy incidence of local taxes, excise and import duty.
- Inadequate growth in the related infrastructure facilities like availability of good quality coal, power, transportation etc. Keeping in view the need for a comprehensive study on the competitiveness of the Indian cement industry, the Department of IP&P is commissioning a study to assess the competitiveness of the Indian cement industry vis-a-vis the cement industry of its competitors as well as to identify the constraints faced by Indian cement industry in the matter of export and recommend remedial measures to improve its competitiveness.

5.3 Cement Import

5.3.1 It is desirable to review the high rate of taxes, duties and other levies, including freight and port charges to ensure a level playing field for domestic companies.

6.0 Limestone Inventory

6.1 The updation of the national inventory of cement grade limestone is being done continuously by National Council for Cement and Building Materials (NCB), erstwhile Cement Research Institute of India, ever since 1974. The total limestone reserves have increased from **44,000 mn.t.** in 1974, with only 3020 mn.t. (6.8%) in proved category; to 95939 mn.t. with 23810 mn.t. (23%) in proved category, as on 31 March 2001. The Proved Equivalent reserves of all the categories have been estimated as **63057 mn.t.**

6.2 The national inventory of cement grade limestone reveals that about 71 percent (**68253 mn.t.**) of the total reserves are concentrated in just six states of Andhra Pradesh, Karnataka, Gujarat, Rajasthan, Madhya Pradesh and Chhattisgarh. Andhra Pradesh alone has about 32% (**30396 mn.t.**) of the country's total reserves. The inventory also reveals zone-wise regional imbalance in the availability of limestone with about **46.6%** of the total reserves in Southern zone, 23% in Northern zone, 20% in Western zone, and a meagre 10.4% in Eastern zone.

6.3 The availability of potential limestone deposits has also been restricted due to various environmental and technological constraints. About 22.5% of the gross reserves fall under environmentally sensitive hilly/forest areas and other 7.5% of the total reserves are inaccessible as they are in Coastal Regulated Zone (CRZ). As a result only 35,585 mn.t. are the net available limestone for the present and future requirement.

6.4 As per the estimates, about 25817 mn.t. (27%) of the total 95939 mn.t. of limestone reserves are of marginal grade. In order to conserve cement grade limestone it is necessary to use the marginal grade limestone.

6.5 A perusal of the potential deposits for green field projects shows that 56 deposits can sustain plants of one million tonnes or higher capacity and 44 deposits are suitable for smaller capacity cement plants (up to 4 lakh tonnes per annum). Out of these, 22 sites are located in Andhra Pradesh and the rest are in Rajasthan, Himachal Pradesh, Gujarat, Meghalaya, Karnataka, Chhattisgarh, Jammu & Kashmir and Assam. Out of the total proved equivalent reserves, 49% (30516 mn.t) have been identified for setting up green-field cement projects.

6.6 Considering 8% GDP growth during the X plan period and a corresponding 10% growth in cement capacity, the installed capacity of cement industry at the end of the X plan period, for both domestic demand and growth in exports would be of the order of 200 mn.tpa which would require the limestone reserves of the order 15,225 mn.t (considering 45 years of plant life). Therefore, net reserves of only 20,350 mn.t would be available for any further capacity addition beyond X plan projections. Hence, the exploration activity has to be intensified to explore additional deposits and also to convert probable and possible reserves into proved category.

7.0 Mini Cement Plants

7.1 The capacity limit of the mini cement plant is reviewed from time to time taking into consideration the technological developments with a view to make them energy-efficient, eco-friendly etc; so that these are economically viable.

7.2 The mini cement plants set up in the country are based either on Rotary Kiln technology or on Vertical Shaft Kiln (VSK) technology. The latter are based on technologies developed by the National Council for Cement and Building Materials (NCB), formerly known as the Cement Research Institute of India (CRI) and Regional Research Laboratory, Jorhat (RRL). Many small VSK plants have also come up mainly in SSI sector, with plant and machinery supplied by Saboo Engineers, Jodhpur. In addition, there are some VSK plants not based on any of the above three technologies.

7.3 There is no single agency for collection of data pertaining to the mini cement plant sector. However, as per the data available with NCB and updated with the information provided by the associations of mini cement plants, it appears that presently, only about 132 mini cement plants out of a total of 365 units set up, with a capacity of about 11 mn.t, are reported to be in operation, producing about 4 mn.t of cement per annum.

7.4 Limitations of capacity fixed for Mini Cement Plants at conceptual stage and financial assistance limits specially the term loans for projects execution, rising cost of fuel and its non-availability in case of VSK cement plants and absence of railway linkage, high ash content and poor quality of coal, poor quality of electrical power, high turnover of trained manpower, lower realization due to consumer preference for branded cement, non-availability of adequate funds for working capital and term loans for modernisation and expansion etc; are some of the main impediments resulting in the poor performance and growth of this sector.

7.5 Presently, in view of abundant availability of pet coke from Reliance Petroleum Ltd, in Gujarat, which is an ideal substitute for coke breeze, many VSK mini cement plants have already been revived in Gujarat, Rajasthan, J&K and in Tamilnadu.

8.0 Pollution Control and Use of Waste Materials

8.1 The level of permissible dust emission in India for operating plants is 150 mg/Nm³. However, for a new plant, Suspended Particulate Matter (SPM) level of 50 mg/Nm³ is insisted for environmental clearance which is even lower than that in some developed countries such as Japan. Therefore, there is a need to have a fresh look at the prescribed SPM levels by the authorities.

8.2 In a survey conducted in 1993 by the Central Pollution Control Board (CPCB), 55 plants were found to be fully complying with pollution control norms out of total 89 plants surveyed. According to the latest survey (2000), 58 out of 99 operating plants, are fully complying with the prescribed norms.

8.3 Constraints faced by the cement industry in complying with the emission regulations are manifold. These may be classified as external ones like poor quality of coal and power etc. which need to be tackled at the national level and internal ones, such as problems of layout to accommodate dust collection

equipment within the existing space, non-availability of water in times of drought, etc.

8.4 Concern has been mounting the world over on the increasing emission of greenhouse gases (GHG) such as CO₂. India's CO₂ emission is about 87 mn.t. out of total 96 mn.t. of cement manufacture. CO₂ emission level in India is about 0.9 tonne/tonne of cement, whereas in countries like Japan, USA and China it is varying from 0.43 to 0.47 tonne/tonne of cement. The basic reason for lower CO₂ emissions per tonne of cement in Japan and European Countries, is prominence of blended cements as part of total cement produced.

8.5 The Central Pollution Control Board is now considering fixing emission levels for SO₂ and NO_x. Gaseous emissions like SO₂ and NO_x need to be studied. A detailed study for generating inventory of SO₂ and NO_x generation from the kiln stacks needs to be carried out.

8.6 Environmental Management Systems (EMS) certification is an opportunity that can enable companies to acquire the label of environmentally sound enterprises and also derive the benefits of improved performance. As on date 27 plants are accredited to ISO 14000 series of certification. 80 more cement plants are proposed to be accredited with ISO 14001 by initiating and implementing EMS.

8.7 Surface miners are successfully operating in some cement plants. Adoption of surface miners wherever feasible in limestone mines will reduce dust emission. Incentives for improvement in environmental performance is encouraged by way of giving various awards like FICCI award, TERI Award, National Award for prevention of pollution instituted by Ministry of Environment & Forest and NCB Environmental Excellence Award.

RECOMMENDATIONS

1.0 Capacity, Demand, Production and Infrastructure

1.1 Streamlining of the Existing Procedures

- Excise duty collection system can be further streamlined through introduction of self-declaration of excise duty thereby avoiding inspections. This process which has already begun, needs to be extended across the country.
- Coastal Regulation Zone (CRZ) Act to be rationalized so as to permit setting up of bulk terminals to increase export.
- Delegation of powers to States in respect of project site approvals for environmental clearance of integrated plants, jetties and bulk terminals.
- Rent Control Act should be amended/abolished so as to encourage construction activities.

1.2 Further Push to Housing Development Programmes

- For giving fillip to Housing Development Programmes, Urban Land Ceiling Regulation Act (ULCRA) already repealed in seven States viz. Rajasthan, Karnataka, Punjab, Haryana, Delhi, Gujarat and Tamil Nadu, may also be repealed in other states.
- Building by-laws should be amended as to allow Higher Floor Space Index (FSI) / Floor Area Ratio (FAR) in cities on payment of impact fees, subject to guidelines of the local/municipal authorities.
- Rationalisation of Property tax structure and stamp duties so as to promote investment in the construction activities.
- Code of conduct as defined by National Real Estate Development Council (NAREDCO) be made applicable at National and State levels.

1.3 Promotion of Concrete Highways and Roads

- Assessing the viability of concrete roads vis-à-vis bituminous roads on life cycle cost basis as is the practice, particularly in respect of World Bank aided projects.
- Excise duty on cement be reduced for infrastructure projects.

- In view the low maintenance cost of concrete roads, allocation of more funds both at Centre and States levels should be ensured.
- Use of PPC and slag cement in reinforced cement works to be included in the codal practices.

1.4 Use of Ready Mixed Concrete (RMC) & Bulk Transportation of Cement

- RMC should be made mandatory for large projects. RMC should be totally exempted from sales tax to boost its growth.
- RMC industry should also be given infrastructure status.
- The use pre-cast concrete should be encouraged in construction industry specially in infrastructure projects. These will include fly-overs, residential complexes, commercial and industrial buildings etc., which are closely related bulk cement and RMC.
- Use of concrete hollow blocks and bricks and other construction elements should be encouraged to reduce extraction of soil from the earth's crust and to protect the environment.
- Infrastructure status to be given to Bulk Transportation/Terminals.
- Single window clearance to be given for setting up Bulk Terminals.
- Concessional rate of excise duty applicable to cement packed in bags may also be extended to cement despatched in bulk.
- To attract private investment for setting up Bulk Terminals, the Railways may consider the possibility of increasing rebate on bulk transportation of cement (existing rate is 22.5%).
- For Rail based Bulk Terminals, the Railways should provide land and siding on a long lease basis.
- Bulk transportation of cement should be privatised/Container Corporation to consider providing special containers for bulk transport.
- Port charges for sea based bulk terminals be reduced.

1.5 Evaluation of a mechanism for regulating production and supply of cement in the market

- The industry will have to evolve a mechanism for production and supply of cement to the market on the basis of its demand. Industry will ensure that the growth in demand for cement is not discouraged through steep escalation in the price of cement.
- Setting up of a mechanism for controlling wide fluctuations in the production and supply of cement in the market to be worked out by the Industry. Appropriate competition policy is essential for efficient and orderly growth of the industry.

2.0 Infrastructure

2.1 Coal

- Coal producers / private operators may be encouraged to set up coal washeries to improve the quality of the domestic coal.
- Provisions in Coal Mines (Nationalisation) Act, 1973 need revisions to attract private investment including giving them the option of free trade and removing the ceiling on the production.
- Steps may be taken to promote use and availability of Petroleum Coke (Pet Coke) for its high heat value and competitive prices.
- Lignite may be promoted as an alternative fuel. A separate study may be undertaken to ascertain cement industry's requirements of lignite in the coming years.
- There should be a coordinating agency, which may meet on quarterly basis, to oversee the supply of indigenous coal as the system of bi-partite coal supply agreements entered into by the cement companies with coal companies is yet to be stabilised.
- Import duty on non-coking coal containing low ash may be made at par with the import duty on coking coal as non-cooking coal is better suited for the production of quality cement.

2.2 **Transportation**

Railways

- Railways may take further pro-active and customer friendly measures to increase their share of traffic in movement of cement. Existing schemes like Volume Discount Scheme, Own Your Wagon Scheme, Early settlement of Claims etc. should be reviewed to make these more flexible and attractive.
- To promote export of cement/clinker, the Railways to consider a mechanism for giving concessions in freight on the quantity of cement/clinker to be exported.
- Railways may consider the following measures:
 - Creation/development of sidings at major cities/consumption centers
 - Development of warehousing facilities through private participation.
 - Closed circuit operation for cement/coal movement
 - Development of bulk terminals at suitable locations / consumption centers for cement movement.
- Joint studies may be conducted by the Railways and the cement industry on bulk movement, closed circuit movement, multi-modal system, viz. modal interchange in road, Inland Water Transport (IWT) and coastal shipping.

Inland Waterways Transport

- Inland Waterways may be developed as viable alternative to the Railways as these can serve cheap mode of transport.
- Suitable Inland Water Transport (IWT) terminals should be created at all important points with mechanised handling facilities for loading/unloading and with connections to the hinterland transport (rail and road). All these waterways be so designed that they can carry vessels of capacities ranging between 400T and 1200T.

2.3 Power

- To supplement the supply of inadequate Grid power, cement plants should be allowed to set up captive power generation units, without any restrictions
- They should be allowed to wheel excess power through the State/National grid to be used by other user industries at appropriate charges.
- Electricity duty should be rationalized.

3.0 Taxation & Tariff/Duty Concessions

- ❖ A gradual reduction in levies/taxation, constituting 30% of the selling cost during the Tenth Plan period will help reduce cost of road construction, private housing etc, and also increase the demand for cement.
- ❖ Housing loans in the rural sectors should be treated as Priority Sector Lending.
- ❖ Separate line of credit from ADB/WB for promoting rural housing should be considered.
- ❖ Stamp duty charges to be harmonised and lowered across States in the range of 1 to 3%.
- ❖ Custom tariff on import of equipment and accessories required for modernization, technology up-gradation, pollution control, energy conservation etc. may be relaxed/further reduced.
- ❖ Use of combustible and agricultural wastes should be promoted by providing similar fiscal and financial incentives at par with other non-conventional energy generating systems.
- ❖ Bulk cement used in large infrastructure projects, should be given excise relief at par with the relief given for bags packed at bulk terminals.
- ❖ Duty free imports of equipment aimed at adoption of technologies conducive to reduction in pollution such as recovery of waste heat for cogeneration of power in cement plants etc.

- ❖ Providing fiscal and financial incentives for the use of the wastes in cement production.
- ❖ Transport subsidy may be considered for encouraging the use of waste materials.
- ❖ It is desirable to review the high rate of taxes, duties and other levies, including freight and port charges to provide a level playing field for domestic companies.

4.0 Export & Import Scenario

4.1 Export

- Duty free import of coal against export of cement/clinker may be increased to a minimum of 50% from the present limit of 20%.
- For promotion of export, some quantity of cement sold in the domestic market may be exempted from payment of Excise Duty.
- To promote export of cement/clinker the Railways to consider a mechanism for giving concessions in freight on the quantity of cement/clinker to be exported.
- For export promotion to potential neighbouring countries, particularly Bangladesh, all modes of transport, including usage of river and inland water routes need be put to use. Wherever possible cement, rather than clinker (which is lower value-added) must be exported.
- With increased exports to Bangladesh and Sri Lanka, Bulk terminals be set up in Kolkata and Chennai/Tuticorin.
- A dialogue should be initiated with Bangladesh Govt. to accord preferential treatment for cement/clinker exports from India as given by Sri Lanka.
- A comprehensive study be undertaken to assess the competitiveness of the Indian cement industry vis-à-vis cement industry of other cement exporting countries with a view to make it competitive in the international market.
- Railways may be requested not to impose custom examination charges of Rs.17 per MT on cement export to Bangladesh.

- Free Trade Agreement (FTA) facility is extended to countries in Africa, Mauritius etc.

4.2 Import

- It is desirable to review the rate of taxes, duties and other levies, including freight and port charges to provide a level playing field for domestic companies and ensuring consumer interest.

5.0 Upgradation of Technology through R&D

- Efforts should be directed to utilize low and marginal grade limestone by modern mining techniques and state-of-the-art equipment. The use of surface miners wherever possible should be encouraged.
- Significant portion of increase in cement capacity must be encouraged through optimisation and debottlenecking of existing processes and modernization.
- Newer energy efficient and environment friendly technologies like horizontal roller mills, fluidized bed kiln systems etc. need to be studied and evaluated for their successful adoption by Indian cement industry
- Promotion of blended cement for energy conservation and technologies for reduction of GHG emissions must be given special emphasis. However, this calls for assured availability of good quality dry flyash.
- Benchmarking of various performance indicators would make plants to strive for achieving higher energy efficiency and productivity levels. Such studies should be encouraged by providing fund support for the generation of extensive database.
- More funds of the order of Rs.200 crores must be allocated to R&D organizations like NCB to conduct pilot scale research & developmental work directed towards energy efficiency and environment friendly technologies.
- Development of clean coal technologies such as desulphurisation of high sulphur lignite and beneficiation of high ash coals require financial support to propagate economical use of such fuels.

- Advanced training needs of the personnel should be identified to meet the changing needs of the industry and improve manpower as well as machine productivity.
- More funds may be provided for improving the infrastructural facilities in the existing training centres and new centres be opened.
- Number of training centres may be increased.

6.0 Limestone Inventory

- Rapid conversion of **Probable** and **Possible** categories of limestone reserves (77% of total reserves) into the **Proved** category should be initiated through joint exploration by the state DGM's and national organizations to ensure availability of resources for growth of cement industry.
- Focused efforts have to be initiated to utilize **25817 mn.t.** of the marginal grade limestone (27% of the reserves) associated with cement grade limestone to facilitate conservation of cement grade limestone reserves.
- Studies on environmental load carrying capacity have to be conducted within the clusters to assess the limit load and find out the additional cement capacity which can be created based on the available limestone reserves and infrastructure.
- In order to ensure the availability of various grades of residual limestone reserves for rational utilization, periodic re-assessment of captive limestone mines of all cement plants should be carried out by an independent national agency, such as NCB or IBM.

7.0 Mini Cement Plants

- The definition of Mini Cement Plant capacity for rotary kiln mini cement plant is to be revised to **1200 tpd** from the existing **900 tpd** and the definition of capacity for VSK mini cement plant is to be revised to **400 tpd** from the present capacity of **300 tpd**.
- Coal and other fuel linkages to be given to Mini Cement Plants.
- Mini Cement Plants should be encouraged to upgrade the level of technology.

- Mini Cement Plants must be encouraged particularly in remote and hilly areas like J&K and North East Region in view of Limestone, transport, market and infrastructure constraints.
- The financial institutions may consider viable Mini Cement Plants for term loan and working capital assistance.
- A Regional Training Centre be established at an appropriate location in North-Eastern Region.

8.0 Pollution Control and use of Waste Materials

- Emission limit of 100 mg/Nm³ may be fixed for achievement by the new plants in the initial period of X Plan, to be reduced to 50 mg/Nm³ by the end of X Plan.
- Better and consistent quality coal to be used to reduce the emission level
- A detailed study may be conducted for fixing the reasonable emission levels of SO₂ and Nox.
- The plants, which are accredited to ISO 14000 series of certification should be exempted from yearly consent and it should be taken once in three years.
- Since the cement industry does not produce any toxic or hazardous wastes in the form of effluents, it should be deleted from the list of hazardous industries.
- It is proposed to bring down CO₂ emission level by adopting the following measures:
 - Increased production of Blended Cements and promotion of its use.
 - Optimizing the pyro-processing system and avenues for reduction in electrical power consumption
 - Enhancement of afforestation and sink potential for CO₂
 - Optimizing the particle size distribution of fine coal
 - Use of alternate fuel (Oil, Gas/pet coke)
 - Use of marginal grade limestone.
 - Manufacture of belite cement.

- Land adjoining the waste generating plant should be given on long lease to the waste utilising plant with necessary infrastructure such as water, power etc.
- BIS specifications may be modified for permitting use of waste materials like steel slag, phosphorous furnace slag etc.

CAPACITY, DEMAND, PRODUCTION AND INFRASTRUCTURE

SUB-GROUP – I



Modern Cement Plant

I. CAPACITY, DEMAND, PRODUCTION AND INFRASTRUCTURE

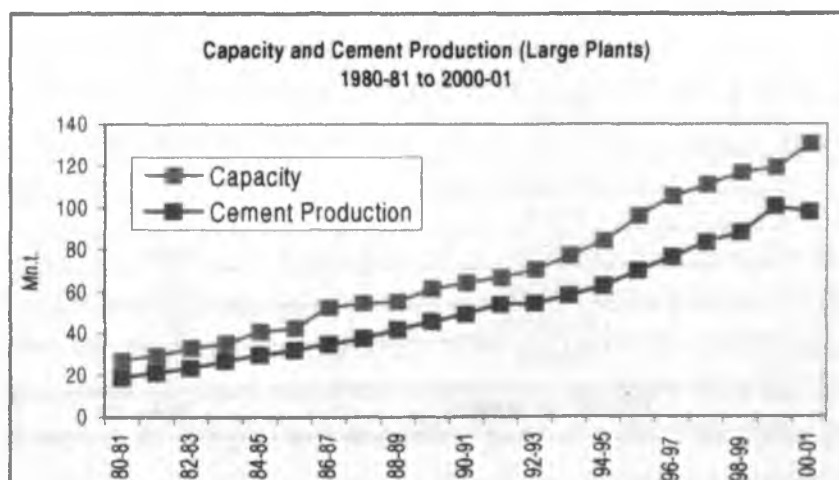
1.0 Introduction

1.1 Cement is a basic construction material and plays an important role in the development of social, industrial and commercial infrastructure, which are considered prime engines of economic development. It forms the backbone of infrastructure development of the country. In fact, per capita cement consumption is considered an important index of a country's economic growth.

1.2 The cement industry in India is by and large self sufficient both in raw material availability and process technology as well as indigenous sources of plant and machinery. Indeed, it is comparable to the best in the world in respect of quality standards, low fuel and power consumption, environment norms, use of latest technology and consistently high capacity utilisation.

1.3 The industry directly employs 1.35 lakh people, while creating a substantially higher proportion of indirect employment through machinery manufacture, materials and services. It is estimated that a million tonne of cement production provides employment to about 20,000 persons downstream. Cement contributes as much as 5% of the Centre's excise revenue, even though it has 1.6% weight in index of industrial production.

1.4 Cement manufacturing commenced in India in 1914 and till 1982 was regulated, barring a brief patch of decontrol of two years in 1966 and 1967, with controls on production, distribution and price. During 1982-1989, the industry was progressively deregulated with total decontrol in 1989 and delicensing of the industry in July 1991. Implementation of liberalisation policies put the industry on a higher growth trajectory and the industry became truly competitive.



1.5 Cement industry has grown at a Compound Annual Rate of Growth (CARG) of 8.4% over the last two decades. This high rate of growth was made possible due to a combination of pragmatic Government policies and an equally proactive and responsive cement industry. Today, India is the second largest cement producing country next to China.

Country	Production (mn.t.)	
	2000	1999
China	597.65	573.00
India	101.81	99.11
Japan	85.95	83.47
USA	84.70	85.00
Korea	52.20	49.50

1.6 The Indian cement industry presents a harmonious co-existence of both conventional large cement plants, having single kiln capacity as high as 12000 tpd and mini cement plants having - Rotary kilns of 200- 900 tpd and Vertical shaft Kilns of 30- 100 tpd capacity.

1.7 The installed capacity of the industry is of the order of 140 mn.t; (Sept'01), comprising of about 129 mn.t. from 120 large plants and about 11 mn.t. from 365 mini cement plants (Rotary and VSK).

1.8 India's per capita cement consumption of 99 kg during the year 2000 is far below the world average of 263 kg. and of several developed and developing countries, as given below :

Country	Per Capita Cement Consumption (Kg)
Japan	570
USA	397
China	450
Egypt	376
U.K.	224
Brazil	232
India	99
Taiwan	890
Malaysia	506
Thailand	285
Korea	1015
World Average	263

1.9 The emerging severe competition at the market place, while favouring consumers interest immensely in terms of quality, variety, quantity and delivery, led to a total metamorphosis of the industry's character and structure with focussed emphasis on finding ways and means of cutting and containing costs as an ongoing effort. This brought about, *inter alia*, major changes in the industry's working and dynamics. Some of the key ingredients of this change are:

- Continued upgradation of technology parameters resulting in increased size of kilns, economy in power and fuel consumption and better environmental standards.
- Increased dependence on captive power plants due to the twin advantage of reliability and much lower cost, compared to the unreliable supply from the grid at a much higher (twice) cost.
- Emergence of many split-location grinding units across the country with twin objectives of proximity to markets and flexibility to use industrial wastes, namely, blast furnace slag and flyash, not only provides blended cements, but also rid the country of such malice as industrial pollutants.
- Substantial optimisation of transport logistics with a view to innovating new modes of transportation, such as coastal shipping which are not only cost effective, but also highly environment friendly.
- Bulk vending with many Ready Mix Concrete outlets to facilitate efficient and high standards of construction.
- Increased exports, touching an all time high of over 5.15 mn.t. in 2000-01.

2.0. Review of Performance of Cement Industry during the IX Plan

2.1 Capacity

2.1.1 Capacity increased at a Compounded annual Growth Rate (CARG) of 5.98% per annum during the period. As on Sept'01, capacity stands at 140.53 mn.t. (large plants - 129.43 and Mini plants -11.10 mn.t.).

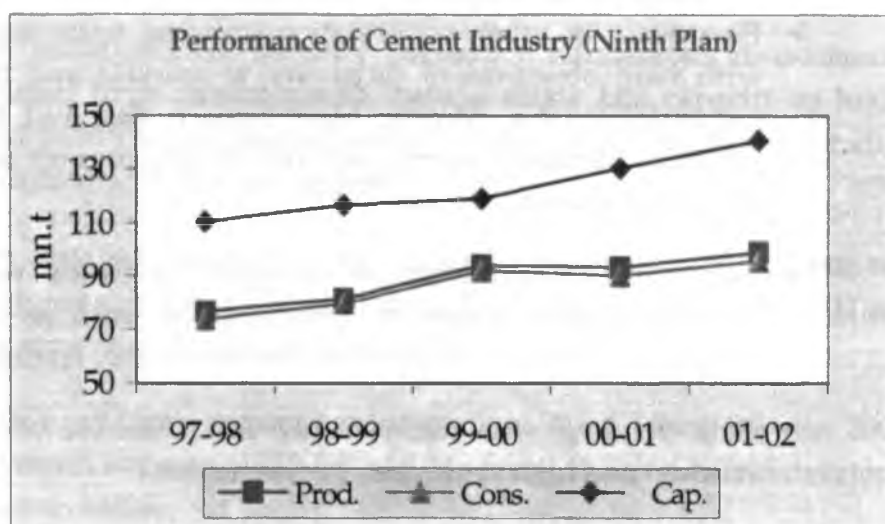
2.1.2 As per the Task Force Report on Cement Industry for the IX Plan, a capacity of 135 mn.t. (large plants : 124 mn.t. and Mini Plants : 11.00 mn.t.) was projected for the terminal year 2001-02. The industry has reached a capacity of 140.53 mn.t. (Sept.01) surpassing the target. The industry thus has been ahead of the target and is in the process of adding further capacities through expansions

and green-field projects in the remaining period of the year 2001-02. With greater use of flyash, production capacity could be increased further, without addition of new kiln capacity.

2.2 Production

2.2.1 Cement production also grew consistently during the IX Plan period at CARG of 6.25%.

2.2.2 Capacity utilisation for large plants has been around 80%, except for the year 1999-2000, during which it reached a peak level of 87%, including public sector units. With the privatization of more public sector units, the capacity utilization is likely to go up further.



Performance of Cement Industry

(mn.t.)

Year	Capacity	Production	Consumption	Exports		
				Cement	Clinker	Total
97-98	110.51	83.16	80.31	2.68	1.72	4.40
98-99	116.56	87.91	86.01	2.06	1.45	3.51
99-00	119.10	100.45	98.29	1.95	1.19	3.14
00-01	130.40	97.61	94.28	3.15	2.00	5.15
01-02	140.53 *	103.23#	99.70#	3.20#	1.50#	4.70#
CARG, %	5.98	6.25	6.03	13.35	9.80	12.14

* Capacity : As on September 2001

Estimated

2.2.3 Considering a 6% growth in cement production during 2001-02, IX Plan, will end with a production of 103 mn.t. Thus, increase in production during the Plan period works out to a CARG of 6.25%.

2.3 Cement Consumption

2.3.1 Cement consumption is estimated to touch 100.0 mn.t. by the end of IX Plan. During the IX Plan, growth in consumption works out to a CARG of 6.03%.

2.3.2 The current per capita cement consumption which is lower than the world average particularly much lower than the consumption of developed countries offers scope for its development and growth. Growth in cement consumption will be linked to GDP growth and per capita purchasing power.

2.3.3 Increase in cement/clinker exports during the IX Plan works out to a CARG of 12.14%.

2.3.4 Cement Consumption - Region and Statewise: All the regions, except East recorded negative growth in cement consumption during the year 2000-01 over the previous year as shown in the table:

(mn.t)

Region	2000-01	1999-00	% Change
North	17.46	17.93	-2.62
East	13.91	12.34	12.72
South	25.99	28.83	-9.85
West	20.13	20.76	-3.03
Central	16.79	18.43	-8.90
All India	94.28	98.29	-4.08

Cement consumption during 2000-01 has decreased in almost all the major consuming states except Maharashtra. The major drop was registered in

Andhra Pradesh (27%), Gujarat (17%), Madhya Pradesh (16%), Bihar (13%) and Rajasthan (12%).

(mn.t.)

States	2000-01	1999-00	% Change	States	2000-01	1999-00	% Change
Uttaranchal	0.3	-	-	West Bengal	4.76	4.73	0.63
Haryana	2.86	2.78	2.88	Chhattisgarh	0.64	-	-
Punjab	4.1	4.29	-4.43	Andhra Pradesh	7.37	10.06	-26.74
Rajasthan	5.33	6.07	-12.19	Tamil Nadu	8.39	8.51	-1.41
Himachal Pradesh	1.12	1.04	7.69	Karnataka	5.1	5.13	-0.58
Chandigarh	0.35	0.3	16.67	Kerala	4.67	4.77	-2.10
Delhi	2.67	2.81	-4.98	Pondicherry	0.1	0.08	25.00
Jammu & Kashmir	0.73	0.64	14.06	Andaman & Nicobar	0.08	0.02	300.00
Assam	0.96	0.89	7.87	Goa	0.29	0.26	11.54
Other N.E. States	0.52	0.37	40.54	Gujarat	6.86	8.26	-16.95
Bihar	3.51	4.05	-13.33	Maharashtra	13.27	12.5	6.16
Jharkhand	0.71	-	-	Uttar Pradesh	11.41	12.03	-5.15
Orissa	2.79	2.3	21.30	Madhya Pradesh	5.39	6.4	-15.78

3.0 Demand and Forecast for the X Plan

3.1 The Task Force on Cement Industry for the IX Plan (1997-2002) had considered projections made by two reputed organizations: IIM, Ahmedabad & NCAER, New Delhi for the IX Plan period. Considering the economic scenario and the planned growth for the IX Plan period, the Task Force estimated cement demand for the IX Plan period (year wise) as below :

(mn.t.)

Year	Demand Estimates	Avg. Growth (%)	Production Targets Including Exports	Capacity Projections
1996-97	73	7	76.0	105
1997-98	79	8.5	83.5	112
1998-99	86		90.0	120
1999-00	93		97.5	125
2000-01	101		105.5	130
2001-02	109		113.0	135

3.2 A comparison of the actual demand with the projections for the five years of IX Plan are given in the following table :

(mn.t.)

Year	Demand Estimates	Actual Consumption		
		Total	Large	Mini
1997-98	79	80.31	73.89	6.42
1998-99	86	86.01	79.77	6.24
1999-00	93	98.29	92.05	6.24
2000-01	101	94.28	90.28	4.00
2001-02	109	99.70 (Est.)	95.70	4.00

3.3 The estimates for the X Plan have been arrived on the basis of :

- Cement consumption is related to overall economic growth (GDP).
- Statistics on GDP (at factor cost – at constant prices) and cement consumption for the period 1990-91 to 1999-2000 indicate that every 1% increase in GDP leads to 1.2% increase in cement consumption in the country. The X Plan envisages a GDP growth of 8% average through the 5 year plan period.

3.4 The X Plan achieving an 8% average growth or a little higher growth would however, depend on the actual implementation of various projects planned or in pipeline. Several national projects for infrastructure development already taken up will be completed by 2006-07:

- Construction of National Highways, i.e. North-South and East-West Corridors and widening of Golden Quadrilateral connecting four mega metros – Kolkata, Chennai, Delhi and Mumbai - already under implementation.
- Rural Connectivity for Sustained Development – Pradhan Mantri Gram Sadak Yojana (PMGSY), a 100% central funded scheme aims to provide rural connectivity through all-weather roads to all unconnected villages with a population of more than 1000 persons by the year 2003 and those with a population of more than 500 persons by the end of 2007.
- Pradhan Mantri Gramodaya Yojana has been introduced to fulfil the critical needs in the areas of drinking water, housing, nutrition, primary health, primary education and rural electrification.
- Housing for All – Construction of 25 lakh houses annually is targeted. All unserviceable Kutcha houses will be converted into semi-pucca/pucca houses by 2006-07.

3.5 Thus, under an optimistic scenario, it is expected that the cement demand will grow at 10% per annum. However, the projections are made under :

- Low Growth Scenario
- High Growth Scenario

3.5.1 Low Growth Scenario: Economic growth in 2001- 02 is expected to be around 5.5%. A positive aspect expected is a significantly higher agriculture growth during the year 2001-02, which would have its effect in the 1st year of X Plan. Assuming that the global recession shows recovery and the plans of housing construction of highways/infrastructure and rural connectivity roads gain momentum, which would translate into a 7% growth in cement demand during the 1st and 2nd years of X Plan and a steady 8% growth for the next three years. On this basis, the demand estimates for the 5 years of the X Plan would be as under :

Year	Cement Demand (mn.t)	YOY Growth (%)
2002-03	106.68	7
2003-04	114.15	7
2004-05	123.28	8
2005-06	133.14	8
2006-07	143.79	8

Region-wise cement demand estimates is given at Annexure-I

3.5.2 High Growth Scenario: Assuming that the global recession shows signs of recovery and the various projects of infrastructure, housing, roads and rural development are aggressively monitored & implemented and GDP grows by 8% as planned, cement demand is likely to increase by around 10% during the 5 years of the X plan. On this basis, the demand estimates for the next 5 years would be as under :

Year	Cement Demand (mn.t.)	YOY Growth
2002-03	109.67	10%
2003-04	120.63	10%
2004-05	132.70	10%
2005-06	145.97	10%
2006-07	160.56	10%

Region-wise cement demand estimates is given at Annexure-II

3.5.3 Based on both the scenarios and including the expected growth in exports, the year wise production required and the capacity needed during the X Plan period are presented in the following tables :

Low Demand Scenario

(mn.t.)				
Year	Domestic Demand	Export	Production Required	Capacity* Needed
2002-03	106.68	3.50	110.18	136.01
2003-04	114.15	3.75	117.90	145.10
2004-05	123.28	4.00	127.28	157.78
2005-06	133.14	4.25	137.39	169.67
2006-07	143.79	4.50	148.29	182.32

High Demand Scenario

(mn.t.)				
Year	Demand	Export	Production Required	Capacity* Needed
2002-03	109.67	3.50	113.17	139.53
2003-04	120.63	3.75	124.38	152.72
2004-05	132.70	4.00	136.70	168.86
2005-06	145.97	4.50	150.47	185.06
2006-07	160.56	5.00	165.56	202.64

* Considering 85% capacity utilization.

4.0 Infrastructure

The three main infrastructure areas that support the existence and growth of cement industry are :

- Coal
- Power
- Transportation

All the three areas are in the public sector. The constraints faced by the cement industry due to inadequacy in the performance of these sectors and the recommendations for their improvement are discussed below:

4.1 Coal

4.1.1 Non-coking coal is the basic fuel used in Indian cement industry. The fuels generally used in cement plants are coal and lignite. Pet coke and other waste derived fuels (WDF) are also emerging as alternate fuels. Oil and gas are excellent fuels in the context of cement industry but India has its own limitations arising from uncertainties of supply besides high cost.

4.1.2 India has abundant deposits of lignite particularly in Gujarat and Rajasthan after Tamil Nadu. Lignite is currently used for power generation, but taking advantage of geographical vicinity, small quantities of lignite are used in cement plants in Gujarat and Rajasthan.

4.1.3 In the light of the foregoing, coal will continue to be the dominant fuel for cement industry. However, pet coke, lignite and waste derived fuels will also have increased use in future.

4.1.4 The actual coal consumption in kiln varies from plant to plant depending on the technology and the size of the plant, as also on the quality of coal. The new plants are all based on dry process with technological innovations like preheaters and precalcinators and other energy saving equipment. The average consumption of coal which used to be 250 kg per tonne of cement during 1990's, has come down to about 180 kg in 2000-2001. Currently, the fuel to clinker ratio is 170 kg for each tonne of clinker produced. However, this includes around 30% of imported coal of high calorific value of 6000-6500 kcal/kg. As an approximation, one tonne of imported coal is equivalent to 1.5 tonnes of indigenous coal, in terms of heat value.

4.1.5 Cement Industry has a total installed captive power generation capacity of 1602 MW as on 31st March 2001, based mostly on diesel and partly on coal. The coal-based capacity is just 433 MW.

4.1.6 The cement industry consumed about 1.90 mn.t. of coal in coal based captive power plants during 2000-01.

4.1.7 Coal deposits are mostly located in West Bengal, Jharkhand, Uttar Pradesh, Chattisgarh, Orissa, Maharashtra, Assam and Andhra Pradesh, whereas the cement plants are spread all over the country. Thus coal is required to be transported over long distances.

4.1.8 The Bureau of Indian Standards (BIS) has recommended the following coal quality parameters for cement industry :

Item	Value
Volatile Matter	24% min.
Moisture	8% max.
Sulphur	0.8% max.
Ash (wet process)	24% max.
Ash (dry process)	27% max.
Upper size limit	200mm.

4.1.9. The quality of indigenous coal supplied to cement industry has vastly deteriorated over the years. A cement company having all India presence reported the following figures, which are taken as all India trend. During the last few years there has been some improvement in coal quality, because of easy availability of imported coal.

Year	Gross Calorific Value (GCV) of Coal, Kcal/kg
1977-78	4828
1981-82	4173
1985-86	3974
1989-90	3845
1993-94	3695
1997-98	3840
2001-02	NA

4.1.10 The industry looks forward to supply of coal having uniform quality and low ash content. As already stated, uniform quality is important. This can be achieved either by import of coal or by coal beneficiation.

4.1.11 Coal Imports: Coal import is generally resorted to by the cement industry due to the following main reasons :

- Economic considerations
- Quality compulsions
- Technical considerations - utilising marginal grade limestone
- Environmental necessity

The coal import reached a peak of 6.04 mn.t. in 1999-2000 but have now started coming down because of rising CIF values and high rate of import duty. Coal import is generally made from Australia, China, Indonesia and South Africa.

(mn.t.)

Year	Quantity imported	Coal Consumption in Kiln
1992-93	0.09	11.55
1993-94	0.11	11.96
1994-95	0.72	12.45
1995-96	1.30	13.25
1996-97	1.65	13.95
1997-98	3.52	13.75
1998-99	4.66	12.63
1999-00	6.04	13.65
2000-01	4.40	13.84

4.1.12 Import Duty: The import duty on non-coking coal since 1996-97 has increased substantially as given below :

Year	Total Import Duty on Non-coking coal (Including SAD/Surcharge etc.)
1996-97	12%
1997-98	15%
1998-99	19.62%
1999-2000	21.16%
2000-01 (w.e.f. May 2000)	32.6%
2000-01 (w.e.f. March 2001)	30%

Significant rise in import duty is an inhibiting factor for coal imports. This needs to be reviewed for bringing it to a reasonable level.

4.1.13 Duty Free Imports: At present, plants exporting cement/clinker are allowed import of 200 kg coal on duty-free basis for each tonne of export. For smooth operation of kiln and to maintain and meet the stringent quality standards of exports, it is proposed that duty-free imports may be increased to at least 500 kg of coal for each tonne of exported cement/clinker.

4.1.14 Use of Pet Coke: Some cement plants have started using, of late, petroleum coke as a fuel in kilns along with coal. Since fuel accounts for about 40% of the overall cement production cost, cement industry is constantly on the lookout for more economical alternative fuels. Pet coke which is a residual product from oil refineries, has attracted attention in recent years, as cement manufacturers have found in petcoke an economical fuel option.

4.1.15 Use of Lignite: As coal has to be transported from Singareni and South Eastern Collieries over large distances, some southern cement plants found lignite quite economical and readily available. Up to 1995, substantial quantity of lignite was used by some cement plants in the southern region as a part substitute for coal. However, for the last few years, use of lignite has become almost negligible. This is because of the increasing use of imported coal in these plants.

Year	Lignite Used (mn.t)
1995-96	0.80
1996-97	0.70
1997-98	0.42
1998-99	0.20
1999-00	0.05

As a long term strategy, cement industry has to think of utilising lignite particularly in Tamil Nadu and Gujarat where large scale lignite mining is on for catering to power plants.

4.1.16 Entry of Private Sector in Coal Mining: In view of the rising demand/supply gap the Government decided to allow coal mining by end users of coal. Accordingly, power and steel sectors were allowed to operate their own coal mines from the year 1993. Subsequently, in 1996, cement industry, as an end user of coal, was also allowed to operate private captive coal mines. As a result, some of the cement plants got captive blocks allotted for opening their own coal mines but had eventually to give up the same. The major drawbacks of the scheme were -

- **Restriction on disposal of surplus coal**
- **Non-viability of the project because of ceiling on production**
- **Difficulty in getting clearances**
- **Lack of infrastructure in the green-field areas where most of the blocks were situated, etc.**

The Government has now decided to amend the *Coal Mines (Nationalisation) Act, 1973* to enable private investment by domestic/foreign companies including cement companies.

4.1.17 Bi-partite Agreement of Coal Supply: In line with the Govt. policy of liberalisation and for creating a free market economy in coal trade, the authorities desired that coal supplies to cement industry should be governed by bi-lateral agreements. Accordingly, large number of cement companies have already signed such agreements with coal companies.

4.1.18 Coal Washeries for Beneficiation: There is a continuous deterioration in the quality of indigenous coal. This will necessitate the cement industry to consider use of washed coal in kilns. Presently, about 1.5 mn.t. washed coal is used in the Bilaspur cluster, which is likely to go-up. Encouragement need to be given for setting up washeries by coal producers/others.

4.1.19 Future Coal Requirement: The large plants in the industry achieved 93.61 mn.t. of cement production in 2000-01 and are expected to touch 99.00 mn.t. in 2001-02, the final year of IX Plan. Corresponding to the production levels, the fuel consumption levels in the IX Plan are given in the table:

Fuel Consumption Trends in IX Plan (For Large Plants)

(mn.t)

Year	Cement Prod.	Clinker Prod.	For Process in Kilns				Coal for Captive Power Plant	Total Fuel Consumption	Fuel/Clinker Ratio (%)
			Coal**	Lignite	Pet coke	Total			
1997-98	76.74	71.28	13.38	0.37	-	13.75	1.23	14.98	19.20
1998-99	81.67	73.14	12.47	0.16	-	12.63	1.35	13.98	17.30
1999-00	94.21	86.34	13.60	0.05	-	13.65	1.77	15.42	15.80
2000-01	93.61	84.38	13.39	0.05	0.40	13.84	1.89	15.73	16.40
2001-02*	99.23	87.40	14.00	0.02	0.40	14.47	2.00	16.42	16.50

** Includes imported coal

*Estimated

4.1.20 Fuel-Clinker Ratio: The fuel/clinker ratio in the last few years has come down to about 16% from around 21.5% with increased use of high quality imported coal. The coal receipts including imports and use of lignite, petcoke are as under:

(mn.t.)

Year	Receipt. Against Linkage from CIL	Receipt. Against Linkage from SCCL	Total Receipts	Coal Import	Open Market	Lignite	Pet Coke
1997-98	6.85	2.75	9.60	3.52	1.62	0.37	-
1998-99	5.53	2.71	8.24	4.66	0.77	0.16	-
1999-00	7.15	1.86	9.01	6.04	0.63	0.05	-
2000-01	6.88	2.86	9.71	4.40	0.75	0.05	0.40
2001-02*	7.00	3.00	10.00	3.50	0.50	-	0.60

* Estimated

4.1.21 Estimated requirement of Coal/Fuel during X Plan (For large plants) for both the scenarios of cement demand are given in tables below :

Low Growth Scenario

(mn.t.)

Year	Estimated Production		Coal/Fuel Requirement for kilns	Fuel/Coal Requirement for CPP	Total Requirement (Indgn. Coal)
	Cement	Clinker			
2002-03	106.18	89.12	15.15	2.00	17.15
2003-04	113.90	97.82	16.63	2.00	18.63
2004-05	121.28	109.69	18.65	2.00	20.65
2005-06	131.39	117.11	19.90	2.00	21.90
2006-07	141.29	125.56	21.34	2.00	23.34

CPP - Captive Power Plant

High Growth Scenario

(mn.t.)

Year	Estimated Production		Coal/Fuel Requirement for kilns	Fuel/Coal Requirement for CPP	Total Requirement (Indigenous Coal)
	Cement	Clinker			
2002-03	109.17	96.59	16.42	2.00	18.42
2003-04	120.38	102.25	17.40	2.00	19.40
2004-05	130.70	116.00	19.70	2.00	21.70
2005-06	144.47	119.00	20.20	2.00	22.20
2006-07	158.56	129.10	21.90	2.00	23.90

- Notes
- 1 The estimates are only for large plants and in terms of indigenous coal. A coal/clinker ratio of 17% has been adopted corresponding to 170 kg of coal for each tonne of clinker produced.
 - 2 The consumption will be less by using higher quality, low ash, and imported coal.
 - 3 Transit loss of approximate 0.5 mn.t. coal excluded.

4.1.22 The break up of the expected fuel requirement by the terminal year of X Plan is shown below :

(mn.t.)

Type of fuel	Requirement	Indigenous coal equivalent
Indigenous coal	16.00*	17.00*
Imported coal	4.00	5.30
Pet coke and combustible wastes	0.90	1.50
Lignite	0.10	0.10
Total	21.00	23.90

* 4.00 mn.t. will be beneficiated - giving 3 mn.t. beneficiated coal and 1 mn.t. rejects

4.1.23 Recommendations

- There is a continuous deterioration in the quality of indigenous coal. This will necessitate the cement industry to consider use of washed coal in kilns. Presently, about 1.5 mn.t. washed coal is used in the Bilaspur cluster, which is likely to go-up. Encouragement need to be given for setting up Washeries by coal producers/others.
- Because of technical and locational considerations as also to relieve the strain on railways, coal imports will continue to be a necessity. Govt. should consider reduction in import duty on non-coking coal to a level of 5% at par with coking coal.
- At present, 200 kg. of coal imports are permitted duty-free for each tonne of cement/clinker exported from the country. This may be increased to 500 kg. Per tonne of export of cement/clinker, as an incentive for encouraging exports.
- Petroleum coke has been found suitable and many cement plants are using pet coke on trial basis because of its high calorific value and economical price. One cement plant in Rajasthan is using only pet coke in its kilns. The availability of fuel is however limited at the moment as petcoke from the Reliance Refinery at Jamnagar only is being used by cement industry. More sources of petcoke supply will have to be located.
- The use of lignite which used to be about 0.8 mn.t. in the year 1995-96 has come down to negligible levels but this fuel is likely to be used increasingly in the coming years. To this end, a dialogue may be opened with Lignite Companies in Tamil Nadu and Gujarat for keeping cement industry on their list of customers. A separate study may be undertaken to ascertain cement industry's requirements of lignite in the coming years.
- Entry of private sector in coal mining will be a right step to create open market conditions. The *Coal Mines (Nationalisation) Act, 1973* may be amended for the purpose at the earliest.
- Many cement companies, have already signed bi-partite coal supply agreements with coal companies governing supply of indigenous coal. Many more cement companies, will be entering into similar agreements in the near future. As this type of arrangement has been initiated for the first time, the post agreement fallout will have to be watched to ensure proper planning and movement of coal. This will have to be taken care, on a regular/ quarterly basis by evolving a co-ordinating mechanism.

4.2 Power

4.2.1 Production of cement is a continuous process and therefore needs uninterrupted power supply. Majority of cement production operations depend exclusively on power. The requirement of power is 25 MW for a million tonne plant. Generally, 120 units of power were consumed for production of one tonne of cement, which has been brought down to 110 units by the industry's continuous efforts towards energy conservation.

4.2.2 Most of the cement units have installed captive power generation capacities to the extent of 60% of their requirement, and in some cases 100% of the requirement. However, some of the states (such as Andhra Pradesh, Chhattisgarh, Madhya Pradesh and Rajasthan) have imposed use of minimum quantity of grid power, ranging between 50-80% of the contract demand. Because of this restriction, the cement industry is not able to take full advantage of installed low-cost captive power generation capacity (*Annexure III*).

4.2.3 The captive power generation capacity installed by cement industry as on 31.3.2001 is 1530 MW. Of this, 72% is based on diesel and the rest 28% is thermal. In addition, some plants have installed wind power generation facilities (Unit-wise details at *Annexure-IV*). The details of cement produced by use of captive power is given in the table.

Year	Million Units Produced by Captive Sets	Cement Production from Captive Power	
		(mn.t.)	(percentage)
1985-86	634.92	5.29	16.50
1986-87	646.20	5.39	15.48
1987-88	795.65	6.63	17.72
1988-89	756.08	6.30	15.09
1989-90	854.10	7.12	16.59
1990-91	930.14	7.75	16.94
1991-92	1166.30	9.72	19.21
1992-93	1100.00	9.17	18.07
1993-94	1248.65	10.41	19.24
1994-95	1481.18	12.34	21.15
1995-96	2109.06	17.58	27.24
1996-97	2346.49	19.55	27.94
1997-98	2575.87	21.47	27.97
1998-99	3192.91	26.61	32.58
1999-00	4298.71	37.38	39.68
2000-01 (Prov)	4779.42	41.56	44.40

It is observed that cement production by use of captive power has been increasing year after year. In fact, it has more than doubled in the last six years from 21.15 mn.t.in 1994-95 to 44.40 mn.t. in 2000-01.

4.2.4 Future Scenario: By the end of X Plan, cement production is expected to reach 165 mn.t. requiring power of 4200 MW and captive power requirement would be 2670 MW.

4.2.5 Recommendations

- Privatization, which is already in vogue, is proceeding at slow pace. Till grid power is made available in adequate quantity/quality and at an economical/competitive price, use of captive power has to be permitted.
- Still a number of States (Andhra Pradesh, Chhattisgarh, Madhya Pradesh and Rajasthan) are not prepared to give NOC for captive power generation. Even with captive units coming up, States are reluctant to adjust the contract demand. As such restrictions are not in tune with the liberalization policy, cement plants should be encouraged to install captive power generation capacity without any restrictions and also allowed to wheel excess power through the State/National grid for use by other cement units/industries.

4.3 Transportation

4.3.1 The cement industry is location-specific and is dependent upon the availability of limestone – the major raw material, which however, is available only in a few states. Similarly, the main fuel coal is available in a few states only, while markets are distributed through out the length and breadth of the country. This involves long distance transportation of raw materials (coal, gypsum) to plants and the finished product - cement from plants to markets. Rail transport being economical, is the ideal mode of transportation for the cement industry. Hence, the industry depends mainly on the railway system for long lead movements. Any bottleneck or inadequacy in railway transport has, therefore, an adverse impact on cement production and distribution. This issue has assumed great importance in the context of the significant increase both in cement production and consumption in the last decade.

4.3.2 The Task Force on Cement Industry, in its IX Plan Report, *inter alia*, recommended 60% movement of cement production by rail on macro level. However, the railways could not reach this percentage level, rather kept on

declining every year mainly due to high logistics cost as compared to road transport.

4.3.3 Current share of railways as a percentage of the total despatches has come down to 38% as against 57% a decade ago. So far, the drop was in the form of percentage to the total despatches. However, during the year 2000-01, Railways witnessed, for the first time, a drop in the volume of cement transported by rail (from 38.71 mn.t. in 1999-2000 to 36.72 mn.t. 2000-2001). Year-wise cement despatches both by rail and road during the IX Plan (for large plants) are given below.

(mn.t.)

Year	Cement Despatches			Rail Share (%)
	Total	Rail	Road	
1997-98	77	33	44	43%
1998-99	82	33	49	40%
1999-00	94	39	55	41%
2000-01	93	37	56	40%
2001-02(Proj)	100	38	62	38%

The situation regarding cement loading by rail is likely to deteriorate further if corrective steps are not taken on an urgent basis.

4.3.4 Zone-wise analysis indicates that the modal shift has been quite significant on some major railways in the last six years, as shown below :

Zone-wise Cement Movement - Large Plants

(percentage)

Railway Zone	1994-95	2000-01
Central	62	55
Eastern	46	48
Northern	59	13
Southern	26	15
South Central	60	46
South Eastern	67	67
Western	41	28

4.3.5 Realising the continuous downward trend of rail share, the Railway Board formed a Rail Cement Co-ordination Group (RCCG) in 1992-93 to examine various problems and recommend mutually acceptable solutions. On the recommendation of RCCG, Railway Board have come out with some innovative schemes - Own Your Wagon Scheme (OYW), Volume Discount Scheme (VDS), but these schemes need to be made more attractive to increase the share of railways in the transportation of cement.

4.3.6 Future Scenario - X Plan: Cement demand estimates have been made for two scenarios i.e. Low Growth Scenario and High Growth Scenario. Accordingly, rail/road despatches for large plants have also been made under these two scenarios.

4.3.6.1 Low Growth Cement Demand Scenario

i) **Current Performance:** With the continuous declining trends in cement movement by rail and with the coming up of new modern highways/roads and multi-axle trucks, cement movement by rail may further drop to 33% by the terminal year of the X Plan from the present 38%. Considering the above, cement despatches by rail during the X Plan years are shown below:

(mn.t.)

Year	Cement Despatches			Rail Share (%)
	Total	Rail	Road	
2002-03	106.18	39.29	66.89	37%
2003-04	113.9	41.00	72.90	36%
2004-05	121.28	42.45	78.83	35%
2005-06	131.39	44.67	86.72	34%
2006-07	141.29	46.63	94.66	33%

ii) **Improved Performance:** However, there is also a possibility to increase rail share for cement movement up to 50%, provided railways make their policies customer-friendly and gradually reduce the total delivered cost comparable with road transport. The projections of rail movement for the X Plan years for such a situation are given below:

(mn.t.)

Year	Cement Despatches			Rail Share (%)
	Total	Rail	Road	
2002-03	106.18	42.47	63.71	40%
2003-04	113.9	47.84	66.06	42%
2004-05	121.28	53.36	67.92	44%
2005-06	131.39	61.75	69.64	47%
2006-07	141.29	70.65	70.65	50%

4.3.6.2 High Growth Cement Demand Scenario

i) **Current Performance:** Considering the declining trends in cement movement by rail, it is likely to drop to about 33% from the present 38% by the terminal year of the X Plan, the projections of cement movement by rail during the five years of X Plan are given below :

(mn.t.)

Year	Cement Despatches			Rail Share (%)
	Total	Rail	Road	
2002-03	109.17	40.39	68.78	37%
2003-04	120.38	43.34	77.04	36%
2004-05	130.70	45.75	84.96	35%
2005-06	144.47	49.12	95.35	34%
2006-07	158.56	52.32	106.24	33%

ii) **Improved performance:** Considering the possibility to increase the rail share to 50% if railways make their policies customer friendly and gradually compete with the road transport, the projections for the rail despatches are given below:

(mn.t.)

Year	Cement Despatches			Rail Share (%)
	Total	Rail	Road	
2002-03	109.17	43.67	65.50	40%
2003-04	120.38	50.56	69.82	42%
2004-05	130.70	57.51	73.19	44%
2005-06	144.47	67.90	76.57	47%
2006-07	158.56	79.28	79.28	50%

4.3.7 Recommendations

The following measures are required towards improving transportation of cement by rail.

i) Customer Orientation: Railways need to follow a more *Commercial* approach:

- The total delivered cost be comparable with road transport
- Schemes/policies be made more attractive and customer-friendly viz. Volume Discount, Station to Station, Engine on Load, Early Settlement of Claims, etc.
- Share advantages with users in respect of increased efficiency of terminals.
- Remove procedural delays in dealing with customers viz. Volume Discount Scheme (VDS), Station-to-Station (STS) etc.
- Freight concession be given for cement/clinker meant for exports.

ii) Advance Planning: Looking at the tremendous growth potential in cement production, railways should make advance planning in the following areas :

- Creation/development of sidings at major cities
- Development of warehousing facilities
- Closed circuit operation for cement/coal movement
- Development of bulk terminals at suitable locations for cement movement.
- Conduct studies on bulk movement, closed circuit movement, multi-modalism, viz. modal interchange-road, Inland Water Transport (IWT) and coastal shipping.

5.0 Exports

5.1 High input costs: High incidence of input costs and domestic taxes combined with high limestone royalty charges make Indian cement, non-competitive in overseas markets, despite Indian cement quality being comparable to the best in the world.

5.2 Poor export infrastructure:

- Non-availability of modern loading/unloading facilities at ports.
- Lack of proper approach roads to ports.
- General congestion at ports causing undue delay.
- Non-availability of dedicated berths and storage facilities at ports.

5.3 Measures Taken by RBI on September 24, 2001 to Boost Exports: RBI has announced several measures to boost the country's exports; draws special financial package for large value exports of six select categories – cement, iron & steel, pharmaceuticals, agro-chemicals, transport equipment and electrical machinery. Manufacturer cum exporter with export contracts of Rs100 crores and above in value terms in one year would be eligible for the special financial package, which will remain valid up to one year from October 1, 2001. These measures are expected to help boost cement exports.

6.0 Investment Trends

6.1 Considering the two demand scenarios discussed earlier, cement production has to increase to 148.29 mn.t. in case of low growth scenario and 165.56 mn.t. in case of high growth scenario to be in consonance with demand in the year 2006-07, the terminal year of the X Plan. This would translate into a production capacity of 182.32 mn.t. to 202.64 mn.t. The Present capacity is 140.53 mn.t. which comprises of 129.43 mn.t. of large plants and 11.10 mn.t. of mini cement plants. The report on mini cement plants has estimated that the capacity of mini cement plants at the same time would reach to 16.10 mn.t. at the terminal year of the X Plan. Thus, the capacity to be reached by the large plants would be 166.22 mn.t. in case of low growth scenario and 186.54 mn.t. in case of high growth scenario. Hence the capacity addition during the X Plan, by large plants, would be 37 mn.t. in case of low growth scenario and 57 mn.t. in case of high growth scenario.

6.2 Considering that by the end of X Plan, the share of OPC, PPC and PSC will change from the present 63%, 26% and 10% to 50%, 35% and 15%

respectively, the clinker capacity addition by large plants will be 30 mn.t in case of low growth scenario and **45 mn.t. in case of high growth scenario.**

6.3 Following the present trend in large plants wherein almost 65% of capacity has been through expansions, it can be safely presumed that 75% of capacity addition could be through expansion of existing plants i.e. 35 mn.t. clinker in case of high growth scenario. Only 10 mn.t. clinker would be needed through greenfield plants. In order to rationalize investments, the Foreign Direct Investments (FDI) should be permitted only in green-field projects.

6.4 Amount of investment: The above capacity addition would require an investment of the order of **Rs.17,600 crores** for the cement capacity expansion of 62 mn.t. including 5 mn.t. from mini cement plants. This includes investment which has to be made in improving infrastructure areas such as coal washeries, power and railway siding to support the increased production. In addition, around **Rs.1100 crores** would be required to convert existing wet process plants except those based on **Sludges**, to dry process for the same capacity (i.e. 4.5 mn.t.). These investments are expected to be mainly in private sector.

7.0 Concerns of the Cement Industry

7.1 Cement demand growth during the IX Plan period has been highly encouraging, barring the 2000-01, the financial performance of the industry has been not very satisfactory, primarily on account of mismatch between demand and supply.

7.2 As per the studies on forecast of cement demand in IX Plan by NCAER and IIM Ahmedabad, with a GDP of around 6%, the cement demand was estimated to grow around @ 8-9% annually, to reach 109 mn.t. in the terminal year (2001-02). The production was expected to reach 113 mn.t., taking into account 8 mn.t. of exports comprising 50% cement and 50% clinker, expected in that year.

7.3 The cement industry had been marching towards achieving its goal set for the IX Plan till 1999-2000. However, the economic downturn in the country as a fallout of the worldwide economic slowdown during 2000-01, had an adverse impact on the steady progress.

7.4 During the year 2000-01, cement production and despatches (for large plants) declined by about 1% to 93.61 mn.t. and 93.44 mn.t., respectively over the previous year. Cement consumption recorded a negative growth of 2% to touch

90.28 mn.t. Capacity utilisation came down to 82% as against 87% achieved during 1999-2000. Sluggish demand for cement had its impact on cement prices. Consequently, many cement companies incurred losses, some of which have been referred to BIFR.

7.5 Factors Affecting Cement Industry's Competitiveness

- Persistent sluggish demand for the last one year and a half because of non-materialisation of the infrastructure/housing projects and general economic slowdown.
- At the end of March 2001, excess cement capacity was about 24 mn.t, and this is expected to increase. This carries serious macro-economic implications on growth, employment generation, savings and capital formation and revenue accruals to Government.
- High and rising input costs mainly due to exogenous factors.
- Cement, a core and basic product is saddled with high indirect levies/taxes at all levels - Centre/States/Local (around 60% of ex-factory price).

Taxes as % of Cost of Production

Country	Tax Rate
Malaysia	0
China	17
India	60

Source: CMA

- The recent 25% hike in royalty on limestone effected in September 2000, which impose Rs.125 crores additional tax on cement industry; works out to an average of 80% on the pit-head cost of around Rs 50 per tonne as against norm of 10%.
- Roads of sub standard quality and mostly un-surfaced - are not favourable for cost - economic and time-efficient transport of inputs and finished products.
- Procedural delays in obtaining clearances for infrastructure projects as well as limestone mining, land acquisition, environment etc. usually take 2 to 4 years, leading to time and cost over-run.

- High cost of funds.
- Labour market rigidities affecting flexibility in organizations.

8.0 Recommendations

- Growth of cement industry, having a multiplier effect on growth of other sectors, is of prime importance to national economic growth.
- A healthy growth of cement industry in the X Plan would depend largely upon following measures:

8.1 Role of Government

- Excise duty collection through self-declaration.
- Provisions in coal mining act need revisions to attract private investment.
- Urban Land Ceiling Act (ULCRA), which has already been repealed in seven States viz. Rajasthan, Karnataka, Punjab, Haryana, Delhi, Gujarat and Tamil Nadu, should be revoked in the remaining States.
- Coastal Regulation Zone (CRZ) Act to be rationalized so as to permit setting up of terminals to boost cement/clinker exports.
- States to be delegated powers for project site approvals for environmental clearance of integrated plants, jetties and terminals.

8.2 Enhancing Cement Consumption

- There is need to increase the per capita cement consumption from 99 kg. at present to a figure closer to the world average of 263 kg to ensure better standards of living for the masses. There is need to increase cement consumption by suitable measures and incentives covering.

8.2.1 Further Push to Housing Development Programmes: Considering the multiplier effect housing, has on various industrial segments and also on key macro economic parameters like capital formation, savings,

industrial revival, etc., housing needs to be further promoted through special measures, such as :

- Housing loans for self-occupation to be made available at 4-5% interest. (At present, rate of interest is 12-12.75% for loans of Rs.2 - 5 lakhs category).
- Stamp duty charges to be harmonised and lowered across States to 1-3%. Collateralised Mortgaged Obligations (CMOs) to be encouraged for development of secondary market of housing loans. CMOs to be exempted from stamp duty.
- Government to consider pumping into housing sector about \$10 billion per year for the next five years at multilateral bodies' rate of interest stipulated for the social sector loans. Government could tap these funds from multilateral lending agencies like World Bank/ADB/international markets. Government then can make available these funds to Housing Finance Institutions (HFI) at the same rates of interest at which Government has borrowed and the Centre has to only bear the exchange risk cost. HFIs in turn would lend this money to consumers. Exchange risk cost, if any, will get more than compensated by the increased accruals of revenue in later years.
- Promotion of construction of pucca houses in rural areas. Development of rural housing is sensitive to the cost of cement. Government can provide a push to construction of pucca houses in rural areas by reducing or waiving excise duty and sales tax on cement. It is to be noted that the revenue loss to the Government will be notional, apart from the fact that this facility will bring in the future, a permanent stream of revenues through housing sector's linkage effects.
- Land use restrictions in terms of Agricultural and Non-Agricultural land to be abolished and land usage to be freely permitted for purposes of housing.
- At present, Floor Space Index/ Floor Area Ratio (FSI/FAR) in Indian cities is very low. Building bylaws to be amended to allow Higher FSI/FAR in cities on payment of fees to the local authority, which should be ploughed back for infrastructure.
- Property tax system requires complete overhaul to establish market based valuation procedures; to regularise reassessment and to improve collection procedures.
- While the overall reforms in legal framework will take some time, it is essential that the code of conduct as defined by National Real Estate Development Council (NAREDCO) be made applicable at National and State levels.

8.2.2 Concrete Highways/Roads

- India has around 33 lakh km. of road network, less than half of which is paved. Out of this, about 68,000 km. are designated as National Highways which, though, just about 2 per cent of the total length, carry almost 40 per cent of the traffic. Even the National Highway system is in urgent need of attention, since about one-third need major repairs and another one-third have inadequate width. These deficiencies affect the speed and life of vehicles, causing loss of thousands of crores of rupees to the economy every year.
- The Prime Minister, in 1998, has directed that 7,000 km of six lane expressways connecting North-South and East-West to be built with concrete pavements. As there is no significant progress during the last two years, this national project needs to be monitored for timely implementation.
- Concrete roads, in addition to providing an excellent surface (virtually maintenance-free) enjoy lower life cycle cost and entail considerable saving in fuel for automobiles running upon them as compared to bituminous roads. It has been estimated that fuel savings can amount up to Rs 10,000 crores with corresponding reduction in import of fossil fuel if around 12,000 km of National Highways (double lane) are made of concrete. A point not sufficiently appreciated is the environment friendliness of concrete roads vis-à-vis bituminous roads.
- The World Bank has recently recommended for its road projects in India, the construction of concrete roads instead of bituminous roads. A policy decision to have concrete roads should be announced for non-world bank projects also, on the basis of life cycle cost.
- Allow the use of PPC/ PSC in the construction of bridges and other structures by amending the codal practice by MHRT/CPWD, in accordance with IS-456-2000.
- PPC manufactured using flyash should be given reduction in excise duty.

A note on the subject *A case for Concrete Roads* is at *Annexure V*.

8.2.3 Concrete pavement for rural roads: It is a known fact that while about 65% of the country's population lives in villages, most of the villages do not have proper all-weather connectivity roads to the nearest highways. Bituminous roads become unserviceable after 1-2 years due to lack of maintenance.

Prime Minister's recent announcement of Pradhan Mantri Gram Sadak Yojana (PMGSY) to connect all villages with a population of 1000 to the nearest highway in Phase I by 2003 and all villages with a population above 500 in Phase II by 2007, would go a long way in stimulating growth of rural economy.

In view of the special characteristics of rural areas viz. :

- wet soils due to agricultural activities.
 - Water logging due to lack of proper drainage systems
 - Need to bear the load of iron-tyre traffic,
 - Non-availability of maintenance budgets,
-
- Concrete pavements provide the ideal all-weather alternative connectivity under rural conditions. Once laid, concrete roads need no maintenance for at least for 10 -15 years, which conform to the guidelines set for PMGSY - a minimum maintenance free service life for five years.
 - Concrete pavements, in addition to withstanding intense rain, water logging, abrasion by iron tyre vehicles, are environment friendly and have scope for using waste material like flyash.
 - Cost-wise, though the initial cost of concrete pavement is 10% higher than bituminous ones, it turns out to be cheaper by 21% on life-cycle basis. In fact, concrete pavements could be comparable with bituminous ones even at the initial laying, if use of flyash is permitted.
 - The States of Tamil Nadu, Andhra Pradesh and Gujarat have already laid concrete roads, in Panchayats for 5000 km, 2500 km and 1000 km. respectively.

In view of several advantages, Ministry of Rural Development/MHRT may be advised for mandating concrete pavements for village roads and other district roads. The Ministries may finalise design norms and specifications for concrete roads and permit use of flyash in the construction of concrete roads. They may also undertake laying of a few demonstration concrete roads for which the cement industry should offer cement at lower price, provide technical assistance in the design and also organize training of local artisans and supervisors.

8.2.4 Check-dams and Canal Lining: India faces scarcity of water both in cities and in rural areas every year. A large percentage of water is lost due to seepage from irrigation canals, which can be avoided with proper lining of the canals with concrete. Today, more than 30% of water is estimated to be lost through seepage. Concrete check-dams and canal lining have proved to be economically viable. Construction of check-dams and canal lining needs to be promoted in a major way if irrigated area under cultivation and agricultural production is to be increased. Canal lining with cement should be taken as a national project.

8.2.5 Other Construction Activities: Economic upliftment demands development of ports, bridges, building complexes, etc. All these activities would result in increased cement consumption. Government's thrust on these areas needs to intensify, as these activities have a multiplier affect on the economy and promote employment generation.

8.2.6 Ready Mixed Concrete (RMC): RMC is a worldwide modern trend and needs to be promoted in our country too. RMC should be made mandatory for large projects. This move will make construction activity eco-friendly and more expeditious particularly in metropolitan and congested areas. RMC should be exempted from sales tax to boost its growth.

8.2.7 Reduction of Taxes and Levies on Cement: Cement is one of the highest taxed commodities in India. It is subject to Government levies both by Centre and States. Taxes and levies on cement comprise duties on power tariff, sales tax, etc. and royalty / cess on limestone / coal/ gypsum as well as excise duty.

The average tax on cement is as high as Rs 934 per tonne. This constitutes more than 30% of the selling price of cement at Rs 2800 per tonne, excluding local transport and dealer's margin. The average freight incurred for transportation of cement is around Rs 500 per tonne. Total incidence of both taxes and freight

works to around Rs 1,450, which leaves the cement producer with only Rs1350/tonne of cement sold.

Break-up of Levies on Cement

Item	Rs per tonne (Avg.)
States	
Royalty & cess on limestone (Rs 40x1.5)	60.0
Royalty on coal	20.0
Duties on power tariff	22.0
Avg. sales tax	438.0
Sales tax on stores & spares/raw material/packaging material	20.0
Octroi	20.0
Revenues to States	580.0
Centre	
Excise Duty on Stores & Spares etc.	4.0
Excise Duty on Cement	350.0
Revenues to Centre	354.0
Total (Revenues to Centre & State)	934.0

Such a high incidence of taxes/levies on cement makes cement costly to the consumer. A gradual reduction in levies/taxation during the X Plan period will help reduce cost of road construction, private housing, etc, and also increase the demand for cement.

8.2.8 Encouraging Cement/Clinker Exports: Cement has been identified as an extreme focus industry. Indian Cement has potential to tap cement/clinker markets in the countries in Indian sub-continent, Middle East and South East Asian countries in view of its strengths viz. locational advantages, large limestone deposits, adequate cement capacity and world class cement production with latest technology.

Recommendations for boosting cement exports:

- Duty-free imports of coal, against the exported quantity of cement/clinker be increased from the present limit of 20%.
- Full compensation for levies at State level, aggregating to Rs139/tonne consisting of royalties on coal, limestone and gypsum, tax on power tariff and sales tax on consumables and spares used in cement production.
- To promote export of cement/clinker, the railways to consider a mechanism for giving concession in freight on the quantity of cement/clinker to be exported.

8.2.9 Environmental Issues Facing Cement Industry: Cement industry has come out from the state of environmental non-compliance in the 70's and the 80's towards environmental compliance in the 90's. In the 21st century cement industry has become highly environment conscious through use of fly-ash/slag and observing ISO 14001 norms.

Greater use of flyash would help in increasing cement production capacity and reduce the need for new capacity addition. Further, flyash addition improves the durability of concrete, in addition to economy in construction.

8.3 Role of Cement Industry in Supply of Cement

- The industry will have to evolve a mechanism for production and supply of cement to the market on the basis of its demand.
 - The industry will ensure that the growth in demand for cement is not discouraged through steep escalation in the price of cement.
 - Setting up of a mechanism for controlling wide fluctuations in the production and supply of cement in the market to be worked out.
 - Appropriate competition policy is essential for efficient and orderly growth of the industry.
-

Regionwise/Statewise Cement Demand Estimates

Low Growth Scenario

(Mn.t.)					
Region/State	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Northern Region					
Uttanchal	0.34	0.36	0.39	0.42	0.45
Harayana	3.23	3.46	3.74	4.04	4.36
Punjab	4.64	4.96	5.36	5.79	6.25
Rajasthan	6.03	6.45	6.97	7.53	8.13
Himachal Pradesh	1.26	1.35	1.46	1.58	1.71
Chandigarh	0.40	0.43	0.47	0.51	0.55
Delhi	3.02	3.23	3.49	3.77	4.07
Jammu & Kashmir	0.82	0.88	0.95	1.02	1.10
Total North	19.74	21.12	22.83	24.66	26.62
Eastern Region					
Assam	1.09	1.17	1.26	1.36	1.47
Other N.E. States	0.59	0.63	0.68	0.73	0.79
Bihar	3.97	4.25	4.59	4.96	5.36
Jharkhand	0.80	0.86	0.93	1.00	1.08
Orissa	3.16	3.38	3.65	3.94	4.26
West Bengal	5.38	5.76	6.22	6.72	7.26
Chattisgarh	0.73	0.78	0.84	0.91	0.98
Total East	15.72	16.83	18.17	19.62	21.20
Southern Region					
Andhra Pradesh	8.35	8.93	9.65	10.42	11.25
Tamilnadu	9.49	10.16	10.97	11.85	12.80
Karnataka	5.77	6.17	6.66	7.19	7.77
Kerala	5.29	5.66	6.11	6.60	7.13
Pondicherry	0.12	0.13	0.14	0.15	0.16
Andaman & Nicobar	0.09	0.10	0.11	0.12	0.13
Goa	0.33	0.35	0.38	0.41	0.44
Total, South	29.44	31.50	34.02	36.74	39.68
Western Region					
Gujarat	7.76	8.30	8.96	9.68	10.45
Maharashtra	15.01	16.06	17.34	18.73	20.23
Total West	22.77	24.36	26.30	28.41	30.68
Central Region					
Uttar Pradesh	12.91	13.81	14.91	16.10	17.39
Madhya Pradesh	6.10	6.53	7.05	7.61	8.22
Total Centre	19.01	20.34	21.96	23.71	25.61
All India	106.68	114.15	123.28	133.14	143.79

Regionwise/Statewise Cement Demand Estimates

High Growth Scenario

Region/State	(Mn.t.)				
	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Northern Region					
Uttaranchal	0.35	0.38	0.42	0.46	0.51
Haryana	3.32	3.65	4.02	4.42	4.86
Punjab	4.77	5.25	5.78	6.36	7.00
Rajasthan	6.20	6.82	7.50	8.25	9.07
Himachal Pradesh	1.30	1.43	1.57	1.73	1.90
Chandigarh	0.41	0.45	0.50	0.55	0.60
Delhi	3.10	3.41	3.75	4.12	4.53
Jammu & Kashmir	0.84	0.92	1.01	1.11	1.22
Total North	20.29	22.31	24.55	27.00	29.69
Eastern Region					
Assam	1.12	1.23	1.35	1.49	1.64
Other N.E. States	0.61	0.67	0.74	0.81	0.89
Bihar	4.08	4.49	4.94	5.43	5.97
Jharkhand	0.83	0.91	1.00	1.10	1.21
Orissa	3.25	3.58	3.94	4.33	4.76
West Bengal	5.53	6.08	6.69	7.36	8.10
Chattisgarh	0.75	0.83	0.91	1.00	1.10
Total East	16.17	17.79	19.57	21.52	23.67
Southern Region					
Andhra Pradesh	8.58	9.44	10.38	11.42	12.56
Tamilnadu	9.76	10.74	11.81	12.99	14.29
Karnataka	5.93	6.52	7.17	7.89	8.68
Kerala	5.43	5.97	6.57	7.23	7.95
Pondicherry	0.12	0.13	0.14	0.15	0.17
Andaman & Nicobar	0.09	0.10	0.11	0.12	0.13
Goa	0.34	0.37	0.41	0.45	0.50
Total South	30.25	33.27	36.59	40.25	44.28
Western Region					
Gujarat	7.98	8.78	9.66	10.63	11.69
Maharashtra	15.43	16.97	18.67	20.54	22.59
Total West	23.41	25.75	28.33	31.17	34.28
Central Region					
Uttar Pradesh	13.28	14.61	16.07	17.68	19.45
Madhya Pradesh	6.27	6.90	7.59	8.35	9.19
Total Centre	19.55	21.51	23.66	26.03	28.64
All India	109.67	120.63	132.70	145.97	160.56

Constraints Pertaining to Setting up of Captive Power Plants (CPP) – Statewise Summary

Sl. No.	State Item	Gujarat	Himachal Pradesh	Orissa	Punjab	Maharashtra	Karnata
1.	Any restrictions on setting up of CPP by the industry	The consent of State Electricity Board is essential for installation of CPP	CPP is allowed only as stand-by unit i.e. to be used only to make-up for shortfall of grid power.	The application for CPP has to be routed through private licensees who have distribution licence to Orissa Regulatory Commission. In most of the cases, these private licensees do not recommend for installation of CPP	PSEB is not permitting CPP for normal use. The CPP is restricted for use during peak load and power failure only.	Presently, there is total restriction from MSEB for setting up new CPP in the State.	There is no restriction for setting up CPP in Karnataka State. CPP of capacities 1000 KVA and above, are allowed to synchronise with grid through Karnataka Power Transmission Corpn.Ltd.
2.	Any compulsory payments by way of s/c or duties on the installed capacity or generated power	Electricity Duty @ Rs.0.40 per unit generated on monthly basis	No compulsory payments	Electricity duty @ 12 paise per unit on power generated by CPP	Advance consumption deposit based on the capacity of the DG set @ Rs. 750 per kw is required to be deposited.	The existing CPP's are covered by a clause for duty charges.	At present, Elec. Tax is abolished to encourage captive generation. However, we have to pay: i) Elec. Tax @ 5 paise per unit for the energy consumed by auxiliary drives required for running CPP. ii) If energy is sold to other consumers by us then Elec.Tax @ 5 paise per unit is payable on the qty. of energy wheeled through grid.
3.	Any compulsion to buy a specific qty. of Grid power if respective of the availability and/or penalties for not doing	No compulsion to draw the minimum grid power.	No compulsion to buy specific quantity of power.	No compulsion to buy a specific quantity of grid power.	Minimum monthly charge per KW is payable at the prevailing rates on connected load basis	Minimum fixed charges are payable against agreed demand.	No compulsion to buy a specific qty. of grid power or penalties for not buying.

Sl. No.	State	Gujarat	Himachal Pradesh	Orissa	Punjab	Maharashtra	Karnataka*
4	Normal time taken by SEB to clear proposals for CPP	It took almost a year to grant consent for installation of CPP.	6-9 months	Around 3 months.	18-24 months	---	Normal time for clearance varies : - Small plants upto 1000 KVA : 2/3 months - Medium plants upto 5000 KVA : 4/6 months. - Bigger plants above 5000 KVA : 6/8 months
5	How such restrictions affect the cost of production	Cost of grid power is almost twice the cost of captive generation. The impact works out to almost Rs 250 per tonne of cement		The impact of Electricity duty on captive generation @ 12 paise per kwh works out to about Rs. 10/- per tonne of cement		Cost of captive power is less by about 25-30% than MSEB power.	i) Cause delay in installation of CPP ii) Cause loss of prodn. due to poor quality of grid power. iii) Cost escalation of CPP projects due to delay in clearing the proposal by SEB.

Constraints Pertaining to Setting up of Captive Power Plants (CPP) – Statewise Summary

Sl. No.	State Item	Madhya Pradesh	Rajasthan	Andhra	Tamil Nadu
1.	Any restrictions on setting up of CPP by the industry	Permission is being granted with a validity period of 10 years only	No restrictions but permission is required	i. Generally, CPP above 10 KVA capacity is not permitted ii. Captive power generation is permitted only as "stand by units" iii. Parallel operation with the Grid is not provided	There is no restriction for setting up CPP. However, when CPP is away from user's premises, sale of power to third parties is not allowed. There is wheeling charge of 17% when the generated energy is to be used at customers' premises using TNEB grid system.
2.	Any compulsory payments by way of s/c or duties on the installed capacity or generated power	Captive power attracts Electricity duty @ 10.5% + Energy Dev. Cess @ 20 paise per kwh. The total impact works out to Rs.0.52/- per kwh	i. No duty on generated power for captive use ii. Generated power not used for captive purpose attract duty @ Rs.0.25 per kwh. iii. System stand by charges @ Rs.4.50 lakh per MVA per annum, to be paid if contracted demand is reduced to below 50%, due to installation of CPP.	For grid support for the excess capacity of CPP over 1.5 times the contracted Max. Demand, a charge @ Rs.170/- per KVA has been fixed	Consumption tax @ 15 % of the power tariff is levied if captive power is generated using furnace oil (This tax is exempted if power is generated using diesel and LSHS as fuel).
8.	Any compulsion to buy a specific qty. of Grid power irrespective of the availability and/or penalties for not doing	It is mandatory to draw at least 50% of monthly requirement from Grid.	There is restriction to purchase the minimum grid power equivalent to @ Rs.520 per KVA per month of billing demand or 75% of Contract Demand, whichever is higher.	Consumer has to utilise a minimum of 80% of the contracted demand.	No compulsion
3.	Normal time taken by SEB to clear proposals for CPP	No time frame specified. In case of delay, a working committee disposes of in 4 weeks.	Around 4 months.	No specific time limit is prescribed for grant of permission. The time taken for clearing new proposals is about 3 to 6 months	TNEB normally takes 2-3 months for giving NOC and after installation of CPP again takes 2-3 months to give permission to generate the power from CPP.
4.	How such restrictions affect the cost of production	Captive power is cheaper by Rs.1.50 per kwh or Rs.90/- per tonne of cement	The cost of captive power is less by Rs.2/- per unit compared to the cost of grid power. However, due to Minimum Consumption Clause, we are not able to use CPP fully.	The cost of captive generation is only about 60% of the cost of grid power.	Since generation of captive power is cheaper than TNEB tariff, the above restrictions enhance the cost of production by about Rs.48/- per tonne of cement

Annexure IV

CAPTIVE POWER GENERATING CAPACITY - COMPANYWISE

		As on 31 st March 2001	
Sl. No.	Company/Unit	Installed Capacity(MW)	
		D.G.	Thermal
A.C.C. Ltd.			
1	Chaibasa	0.14	9.50
2	Chanda	-	-
3	Jamul	9.60	25.00
4	Kymore	3.20	48.25
5	Lakheri	5.50	-
6	Madukkarai	7.35	-
7	Tikaria (G)	-	-
8	Mancherial	6.40	-
9	Sindri	2.50	-
10	Wadi	3.20	-
11	Gagal	12.80	-
12	Damodhar Cmt & Slag (G)	0.56	-
Total of ACC Ltd.		51.25	82.75
Andhra Cements			
13	Vijayawada (G)	-	-
14	Vizag (G)	-	-
15	Durga Cement Works	12.60	-
Total - Andhra Cements		12.60	-
Birla Corporation Ltd.			
16	Birla Vikas	10.00	12.00
17	Satna Cement	6.00	7.50
18	Birla Cement	10.00	14.50
19	Chittor Cement	-	-
20	Durgapur (G)	0.69	-
21	Birla Cmt - Raebareli (G)	-	-
Total - Birla Corporation Ltd.		26.69	34.00
C.C.I. Ltd.			
22	Adilabad	7.20	-
23	Akaltara	0.80	-
24	Bokajan	2.40	-
25	Charkhi Dadri	1.60	-
26	Kurkunta	3.20	-
27	Mandhar	0.80	-
28	Neemuch	6.40	-
29	Rajban	1.60	-
30	Tandur	13.40	-
31	Delhi (G)	-	-
Total - C.C.I. Ltd.		37.40	-

As on 31st March 2001

As on 31st March 2001

Sl. No.	Company/Unit	Installed Capacity(MW)	
		D.G.	Thermal
Century Textiles			
32	Century Cement	10.30	15.70
33	Maihar Cement	10.30	19.70
34	Manikgarh Cement	0.32	10.00
Total of Century Textile		20.92	45.40
Grasim Industries			
35	Rajashree - Malkhed	23.60	38.20
36	Rajashree - Hotgi (G)	-	-
37	Vikram Cement	46.60	-
38	Grasim Cement - Raipur	18.00	-
39	Aditya Cement	18.00	-
40	Sikka	4.00	-
	Sikka New	18.00	-
41	Grasim South	18.75	-
Total - Grasim Industries		146.95	38.20
Guj. Ambuja Cements Ltd.			
42	Ambuja Cement	58.90	-
43	Gajambuja Cement	-	-
44	Gujarat Ambuja- H.P.	24.00	-
45	Gujarat Ambuja - Ropar (G)	-	-
46	Ambuja Cmt Eastern	18.00	-
47	Ambuja Cement Rajasthan	6.00	15.00
Total - Guj. Ambuja Cements Ltd.		106.90	15.00
HMP Cements Ltd.			
48	Porbandar	-	-
49	Shahabad	-	10.50
Total - H.M.P. Cements		-	10.50
India Cements			
50	Yerraguntla	3.20	-
51	Sankarnagar	20.80	-
52	Sankaridurg	3.28	-
53	Chilamkur Works	18.10	-
54	Dalavoi	12.00	-
55	Visaka Cement	-	-
56	Raasi Cement	30.44	-
57	Sri Vishnu Cement	15.72	-
Total - India Cements		103.54	-



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As on 31st March 2001

Sl. No.	Company/Unit	Installed Capacity(MW)	
		D.G.	Thermal
J.K. Group			
58	J.K. - Nimbahera	18.50	23.00
59	J.K. - Mangrol (G)	-	-
60	Lakshmi Cement	23.50	-
61	J.K. Udaipur Udyog	13.00	-
Total - J.K. Group		55.00	23.00
Jaypee Group			
62	Jaypee Rewa	41.40	-
63	Jaypee Bela	18.00	-
Total - Jaypee Group		59.40	
Kesoram Industries			
64	Kesoram Cement	8.00	15.00
65	Vasavadatta Cement	18.30	15.70
Total - Kesoram Industries		26.30	30.70
L & T Cement			
66	L & T - ACW	4.00	46.00
67	L & T - JCW (G)	6.00	-
68	L & T - HCW	30.00	-
69	L & T - Gujarat	12.00	54.00
70	L & T - A.P.	22.00	-
71	Jafrabad	10.00	-
71	Magdalla (G)	-	-
73	Ratnagiri (G)	0.10	-
Total - L & T Group		84.10	100.00
Lafarge India Ltd.			
74	Lafarge - Sonadih	16.00	-
75	Lafarge - Bihar (G)	-	-
76	Lafarge-Arasmeta	27.00	-
Total - Lafarge India Ltd.		43.00	-
Madras Cements			
77	Ramasamyraja Nagar	12.00	-
78	Jayantipuram	21.09	-
79	Alathiyur Works	12.00	-
Total - Madras Cements		45.09	-

As on 31st March 2001

		As on 31 March 2001	
Sl. No.	Company/Unit	Installed Capacity(MW)	
		D.G.	Thermal
Mangalam Cement			
80	Mangalam Cement	11.70	-
81	Neer Shree Cement		-
Total - Mangalam Cement		11.70	-
Mehta Group			
82	Saurashtra Cement	11.70	-
83	Gujarat Sidhee Cmt	0.20	-
Total - Mehta Group		11.90	-
Mysore Cement			
84	Mysore Cement	23.10	-
85	Diamond Cement	16.50	29.20
86	Diamond Cement-Jhansi (G)		-
Total - Mysore Cement		39.60	29.20
Tamil Nadu Cement			
87	Alangulam	4.00	-
88	Ariyalur	6.00	-
Total - Tamil Nadu Cements		10.00	-
U.P. State Cement			
89	Churk	-	-
90	Dalla	-	-
	KCC		Clinkerisation Unit
91	Chunar (G)	-	-
Total - U.P. State Cement Corpn.		-	-
Others			
92	Orient Cement	22.90	-
93	Zuari Cement Ltd.	29.20	-
94	Shree & Raj Cement	25.10	2.50
95	Prism Cement	30.00	
96	Binani Cement	-	25.60
97	Lemos Cement	0.20	4.00
98	Kistna	-	4.00
99	Kanoria Industries.	8.00	-
100	Chettinad Cement	12.24	-
101	Dalmia Cement	12.80	-
102	OCL India Ltd.	20.90	-
103	Idcol Cement	-	-
104	J & K Cement Ltd.	-	-
105	Kalyanpur Cement	2.40	-

As on 31st March 2001

Sl. No.	Company/Unit	Installed Capacity(MW)	
		D.G.	Thermal
106	K C.P. Ltd.	9.90	-
107	Malabar Cements	2.50	-
108	Mawmluh Cherra	-	-
109	Panyam Cements	12.35	-
110	Sone Valley	-	12.50
111	Priyadarshini	13.00	-
112	Shriram Cement	-	-
113	Indo Rama Cement(G)	-	-
Total - Others		201.49	48.60
Grand Total		1093.83	457.35

WIND FARMS

Company/Unit	Installed Capacity (MW)	Location where wind farms have been installed
Madras Cements Ltd (Tamil Nadu)	36.50	Poolavadi, Coimbatore
Chettinad Cement (Tamil Nadu)	17.35	Poolavadi, Coimbatore
Dalmia Cement (Tamil Nadu)	16.50	Muppandal, Kanyakumari
The India Cements Ltd (Tamil Nadu)	9.90	Palladam, Coimbatore
Total	80.25	

Based on information available with CMA

A Case for Concrete Roads

1. Concrete Roads - a need

Roads are accelerators of economic growth and a world class road network can provide boost to our economy, industry and tourism.

India has around 33 lakh kms. of road network, less than half of which is paved. Out of this, about 68,000 kms. are designated as National Highways which, though just about 2 per cent of the total length, carry almost 40 per cent of the traffic. The National Highway system is in urgent need of attention, since about one-third need major repairs and another one-third have inadequate width. These deficiencies affect the speed and life of vehicles causing loss of thousands of crores of rupees to the economy every year.

The Prime Minister's 1999 policy statement on National Highway Development Project is the right answer to our National need. It envisaged expansion of 4 lane Golden Quadrilateral of 6000 km. and construction of 4-lane North-South & East-West corridor of 7000 km.

This policy statement contemplated extensive use of concrete in road construction because, concrete roads offer various fallout advantages:

- Cheaper in the long run (lower life cycle cost)
- Environment friendly, as bitumen causes pollution
- It provides an annual savings in fuel, estimated at Rs.200 crores per 1000 km.

There are many reasons for opting concrete roads for sustainable development as illustrated below :

Characteristics	Concrete Road	Bitumen Road
Initial Cost	More or less same	
	Some times 10% higher or lower	
Service Life	40 years	10-15 years
Annual Maintenance per km	5,000/- to 10,000/- per year	Very high -Rs. 1 lakh per year
Vehicle Optg. Cost	LOWER due to long lasting smoothness	HIGHER since road needs frequent resurfacing
Life cycle cost	Lower	Higher
Raw Material	Local	Obtained from Imported crude
Requirement of Bitumen will skyrocket with rapid growth of road network. Scarcity of bitumen may increase in future		
Environmental Friendliness	High	Low
• Fossil fuel	Saved	
• GHG gas emissions	Reduced	No effect
• Fly Ash Disposal	Can be used	No
These aspects also dictate a careful combination of choices with preference for Concrete Road		

Major economic advantages of concrete road generally not factored lie in fuel saving. Study conducted by Portland Cement Association (PCA), USA and Central Road Research Institute (CRRI), India indicated that savings in fuel for 15 tonne trucks (India) will be around 14% (study by CRRI) whereas for 20 tonne trucks (USA), it is 19% (Federal Highway Administration).

For 10,000 km. of concrete roads (10,000 trucks per day), the annual savings in fuel will be about Rs. 2,000 crore. This will undoubtedly reduce fuel consumption and would thereby save precious Foreign Exchange outgo.

Concrete roads also ensure lower GHG emissions and are therefore more environmental friendly.

2. Relative Economics of Concrete Roads

Although generally initial capital cost is slightly higher for concrete roads than bitumen ones, following advantages offset the initial cost on life cycle basis.

- Savings in annual maintenance cost, which is almost nil in case of concrete roads
- Savings in periodic laying cost – not applicable for concrete roads.
- Saving in fuel consumption and vehicle operating costs including vehicle maintenance costs.
- Total cost of concrete roads cheaper by 10-20% on life cycle basis.
- Concrete roads conserve road construction materials in the sense that concrete pavements require less thickness than flexible pavements designs for the similar load and soil conditions.
- Under deteriorating soil conditions, the required thickness of the flexible pavement increases considerably. For a very poor soil, the thickness may even touch 1000 mm. The thickness of the concrete pavement, on the other hand, is only marginally affected by soil conditions.
- Marginal cost differences observed between concrete and bitumen pavements will become negligible if bitumen road requires soil stabilisation or polymer modified bitumen is required to be used or asphalt treated drainage layer is required.
- On the contrary, with advancement of technology and construction practices for concrete roads, the initial cost of concrete roads will keep coming down in future

The Projected Bitumen Demand Supply position in forthcoming years gives a grim picture as indicated in the table.

'000 tonnes

Fiscal	Demand	Domestic Supply	Surplus/ (Deficit)
2001	2675	2773	98
2003	3005	2840	(165)
2005	3375	3109	(266)
2007	3795	3109	(686)

Source : J.S. Oberoi (Ex-Member of the OCC) Report of the Bitumen Supply & Demand Balance.

Construction cost of bitumen roads is highly sensitive to Bitumen Price & Quality

- Bitumen prices have risen 300% in the last decade whereas cement prices increased by 90% only
- A further increase in current bitumen price will make cost of concrete and bitumen roads nearly the same
- No commitment from refineries to quality of bitumen; no test certificates available; quality of bitumen alleged to be the cause of poor road sometimes

What we lose by continuing Bitumen roads can be summarised as:

For 13,000 km of Expressways

- Higher maintenance cost Rs. 6,500 per km.
(Avg per year)
- Fuel saving per year Rs. 5,200 per km.
- Higher vehicle maintenance

Cost of Concrete Roads can be reduced substantially if flyash is used

- Use of flyash upto 30% can further reduce cost of concrete road by 4 - 6%
- Use of flyash in concrete roads increases durability and performance and thereby decrease its life cycle cost.

3. Technological Advantages of concrete roads

Choice of Concrete Pavement for NHDP:

- Concrete pavement has been chosen for World Bank funded segments of Golden Quadrilateral on life cycle cost basis
- Present hesitation for our own funded segments due to higher initial cost - self defeating because in the long run, more length of concrete roads can be built with the same amount of money
- Roads are invariably not maintained properly due to paucity of funds
- Overloading of single-axle trucks and high ambient temperatures prevailing in most parts of the country make bitumen roads unsuitable.
- Project completion time can be significantly reduced by use of RMC leading to lower capital cost

Concrete Road : The only Choice for NHDP

Even on initial cost basis, concrete pavement should be the preferred choice for NHDP where:

- Sub-grade is poor
- Heavy rainfall is received
- Traffic density is high
- Cost of aggregates is very high
- Cement available in close proximity
- Easy availability of flyash and slag

World Bank has chosen Concrete for NH-2; the details are as follows:

Total length involved	477.35 km
Concreting of new 2 lanes	398.60 km
White topping existing 2 lanes	100.85 km
Under consideration additional white-topping	145.00 km
Recent experience of NHAI indicates that through international competitive bidding, concrete pavements cost worked out comparable to bitumen roads	

USA's Experience in Concrete Roads

- First Federal - Aid Highway Act passed in 1916 directing the federal governments to cooperate 50:50 with the states in road building
- During 1920's and 1930's \$ 2 billion for federal - aid road construction was authorised
- "Federal - Aid Highway Act of 1956" called for 41,000 miles of Interstate roadways at an estimated cost \$ 41 billion
- When the 41,000 mile roadways system was complete about 60% of it was in concrete

To sum up, concrete roads will provide the following advantages:

- Long service life - maintenance-free
- Pollution-free construction - Eco-friendly
- Economical in the long run
- Superior performance - good riding quality
- Fuel Savings
- Easy to Maintain
- Ability to take heavy loads
- Water resistance
- Better reflectivity in night
- Resistant to effect of oil spillage
- No need to import bitumen
- Reduction in maintenance cost of commercial vehicles
- Reduction in vehicular maintenance combined with fuel saving has multiplier effect on economy as a whole.

The following conclusions emerge from the aforestated :

- Assessment of the viability of concrete roads vis-à-vis bituminous roads to be done on life cycle cost basis as is the practice abroad.
- Indian economy is now going through second-generation reforms wherein cost effectiveness is the key parameter. A beginning is therefore required to be made for laying concrete roads even for non-World Bank aided projects.
- Concrete roads to be encouraged for more than two lanes both at National and State Highway levels.
- The matter should be taken up with concerned departments to opt for concrete roads if found favourable on life cycle cost basis.

- Progress in building concrete pavements has slowed down due to higher initial costs. Concrete construction can get a boost if the excise duty burden on cement used in these roads is reduced.
- More funds to be allocated for concrete roads both at Centre and States.

4. Case Studies

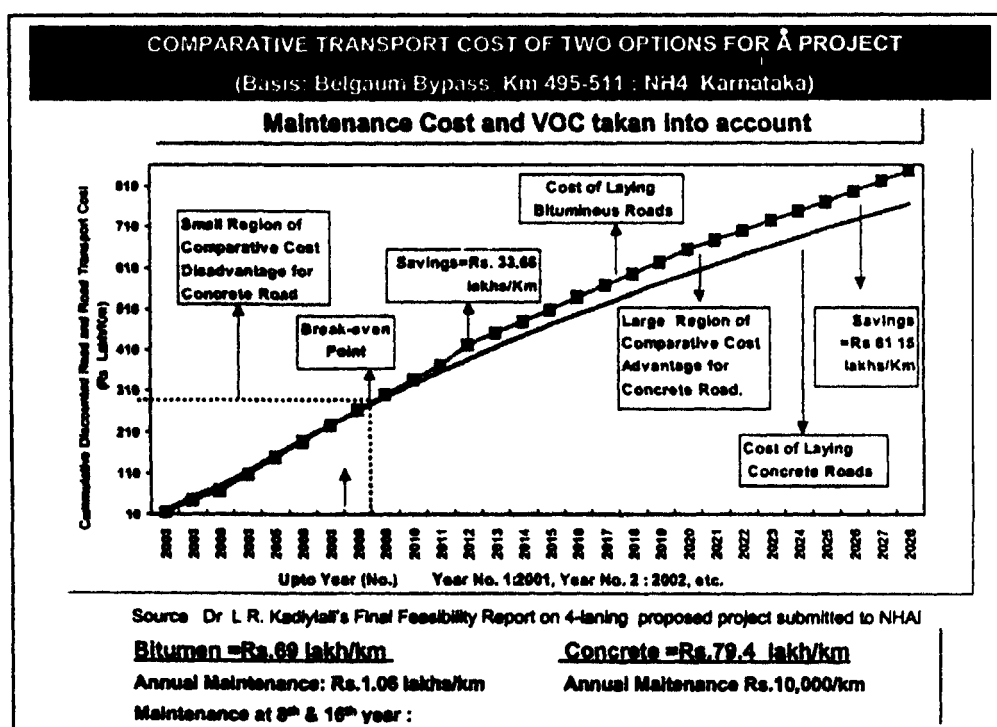
A few case studies of cost-benefit analysis between bitumen and concrete roads are given below :

4.1. Belgaum By-Pass case study

Characteristics	Concrete Roads	Bitumen Road
Initial Cost ^a	Rs. 79.4 lakh/km Higher by 15%	Rs. 69 lakh/km
Service Life	40 years	10 – 15 years
Annual Maintenance [*]	Low – Rs. 10,000/year	Very High Rs. 1 lakh/year [#]
Vehicle Optg. Cost	LOWER due to Long Lasting smoothness	HIGHER since road needs frequent resurfacing
Life cycle cost ^{**}	Lower – by 14 %	Higher

^a Source : Belgaum by-pass report submitted to NHAI
^{*} Figures for 2-lane National Highway pavement ^{**}Discount rate 12%
[#] Including routine repairs and resurfacing which needs to be done once in 6 to 8 years

i)



ii) Inferences on Economics Of Concrete Pavement For Belgaum By-Pass

- Higher initial capital cost of concrete pavement is offset by saving in maintenance and Vehicle Operating Cost (VOC)
- With both - Break Even in 7 years
- With maintenance saving only - Break Even 11 years

4.2 Golden Quadrilateral - relative economics

Concrete Pavement				Difference in average cost of concrete segments over bitumen segments 10.6%
	Length (Km.)	Value (Rs. Cr.)	Value/Km. (Rs. Cr.)	
Contracts awarded	710.01	2848.97	4.01	
Contracts to be awarded	535.33	2089.20	3.90	
Total	1245.34	4938.17	3.97	
Bitumen Pavement				
	Length (Km.)	Value (Rs. Cr.)	Value/Km. (Rs. Cr.)	
Contracts awarded	2161.83	7289.68	3.37	
Contracts to be awarded	819.84	3419.50	4.17	
Total	2981.67	10709.18	3.59	

4.3 NH2: Delhi-Kolkata - relative economics

Concrete Pavement				No Difference in cost of concrete and bitumen pavement
	Length (Km.)	Value (Rs. Cr.)	Value/Km. (Rs. Cr.)	
Contracts awarded	417.75	1816.30	4.35	
Contracts to be awarded	131.33	498.20	3.79	
Total	549.08	2314.51	4.21	
Bitumen Pavement				
	Length (Km.)	Value (Rs. Cr.)	Value/Km (Rs. Cr.)	
Contracts awarded	74.00	315.98	4.27	
Contracts to be awarded	350.74	1518.00	4.33	
Total	424.74	1833.98	4.32	

Relative Economics show :

Marginal cost differences observed between concrete and bitumen pavement will become negligible if bitumen road requires soil stabilisation or polymer modified bitumen is required to be used or asphalt treated drainage layer is required.

5. Use of Blended Cement

In 1970, due to strict price and distribution controls, cement production became uneconomic and output stagnated. As a result there was a grave shortage of cement. To satisfy the demand, several producers started manufacturing PPC, blending in different pozzolanas, some suitable, some not so suitable. As a result, several cases of unsatisfactory performance by PPC were reported. Consequently, the CPWD imposed a ban on use of blended cement for bridges. Now a days, blended cements are manufactured under strict quality control and meet international standards. Hence the ban on their use should be lifted.

TECHNOLOGY, ENERGY CONSERVATION, BENCHMARKING, R&D NEEDS AND MANPOWER

SUB-GROUP – II



Limestone Stacker Reclaimer, Cooler, ESP & Chimney

II. TECHNOLOGY, ENERGY CONSERVATION, BENCHMARKING, R&D NEEDS AND MANPOWER

1.0 Introduction

1.1 Modernisation and technology up-gradation is a continuous process for any growing industry and is equally true for the cement industry. The Indian cement industry, today is by and large comparable to the best in the world in respect of quality standards, fuel & power consumption, environmental norms, use of latest technology and capacity utilisation.

1.2 Cement industry being energy intensive, the energy conservation has assumed greater importance for reducing cost. The major challenges confronting the industry today are constraints like high ash content and variations in quality of indigenous coal, inconsistent power supply with unpredicted power cuts, etc. Keeping these challenges in view, the efforts by the industry towards energy conservation must continue.

1.3 The role of R&D in the growth of cement industry cannot be overlooked. However, data reveal that the expenditure on R&D activities related to cement in India is much below compared to some of the developed countries. This gap needs to be bridged by strengthening R&D base particularly on design of state-of-art energy efficient and environment friendly plant machinery and equipment.

1.4 Human resources base and skill development of workers to cope up with the changing technologies need continuous upgradation at all levels. To fulfill this objective, organizations like NCB at national level and RTCs at regional levels are conducting training courses regularly.

2.0 Review of Technological Status

2.1 Cement Capacity and Production

2.1.1 During the year 2000-01 of IX plan, the total installed capacity and cement production from large cement plants was 119.30 and 93.61 mn.t. respectively. The industry (large plants) witnessed a capacity utilization of 78.5% during 2000-01, as compared to 73.3% in the year 1995-96. The capacity utilization in the current year (2001-02) is expected to go upto 88%. The capacity of large cement plants as on September 2001 is estimated to be 129.5 mn.t. with expected production of 99 mn.t. during 2001-02 at 6% growth rate.

2.1.2 At 10% growth rate, the total cement production from large plants by the end of X Plan (2006-07) is likely to be 158.5 mn.t. as shown in the Table. Considering a capacity utilization of 85%, the total cement capacity is projected at 186.5 mn.t. i.e. an increase of around 57 mn.t.

Item	1995-96	2000-01	2001-02*	2006-07*
Major Plants (No.)	112	118	120	124
Capacity (mn.t)	88.00	119.30	129	186.5
Production (mn.t)	64.50	93.61	99	158.5

* Estimated

* Projected

2.1.3 With 50% OPC, 35% PPC and balance 15% PSC as projected during Xth Five Year Plan, the additional capacity (clinker basis) by the end of Xth plan would be to the tune of 45 mn.t. Green field plants are expected to come up with additional capacity of 10 mn.t. by 2006-07. Hence, the additional capacity by way of modernization /expansion in existing dry process plants by 2006-07 would be 35 mn.t.

2.2 Process Profile

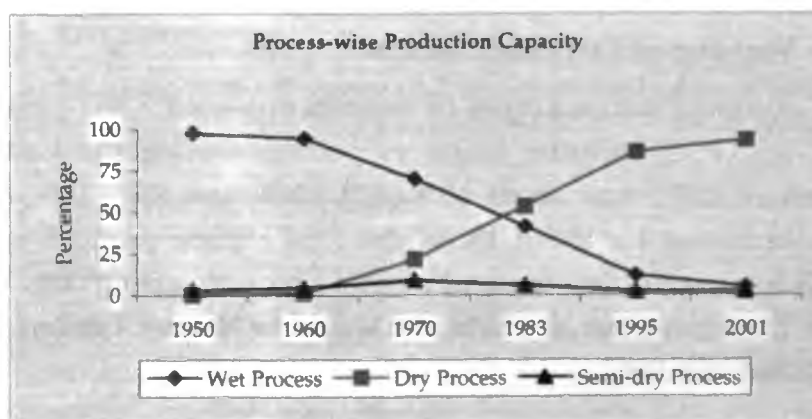
2.2.1 The Cement Industry today comprises mostly of Dry Suspension Preheater and Dry-Precalciner plants and a few old wet process and semi-dry process plants. Till late 70's the Cement Industry had a major share of production through the inefficient wet process technology. The scenario changed to more efficient large size dry process technology since early eighties. In the year 1950, there were, only 33 kilns out of which 32 were based on wet process and only one based on semi-dry process. Today, there are 157 kilns in operation out of which 117 are based on dry process, 32 on wet process and 8 on semi-dry process.



Changing Process Profile of Indian Cement Industry

Item	1950	1960	1970	1983	1995	2001
<u>Wet Process</u>						
Number of Kilns	32	70	93	95	61	32
Capacity (TPD)	9151	25011	38441	39641	25746	13910
% of Total	97.3	94.4	69.5	41.1	12	5
<u>Dry Process</u>						
Number of Kilns		1	18	50	97	117
Capacity (TPD)		300	11865	51265	188435	282486
% of Total		1.1	21.5	53.2	86	93
<u>Semi-Dry Process</u>						
Number of Kilns	1	3	8	9	8	8
Capacity (TPD)	250	1200	5000	5500	5244	5260
% of Total	2.7	4.5	9	5.7	2	2
Total Kilns	33	74	119	154	166	157
Capacity (TPD)	9401	26511	55306	96406	219425	310706
Average kiln Capacity (TPD)	285	358	465	626	1322	1921

2.2.2 The share of production through different processes have changed substantially over the years. Until 1960, the major share of cement capacity was from wet process (94.4%); the semi-dry process contributed 4.5% and the dry process only 1.1%. Today the share of wet process is only 5% whereas dry process accounts for 93% in total installed capacity. The balance 2% is from Semi-dry process plants. It is expected that almost all the wet-process plants except those based on **Sludges** will be converted to energy efficient dry process plants by the terminal year of X Five Year Plan.



2.3 Kiln Capacity and Size

2.3.1 The economic unit capacity for cement plants in India till early sixties was about 300 TPD. In mid sixties this was standardized at around 600 TPD for both wet and dry process plants. About a decade later, i.e. from mid seventies, the new plants installed were of 1200 TPD capacity. The advent of precalciner technology in mid eighties provided an opportunity to the industry to modernize and increase the capacity of existing dry process plants, to convert plants from wet to dry process as well as to set up large capacity plants incorporating the latest technological advancements. This led to installation of single line kilns of 3000 TPD (1 MTPA) capacity and more. The present trend indicates the preference of still larger kilns of about 6000 TPD capacity and above. Already one kiln of capacity 12000 TPD has been installed. The liberalization of imports and lowering of customs tariffs in recent years have opened up further avenues of inducting state-of-the-art-technology and equipment in cement plants. The green-field plants being installed now are based on advanced and the best available technology.

2.3.2 The capacity of presently operating wet process kilns varies from 200 to 750 TPD with an average of 435 TPD. The semi-dry process kilns have an average capacity of 658 TPD. The dry process kilns have average kiln capacity of 2414 TPD.

2.3.3 Plants with a total capacity of one million tonne and above at a single location, numbering 54, are having a total capacity of 89 MTPA accounting for 75% of installed capacity. It is expected that the number of plants having capacity of more than a million tonne at single location will be 80 by the year 2006-07.

2.3.4 Average annual installed capacity per plant in India is about 1.0 MTPA as against more than 2.1 MTPA in Japan . This is due to blend of small and large plants coming up at various stages and still operating in India as against smaller plants having been decommissioned in Japan.

2.4 Varieties of Cements Produced

2.4.1 Amongst various types of cements produced, OPC (Grade 33, 43 and 53), PPC and PSC comprise major proportion. During the year 2000-01, the production of OPC was about 63%, PPC 26% and PSC 10% and the other varieties accounted for about 1% of the total cement production. By the year 2006-07, it is expected that the total cement production from large cement plants would be 158.5 mn.t, out of which 50% would be blended cement, comprising of 35 % PPC and 15% PSC.

3.0 Capital Investment

3.1 The capital investment of green field cement plants for enhanced capacity of 10 mn.t. works out to Rs 3500 crores @ Rs 3500 per tonne of annual installed capacity. For additional enhanced capacity of 35 mn.t. after modernization and expansion in existing cement plants, the capital investment @ Rs 2000 per tonne of annual installed capacity is projected at Rs 7000 crores. In order to cope-up with the total cement enhanced capacity of 57 mn.t. including 50% OPC, 35% PPC and 15% PSC, the power infrastructure of 1125 MW will have to be created by Indian cement industry. Out of this, 70% power generation will be based on captive thermal power plants and balance 30% will be met by diesel power generating sets. The capital investment for new captive power generation will be of the order of Rs. 4600 crores. The capital investment for setting up coal washeries with total capacity of 3.0 mn.t. would be around Rs. 300 crores. Thus the total investment to be made by Indian cement industry during X Plan is likely to be Rs. 15400 crores excluding investment cost for developing supporting infrastructure on railway. The last mentioned item may add up to Rs. 1200 crores, making the total investment by large cement plants around Rs. 16600 crores.

3.2 In addition to above, Rs. 1100 crores would be required for the conversion of existing wet process plants, except those based on Sludges, to dry process for the same capacity (4.5 mn.t).

4.0 Present Status of Technology

Some of the modernization in equipment and also the technologies absorbed or implemented by the Indian cement industry are as under :

Technologies with High level of Absorption

- Vertical Roller Mills for Raw Material and Coal Grinding
- High efficiency separators
- Precalcinators
- Modified high efficiency and low pressure loss cyclones
- Improved burners
- Improved refractory bricks
- ESP
- Bag Filters

- X-ray Analysers
- High efficiency clinker coolers
- Pre-blending of coal
- Online Bulk Material Analysers (PGNAA)
- Computerised Maintenance
- Technologies with Medium level of Absorption
 - Computerised Mine Planning
 - High pressure grinding rolls
 - Conversion from Wet to Dry
 - Alternate fuels
 - Horizontal impact crusher
 - Kiln control based on Expert System
- Technologies with Low level of Absorption
 - Mobile crushers
 - Coal beneficiation
 - Surface Miners
 - Automation by use of Robotics
 - Horomills
 - VRM for Slag grinding
 - VRM for Clinker Grinding

The directions in which the modernization activities are proceeding are as illustrated below :

4.1 Mining

4.1.1 For rational exploitation of the raw material source, a systematic mine plan is developed by cement plants. Computer-aided techniques for raw material deposit assessment to arrive at proper extraction sequence of mining blocks, keeping in view the blending operational requirements, are envisaged and put to use in number of units.

4.1.2 Use of surface miner is a recent development in the area of mining operation where the deposit is amenable. The surface miner combines all the

three operations viz. ripping, crushing and loading operations in one machine. Rock breakers are also deployed to break oversize rocks.

4.2 Crushing

4.2.1 Mobile crushers have come in use in some of the newer plants, keeping in view the split location of limestone deposits and long conveying distances. The mobile crushing plant is stationed at the mine itself and raw material is crushed at the recovery site.

4.2.2 Roll crushers/horizontal impact crushers (HIC) are also being used as a pre-crusher with the existing mills to augment the capacity of ball mill systems.

4.3 Grinding

4.3.1 Different systems of ball mills were developed in the past to economize on energy consumption. Vertical Roller Mills (VRM) have given the real breakthrough in the area of grinding. The VRM draws 20-30 % less electrical energy as compared to the corresponding ball mill system, apart from its ability to give much higher drying capacity. These mills can accept larger feed size and hence mostly be used with single stage crushing. VRMs are now being used in clinker and slag grinding and also as pre-grinder to an existing grinding installations.

4.3.2 Another breakthrough has come with the application of high pressure grinding rolls (HPGR). The HPGR is being used as pre-grinder for upgrading the existing ball mill systems. Different modes of operating HPGR in open circuit, pretreatment with circulation, pretreatment with disagglomeration and recirculation and closed circuit are in operation. Such installations could achieve an increase in capacity upto 200% and savings in power consumption to the extent of 30 to 40% as compared to ball mills.

4.3.3 High efficiency separators are now widely used for better classification of product and help in increasing the mill capacity besides reducing the specific power consumption. The new classifier designs include two stage separation integrating primary and secondary separation. High efficiency separators are also used now with VRM's for further improvement in their performance.

4.3.4 Recently, a new mill system called Horizontal roller mill has been developed which is capable of producing uniform raw meal and have advantages in processing raw materials containing higher percentage of quartz.

4.4 Pyroprocessing

4.4.1 The main developments and areas undergoing modernization and up-gradation in pyroprocessing section include

- **Introduction of precalcinators**
- **Increase in number of preheater cyclones**
- **Modifications in preheater cyclone design for better separation efficiency and lower pressure loss**
- **Improved burners**
- **Improved refractory bricks**
- **High efficiency clinker coolers**

4.4.2 The introduction of precalcinator technology has increased the production from the kiln by 2.0 to 2.5 times and enabled utilization of high ash coals with lower calorific value, as well as various agricultural and industrial combustible wastes. Systems have been developed to use fuels like lignite and petcoke. Calciners designed with longer retention time can also take coarsely ground fuel thereby saving in grinding cost. All the new kiln installations are now coming up with precalcinators.

4.4.3 The advantages of economy of scale are fully exploited by the cement industry through the precalcinator technology. Many single kilns capable of producing more than 6000 tpd capacity have already been installed and are operating with state-of-the-art technology.

4.4.4 Many cement plants have some excess capacity at both upstream and downstream, which could be utilized economically if the kiln output can be increased at modest costs. Traditionally, the kilns have been designed with specific volumetric loading of 1.5 to 2.2 tpd/m³ for SP kilns and 3.0 to 4.0 tpd/m³ for precalciner kilns. The corresponding thermal loads in burning zone for such kilns have remained between 3.5 to 4.5 x 10⁶ K.cal/m²/hr. Many cement plants have gradually increased the specific volumetric loading upto 6 tpd/m³.

4.4.5 The introduction of high efficiency and low pressure-drop-cyclones have led to conversion of conventional 4-stage cyclone preheaters to 5-stage and even 6-stage cyclone preheaters with improved thermal efficiency.

4.4.6 The latest development of controlled flow grate clinker cooler system ensure better clinker distribution, increase in cooler heat recuperation efficiency, decrease in clinker exit temperature and reduced maintenance costs.

4.4.7 The limitations of the conventional straight pipe burner have been overcome by use of highly flexible multi-channel burner. The multi-channel burner enables easy and sensitive flame shape adjustment as well as gives rise to entrainment of secondary air.

4.4.8 High Alumina refractory bricks which were mostly used in pre-heating / pre-calcining zone in the past, are now replaced by light weight high strength insulating bricks. The Aluminium-Zirconium-Silicate bricks with coating repellent properties are also in use now in transition zones. With the new improved refractory bricks it is possible to increase the refractory lining life and reduce the radiation losses in the kiln. Greater use of monolithic refractories in pre-heater, pre-calcinator, cooler, kiln outlet zone etc. is in practice now.

4.4.9 In cement industry, conventional analog instrumentation is gradually being replaced with digital instrumentation. The large mimic diagrams used off late are being replaced by cathode ray tube (CRT) display. Motor control by relay sequence are being changed to programmable logic controllers. Analog PID controllers are being replaced with multi-loop digital controllers. Due to the advent of microprocessors, a variety of advanced control concepts like adaptive control, self-tuning control, feed forward control, etc. have been introduced in the Indian cement industry.

4.4.10 Rapid advances in computer hardware and software have enabled optimization of production thereby reducing energy consumption and simultaneously improving productivity and quality.

4.4.11 The advent of state-of-the-art one million tonne and above capacity dry process cement plants has brought into focus the need for automatic kiln control systems based on expert and fuzzy logic systems. Expert systems have also found applications in automatic control of closed circuit ball mills and refractory management.

4.4.12 As a corollary to automation, quality is also maintained by continuous monitoring of the raw mix composition with the help of X-ray analyzer and automatic proportioning of raw mix components. New type of on-line bulk material analyzers have also been developed based on Prompt-Gamma-ray Neutron Activation Analysis (PGNAA) for giving maximum control over raw

mix. The analyzer quickly and reliably analyses the entire flow-on-line providing real time results. The latest trends in on-line quality control include computers and industrial robots for complete elemental analysis by X-ray fluorescence, on-line free lime detection and particle size analysis by latest instrumental methods and x-ray diffraction techniques respectively.

5.0 Future Modernization Needs of the Indian Cement Industry

5.1 Although the industry has largely set up energy efficient plants or equipment, there are still some areas for further improvements like:

- **Appropriate pre-blending facilities for raw materials**
- **Fully automatic process control and monitoring facilities**
- **Interactive standard software packages for process and operation control with technical consultancy back-up**
- **Energy efficient equipment for auxiliary /minor operations**
- **Mechanized cement loading operations**

5.2 Technologies yet to be introduced in Indian cement industry are :

- **Waste-Heat Recovery based Co-generation of power**
- **Horizontal Roller Mills for Raw Material and Cement Grinding**
- **Advanced Computerised Kiln Control System**

6.0 Fuel Requirements and Alternate Sources of Energy

6.1 Fuel Consumption Status

6.1.1 Coal continues to be the main fuel for the Indian cement industry and will remain so in the near future as well. The industry is mainly using coal from various coal fields in the country. It is also procuring coal through open market and direct imports. Lignite from Neyveli Lignite Corporation (NLC) in the south and some quantity from deposits in Gujarat and Rajasthan are also being used by cement plants. During the past two years small quantities of Pet Coke have also been tried by some cement plants, mainly in Gujarat, Rajasthan and MP. The table below gives details of fuel consumed by cement industry during the terminal year of VIIIth Five Year Plan i.e 1995-96, 2000-01 and the projected consumption of fuel for the year 2006-07, the terminal year of X Plan.

Type of Fuel	(mn.t)		
	VIII Plan Terminal Year (1995-96)	IX Plan (2000-01)	X Plan Terminal Year (2006-07*)
Indigenous coal	11.20	8.65	16.00
Imported coal	1.30	4.40	4.00
Lignite	0.75	0.05	0.10
Pet-coke & combustible wastes	---	0.37	0.90
Total	13.25	13.47	21.00

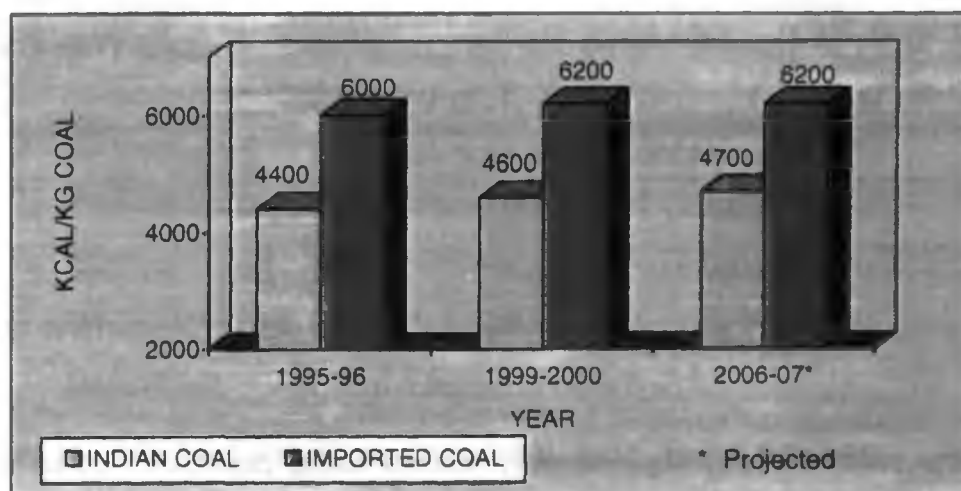
* Projected

-- Transit loss of approximate 0.50 mn.t coal excluded

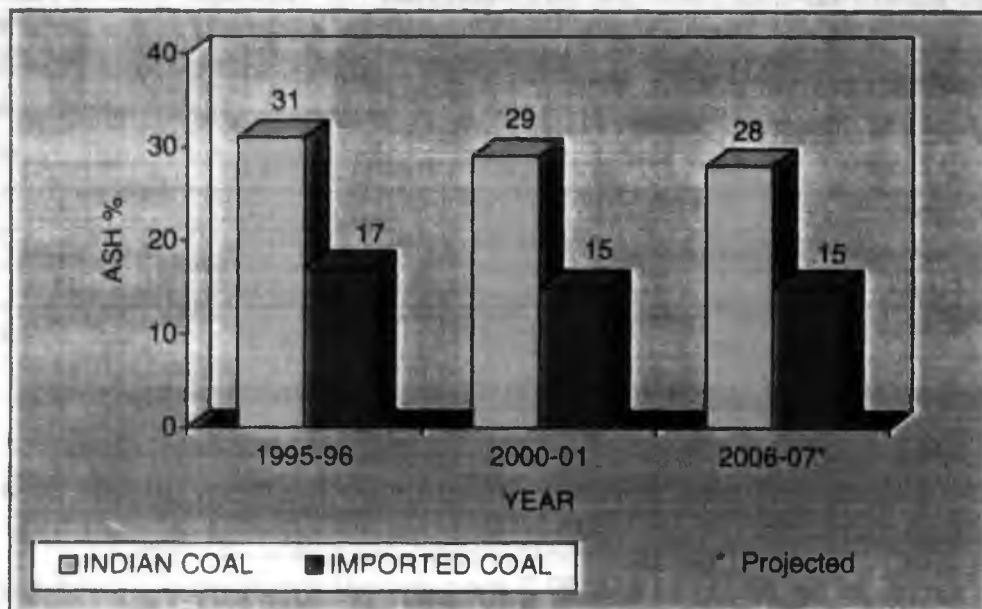
6.1.2 During X plan, the coal consumption has been considered as 170 kg per tonne of clinker (17%) and total clinker production by the end of X Plan has been estimated at 129 mn.t for 159.5 mn.t cement production considering 50% of total cement as OPC, 35% PPC and 15% PSC. It is further presumed that about 4 mn.t of indigenous coal will be subjected to beneficiation.

6.1.3 The average net calorific value and ash percentage of indigenous as well as imported coal as available to the Indian cement industry during the year 1995-96, 1999-2000 and projection for 2006-07 are in figures below. The calorific value and ash percentage of indigenous coal is envisaged to improve from present levels of around 4600 kcal/kg coal & 29% ash to 4700 kcal/kg coal & 28% ash respectively. In the case of imported coal, however, these values may remain more or less the same.

Net Calorific Value of Coal



Average Ash Content in Coal



6.1.4 It is envisaged to make use of increased indigenous coal after beneficiation in regional washeries. However, inadequate coal supply from the coal fields because of several reasons including inadequate wagons availability for movement over large distances, aggravates non-availability of coal for cement plants. With the expansion of cement industry in the coming years, the coal movement by rail might become a major bottleneck. For minimizing dependence on coal, it is necessary to use alternate fuels of sufficient combustible value to substitute coal to the extent possible. Use of alternate/high grade fuel depending upon their availability, costs, logistics etc., therefore becomes imperative. Such fuels should have minimum contamination and also should have no adverse effects on the kiln operation and clinker quality.

6.1.5 The following fuels are considered to have good potential to either partially or fully substitute coal in cement manufacture.

- **Pet coke**
- **Lignite**
- **Natural gas**
- **Agricultural and Industrial wastes (including rubber tyres)**
- **Refused derived fuel from Municipal Solid Wastes**

A few cement plants have already started using pet coke, lignite and several combustible wastes like rice husk, bamboo dust, bagasse etc. Natural gas is considered as a promising fuel for cement industry particularly for those plants

located in the vicinity of natural gas sources, or far off from the coal deposits or using low/marginal grade limestone. However, availability of gas for cement industry is still a remote possibility because of its high installation costs. Waste oil sludge and refused derived fuels from municipal solid wastes are other attractive alternate sources of energy.

i. Pet coke - Pet coke is a residual product from oil refinery with relatively low volatile matter, insignificant ash content and high calorific value, but often with high sulphur content as compared to Indian coal. Petcoke production in India was around 2 mn.t. in the year 2000-01, out of which nearly 0.37 mn.t. was used by major Indian cement plants. Petcoke has been successfully used in kiln firing; however, a few cement plants are using petcoke also in the precalciner alongwith coal. The quality of petcoke received from Reliance Petroleum Refinery, the main source of petcoke supply at Jamnagar, Gujarat is given below.

Moisture	5 - 10 %
Ash	< 2.0 %
Volatile Matter	< 10.0 %
Fixed Carbon	80 - 85 %
Sulphur	5 - 7 %
Gross Calorific Value	Around 8000 K. Cal / Kg.
Hard Grove Grindability Index	35 - 45
Bulk Density	0.8 Kg / M ³
Lump Size	40 mm (maximum)

The advantages of using pet coke as fuel for cement manufacture are:

- Reduced cost of energy input and cost of production
- Less dependency on coal for cement manufacture
- Exploitation and use of lower grade limestone reserves
- Utilisation of limestone with high alkali content
- Easy burning in the kiln with reduced CO formation

The limitations associated with the use of Petcoke in cement manufacture are:

- Loading in the riser duct/cyclones regretting in kiln stoppages.
- Since the sulphur content in petcoke is high, the quantity of its use is limited by the molar ratio of alkali oxides to sulphur in the kiln feed which must be maintained between 0.8 to 1.2.

- The grinding capacity of the coal mill is lowered by around 50% in grinding pet coke to a residue of 4-5% on 90 μ . Therefore adequate grinding capacity of the mill need to be provided to meet the production levels.
- Harder clinker leading to high energy consumption during finish grinding.

ii. Lignite - Lignite having low ash content and high calorific value compared to coal is considered a promising alternate source of fuel for cement plants particularly located in the vicinity of lignite deposits. The important known deposits of lignite in India are in Tamilnadu, Rajasthan, Gujarat, J&K and Kerala. The total geological reserves of lignite have been assessed at over 24000 mn.t. About 90 % of these occur in Tamilnadu alone. State-wise breakup of lignite reserves in the country is shown in the following table.

State	Reserves in mn.t.
Tamil Nadu	21806
Rajasthan	1431
Gujarat	932
J & K	128
Kerala	405

Lignite is characterized by high moisture, high volatile matter and low ash content. The composition of lignite varies widely from one deposit to another. The moisture content of run-of-mine lignite varies generally from 30 to 55 %. On dry basis, lignite is found to contain 40-50 % volatile matter and 15-20 % ash. The maximum size of lignite obtained from the mine is 200 mm but it predominantly contains fines. Lignite is friable in nature and has a tendency to crumble into small pieces on drying. The sulphur content in lignite from Neyveli (Tamilnadu) is only upto 1.5%, whereas lignite from deposits in Gujarat and Rajasthan contain upto 9% Sulphur (on dry basis).

The advantages of using Lignite as fuel in cement manufacture are :

- Amount of ash entering into the kiln, when using lignite as a fuel in place of coal, is reduced both on account of relatively low ash content and less fuel consumption due to higher calorific value (on dry basis).
- Landed cost of lignite per unit heat (thousand kilocalories) is much lower than that of coal particularly for the cement plants located far from coal fields and near the lignite deposits.

- Use of lignite allows use of marginal grade limestone and eliminates purchase of costly sweetener. Also, for given raw mix, the quality of clinker is improved.
- Load on railways in transporting coal is reduced as lignite is mostly transported by road.

Use of lignite as a fuel in cement manufacture has certain limitation owing to its high moisture content, high volatile matter and high sulphur content. However, technical solutions are available to overcome these problems.

iii. Natural Gas - Natural gas is considered to be an excellent fuel for effective utilisation of low/marginal grade limestone and conserve higher grade limestone for future needs. The natural gas reserves in the country are estimated at 718 billion cubic meters (BCM). Out of these, 253 BCM are on the on-shore and the remaining 465 BCM are on the off-shore. Assam (on-shore) has the maximum reserves of 156 BCM followed by Gujarat (on-shore) with 93 BCM. The major gas fields in India are western (off-shore), Krishna-Godavari (off and on-shore), Cauvery (on-shore) Assam (on-shore) and Jaisalmer (on-shore).

In cement industry natural gas can be used in the following ways:

- As main fuel for pyroprocessing
- As fuel sweetener for modulating the coal quality
- For captive power generation
- For cogeneration

Natural gas has so far not been used for cement manufacture due to its high cost compared to other fuels as shown in the table. However, a number of cement plants in overseas countries are using natural gas either as the only fuel or in combination with other fuels such as coal and fuel oil.

Quality and Cost of Fuels

Item	Indian Coal	Imported Coal	Pet Coke	Lignite	Natural Gas
Inherent moisture, %	2-4	2-3	2-3	5-7	--
Ash, %	30-35	10-15	<2	15-20	--
Volatile matter, %	25-30	25-30	<10	40-50	--
Fixed carbon, %	35-40	45-55	80-85	40-50	--
Calorific value, K.Cal./kg.	4000-4500	6000-6500	8000-8200	3000-4000	8000-8500 Kcal/Nm ³
Cost, Rs/tonne	1000-1800	2200-3000	1500- 2300	1000-1700	3000-4000 per Nm ³

The advantages of using Natural Gas as fuel in cement manufacture are summarised as under :

- Natural gas can be directly fed into the kilns/precalcinator thus eliminating the need for having crushing, drying and grinding systems required for coal entailing saving of 15 percent in the initial capital investment and power saving of 4-7 kWh/t clinker.
- Relatively good quality clinker with increased C3S content can be produced. Such clinker improves the cement mill performance thereby achieving reduction in specific power consumption of the order of 5-7% and increase in mill output rate by around 5%.
- Significant reduction of CO formation is achieved thereby improving the thermal efficiency of the kilns generally by about 2.5%.
- Higher kiln availability on account of increase in refractory lining life as they are subjected to minimum thermal shocks due to uniform temperature in the burning zone.

The potential cement plants and estimated natural gas requirement are shown in the table.

Gas Source	No. of Cement Plants	Installed Capacity (MTPA)	Estimated Gas Requirement (MCMD)
HBJ Pipe Line	18	19.434	6.413
Saurashtra/Kutch	7	6.365	2.100
Krishna-Godavari/Cauvery	15	8.516	2.810
North-Eastern / Tripura	2	0.400	0.132
Total	42	34.715	11.455

Major constraints in the Use of Natural Gas for cement manufacture are:

- Coal based industries have not been considered for allocation of natural gas so far. Other sectors such as fertilizer, petrochemical and power have been given priority for allocation of natural gas.
- Installation of gas pipeline from the gas source to the plant requires huge investment to the tune of Rs 1.0 -1.2 crore per km depending upon quantity of gas to be handled and operating gas pressure. Location of 18 cement plants near the HBJ pipeline

indicate that the length of laying the gas pipeline to some of these plants is more than 200 km. The distances between the plants and the sources of natural gas in other regions are also likely to be of the same order.

- Supply of natural gas for cement manufacture on continuous basis is a necessity whereas presently its supply can be cut off on 24 hours notice under fall-back option.
- High cost of natural gas compared to coal restricts its use for cement manufacture.

Compressed natural gas (CNG) is a clean fuel having a high calorific value of 8000-9000 kcal/Nm³ with zero contamination as against 4500-5000 kcal/kg of coal generally received by Indian cement industry. CNG has a major disadvantage of being costlier fuel as compared to coal per unit heat. Also, CNG needs to be stored in the tanks at a very high pressure between 200-300 pounds per square inch. The danger of explosion of such high pressure tanks in hot environment could be a major risk for the cement plants. The storage and handling of CNG in tankers to ensure continuous supply to the cement plants will further add to the safety requirements of cement plants. As per Middle East Economic Survey (MEES), gas transportation through pipelines is cheaper compared to compressed or liquefied natural gas (LNG) shipped in tankers from the Gulf countries.

iv. Agricultural and Industrial Wastes - The use of agricultural and industrial wastes can provide twin benefits - energy conservation and environmental protection. However, various factors such as availability, characteristics, economics and effects on kiln operation, refractory lining and product quality etc. need to be assessed, prior to its use in cement manufacture.

Some agricultural and industrial wastes have combustible value and can be economically and effectively used as partial substitute to coal. Agricultural wastes include rice husk, bamboo dust, bagasse, coconut husk, peanut husk, straw etc. Industrial wastes cover carbon wastes, petro-chemical wastes, spent pot lining, hazardous wastes from paint and chemical industries etc.

Since the temperature requirements in the precalcinator are low, combustible wastes have the potential to be used for secondary firing without appreciable impact on the kiln operation.

The use of rice husk, saw dust, waste oil, wood chips etc. have been reported to be used by overseas cement plants for secondary firing replacing upto 50 % of

the main fuel in the Precalciner. The experience of cement plants in India in using these combustible wastes indicate that rice husk, bamboo dust, carbon waste, bagasse etc. can be rationally used alongwith coal in the Precalciner replacing upto 20-30% of coal.

The experience in some of the overseas cement plants reveal that upto 25% main fuel substitution can be achieved through the use of waste rubber tyres. However, in India, the used tyres are generally retreaded and recycled for manufacture of low cost rubber based product. Moreover, there is no organized system for collection of scrapped rubber tyres to make it available for cement sector.

Waste derived fuels (WDF) such as hazardous and non-hazardous waste oils, spent solvents, paint thinners, petrochemical refinery wastes etc. have also been successfully tried abroad alongwith the conventional fuels. Upto 60% of the conventional fuel is reported to be substituted by WDF in a few overseas cement plants. The use of oil shale is reported to have resulted in reduction of fuel oil consumption equivalent to 40-50 % of total heat requirement. While in the Indian context, such fuels are yet to be used in a big way.

The availability of agricultural wastes is seasonal and, therefore, cement plants cannot be assured of continuous supply round the year. In case of some of the industrial wastes, which are hazardous in nature or contain some toxic contaminants, handling such wastes is major constraint in their utilisation.

v. Refused Derived Fuel (RDF) from Municipal Solid Wastes - The generation of municipal solid wastes (MSW) in the country is estimated around 40 mn.t. during 2000-01, which is expected to go upto about 55 mn.t. by 2010. Presently more than 10 mn.t. of MSW are generated per year in 23 large cities/metros. New Delhi and Mumbai generate 4000 tpd (1.5 MTPA) and 5355 tpd (2.0 MTPA) of MSW respectively.

The safe disposal of municipal solid wastes has become a environmental problem and a health hazard because of pollution in the surrounding environment of the garbage dumping yards. These dumps constantly produce and release methane gas, which contributes more to global warming than CO. The new technologies developed elsewhere in the world can be used for converting MSW to RDF, which is a rational approach of solving the disposal of MSW.

RDF can be used as a solid fuel in a fluidized bed boiler for the generation of steam which can be used for generation of electricity. About 1.5 tonne of RDF can

produce about 1 MWh of electricity based on 3400 to 3800 kcal/kg of RDF. RDF can also be used in a cement kiln to substitute coal. When MSW is converted to RDF, the yield is about 40% of input waste and when it is mixed with selective industrial and agricultural wastes, the yield can increase upto about 60%.

RDF plants are new concepts in India and present experience is not very encouraging. MSW in India has been found to have very low calorific value in the range of 1100-1200 Kcal/kg. Therefore, for using it as a potential fuel in cement kilns, it is necessary to segregate or process to enhance its calorific value to minimum 2500 Kcal/kg. It may not also be convenient and economical to transport MSW to a cement plant site.

7.0 Energy Conservation

7.1 Energy Performance Scenario of Cement Plants

7.1.1 Scarce energy resources and rising energy costs have created an awakening all over the world to the need of conserving it, finding alternate or renewable sources and bringing about efficiency in its generation and use. Energy conservation has assumed greater importance as one of the effective ways to reduce cost of production particularly in energy intensive industries like cement.

7.1.2 The Indian cement industry is facing problems like high ash coal, variable quality of coal, poor grindability of raw materials, inconsistent power supply with power cuts. Keeping these factors in view, a comprehensive approach must continue to intensify energy conservation efforts.

7.1.3 Over the past decade, the thermal and electrical energy consumption levels have reduced in dry process plants through various energy conservation measures, including use of various energy efficient equipment/systems.

7.1.4 The weighted average thermal consumption in dry process plants has reduced from 780 Kcal/kg clinker in 1995-96 to 750 Kcal/kg clinker in 1999-2000. Similarly, the weighted average electrical energy consumption in dry process plants during this period showed a reduction from 104 kWh/t cement to 91 kWh/t cement. It is expected that the average thermal and electrical energy consumption by the year 2006-07 will come down to 730 Kcal/kg clinker and 86 kWh/t cement respectively due to further improvement in energy efficiency in the existing plants and new capacity addition with energy efficient technologies and conservation efforts. The lowest thermal and electrical energy consumption presently achieved by the cement plants in India is 677 Kcal/kg clinker and 69

kWh/t cement which are comparable to the best figures of 650 Kcal/kg clinker and 65 kWh/t cement in a developed country like Japan.

7.1.5 The improvements in energy performance of cement plants in the past few years have been possible largely due to :

- **Retrofitting and adaption of energy efficient equipment**
- **Better operational control and optimisation**
- **Upgradation of process control and instrumentation facilities**
- **Better monitoring and Management Information System**
- **Active participation of employees and their continued training in energy conservation efforts etc.**

7.2 Effect of Various Factors on Energy Consumption

7.2.1 Electrical energy consumption of plants having VRMs & Roller Press systems is relatively less in comparison with plants having Ball Mills. However, the overall choice is dictated by capital and operational cost taken together. During the year 1999-2000, the average electrical energy consumption for raw material grinding in VRM's was about 20% less as compared to ball mills. For coal grinding also, the average electrical energy consumption in VRM's was about 20% less as compared to ball mills. In the case of cement grinding, average electrical energy consumption in Roller press-Ball mill systems was less by 20% as compared to Ball mills.

7.2.2 Dry process plants having 5/6 stage precalcinator kilns are consuming lesser thermal energy as compared to dry process plants having only suspension preheater kilns. The main reason for better energy efficiency in precalcinator kilns is that these plants are of relatively larger capacities and fitted with latest energy efficient equipment, process control instrumentation and reduced specific radiation losses. In the year 1999-2000, the average thermal energy consumption in 5-stage PC kilns was about 10% less as compared to suspension preheater kilns. In case of 6-stage PC kilns, the specific heat consumption was lower by about 14% compared to suspension preheater kilns and by 5% compared to 5-stage PC kilns. Also, the 6-stage PC kilns had an average electrical energy consumption lower by about 10% compared to 5-stage PC kilns.

7.2.3 The capacity utilization and kiln size have a direct bearing on energy consumption. Both thermal and electrical energy consumption decreases with increase in capacity utilisation. During the IX Five Year Plan, the average kiln size of the Indian cement industry has witnessed an increase from 1322 to 1921

tpd. The capacity utilization during this period also improved from 73.3% to 83.5%.

7.2.4 Frequent power interruptions is another important factor affecting energy performance, as this requires number of startups and stabilization period. It is expected that the specific power consumption per tonne of cement can be straightaway reduced by 2 to 3% if such interruptions are minimized or eliminated.

7.3 Energy Saving Methods

7.3.1 Process optimisation, load management and operational improvement generally involve marginal financial investment and yet have multiplying effects in energy saving. The different aspects explored in this direction by the industry are given below :

- Reduction of Excess/false Air in kiln, preheater circuit and raw mill.
- Reducing idle running.
- Installation of improved insulating bricks in kiln.
- Effective utilization of hot exit gases.
- Optimisation of cooler.
- Optimisation of grinding mills.
- Rational utilization of compressed air.
- Improvements in raw mix design.
- Use of capacitor banks for power factor improvement.
- Replacement of over-rated motors with optimal ones.
- Optimisation of kiln system.
- Use of high calorific value fuels.

7.3.2 Use of energy efficient equipment involving some capital investment gives very encouraging results. Various energy saving equipment already in operation are listed below :

- Slip power recovery system
- Variable voltage and frequency drives
- Grid rotor resistance
- High efficiency Fans and Motors
- High efficiency separators
- Vertical roller mill for grinding raw meal, coal, slag and cement.
- Pre-grinders like horizontal impact crusher, vertical roller mill or roller press.

- Low pressure - drop preheater cyclones
- Multi - channel burner
- Bucket elevator for kiln feed and silo filling.
- Fuzzy logic/expert kiln control system
- Improved ball mill internals
- Controlled flow grate/IKN/KIDS grate cooler

8.0 .Quality Control Practices

8.1 Indian cement industry has recognized that ISO 9000 quality systems certification is extremely important for quality, reliability and competitiveness. At the beginning of IX Five Year Plan (1996-97), 20 cement plants were awarded ISO 9002 certification and about 40 were at various stages of quality systems implementation. By the year 2000-01, as many as 59 cement plants acquired ISO 9002 certification.

8.2 In addition, 27 cement plants have been awarded with ISO 14001 certification for environmental protection and improvement which was non-existent earlier. By the end of X Plan (2006-07), it is expected that number of plants with such certifications will grow to 110.

8.3 The industry has taken one step further in getting their testing and research laboratories accredited by NABL (National Accreditation Board of Laboratories). So far only one laboratory has acquired such accreditation but many such labs are in pipeline. It is expected that by the end of 2006-07, at least 20 laboratories will be having NABL accreditation.

8.4 The Indian cement industry is fast catching up with OHS-18000 / ISO-15000 certification for health and safety. The table below shows details of plants with ISO certification/NABL accreditation.

Item \ Year	1996-97	2000-01	2006-07*
No. of plants having ISO-9002	20	59	110
No. of plants having ISO-14001	NIL	27	110
NABL accredited laboratories	NIL	1	20
Number of plants having OHS-18000/ISO-15000	---	1	20

* Projected

8.5 Due to international competitiveness and business excellence, the cement quality needs to be improved continuously. Keeping this in view the Total Quality Management (TQM) approach is also being put in practice by a few cement plants. ISO-9000 quality system installation is the first step towards the TQM approach. Further, alignment of Indian Standards on cement with corresponding International Standards within a reasonable time frame will give a boost to cement export.

9.0 ‘ Benchmarking Practices

9.1 The concept of benchmarking is relatively new for industries, particularly in India. There had been no benchmarking practice till the end of VIIIth Five Year Plan (1992-1997). An attempt of benchmarking through inter-firm comparison at national level through structured formats was made by the National Productivity Council in eighties but this did not produce the desired results.

9.2 However, during IX Five Year Plan, the awareness of industry grew towards importance of having benchmarking for intra-firm and inter-firm comparison and global level performance and standards. The Indian cement industry got acquainted with benchmarking system advocated by the Blue Circle Technical Center, UK, which basically involved a process for locating best practices and applying them continuously at plants to improve their performance. This system had been effective for groups having a large number of plants spread across the globe like the Blue Circle, Lafarge, Cemex, etc. Simultaneously, another form of benchmarking was introduced in the late nineties by the International Cement Review – Whitehoppleman Group. This system involved comparative evaluation of performance of leading cement-manufacturing companies in different countries through paid enrolment for evaluation. The results are aimed at larger visibility for market promotion of participating companies.

9.3 For evolving a realistically national system of benchmarking for performance improvement through free and frank exchange of information and data, the Cement Manufacturers Association took up a benchmarking exercise for the Indian Cement Industry during 1999-2000 with the following objectives :

- **Direction-setting exercise for goal achievement.**
- **Continuous process of measuring products, services and practices.**
- **Identification and implementation of the best operational practices.**

- **Performance analysis and diagnosis for tracking productivity based on the national and international best practices.**

9.4 The exercise involved collection of input data through a structured format followed by site visits and discussion with plant personnel on the status and functioning of technology level, process & operational control and management systems. The data was further analysed with respect to specific indicators for benchmarking and results were compared with the practices followed by state-of-art plants in other countries. In all 48 indicators were used for comparative assessment in the study ranging from energy (fuel and power) consumption in different unit operations, pollution level (suspended particulate matter concentration), manpower and machinery productivity, raw material consumption, green house gas (GHG) emission level, least cost strategies for technology up-gradation upto the benchmark level. 20 cement plants participated in the exercise in two phases conducted during 1999-2000.

9.5 The Cement Industry, through CMA and NCB, has taken upon itself the task of indigenising the model which further requires to be enlarged for universal application and enroll most cement plants under its purview through voluntary participation during the X Five Year Plan. It is expected that the benchmarking exercise will cover most of the existing cement plants by the year 2006-07. Areas like energy consumption, environmental performance, quality, manpower productivity, consumables, maintenance practices, operating performances etc. of all cement plants in India will form part of this exercise.

10.0 Human Resource Development

10.1 The production results and performance rely mostly on full utilization of equipment potential and manpower skills. This can be achieved only by human resources through good operation and maintenance practices. To fulfill this objective, the following organizations are conducting regularly training courses in varied topics:

- **National Council for Cement and Building Materials through its Centre for Continuing Education and Human Resource Development (NCB-HRD).**
- **Associated Cement Cos. Ltd. through its Research and Consultancy Directorate, Technical and Management Training Division, CRS, Thane.**

➤ **Regional Training Centers located at :**

- ACC-Kymore (MP)
- Dalmia Cement, Dalmiapuram (TN)
- Ambuja Cement, Kodinar (Gujarat)
- J K Cement, Nimbahera (Rajasthan)

10.2 The total manpower deployed in the cement industry alongwith the number of persons trained and courses held so far by the above mentioned training organisations are given in the Table :

Item	1995-96	2000-01	2006-07*
Total manpower deployed by Indian cement industry	150000	135000	137000
Number of persons trained at NCB, ACC-RCD & all four RTCs	15662	30123	44500
Number of courses held	1090	2212	2900

* *Projected*

10.4 The direct manpower in the cement industry in the year 1995-96 was 1,50,000 which was reduced to 1,35,000 by year 2000-01 due to superannuation and implementation of voluntary retirement schemes (VRS) by a number of cement plants. It is expected that the manpower deployed in the industry during the year 2006-07 will slightly go up by another 2000 with fresh recruitment and availing secondary and tertiary mode of employment. The existing cement plants will render surplus manpower due to modernization, however is expected that this surplus manpower would get absorbed by the additional capacities/redeployment.

10.5 The number of persons trained at various institutions/organisations by the year 1995-96 were 15662 in 1090 courses. In the year 2000-01 these figures increased to 30123 and 2212 respectively. It is estimated that around 15000 more cement plant personnel would be trained or re-trained through additional 700 courses.

11.0 Research and Development

11.1 In today's fast progressing world, no industrial system can grow without R&D support. The role of R&D in the growth of cement industry in India is well known and documented. In order that the desired results are produced, research has to be properly focused and mission-oriented, taking into

account what the industry aspires. The research efforts could be directed with a three-pronged approach :

- **Technological developments in the process of cement manufacture and the related plant and machinery, and systems design**
- **Operational improvements to ensure cost reduction, productivity enhancement, environmental protection and quality improvement and**
- **R&D to ensure proper utilization of cement in constructions and propagate its use for newer applications.**

11.2 Any attempt to reduce the expenditure on R&D for considerations of economy can be counter-productive in the long run. Therefore, adequate funds have to be made available for a meaningful R&D.

11.3 During the last decade a number of cement manufacturing organisations have developed their in-house R&D units and today there are 12 units dedicated to R&D on cement and allied industries in India.

11.4 Two major organizations namely National Council for Cement & Building Materials and Research & Consultancy Directorate of The ACC Ltd. are fully devoted to research and development activities. The results of the R&D work carried out by them are regularly transferred to the cement industry for commercial application. Besides, a number of cement plants in the country are carrying out in-house R&D to upgrade the existing technology, modernization for improving productivity and energy efficiency of their plants. Cement plants with R&D establishments at plant's site are :

- **Dalmia Institute of Scientific & Industrial Research**
- **India Cement Ltd.**
- **Grasim Industries Ltd.**
- **Madras Cement Ltd.**
- **R&D Centre, CCI-Nayagaon**
- **Gujarat Ambuja Cements Ltd.**

11.5 The cement machinery manufacturers concurrently carrying out R&D activities for the development of energy efficient technologies are as under :

- **Larsen & Toubro Ltd.**
- **Fuller India Ltd.**
- **Krupp Polysius India Ltd.**
- **Walchandnagar Industries Ltd.**

11.6 The R&D expenditure in India as a percentage of the gross national product (GNP) has been around 0.7% during the last few years. For a comparison, most of the developed countries spend between 2 to 3% of their GNP on research & development. Data compiled from various R&D organizations show that total expenditure on R&D activities related to cement is only 0.11% of sales turnover of the industry during the year 2000-01. Correspondingly, the expenditure on R&D units on cement in a developed country viz. Japan is about 0.23% of the annual turnover as shown in the Table below :

	Amount	% of Total Turnover	No. of R&D Units	Cement Production (mn.t)
Japan	1.4b Yen (Rs 52.5 crores)	0.23	14	83
India	Rs 32 crores	0.11	12	99

This gap in the capital investment on R&D needs to be bridged because R&D can bring manifold returns to the industry and is important for a sustainable development. It is estimated that at the prevailing rate of R&D expenditure @ 0.11% of the sales turnover of industry, the R&D expenditure by 2006-07 would be about Rs 69 crores.

11.7 The thrust areas of relevance to Indian cement industry as spelt out in the draft Technology Policy Statement, 1993 of the Government of India are :

- Energy related technologies including those for alternate fuels, renewable/non-conventional energy sources and energy conservation technologies with the weightage for domestic/local availability base.
- Technologies for conservation of land, water and energy resources and their integrated management for sustainable development leading to their ecologically balanced management with higher efficiencies in utilization.
- Extensive mapping and intensive exploration of natural resources as well as estimation of reserves for ensuring resource base for rational utilization.
- Manufacturing sciences and technologies to update industries including electronification as appropriate for higher productivity and up-gradation of industrial processes with due consideration for employment generation, productivity enhancement and automation.
- Speedily enlarging areas of recognized strength like software.

11.8 Keeping in view the identified thrust areas and the outlined technological status, specific areas of research for fulfilling the needs of the Indian cement industry can be identified. A broad listing of specific areas of research undertaken by various R&D units and suggested areas of research and development is given in the following Tables :

Review of Research & Development - IX Plan

Sl. No.	Areas	IX Plan Achievements 2000-01	X Plan Priority 2006-07	Benefits
1	Use of alternate raw materials such as lime-sludge, phospho-chalk, steel slag, red mud etc.	Low	High	Resource conservation
2	Studies on various performance improvers (cement mortar & concrete)	Low	Moderate to high	Durability & sustainable development
3	Use of waste derived fuels in cement kilns like petcoke, oil sludge	Low	Very high	Fuel substitution
4	Desulphurisation of lignite & petcoke, Beneficiation of coal	Low	Moderate	Improved productivity and environment
5	Softwares for mine planning, refractory & energy management and kiln control	Low to moderate	High	Process optimisation, productivity improvement
6	Design & development of mobile quality control for concrete & bituminous roads, concrete & steel bridges and dams	Low	High	Improvement in quality of concrete & steel construction
7	Technology to process rice-husk ash to improve performance & durability of concrete structures	Low	High	Improvement in quality of cement & concrete, waste recycling
8	R&D towards alignment of Indian standards with European standards	Low	High	Improvement in quality for global recognition

Thrust Areas of Research and Development - X Plan

Sl No	Areas of Technology Development	Benefits Expected	Recommendations
1	Dry beneficiation of limestone	Utilisation of marginal grade limestone which is abundant & closer to consuming centres; Conservation of limestone reserves	Waiver/reduction of cess /royalty on lower grades of limestone as a facilitator
2a	Maximise the use of flyash in blended cement (PPC) through incorporation of appropriate additives and accelerators	Energy conservation & reduction in GHG emission ; Increased utilization of flyash having disposal problem	Flyash to be continuously made available free of cost
2b	Processing of dry flyash to maximize absorption level in PPC		
3	Improvement in quality of chemical gypsum through purification, inertization & drying	To augment reserves of natural gypsum available in country	Govt. to make suitable regulations to support / encourage use of such gypsum
4	Development of fluidised bed kiln technology for manufacture of cement clinker	Reduction in specific heat consumption, maintenance requirement, NO _x , SO _x & other pollutants	Govt. support for duty free import till the technology is fully absorbed
5	Development of technology for use of waste derived fuels like oil sludges, refused derived fuels (RDF) from urban wastes etc.	Conservation of fossil fuels	Local Govts. to encourage municipalities & other industrial estates for setting up facilities to produce RDF
6	Cost effective waste heat recovery based cogeneration of power	Conservation of fossil fuels	Incentives given by Govt. agencies for non-conventional energy sources to be extended for this technology, due to its high investment.
7	Development of technology for manufacture of belite cement, sulfo-aluminate cement etc.	Conservation of limestone reserves; Reduction in fuel consumption	Reduction in royalty on marginal grade limestone
8	Development of technology for cost effective concrete rural roads & highways etc.	Saving in automobile fuel & improvement in productivity	Govt. to promote concrete roads
9	Development of technology for conversion of CO ₂ from kiln exhaust gases to produce marketable products	Green house gas and environmental improvement	Govt. to identify suitable World Bank/Green-Aid grants for such technology development
10	Benchmarking of various performance indicators	Improvement in energy efficiency and productivity	Continued R&D

12.0 Action Plan for Technological Upgradation, Energy Conservation and R&D Needs for Cement Industry

- Efforts should be directed to utilize low and marginal grade limestone by modern mining techniques and state-of-the-art equipment for their optimum utilization. Advanced computer-added evaluation and mine planning techniques are now available
- indigenously for this purpose. The use of surface miner wherever possible should be encouraged, as drilling and blasting operations are eliminated resulting in cost reduction in mining operations as well as avoiding noise and dust pollution.
- The capital cost requirement for the enhanced capacity by way of optimization, de-bottlenecking and modernization of existing plants is much less than the cost of setting up Green field cement plants. Therefore, it is recommended to upgrade the existing cement plants for future capacity additions.
- Conversion of all existing wet process plants to dry process must be taken up on priority to improve their productivity and energy efficiency levels. Soft loans may be provided for their conversion.
- Newer energy efficient and environment friendly technologies like horizontal roller mills, fluidized bed kiln systems etc. need to be studied and evaluated for their successful adaption by Indian cement industry.
- Various measures towards modernization, technology upgradation, pollution control and energy conservation taken up by the industry should be given further boost. For this, custom tariff may be relaxed on import of equipment.
- Use of combustible wastes including scrapped rubber tyres should be promoted by providing fiscal and financial incentives similar to those granted for other non-conventional energy generating systems.
- Production of blended cements for energy conservation and reduction of GHG emission must be given special emphasis. However, this calls for assured availability of good quality dry

flyash. For this, flyash must be continued to be made available free of cost to the cement industry.

- Cement kilns are ideal incinerators for using waste oil sludge and refuse derived fuel (RDF) from municipal solid waste. The municipalities must therefore be encouraged for setting up facilities to produce RDF. Proper technologies, however, need to be developed for effectively converting these wastes into potential sources of fuels. R&D organizations like NCB must be provided financial support to carry out the developmental work.
- Development of clean coal technologies such as desulphurisation of high sulphur lignite and beneficiation of high ash coals require financial support for effective use of such fuels.
- Cement industry has good potential to recover waste heat from kiln exit and cooler vent gases and convert it to electrical energy by setting up cost effective waste heat recovery based co-generation power units. This would help in conserving the fossil fuels and reduce the global warming effects. A waste heat recovery cogeneration plant is being installed in one of the cement plants as a demonstration unit. In view of high capital cost, incentives given by Government agencies for non-conventional energy sources should be extended to this technology also for setting up more such plants in the country.
- In order to be competitive in the international market, the industry has to adopt highest quality standards. Plants are already making all efforts towards acquisition of various international quality systems and certifications to meet this objective. Further, alignment of Indian standards on cement with corresponding international standards within a reasonable time frame will give a boost to cement export.
- Benchmarking of various performance indicators would encourage plants to strive for achieving higher energy efficiency and productivity levels. It will give them a chance for inter-firm comparison and adopt best operational practices to be at par with global level performance and standards. Such studies should be encouraged by providing fund support for generation of extensive database.

- The manpower productivity has significantly increased due to introduction of state-of-the-art-technology and higher operating efficiencies as well as increased time utilization factor. However, this calls for further advanced training and re-training of plant personnel to meet the changing needs of the industry.
- The total expenditure on cement R&D activities is presently only 0.11% of the sales turnover of the industry, which is far below the expenditure on R&D activities in some of the developed countries. This gap in the R&D investment needs to be bridged by allocating more funds to R&D organisations. Adequate funds of the order of Rs.200 crores must therefore be made available for the specific areas of research directed towards energy efficiency, pollution control, environmental excellence etc.

BULK TRANSPORT, CEMENT EXPORT, CEMENT IMPORT AND WTO

SUB-GROUP – III



Bulk Handling Terminal, Kalamboli, Mumbai



Bulk Handling Terminal, Kalamboli, Mumbai



RMC Plant

III. BULK TRANSPORT, CEMENT EXPORT, CEMENT IMPORT AND WTO

1.0 Introduction

1.1 As India integrates with the rest of the world, Indian industry needs to look at the implications of the globalization. The Cement industry needs to prepare itself to face the challenges likely to be encountered, as the Indian trade policies align with the rest of the world. The sub-group therefore focused on the three key issues namely; use and transport of Cement in bulk, Exports, and the implications of WTO on the Indian cement industry arising out of the policy of globalization, which may directly affect the cement industry.

1.2 The industry, with a capacity of nearly 130 mn.t has more modern plants than US and Europe. However, it is still primitive in usage, transport, and storage of cement and its impact on downstream industries, like the nascent RMC industry and the construction industry. The industry, incidentally, is one of the highest generators of wealth and employment if one considers it's secondary and tertiary impacts. While Indian cement industry is technologically as advanced as anywhere in the world, its cost competitiveness is influenced by the competitiveness of industries providing key inputs like coal, power, and transport. These basic infrastructure industries need to support the cement industry by providing inputs of international quality similar to what other international cement players receive, to create a level playing field, as the industry moves towards competing with them in both the international and domestic turfs.

1.3 The competitiveness of the industry is a key issue, and the impact of costs such as, cess on limestone, power costs, railway freight and taxes & duties come into sharp focus. These costs, not in the control of the cement industry, account for high percentage of the final cost. These costs also restrict the industry's performance and growth and have a direct bearing on exports. Despite the industry's state-of-the-art technology in cement manufacture, these costs expose the industry to threats from imports.

2.0 Bulk Cement Transportation

2.1 In the developed countries, more than 90% of cement movement is in the form of bulk whereas in India, it is less than 2%. An experiment was initiated some time ago by the Government of India, needs through a Joint Sector company, The Bulk Cement Corporation (India) Ltd., to set-up a pilot project to

create a rail based Bulk Terminal. Around the same time, another cement company, Gujarat Ambuja Cements Ltd., also started a sea-based cement terminal in Mumbai. With the setting up of the two cement terminals, the concept of bulk cement received a fillip in the city of Mumbai.

2.2 The concept of bulk cement transport prompted the growth of RMC industry and because of this, several large infrastructure projects in Mumbai including more than 30 flyovers and the Mumbai-Pune Express Highway, could be completed in a record time. This also prompted other manufacturers to start supply of cement in bulk, and now bulk terminals have been set-up in Mangalore, Surat and Bangalore. Except for the initial growth of bulk terminals in Mumbai, by and large, further growth of bulk terminal/transport (both sea-based and rail-based), has been unsatisfactory and there is a need to review the measures required for increasing cement transportation in bulk.

2.3 Benefits of Bulk Transportation

2.3.1 Bulk cement is cement transported, handled and used in the bulk form without packing. Cement is transported in special bulk carriers either by sea or by special rail wagons. It is then stored in silos at a bulk terminal. From the terminal, it is transported in specially designed bulk tankers/trucks, which then pump the cement into the site silos installed and normally attached to the batching plant at the customer's site or the RMC unit. The whole process, while involving substantial investments in material handling equipment, is clean and efficient and has several benefits:

- According to conservative estimates, 2% loss due to seepage & bursting of bags is noticed when cement is transported in conventional bags. Considering a production of 100 mn.t, this amounts to a loss of 2 mn.t of cement. The Indian economy has to directly or indirectly pay for this wastage of valuable national resource.
- Dust emission at construction sites, railway yards, cement handling godowns, and transportation by trucks is now a major concern in cities. The ensuing suspended particulate matter (SPM) levels lead to crores of rupees being spent by the government towards health related issues. Use of bulk cement through modern bulk terminal and related equipment significantly contributes to reduction in pollution levels.
- Plastic bags, which are currently the preferred mode of packing used in India are not environment friendly, since these bags are not

bio-degradable. The country also has to pay valuable foreign exchange for the import of raw material used for these bags. To pack 100 mn.t of cement in plastic bags, approximately 1,40,000 tonnes of Polypropylene (PP) /High Density Poly Ethylene (HDPE) granules are used. Apart from being non-biodegradable, it costs about Rs. 700 crores per year.

- A major advantage of using bulk cement is the consistency in quality. The construction engineers have no control on consistency when bags stored in godowns are used. These bags could be from various sources and could have been stored for varying periods of time. Since, *last in-first out* principle is typically followed, sometimes poor quality old cement (cement is perishable and the quality deteriorates over time) gets into critical projects.
- The shelf life of cement is increased when used in bulk and is stored in silos. Also, the need for storage space is considerably reduced resulting in savings in multiple handling and storage costs
- A substantial portion of the cost of an infrastructural project is the interest cost on funds. Speed of construction is therefore critical and hence, bulk cement transport is imperative. A living example is seen in Mumbai where rapid rate of construction of flyovers has been made possible only with the help of modern construction techniques, which include Ready Mix Concrete and Bulk Cement. Bulk Cement, in fact, is a necessity for the RMC industry, and has acted as a catalyst in the development of RMC industry.
- Bulk cement has significant advantages for the carrier. For the railways, it ensures captive business. It also helps the Railways to leverage on its investments, since special wagons, owned by the private investor, are used. Typically, the private sector also invests in a captive yard and siding for receiving cement, as well as in arrangements for loading. Not only does this create exit barriers for the investing producer from the Railways, the infrastructure created helps Railways to reduce congestion in the over-loaded public rail-yards. This helps the railways to optimize existing infrastructure for better services to smaller/other industries.
- The railways also get benefit by higher transport efficiency because of faster loading and unloading, better track availability and significantly better haulage to freight and payload ratios. Added advantage to the country and the Railways is fuel savings. This

aspect becomes more relevant, considering recent trends of reduced competitiveness of railways vis-à-vis road. While cement industry is one of the major freight earner for the railways, the share of rail movement of cement has been steadily declining. Promotion of Bulk terminals could help counter this trend, and improve competitiveness of railways as compared to road.

- Sea-based bulk cement movement results in faster turn-around at the Port leading to increased import capacity and to more business and more revenue. The consequent increased business and efficiency help improve the competitiveness of Indian Ports. Needless to say that the infrastructure capacity created is also useful for exports (as also for imports).
- Despite all these benefits, Bulk Cement Transport as the preferred mode to transport cement is yet to gain momentum. While the example of Mumbai can be replicated, the speed of replication is far from the desired levels.

2.4 Bulk Terminal and Its Limitations

- Alongwith the development of the market, it is necessary to simultaneously take measures to make Bulk cement available. This requires conventional and innovative methods to encourage setting up of Bulk terminals, ready to supply increasing quantities as the market develops.
- Bulk Terminals can be rail based or sea based. If the concept of bulk has to grow, both kinds of terminals have to be developed. Rail based terminals, particularly required for serving the vast hinterland, would also serve cement transportation for exports from in-land factories to the ports. Sea based terminals on the other hand are useful alternatives for movement from factories near the coast.
- Bulk cement terminals have a limitations on account of their high capital costs. Since they are mere storage units, with sophisticated material handling machinery, (and most have packing plants as well) certain benefits, which would be available to, say, grinding units are not available to these units. For instance, they do not have the benefit of interstate concessional rate of sales tax under form 'C' since they do not process or manufacture. Also, benefits from the state governments given to industrial units are not available. Besides, by the very concept, bulk terminals are likely to be near urban centres, and no backward area benefits are available. On the contrary, land cost becomes a major constraint, adding to the high

capital cost and being closer to urban centers, these also have higher wage bills.

- All laws and rules applicable to factories and industrial units are applicable to Bulk terminals. In the era of liberalisation there are some 30 odd inspectors and agencies that control the compliance of various rules for industrial and commercial establishments. These rules and regulations, do not apply to packed cement conventionally transported through public railway yards or by road. These issues create a substantial disincentive for suppliers to invest in Bulk transport terminals. As suppliers hesitate to put up infrastructure for bulk movement, the availability of cement in bulk remains limited, and so does the user base for bulk cement and RMC.

2.5 Bulk Supply and Ready Mix Concrete (RMC)

2.5.1 There are two key drivers for the growth of Bulk cement. The first is driven by the market and users and second by the supplier and related agencies, (such as Transport). In most countries, Bulk cement has grown because of the market demands. In contrast to India, in most of the developed world, the construction sector is organised and the Ready Mixed Concrete (RMC) industry is well developed. Bulk Cement therefore makes economical sense to the users.

2.5.2 In India, barring large projects and organised consumers, the impetus to change the consumer's preference from bags to bulk, is low. Where bulk cement is not available, RMC units and large projects in many instances actually have to convert cement from bags into bulk before they use the same in their batching plants. As stated earlier, non-availability of Bulk cement itself, in many instances, inhibits the conversion from Bags to Bulk.

2.5.3 Therefore the focus is on steps required to help in change the market from bags to bulk and on economic issues that would help in creating and enabling situation that would trigger more Bulk Terminals, consequently, ensuring availability, as users switch over from bags to bulk. This should also help in exports. It is equally important to ensure that the existing bulk terminals, such as those in the highly visible market of Mumbai are used to set an example for other centres to emulate.

2.5.4 The growth of the RMC industry is closely linked with the growth of Bulk cement and vice versa. Particularly for urban centres, RMC usage ensures many benefits – even for smaller consumers. Though initially, the RMC industry grew rapidly, the industry's growth subsequently did not keep the desired pace,

and indeed, has started to decline. Many units have closed down or are in the process of doing so, as they are unable to compete with site mixed concrete. The key issues is that this industry is in the organised sector. In addition to large investments on plant and machinery & land, the industry is also subject to taxes and duties.

2.5.5 Compared to this, in the unorganised sector, where site mixed concrete is made, typically, public land is used to dump sand and aggregates, normally free of charge, and no sales tax, or works contract tax is applicable on the concrete produced, (which is generally much poorer in quality compared to RMC).

2.5.6 Considering the eventual cost of frequent repairs required for poor construction, the outflow of wasteful expenditure for the nation's economy would reduce, as RMC would bring about quality in construction and move the construction industry in line with international practices, including development of demand for Bulk Cement. There are significant long term financial benefits in terms of quality and durability.

2.6 Bulk Supply and Pre-Cast/Concrete Block Industry

2.6.1 Another closely related industry is the Pre-cast industry. In the developed world, pre-cast members are extensively used to increase speed of construction in a modular way. These pre-cast elements are made to strict quality specifications and are particularly useful where time (speed), labour productivity and quality are important. These are extremely relevant in mass-housing and large construction projects. Under the present circumstances of focussed thrust on Infrastructural development and mass housing, there is substantial potential for development and growth of this industry.

2.6.2 Like in the case of RMC, the reason for the Pre-cast industry, (and related technologies, like the 'Tunnel Form' technology) not developing is that it is in the organised sector. Consequently it is subject to all taxes and levies. Also, a precast yard requires land and lifting equipment (like cranes) and transport to carry precast elements to the construction sites. Since the demand potential exists near urban centres typically, the industry need to be near urban centres, where land is expensive.

2.6.3 Yet another closely related industry is the 'Concrete Block' industry. Concrete blocks are essentially replacement to conventional bricks. Manufacturing of clay bricks consume fertile soil and also create pollution.

Several countries like China have banned use of clay bricks and the world over concrete block is the most favoured masonry unit due to quality advantages. In India 180 billion clay bricks are used per annum consuming about 540 mn.t of fertile soil every year. This leads to creation of 65000 acres of barren land every year. Besides, about 30 mn.t of coal is consumed per year to make these bricks, which generates about 30 mn.t of CO₂ emissions, into the atmosphere every year.

2.7. Recommendations for Improving Bulk Cement Transport

2.7.1 Increasing Usage of Bulk Cement

- To ensure quality and rapid urban development, RMC units should be provided land on lease by urban authorities. This would help reduce transportation costs and ready availability resulting in popularising RMC usage.
- RMC be charged only those levies / taxes at par with site mixed concrete (for the finished product as also for inputs). Present attempts to use RMC production for generating additional revenue should be deferred, at least till the Industry develops and reaches a level of maturity.
- RMC units should also be given infrastructural status, particularly where they need to import machinery. This is in line with the status given to infrastructure projects like roads where the same or similar machinery is used by the contracting companies.
- Usage of RMC and / or Bulk Cement should be made mandatory in all large cities, say with population of more than 25 lakhs for all constructions beyond a certain size, say 500 sq. mts. Similarly, various Government departments involved with construction should make use of RMC and bulk cement mandatory for projects costing Rs One Crore and above.
- The pre-cast industry be nurtured and not subjected to taxes for the next five years. Additional incentives, which include, help in providing land free of cost will accelerate the growth of this industry.
- Substitution of 25% of clay bricks by concrete blocks would mean an annual consumption of approximately 9 mn.t of cement and 5 mn.t of Flyash which is normally used alongwith cement in the manufacture of Blocks. This could be a target to be achieved in the next 5 years.

- Currently, bags packed at Bulk Terminals attract an excise duty lower by Rs.18 per tonne compared to what is sold as Bulk. Considering the need for catalysing bulk usage, it is recommended that a substantially higher differential in excise duty be created compared to what is available for bags. This would help companies to set up bulk terminals, market more effeciently leading to introduction/penetration of Bulk cement.
- Further, Bulk cement when used in large infrastructure projects, like concrete roads, and canal linings, should be given excise relief in line with the relief given for bags packed at bulk terminals. ·
- The bulk road carriers for cement should be considered as part of infrastructure equipment and should be exempted from excise duty and sales tax.

The above measures are primarily consumer / market related with the objective of rapidly developing a market for Bulk cement. Once the market is developed, the market itself would start driving further development of Bulk Cement.

2.7.2 Creation of More Bulk Terminals

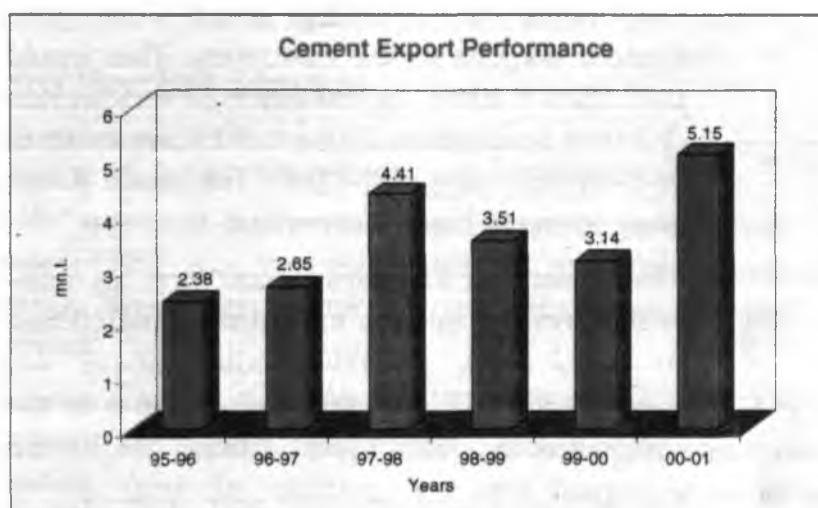
- It is recommended that all unnecessary controls for setting up bulk terminals be reviewed. Bulk Terminals should be given time bound speedy approvals and permissions related to environment, ports, licences (BIS) etc. Various additional expenses incurred, for instance, for licence fee for BIS and other agencies need to be exempted.
- Wherever possible, Bulk terminals for urban areas should be given the same status and benefits at par with industrial units in backward areas. In addition, low cost finance is necessary to provide the required impetus.
- Investments made by the industry in bulk terminals must be passed back so that a reasonable return can be expected. One of the ways to pass this investment is through freight rebate. A re-look is required at the benefits that Railways and Port authorities derive from Bulk cement transportation. In the case of railways, the rebate of 22.5% offered on the freight is neutralised as the railways take away a substantial portion of the same in maintenance and other charges. The other rebates, such as 'own your wagon' scheme, point-to-point movement and volume discounts are not available for bulk cement transport.

- Considering the business potential and potential to improve efficiencies, the railways need to increase the rebate substantially and make all other schemes and rebates applicable to Bulk cement transport. The differential tariff thus created between conventional rail movement and Bulk cement movement would create a strong impetus to encourage bulk transportation.
- For Rail based Bulk terminals, one of the key issues is the land and siding cost. Since Bulk Terminals are generally close to urban centres, the cost of land for the siding becomes prohibitive. It is recommended that the Railways, which are benefited substantially, may consider providing land and siding for setting up such terminals in urban centres. This would reduce the high investment costs of bulk terminals and encourage more terminals to come up.
- Since Bulk Cement movement requires specialised wagons, a Bulk Cement Wagon Corporation or an agency similar to the Container Corporation may be set-up, which would own and service Bulk Cement wagons to the customers. This would ensure optimum utilisation of these wagons amongst various manufacturers and for different destinations. This would bring down the investment costs and running costs of the Bulk Terminals. A consortium of cement companies can build the terminal.
- The Ministry of Railways should form an inter-disciplinary group with a focused mission to evaluate possibilities of moving cement in Bulk, using general-purpose railway wagons with minor modifications. This would be beneficial even to the Railways as the option would present more flexibility for the railways.
- For sea-based terminals, the port authorities need to review and reduce the high port charges, the premiums charged for the storage land provided and other charges levied. This would not only lead to more coastal movement of bulk cement, but would also encourage investment in the development of coastal and port infrastructure, making Indian cement more competitive for exports.
- It is recommended that Mumbai, Bangalore, Kolkata, Hyderabad, New Delhi, Pune, Mangalore and Chennai be identified as centres for focused development for RMC and Bulk Cement, along with targets for setting up at least one bulk terminal in locations where Bulk terminals do not exist. This selection is based upon expected market growth; suitability for development of Sea based terminals (based on the draft available) and for Rail based terminals.

3.0 Export of Cement

3.1 Many issues, which relate to export of cement from India also apply to import of cement into the country. Basically, if the country has enough cement to export, the need for imports should arise only if there are certain special quality cements, which the country does not produce, or when the industry is not competitive to face the international players both in the domestic and international markets. The fundamental issue, then is of competitiveness of the industry – in terms of the costs and efficiencies in its control and the competitiveness of the country– in terms of the quality of inputs, their costs, duties, levies, taxes, etc., and the exchange rates.

3.2 The country actually has the necessary wherewithal to excel in exports. Indeed, Cement export has been identified by the government as an extreme focus item, and the Ninth Five Year Plan had targeted 8 mn.t of cement exports. The cement export performance has been half of what it could have been. The status of cement exports during the last few years is shown in the figure below:



3.3 Exports have grown to touch 5 mn.t. despite the difficult international cement market situation because of the South East Asian economic slow down. However, the country could have achieved more exports. India can currently export 10 mn.t of Cement & Clinker and earn US\$ 250 million in foreign exchange.

3.4 India's Strengths and Weaknesses for Cement Exports

The key issues, which have an impact on Indian cement exports are:

3.4.1 Strengths

3.4.1.1 Of the nearly 130 mn.t of cement manufacturing capability, more than 75% comprises of modern state-of-the-art cement plants comparable to the best

in the world. These plants have efficiencies of power, thermal energy usage etc, comparable to similar plants elsewhere.

3.4.1.2. There are over 120 plants spread across India, many of which are in coastal areas, and these plants are manned by highly experienced and trained personnel. All the raw materials, including cement grade limestone is indigenously available in abundant quantities, and the quality of Indian cement produced is comparable to the best in the world. In addition, sufficient surplus of cement is available after meeting the entire domestic requirements.

3.4.1.3 All the positive factors make a strong case for Indian cement, competing in the international markets and earn substantial foreign exchange.

3.4.2. Weaknesses

There are two main weaknesses, which the industry faces against the other world market players:

- High costs which are not in the control of the industry.
- Extremely poor infrastructure- specially Sea and Rail transport.

3.4.2.1 The high costs relate to not just the actual costs, but also the indirect costs due to poor quality of inputs. The industry of course spends money to buy coal at prices, which are significantly higher than international prices. Likewise, not only is the cost of power high, its quality in terms of outages, and even consistent frequency and voltage have remained a limitation. The extent of state levies on cement exports and cost compared to other countries is given below :

State Levies and Taxes on Cement Exports

Sl.No	Item	Rs/t. of Cement (Avg)
1	Royalty and Cess on Limestone	62
2	Royalty on Coal	25
3	Royalty on Gypsum	1
4	Duties on Power Tariff	26
5	Sales Tax on Stores & Spares for Cement Production	21
	Total	135
	Indian Costs Compared to competing Countries	
1	Interest on Export Credit	41
2	Power Tariff	168
3	Port Charges	250
	Total	459
	Overall Impact	594

3.4.2.2 The poor infrastructure also adds to costs. Arrangements for Bulk movement at ports do not exist and there are very few bulk terminals. In addition, the loading rates, typically, 1,000 tonnes per day do not compare favourably with international comparison of 8,000 - 10,000 tonnes per day.

3.4.2.3 In addition, there are costs for the uncertainties related to the availability and efficiency of infrastructure, (both ports and railways). Also, the cost in moving cement to the ports, as also the port charges and other charges are very high.

3.4.2.4 Most countries have rationalised their tax structures, and have a single point value added tax which varies between 5 to 10%, as compared to Indian cement industry, which has taxes and duties - Excise, Sales Tax, Royalty, Cess etc. Consequently, the domestic realisation itself becomes low, and the domestic realisations are not able to support the competitiveness required for exports.

3.4.3 Competitiveness:

3.4.3.1 The key issue in exports is competitiveness and as in many commodities, price fluctuate over a wide range. International players make profits wherever possible and on some occasions, they work on the basis of marginal costs. The extent of variations is shown below :

FOB Price Per Tonne (US\$)

	Cement	Clinker
September 1996	53	41
September 1997	45	33
September 1998	27	17
September 2001	21.5	15.5
Approx. Manufacturing Cost	38	31

3.4.3.2 The international players are able to sell their cement at below the manufacturing costs due to :

- Advantage of internationally priced costs and quality of inputs (such as transport, power, coal, etc.),
- Support of significantly lower taxes and duties in their respective countries.

- **Significantly higher domestic prices to help them sustain their exports.**

3.4.3.3 The prices of cement as prevalent in some countries are indicated in the table:

Ex-Factory Prices of Cement in Selected Countries

Country	Rs/Tonne of Cement
Mexico	4800
Europe	3000-3200
USA	3450
Sri Lanka	3460
Thailand	2100
Indonesia	1900
India	1200-1400

As can be seen, the ex-factory prices in India are the lowest in the World.

3.4.3.4 Although, the Government has been encouraging the industry to export more, the support has not been forthcoming in terms of any financial benefits. In fact, Duty Entitlement Pass Book (DEPB) rate for cement was reduced to 7% from 8% from April 2001. On the other hand, basic custom duty on cement was reduced to 25% from 35% to encourage import of cement into India.

3.4.3.5 Despite the best efforts, exports have not grown at the projected rate. It can be observed from the cement/clinker exports given in the table, that value of exports has not been commensurate to the quantity exported. The industry which has invested substantial capital in potential countries for brand promotion had to export at a price less than the marginal cost. This situation may be difficult to sustain for long. In fact, the exports for the first half of the current year have been only 2.25 mn.t, and the figure for the total year may drop from 5.15 mn.t to about 4 mn.t.

Year	Exports (Mn.t.)	Value (Million Rs.)
1997-98	4.40	5345.5
1998-99	3.51	3669.0
1999-00	3.14	2700.0
2000-01	5.15	3746.5

Source : CMA & CAPEXIL

Therefore, it is important that the Government and the industry look at cement exports strategically, and create a level playing field for the industry to increase exports during the X Five Year Plan.

3.5 The International Scenario

3.5.1 The international scenario is fiercely competitive, and is expected to remain so during the first part of the X plan period, till the slow-down of the South East Asian region is reversed. This slow down has resulted in almost 50 mn.t of surplus availability in the region's market and this has resulted in severe competition.

3.5.2 Despite the competition, world trade of cement is not expected to decline. Indian cement industry which contributes to a miniscule portion of this trade has an opportunity to capture its rightful market share, and earn valuable foreign exchange.

3.5.3 One important issue is related to exports to Bangladesh. India should have ensured that entire requirement of around 4 mn.t per annum of Bangladesh is met from India. However, exports to Bangladesh have been showing a declining trend.

3.5.4 A forecast of the Asian market indicates that India can export 9 to 10 mn.t. of cement, and earn US Dollars 250 million. During the X Five Year Plan period, India should set an export target of at least 15 mn.t. For this to happen, however, an enabling, enduring competitiveness is required.

Asian Forecast for Cement

Country	Consumption Per Capita (kg)	Production Capacity (mn.t.)	Consumption (mn.t.)	Import (mn.t.)	Export (mn.t.)
Bangladesh	36	3.40	4.81	4.71	-
China	429	576.00	560.00	-	16.00
Hong Kong	690	2.50	4.70	3.60	0.35
India	98	110.00	101.00	-	9.00
Indonesia	91	34.90	20.10	-	13.80
Japan	562	81.00	70.00	1.50	7.50
Korea	970	52.26	48.00	0.61	4.87
Malaysia	439	14.50	11.50	-	3.00
Mynamar	48	0.35	2.40	2.10	-
Singapore	1486	2.00	5.10	5.10	0.01
Sri Lanka	436	1.35	2.50	1.15	-
Thailand	315	30.00	19.40	-	11.00

3.6 Recommendations for Boosting Export of Cement

3.6.1 The key and fundamental issue for boosting cement export is the creation of a level playing field for the industry in comparison with other countries. To achieve this, following measures are recommended :

- The industry must be assured of inputs, (Power, Coal & Fuel) at international prices and conforming to internationally available quality. Alternatively, the government should allow duty free Fuel Oil & Coal to the extent of 50% of Cement Clinker exported, as against 20% now.
- The state must build, or help the industry build, infrastructure facilities like bulk cement terminals (both rail and sea based) to become more competitive against international competitors. Alternatively, the port charges and railway freights, particularly for export consignments must be reviewed with respect to those prevalent in competing countries. Specifically the railway tariff for cement and clinker export to adjoining countries should be reduced by 50%.
- A sharper focus is required for exports to neighbouring countries, particularly Bangladesh. For this purpose, all avenues, including usage of the river and inland water routes need to be energised. Wherever possible, cement rather than clinker (which is lower value-added) must be exported. A bulk terminal be set up at a strategic location in Bangladesh to be catered from both the rail as well as the river routes. Considering the possible difficulties involved, at least one more Bulk terminal should be set up in Kolkata to be fed by the river route, rail route and possibly the sea route as well.
- The industry depends upon the government for many trade issues in terms of trade arrangements. In this context, the government should pursue with Bangladesh to accord preferential rate of custom duty on import of cement and clinker from India on the same lines as that of Sri Lanka. Further, railways may also be requested not to impose custom examination charges of Rs.17 per MT on the cement to be exported to Bangladesh.
- FTA facility be extended to countries in Africa, Mauritius etc.
- The government should rationalize various state and central levies. Alternatively, for each tonne of cement /clinker sold in the export market, some quantity of cement sold in domestic market could be exempted from Excise Duty.

- In case the level playing field cannot be created, the import duty on cement be increased by at least 10% for avoiding dumping of cement from outside.

4.0 Imports and World Trade Organisation (WTO)

4.1 The Indian cement industry is capable of competing with international players in both the international as well as domestic markets, provided they get a level playing field, in terms of currency rates, quality and cost of inputs, infrastructure, as well as taxes and duties.

4.2 The industry is of the view that whereas the government policy of opening up is to be supported, and the guiding principles of WTO are to be followed. It is necessary, that the government looks at how other countries have been invoking Non-Tariff barriers (despite WTO) and consider building up similar barriers in terms of quality specifications, registration etc.

4.3 While Indian cement compares favourably well with other cements in the world, this may not necessarily be true for other countries. Indeed, Indian cement enjoys a premium over Chinese cement in countries where cements from both the countries are available. For this purpose, unless imported cement is carefully tested for the minimum norms of BIS, it could potentially create a difficult situation and addressing quality complaints related to imported cements would be extremely difficult under the legislations related to packaging and quality.

4.4 The Government should consider all the WTO compliant duty structures and subsidies (for example freights) which can be made applicable for the benefit of the industry, to ensure that the industry remains efficient and competitive compared to international players with similar benefits.

4.5 Measures for Cement Imports

- The Government should guard the industry against dumping of cement from other countries which support their cement industries by allowing subsidy to boost their export, through suitable anti-dumping legislations.
- It is recommended that the same benefits should be made available to Indian cement companies as those available to foreign cement manufacturers in their respective countries, such as :
 - Taxes & Levies
 - Raw material and power

- Freight and Local costs
- Incentives & Duty draw backs
- Finance Costs
- Non-tariff barriers (such as quality specifications).

5.0 Inland Waterways Transport (IWT)

5.1• IWT system is an energy efficient and cheap mode of transport for a large number of commodities such as steel and steel items, coal, cement/clinker, fertilisers, stone, oil, jute, foodgrains. It also has a high potential for employment. India has navigable waterways, totalling about 14,500 km. out of which 5,200 km. of major rivers and about 485 km. of canals are suitable for operation of mechanised crafts.

5.2 The Central Inland Water Transport Corpn., (CIWTC) was set up by the GOI in 1967. The Government has been placing stress to develop waterways so that the already overstretched Rail and Road transport systems get some respite, besides economical and ecological advantages of the IWT.

5.3 Inland Waterways Authority of India (IWAI) was set up in October 1986 to coordinate, develop and maintain the waterways in India. Three waterways have been declared as the National Waterways (NWs) viz., Allahabad-Haldia, Sadiya- Dhubri and West coast canal. Although nearly 15 years have passed since IWAI was set up, no worthwhile development has taken place for one reason or the other. In the later half of the last year, a trial run of a half loaded vessel took 35 days to cover distance of about 1600 kms from Kolkata to Allahabad. Such delays discourage the potential users of IWT.

5.4 Merits of IWT

5.4.1 IWT can catalyse multimodalism by linkages to the hinterland surface transport and coastal shipping. The IWT mode is most economical, eco-friendly, energy efficient, employment intensive and has potential for development of tourism. One major advantage of IWT is that no land acquisition, dislocation and rehabilitation of people are involved.

5.4.2 As per the Bhagwati Committee report on IWT, the ratios of cost comparison of the 3 modes are as under :

Mode Item	IWT	Road	Rail
Capital Cost	1	3	9
Maintenance Cost	1	4.5	9.6
Operational Cost	1	4	2

5.4.3 National Transport Policy Committee reported employment intensiveness ratio for a given investment as under:

IWT	Road	Rail
23.4	14.8	4.3

5.4.4 Fuel efficiency of IWT mode is high as for a cargo movement of 1000 tonne-km, IWT, Rail and Road transports require 5.6, 11.0 and 40 litres of HSD respectively.

5.4.5 Despite lower haulage cost and other inherent advantages, the benefits are not fully exploited. The main problem is that the basic infrastructure has not been developed viz., creation and maintenance of the fairway (45 m wide and 2 m deep) channel and the river terminals with suitable cargo handling facilities as also the navigational aids along the channel. In addition, adequate entrepreneurs for operating barges on these waterways are not yet forthcoming.

5.4.6 IWT has been exploited by many other countries in a big way in view of its inherent advantages as below :

(1990 figures)		
Country	Length of Waterways (km)	Cargo Carried mn.t.
China	107800	312
USA	42000	600
Belgium	1960	91
France	8568	76
Germany	6641	239

5.4.7 In India, with 14500 km. of waterways, a small quantity of 1.8 mn.t (excluding iron ore local cargo in Goa) is moved by IWT, which constitutes less than 0.5% of total national cargo. The percentage of cargo moved by IWT is 13% in USA, 17% in China, 24% in Germany, 48% in Netherlands

5.5 Scope for IWT Movement for Cement

5.5.1 Bangladesh imports nearly 4 mn.t. of cement/clinker annually and the cement demand there is growing at the rate of 8 - 9% annually. However, India is exporting about 10 - 12 per cent of this (about half a million tonne every year). Similarly, cement consumption in North Eastern States of India is about 1.5 mn.t. at present. One of the reasons for meagre export to Bangladesh is high transport cost coupled with infrastructure bottlenecks. Both the rail and road routes are badly congested at the border points and unplanned inordinate delays take place. It is reported that these modes are still cheaper than IWT.

5.5.2 There is lot of potential for movement of cement/clinker not only for exports to Bangladesh but also the North-Eastern States. Initially about 3 mn.t. of cement/clinker could be moved by IWT as per the following details :

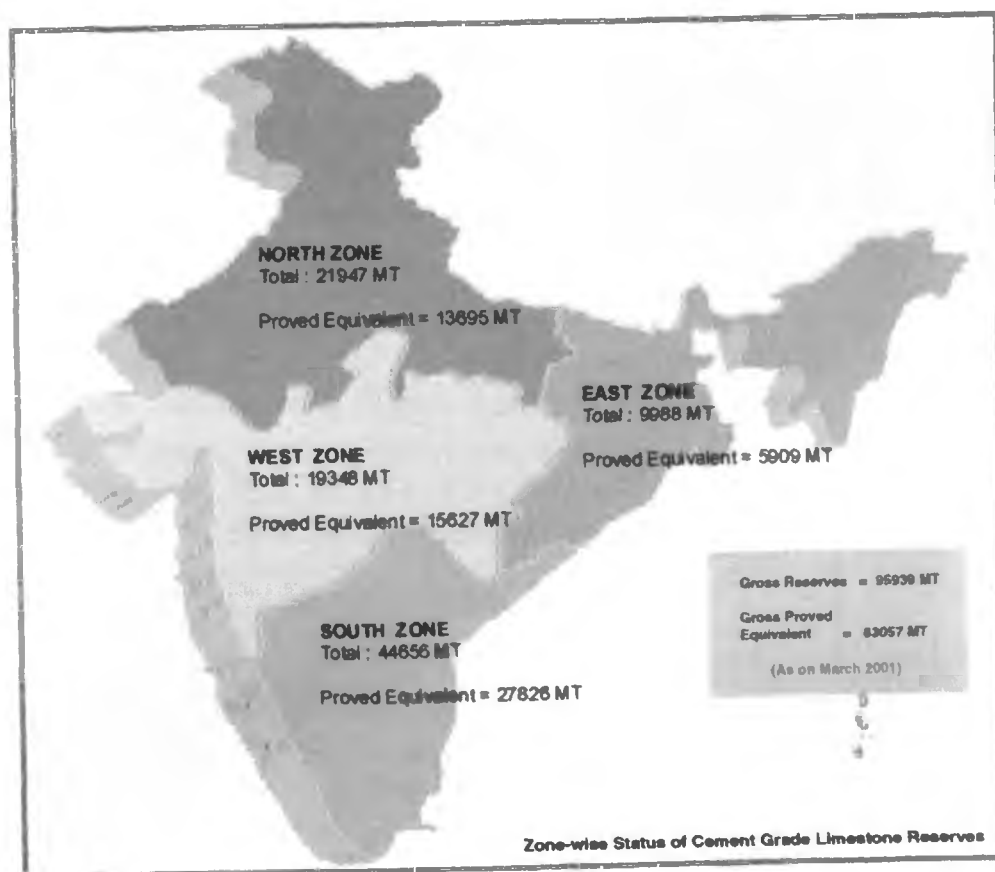
- Cement/clinker export to Bangladesh - 2.0 mn.t. .
- Movement to North Eastern Region - 1.0 mn.t.

The above potential can be realised through the following:

- Plants such as, Satna, Jaypee Rewa, Kalyanpur, Prism can move cement/clinker by using NW-I upto Kolkata/Haldia and onward movement to North East/Bangladesh by suitable means including IWT. (NW-2 and Indo-Bangladesh IWT Protocol route).
- Plants in Bilaspur cluster and in Orissa can move cement upto Shalimar (Kolkata) by rail and onward movement to Bangladesh and North-East Region by other means, including IWT.
- Potential also exists for moving coal from North-Eastern Coalfields to cement plants and imported coal in some cases.

LIMESTONE INVENTORY AND MINI CEMENT PLANTS

SUB-GROUP – IV



Part - I

LIMESTONE INVENTORY

IV. LIMESTONE INVENTORY AND MINI CEMENT PLANTS

Part I - Limestone Inventory

1.0 Introduction

1.1 National Inventory of Cement Grade Limestone is the basic pre-requisite for planning the strategy for the growth of the Cement Industry. The twin objectives of inventory is to update the availability of the limestone and to bring into focus the limiting factors affecting the availability of limestone.

1.2 The gross reserves of Cement grade limestone stood at 95939 mn.t. as on 31st March 2001 but only 35585 mn.t. of gross reserves are available for present and future use due to various environmental and technological constraints.

1.3 To mitigate this adverse effect of reduced availability, focused efforts are required for proper utilization of 27% of marginal grade limestone. There is also need to review the provisions of the Coastal Regulation Zone and Forest Conservation Act to enable eco-friendly use of enormous reserves of cement grade limestone.

1.4 About 71% of the gross reserves are concentrated in just six states and there is a possibility of further growth of Cement Industry in these areas. Such a growth within the existing clusters may have adverse impact on environment. Studies on carrying capacity have to be conducted within the clusters to assess the environmental load vis a vis the additional cement capacity, based on the available limestone reserves and infrastructure.

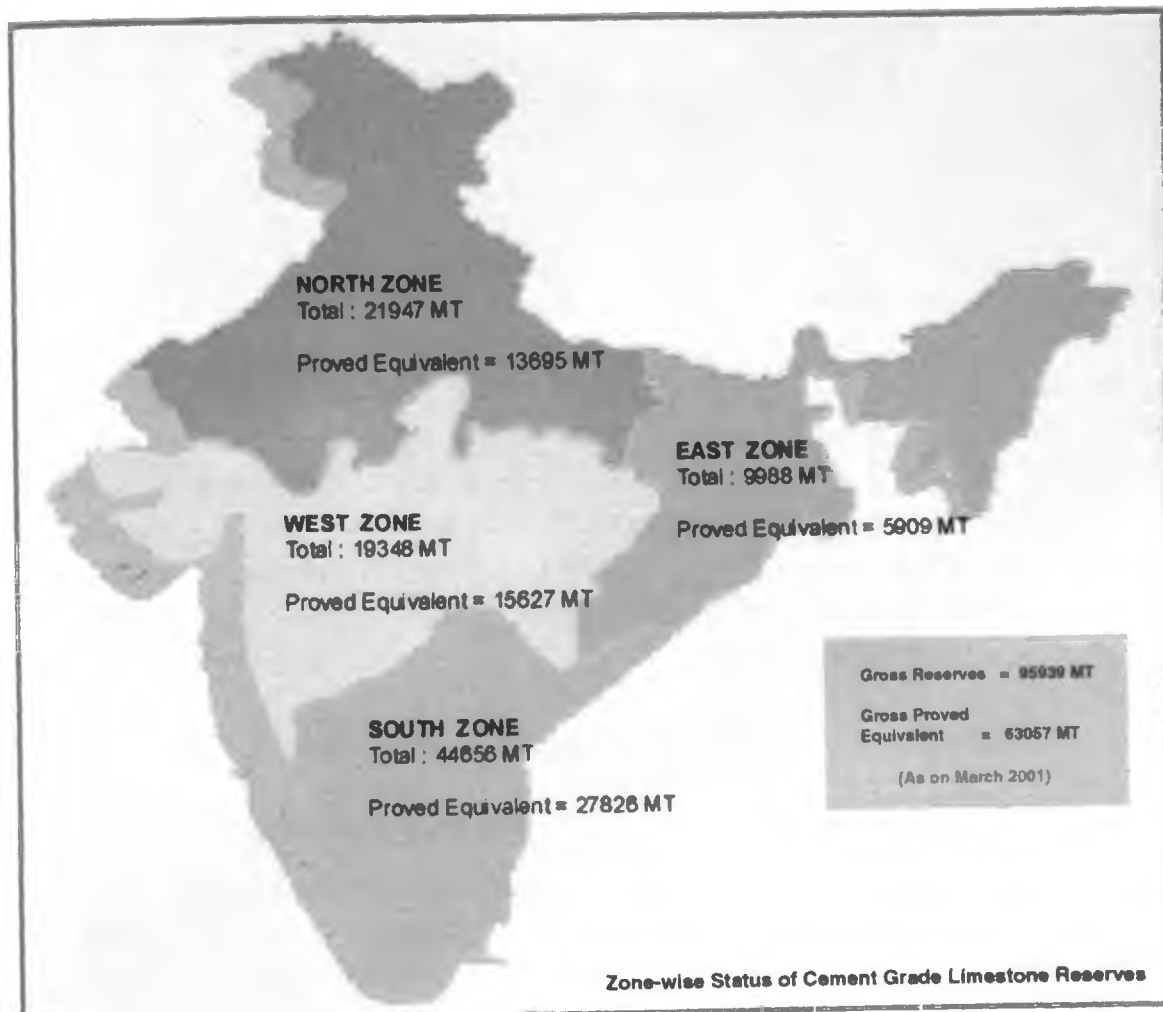
2.0 Status of Limestone Availability

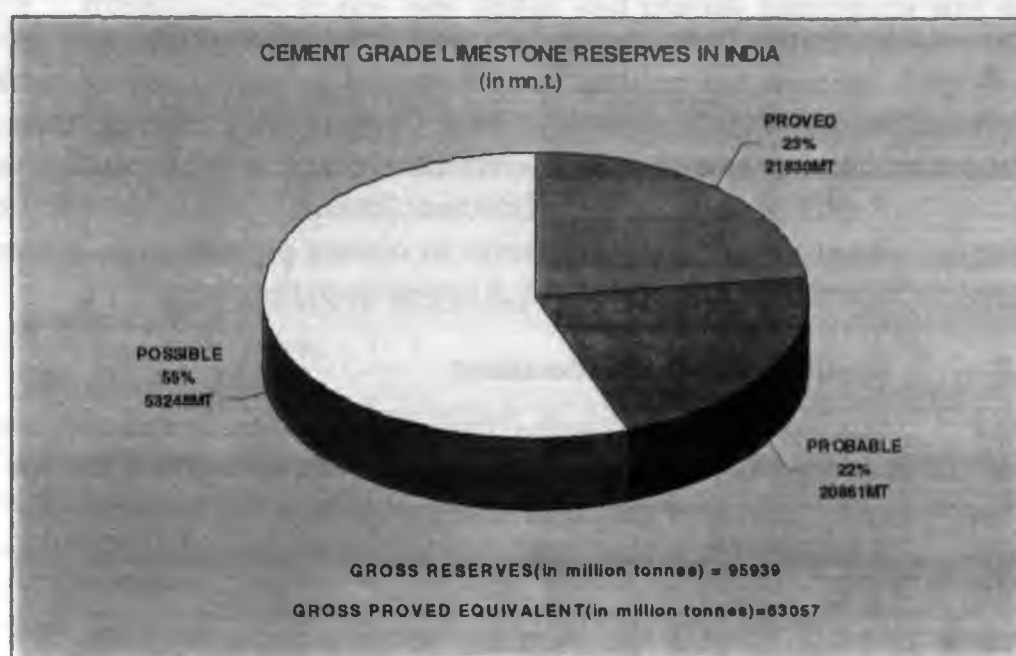
2.1 Limestone is perhaps the most extensively exploited mineral gift of nature and the cement industry is the largest beneficiary of this mineral. Hence, the information on the latest status of availability of cement grade limestone is essential not only for entrepreneurs in making technological and financial decisions intending to set up green field cement plants but also helps planners in formulating the strategy for the growth of the cement industry. Although, many national and state level geological agencies have been exploring such deposits for different limestone based industries, it was only in the late sixties that serious attention was paid towards the assessment and exploration of cement grade limestone reserves in a more comprehensive manner keeping in view the potential for the growth and development of Indian cement industry. National Council for Cement and Building Materials (NCB), the then Cement Research

Institute of India, had taken up updation of the national inventory of cement grade limestone as a continued programmed project since 1974.

2.2 In the year 1974, the total limestone reserves as estimated were of the order of 44,000 mn.t, with only 3020 mn.t (6.8 %) of proved category. As on 31 March 2001, the country's estimated gross reserves of cement grade limestone stand at 95939 mn.t. Out of this, 21830 mn.t (23%) of proved category, 20861 mn.t (22 %) of probable category and 53248 mn.t (55 %) of possible category reserves. The status of cement grade limestone reserves zone-wise is shown in the table below. The proved equivalent reserves of all the categories have been estimated as 63057 mn.t. The substantial increase in reserves have been possible due to the continuous proving of limestone deposits by various national and state level geological agencies.

Zone	State	Reserves in mn.t.				
		Proved	Probable	Possible	Total	Proved equivalent
North	H P	1301.84	1890.10	2703.07	5895.01	3976.45
	J & K	123.22	524.37	4991.15	5638.74	2985.85
	Rajasthan	563.80	3321.29	3711.27	7596.36	4744.34
	Uttaranchal	181.20	1217.19	453.43	1851.82	1259.95
	Uttar Pradesh	327.90	412.02	225.13	965.05	728.88
Total of North Zone		2497.96	7364.97	12084.05	21946.98	13695.46
East	Assam	338.83	244.00	906.20	1489.03	962.73
	Manipur	11.02	2.68	7.70	21.40	16.75
	Meghalaya	547.42	980.41	4779.90	6307.73	3623.66
	Arunachal	0.00	91.00	275.50	366.50	201.45
	Orissa	87.36	95.83	410.55	593.74	359.72
	Bihar	120.22	67.14	658.74	846.10	496.59
	Jharkhand	54.58	55.65	114.16	224.39	150.62
	Nagaland	10.48	111.07	18.00	139.55	97.23
Total of East Zone		1169.91	1647.78	7170.75	9988.44	5908.73
West	Chhathisgarh	2540.49	797.72	1177.86	4516.07	3687.82
	Gujarat	3693.38	6707.99	0.00	10401.37	8388.97
	M P	1588.22	248.53	734.92	2571.67	2129.65
	Maharashtra	888.84	109.52	811.64	1810.00	1371.32
	Diu	48.84	0.00	0.00	48.84	48.84
Total of West Zone		8759.77	7863.76	2724.42	19347.95	15626.61
South	A P	959.41	1442.38	27994.73	30396.52	15966.44
	Karnataka	7692.13	2259.83	2819.53	12771.49	10683.78
	Tamil Nadu	750.46	282.75	454.27	1487.48	1175.52
Total of South Zone		9402.00	3984.96	31268.53	44655.49	27825.74
Grand Total (Gross)		21829.64	20861.47	53247.75	95938.86	63056.54





2.3 Based on the prima-facie availability of freehold cement grade limestone reserves, there is very limited scope for further addition of cement manufacturing capacity in the states of Kerala, Tamil Nadu, Bihar, Uttar Pradesh, Manipur, Orissa and West Bengal. However, states of Andhra Pradesh, Assam, Gujarat, Himachal Pradesh, Karnataka, Chhattisgarh, Meghalaya, Jammu & Kashmir and Rajasthan have potential for further creation/expansion of cement manufacturing capacity.

3.0 Locational Constraints of Limestone Availability

3.1 Regional Imbalance

3.1.1. A closer look at the national inventory of cement grade limestone reveals that about 71 percent of the total reserves are concentrated in just six states of Andhra Pradesh, Karnataka, Gujarat, Rajasthan, Madhya Pradesh and Chhattisgarh. Andhra Pradesh alone has the privilege of having about 32% of the country's total reserves. However, the maximum cement consumption and demand during the last few years have been 12.29 mn.t in Maharashtra (13% of all India consumption), followed by Uttar Pradesh 11.93 mn.t. (12.6%), Tamilnadu 8.2 mn.t (8.7%) Andhra Pradesh 7.71 mn.t (8.2%), Gujarat 7.5 mn.t (8%) and Madhya Pradesh 5.58 mn.t (5.9%). Juxtaposition of States with maximum limestone reserves and states with maximum cement consumption reveals a major inbuilt anomaly between consumption and scope of growth in cement capacity. This is due to the regional imbalance in the availability of limestone; with about 46.6% of the total reserves in South zone, 23% in Northern zone, 20% in Western zone, and a meagre 10.4% in Eastern zone. The non-

uniform distribution with concentration of potential deposits only in a few geological horizons has resulted in formation of, so called, cement production clusters. The seven clusters namely Satna, Chandrapur, Gulbarga, Yerraguntla, Nalgonda, Bilaspur and Chanderia contribute to 52% of total installed capacity and 63% of total annual cement production (2000-2001). This has also been the primary reason for regional imbalances in cement production in the country, entailing large distance of movement of cement from the plants.

3.2 Environmental Considerations

3.2.1 The availability of potential limestone deposits has also been restricted due to environmental constraints, as many of these deposits are located in reserve forests, bio-zones and environmentally sensitive areas of near tourist centers / hill-stations or under thickly populated or cultivated fields. Population growth, rapid urbanization and developmental projects have also led to encroachment of some of the potential limestone deposits. About 30% of the reserves have been restricted due to forest and other constraints.

3.3 Other Factors

3.3.1 The limestone reserves available at deeper levels and the deposits located in inaccessible / remote areas, without adequate basic infrastructural facilities makes it impossible to utilize such deposits. Inhomogeneous deposits with frequent intercalations/ inter-beddings and small-scattered deposits not suitable for large scale mechanized mining etc. further restricts the availability of cement grade limestone for large cement plants.

4.0 Utilisation of Marginal Grade Limestone

4.1 As per the estimates, about 25817 mn.t (27%) of the total 95939 mn.t of limestone reserves are of marginal grade. In addition, due to the poor and variable coal quality with high ash content, even a part of the cement grade limestone is turning to be marginal grade for cement manufacture. Since the available cement grade limestone reserves are not going to last forever, utilization of marginal grade limestone must be given immediate attention and priority through development of suitable techniques. Marginal grade limestone can be utilized for cement manufacture through any of the following techniques:

- Computer aided deposit evaluation and mine planning for rational/optimal utilization of different grades of limestone through selective mining and blending.
- Use of sweetener which could be high grade limestone or industrial wastes like lime sludge etc.

- **Modifications in raw mix design and process parameters and use of mineralisers.**
 - **Use of low ash fuels, such as Petcoke etc.**
 - **Use of natural gas as fuel.**
 - **Manufacture of low CaO reactive belite and other special cements.**
 - **Upgradation of limestone quality through dry beneficiation techniques.**

4.2 The excessive use of sweetener is already affecting the economic viability of a number of cement plants. NCB has been carrying out detailed studies to determine the suitability of Indian limestones to different techniques of beneficiation including the relatively conventional Differential Grinding and Sieving Techniques (DGS) as well as non-conventional techniques like Electrostatic Separation (ESS), Optical Sorting and Bacterial Leaching.

5.0 Potential Limestone Deposits for Green Field Cement Projects

5.1 A perusal of the potential deposits for green field projects shows that 56 of the total deposits can sustain plants of one million tonne or higher capacity and 44 deposits are suitable for smaller capacity cement plants (up to 4 lakhs tonnes per annum). Out of this, 22 deposits are located in Andhra Pradesh itself, the rest are in Rajasthan, Himachal Pradesh, Gujarat, Meghalaya, Karnataka, Chhattisgarh, J & K and Assam. Statewise details of potential limestone deposits for green field cement projects is as given in the table below.

State	Potential Deposits				Restricted Due to Forest and Other Constraints			Net Available			Potential Cement Capacity (mn.t./ annum)
	Large	Small	Total	PE*	Large	Small	PE*	Large	Small	PE*	
Andhra Pradesh	22	8	30	11494	16	4	8328	6	4	3166	31
Karnataka	10	6	16	2072	8	3	1950	2	3	218	2
Gujarat	4	7	11	6768	4	7	6768	0	0	0	0
Rajasthan	7	8	15	2728	5	4	2176	2	4	552	55
Chhattisgarh	2	6	8	1142	1	4	982	1	2	160	15
Meghalaya	3	3	6	2136	3	3	2136	0	0	0	0
Jammu & Kashmir	2	0	2	1215	2	0	1215	0	0	0	0
Himachal Pradesh	5	6	11	2604	5	6	2604	0	0	0	0
Assam	1	0	1	261	1	0	261	0	0	0	0
Total	56	44	100	30516	45	31	26420	11	13	4096	40

* PE : Proved Equivalent in mn.t.

Out of the total proved equivalent reserves, only 49 % (30516 mn.t) have been identified for setting up greenfield cement projects.

6.0 Potential Limestone Deposits in and around Cement Cluster Zones

6.1 Andhra Pradesh: Andhra Pradesh with total reserves of 30396 mn.t (proved equivalent 15966 mn.t) of cement grade limestone ranks first in the country with about 32 percent of total reserves of the country (Appendix-I.) As per the national inventory of cement grade limestone, the potential limestone deposits are available in the following districts.

6.1.1 Adilabad District: Extensive limestone reserves of 4182 mn.t are available to cater to the requirement of large cement plants. These reserves are falling under reserve forest, and need to be de-reserved for exploitation.

6.1.2 Cuddapah District : The Cuddapah district is endowed with 5050 mn.t of cement and high-grade limestone reserves under thick soil over burden. The land is very fertile in this region hence the cost of land is very high.

6.1.3 Guntur District : The Guntur district has 6210 mn.t of cement grade limestone reserves with a number of potential deposits. The deposits are covered under soil over burden of 3 to 4 meters.

6.1.4 In addition to the above, few more potential limestone deposits are occurring in Khammam, Krishna, Kurnool and Nalgonda districts. But all these deposits are either falling under cultivated land or under reserve forest. No limestone deposit is available in the government land. District-wise Status of cement grade limestone availability in the State is given in Appendix-I.

6.2 Karnataka: Karnataka is the second largest state, with total reserves of 12772 mn.t of Cement grade limestone (proved equivalent 10718 mn.t). The cement grade limestone deposits are available in ten districts, of which Gulbarga, Bijapur, Chitradurga, have potential for greenfield cement projects. District-wise availability of cement grade limestone is as given in *Appendix-I*. The potential limestone deposits for greenfield cement projects are located in the following districts :

6.2.1 Gulbarga District : The Gulbarga district alone possesses more than 90 percent of the total limestone reserves of the State. The deposits are horizontally bedded, massive with consistent quality and categorized as simple deposits as

per NCB norms for proving limestone deposits. These limestone deposits are ideally suited for setting up large/ mega cement projects.

6.2.2 Bagalkot (Bijapur) District: The limestone deposits of Gulbarga district are extended in adjoining Bijapur district. The limestone deposits of Kaladgi groups are also reported in the district. These deposits are variable in quality in respect of silica and magnesia and categorized as simple to complex deposits as per NCB norms.

6.2.3 Chitradurga District: Chitradurga is third largest district in Karnataka state having cement grade limestone reserves of 342 mn.t. Due to better-developed infrastructure and market potential, state department of Geology and Mining, has already taken up joint exploration programme with NCB for proving of potential limestone deposit for two major cement projects.

6.3 Gujarat: Gujarat ranks as the third largest state with total reserves of all categories of 10401 mn.t (proved equivalent 8389 mn.t) of Cement grade limestone deposits reported in eight districts, of which seven districts possess proved category of reserves. The potential limestone deposits for green field cement projects are in Kutchh, Junagarh, Bhavnagar, Banaskantha districts of the state. District-wise status of cement grade limestone deposits is as given in Appendix- I.

6.3.1 Kutchch District: Kutchch district possesses more than 75 percent of the total limestone reserves available in the state. Extensive milliolic limestone with little or no overburden is reported in the district, which could not be developed due to poor infrastructural facilities. The carrying capacity studies of the region carried out by NCB have established that despite extensive limestone deposits (7765 mn.t) suitable for cement manufacture, they are not available for mining. The reasons being the limestone deposits are lying below the Narayan Sarovar Sanctuary, having endangered floral and faunal species. The policy framework for utilizing these limestone deposits vis-à-vis Sanctuary limits needs to be looked into with a holistic view so as to develop the region industrially by protecting vital components of the environment for harmonious development.

6.3.2 Junagarh District: Junagarh is the second largest district in respect of cement grade limestone reserves. Most of the deposits are smaller in size to sustain large capacity cement plant.

6.3.3 Bhavnagar District: Bhavnagar district is the third richest district of Gujarat State in respect of Cement grade limestone. The milliolithic limestone of coastal region is slightly crystalline, shallow in depth, with very erratic thickness. The brown to buff colored limestone is very high grade with impurities of Marl (siliceous carbonaceous material). The area is well connected with roads/rail and located along the seacoast, and is ideally located for major cement projects along south coast of Gujarat. The availability of these potential deposits has been restricted due to CRZ (Coastal Regulation Zone) implementation.

6.4 Rajasthan : Rajasthan ranks fourth largest state in respect of cement grade limestone availability with total reserves of 7596 mn.t (proved equivalent 4744 mn.t). The cement grade limestone is reported to occur in 21 districts, however substantial limestone reserves are reported in 18 districts only. Potential limestone deposits for green field projects have been identified in Jaisalmer, Nagaur, Pali, Sikar and Jhunjhunu districts. The Rajasthan state has potential consumer market of Northern States and has very high potentiality for further cement capacity enhancement and for green field projects. Out of the total reserves of 7596 mn.t of all categories, only 564 mn.t (8%) are of Proved Category and remaining 92% are yet to be explored and proved. State Department of Mines and Geology and other agencies should take appropriate measures to prove and evaluate these limestone deposits. District-wise status of cement grade limestone deposits is given in Appendix- I.

6.4.1 Chittorgarh District: The largest cement grade reserves of 1479 mn.t are located in Chittorgarh area. Extensive limestone deposits have been reported all along the district between Chittorgarh to Nimbahera. The region is infrastructurally well developed for setting up greenfield mega cement plants.

6.4.2 Jaisalmer district : Jaisalmer district contains very high grade limestone deposits CaO : 44 to 55%, SiO_2 : 0.5 to 6% and FeO : < 0.5% in and around Khinya, Abur, Sanu, Sam and Ramgarh Villages. Extensive mining activities are being carried out by Rajasthan State Mineral Development Corporation (RSMDC) for Chemical and SMS grade limestone, which have only 8 meter thickness and lying below 16 to 18m thickness of cement grade limestone bed. Therefore, huge quantities of limestone dumps are already available all along the quarry site. These limestone dumps can cater to the requirement of mega cement projects. The State - DGM has established 890 mn.t probable reserves in this area and notified a few mining blocks as suitable, for cement manufacture.

6.4.3 In addition to above, a few more suitable limestone deposits have been identified in Jaipur, Sikar, Nagaur, Pali and Jhunjhunu districts of the State.

6.5 **Chhattisgarh:** The state of Chhattisgarh jointly with neighbouring state of MP has been the largest cement producing state till recent years. The total cement grade limestone reserves available in Chhattisgarh are 4516 mn.t (Proved equivalent 3688 mn.t). The potential cement grade limestone deposits have been reported from seven district of the state. Details of district wise availability of cement grade limestone is as given in Appendix-1. The district wise potential limestone deposits are briefly described as below:

6.5.1 **Raipur District:** The Raipur district possesses nearly 50% of the total state's limestone reserves and also has well-developed infrastructure. The limestone deposits are horizontal and thickly bedded with consistent quality and described as simple deposits as per the NCB norms for proving limestone deposits. Though there is clustering of major cement plants in Raipur - Bilaspur sector, there is scope for additional cement projects, provided a thorough study is conducted for market viability and proper assessment of environmental load etc before setting any additional green field cement projects in this district.

6.5.2 **Bilaspur District:** The Bilaspur district is the second largest cement grade limestone bearing district of Chhattisgarh state with total reserves of 939 mn.t. This district has already four major cement projects and has further potential to add cement capacity.

6.5.3 In addition to above, a few more suitable cement grade limestone deposits are available in Bastar, Durg and Raigarh districts.

7.0 Potential Limestone Deposits away from Cement Cluster Zones

7.1 **Himachal Pradesh:** Himachal Pradesh is very rich in limestone availability ranking first in North Zone and sixth in the Country with total reserves of 5895 mn.t (proved equivalent 3976 mn.t). The geographical condition and general topography has restricted the growth of cement industry in the state. However, due to continued scarcity of cement in the northern states and rapid growth of construction activities in neighbouring states, there is enough potential for the growth of cement industry in the state for utilising the available limestone reserves. District-wise availability of cement grade limestone is also given in *Appendix-1*. District wise details of potential limestone deposits is as given below :

7.1.1 Shimla District : Shimla is having the largest cement grade limestone reserves of 1839 mn.t, sharing more than 30 percent of total reserves in the state. Though the limestone deposits are lying in hilly region, Shimla is relatively better placed in terms of infrastructural facilities.

7.1.2 Mandi District: Similar to Shimla, Mandi district is also well connected through network of roads and highways and therefore it will be easy to explore the possibility of setting up of major cement units around Alsindi and Sundernagar areas.

7.1.3 A few more potential limestone deposits have also been reported in Solan, Chamba, Bilaspur and Sirmour districts of Himachal Pradesh.

7.2 Jammu & Kashmir (J&K): The prominent limestone horizons well developed in the J & K state are upper Triassic limestone of Ladakh with fragmentary remains of fossil Megalodon, the Acchabal-Bawan, Doru and Sop-Kokarnag areas of Anantnag district, Ajas, Gundi-Sunderkot and Sonarwani-Nandihal areas in Baramula district and Khrew, Wuyan areas in Srinagar district. The carboniferous limestone occurs along Murree thrust in Thanamandi Bafliaz-Mandi sector of Poonch and Rajouri district. A fairly thick band of marginal grade limestone of cretaceous age are reported around Khalsi in Ladakh region, the earliest known limestone deposits of Eocene age belonging to Hazara facies occur between Ramarathan and Siara areas of Kathua district. Though J&K state is endowed with good quality of limestone located in almost all the districts, with total reserves of 5639 mn.t, (proved equivalent 2986 mn.t), all other deposits except the deposits in Anantnag district, are inadequate to cater to the requirement of large capacity cement plants. District wise availability of cement grade limestone deposits have been given in *Appendix -1* and described as below :

7.2.1 Anantnag District: Sandran river valley in Varinag areas of Anantnag district is located between longitudes 75° 10' - 75° 20' and latitude 33° 20' - 33° 35'. An area of about 100 Sq km was prospected by state Directorate of Geology and Mining (DGM) and about 16 blocks of limestone deposits have been identified around Sandran Valley with total reserves of 2430 mn.t. The prominent cement grade limestone deposits investigated by state DGM in Punjoo block. Punjoo block is located at a distance of 1 km east of Punjoo village, about 2 KM from Varinag. It consists of scarpment of limestone with moderate to steep slopes. There are two high grades limestone bands in this block, separated by a band of inconsistent quartzite and siliceous limestone. The overall thickness of limestone

band in this area is 16 meter. The total reserves estimated in this block are of the order of 62.6 mn.t, which includes 46.97 mn.t without overburden. The average grade estimated in the area is very high (53.4% CaO, 0.75% MgO and 2.32% SiO₂ content).

7.3 Meghalaya: Meghalaya is endowed with very good quality limestone and it has high potential for additional cement manufacturing capacity. The limestone deposits of East Khasi Hills and Jaintia Hills can be considered suitable for setting up major cement plants keeping in view the quality, reserves and broad infrastructural parameters. These cement grade limestone deposits are highly potential to cater to cement demand of North Eastern States as well as for export to adjacent countries of Bangladesh, Myanmar, and Bhutan etc. District-wise reserves of Meghalaya are given in Appendix - 1. District wise details of Potential Limestone deposits is as given below :

7.3.1 East Khasi Hills District: The prominent limestone deposits of East Khasi Hills district are located in Mawlong-Ishamati, Shella, Komorrah and lower Cherra areas. Isolated small outcrops of limestone are also found near Umstew and Mawkina areas of Laitryngew and below the coal bearing sandstone of Langkerdem and Thangjinath coalfields of Pynursla areas at a distance of 53 Km from Shillong along Shillong Dawki road. Mawmluh-Cherra Cement Company Ltd is mining the limestone deposit of Cherrapunji and Komorrah limestone is being supplied to Chhatak Cement Co. Ltd., Bangladesh. In addition to this, Shella limestone deposit is identified for a proposed major cement plant to be set up in Bangladesh.

7.3.2 Jaintia Hills District: Jaintia Hills district is very rich in limestone having more than 70 percent of total reserves of the state. The deposits have been explored in details by Directorate of Mineral Resources (DMR) Meghalaya and Geological Survey of India, Northeastern Region. Extensive deposits are reported around Litang River Valley over an area of 100 Sq. km. Other notable deposits include Lumshunong, Mynkre and Lakadong located along Shillong-Badarpur Road (NH-44).

8.0 Action Plan

8.1 The total Proved Equivalent Reserves in the gross limestone reserves of 95,939 mn.t. is estimated to be 63,057 mn.t. However, 22.5% of this proved equivalent reserves i.e., 21,718 mn.t. falls under forest areas and other 7.5% i.e., 5,754 mn.t. is under CRZ & other regulated areas. The net Proved Equivalent Reserves available is, therefore, 35,585 mn.t. The amount of reserves needed for

operating existing large capacity cement plants with total installed capacity of 129.5 mn.t. is estimated to be about 10,000 mn.t. To cater to additional capacity of 20 mn.t. during the X plan 2,500 mn.t. of additional reserves will be required for a plant life of 45 years. Therefore, the net proved equivalent reserves available at the end of the 10th plan after meeting the estimated annual installed capacity of 200 mn.t. is estimated to be only 23, 085 mn.t. which are inadequate for future requirement beyond X plan period.

Availability of Limestone Reserves for Future Requirements

(Mn.t.)

Gross Reserves	95939
Proved Equivalent Reserves	63,057
P.E. Reserves Restricted :	
Under Forest (22.5%)	21,718,
CRZ & Other Regulated Areas (7.5%)	5,754
Sub-Total	27,742
Net Proved Equivalent Reserves Available	35,585
P E reserves required for operating existing large capacity cement plants (installed capacity 129.5 mn.t) considering 8% GDP growth and consequent 10% growth in cement production	10,000
Additional reserves required during 10th plan (to cater additional capacity of 20 mn.t)	2,500
Sub-Total	12,500
Net P.E. reserves available at the end of 10th plan after meeting annual installed capacity of 145 mn.t	23,085

* PE : Proved Equivalent

8.2 In order to ensure the availability of cement grade limestone to meet the requirement of projected cement capacity beyond X plan period, appropriate measures have to be taken up on a war footing. Accordingly, following thrust areas have been identified :

8.2.1 Intensified Exploration Activity: The availability of cement grade limestone is inadequate to sustain the projected growth trend of cement industry and there are still 77 percent reserves in probable and possible categories which are to be converted into proved category by intensifying the exploration activities by state DGM's and other exploration agencies. Joint exploration has to be taken up by various State Department of Mines & Geology (DMG) in association with

NCB, IBM etc. for exploring / identification of the limestone deposits. The state DMG's may be advised to incorporate the activity of proving of cement grade limestone deposits in their annual field program. The deposits falling under reserve forest can only be explored by the State/Central exploration agencies by taking a formal permission from the concerned department. Such an action has already been initiated by the DMG, Karnataka and exploration has been taken up in association with NCB. Similar arrangements have to be worked out with other state DMG's.

8.2.2 Potential deposits away from clusters: Presently 52 percent of total production of cement is from seven cement clusters. The studies have indicated that there is enough potential for setting up additional cement capacity in and around existing clusters. Such a growth within the cluster will have adverse impact on existing infrastructure and environment. There is, therefore, urgent need to identify potential limestone deposits away from existing clusters. The exploration activity has to be intensified to explore the deposits in northeastern states, HP and Jammu and Kashmir. Also, there is a need to adopt an eco-friendly mining technology to exploit the limestone deposits located in eco-sensitive hilly regions.

8.2.3 Use of marginal grade limestone: Efforts have to be intensified to utilize 27 percent i.e. 25017 mn.t of marginal and sub-marginal grade limestone associated with cement grade limestone. This will improve the life of mine and mine environment by drastically reducing the waste dumps presently lying in the existing quarries and occupying precious land.

8.2.4 Dereservation of limestone deposits falling under Eco-sensitive zones and other states: About 21718 mn.t (22.5%) of cement grade limestone are restricted due to implementation of forest conservation act. Most of the potential deposits of hill states and northeastern and other states and coastal zones have been covered under forest and are not available for cement manufacture in these cement deficit areas. Efforts have to be made to release the deposits for exploitation on a selective basis. A beginning has already made in this direction in Himachal Pradesh and Karnataka. Present practice of afforestation of equivalent coverage of land in place of mining lease land, and its substitution by alternative land reclamation, landscaping etc., has to be encouraged in other regions.

8.2.5 Relaxation of Coastal Regulation Zone: The exploitation of off shore/ onshore deposits has been restricted by declaring coastal stretches as coastal

regulation zone (CRZ). The coastal stretches upto 500m from high tide line and the land between the low tide line and high tide line is covered under CRZ. Review of the provisions of the Coastal Regulation Zone is essential to enable eco-friendly use of enormous reserves of cement grade limestone blocked in Gujarat Coast and to save operating plants from gradual demise.

8.2.6 Incentive for Using Low Grade Limestone, Industrial and Mining Wastes: Technologies for use of marginal grade limestone, including limestone with high silica, magnesia or alkalis need perfection on a mission mode, their promotion on large scale need suitable incentives to the cement plants. A lower rate of royalty may be fixed for utilizing low grade (high silica / high magnesia) limestone and calcareous shale.

8.2.7 Periodic Re-assessment of Limestone Reserves: In order to ensure the availability of various grades of residual limestone reserves for rational utilisation, periodic re-assessment of captive limestone mines of all cement plants should be carried out by an independent agency such as NCB or IBM.

Appendix-1

District- Wise Inventory of Cement Grade Limestone Deposits

Sl. No	District	Reserves in mn.t			Total	Proved Equivalent
		Proved	Probable	Possible		
Andhra Pradesh						
1	Adilabad	81.18	0.00	4100.90	4182.08	2131.63
2	Anantpur	0.00	27.00	4.40	31.40	21.10
3	Cuddapah	376.00	99.00	4574.93	5049.93	2732.77
4	Guntur	122.21	758.80	5329.02	6210.03	3317.88
5	Karimnagar	31.00	0.00	206.50	237.50	134.25
6	Krishna	70.56	180.74	721.64	972.94	557.90
7	Kurnool	39.00	94.74	9189.55	9323.29	4700.09
8	Mahaboobnagar	46.00	0.00	24.77	70.77	58.39
9	Nalgonda	25.00	282.10	3843.02	4150.12	2143.98
10	Rangareddy	168.46	0.00	0.00	168.46	168.46
Total		959.41	1442.38	27994.73	30396.52	15966.45
Assam						
1	N. Cachar Hills	286.80	244.00	855.30	1386.10	885.25
2	Karbi Anglong	52.03	0.00	50.90	102.93	77.48
Total		338.83	244.00	906.20	1489.03	962.73
Arunachal Pradesh						
1	Lohit	0.00	91.00	49.00	140.00	88.20
2	Siang	0.00	0.00	226.50	226.50	113.25
Total		0.00	91.00	275.50	366.50	201.45
Jharkhand						
1	Hazaribagh	3.41	14.13	50.86	68.40	38.73
2	Ranchi	5.06	0.00	38.68	43.74	24.40
3	Singhbhum	46.11	41.52	24.62	112.25	87.48
Total		54.58	55.65	114.16	224.39	150.61
Bihar						
1	Palamau	50.25	25.00	118.81	194.06	127.16
2	Rohtas	69.97	42.14	539.93	652.04	369.43
Total		120.22	67.14	658.74	846.10	496.59
Diu						
1	Diu	48.84	0.00	0.00	48.84	48.84
Total		48.84	0.00	0.00	48.84	48.84
Gujarat						
1	Amreli	233.31	0.00	0.00	233.31	233.31
2	Banaskantha	270.96	4.50	0.00	275.46	274.11
3	Bhavnagar	540.85	0.00	0.00	540.85	540.85
4	Junagarh	1553.98	0.00	0.00	1553.98	1553.98
5	Kutchch	1061.68	6703.49	0.00	7765.17	5754.12
6	Sabarkantha	32.60	0.00	0.00	32.60	32.60
Total		3693.38	6707.99	0.00	10401.37	8388.97
Himachal Pradesh						
1	Bilaspur	150.00	317.10	500.00	967.10	621.95
2	Chamba	400.00	850.00	0.00	1250.00	995.00
3	Kullu	0.00	0.00	19.70	19.70	9.85
4	Mandi	406.00	17.00	100.00	523.00	467.90

Sl. No	District	Reserves in mn.t			Total	Proved Equivalent
		Proved	Probable	Possible		
5	Sirmur	150.84	200.00	64.01	414.85	322.85
6	Shimla	0.00	40.00	1799.36	1839.36	927.68
7	Solan	195.00	466.00	220.00	881.00	631.20
Total		1301.84	1890.10	2703.07	5895.01	3976.43
Jammu & Kashmir						
1	Anantnag	109.88	497.46	4843.00	5450.34	2879.60
2	Baramulla	0.00	1.20	23.40	24.60	12.54
3	Kathua	0.00	0.00	45.45	45.45	22.73
4	Rajauri	0.00	18.21	4.00	22.21	14.75
5	Srinagar	13.34	7.50	75.30	96.14	56.24
Total		123.22	524.37	4991.15	5638.74	2985.86
Karnataka						
1	Belgaum	169.00	80.00	65.22	314.22	257.61
2	Bagalkot - Bijapur	427.14	340.63	325.45	1093.22	828.31
3	Chitradurga	0.00	66.35	275.53	341.88	184.21
4	Gulbarga	7095.89	1687.55	2086.93	10870.37	9320.64
5	North Kanara	0.10	68.80	37.00	105.90	66.76
6	Tumkur	0.00	16.50	29.40	45.90	26.25
Total		7692.13	2259.83	2819.53	12771.49	10683.78
Madhya Pradesh						
1	Bhind	0.00	24.00	0.00	24.00	16.80
2	Damoh	259.90	0.00	280.21	540.11	400.01
3	Dhar	9.84	17.02	0.00	26.86	21.75
4	Hoshangabad	0.00	0.00	39.45	39.45	19.73
5	Jabalpur	141.80	6.78	112.85	261.43	202.97
6	Mandsaur	461.23	0.00	7.12	468.35	464.79
7	Morena	8.82	17.01	221.51	247.34	131.48
8	Panna	26.00	0.00	0.00	26.00	26.00
9	Rewa	197.21	118.58	0.00	315.79	280.22
10	Satna	334.42	65.14	73.56	473.12	416.80
11	Sidhi	149.00	0.00	0.22	149.22	149.11
Total		1588.22	248.53	734.92	2571.67	2129.66
Chhattisgarh						
1	Bastar	142.85	408.68	209.35	760.88	533.60
2	Balaghat	11.80	2.02	3.40	17.22	14.91
3	Bilaspur	530.36	26.50	382.08	938.94	739.95
4	Durg	254.42	60.25	0.00	314.67	296.60
5	Raigarh	67.93	48.06	6.03	122.02	104.59
6	Raipur	1511.13	246.46	577.00	2334.59	1972.15
7	Rajnandgaon	22.00	5.75	0.00	27.75	26.03
Total		2540.49	797.72	1177.86	4516.07	3687.83
Maharashtra						
1	Chandrapur	634.99	32.46	754.13	1421.58	1034.78
2	Yeotmal	171.85	77.06	26.51	275.42	239.05
3	Gadchiroli	82.00	0.00	0.00	82.00	82.00
4	Nagpur	0.00	0.00	31.00	31.00	15.50
Total		888.84	109.52	811.64	1810.00	1371.33

Sl. No	District	Reserves in mn.t			Total	Proved Equivalent
Manipur						
1	Ukhrul	11.02	2.68	7.70	21.39	16.75
Total		11.02	2.68	7.70	21.39	16.75
Meghalaya						
1	West Garo Hills	29.77	281.95	0.00	311.72	227.14
2	West Khasi Hills	0.00	37.00	0.00	37.00	25.90
3	East Khasi Hills	433.65	374.25	3779.85	4587.75	2585.55
4	Jaintia Hills	84.00	287.21	1000.05	1371.26	785.07
Total		547.42	980.41	4779.90	6307.73	3623.66
Nagaland						
1	Tuensang	0.00	111.07	2.50	113.57	79.00
2	Phek	10.48	0.00	15.50	25.98	18.23
Total		10.48	111.07	18.00	139.55	97.23
Orissa						
1	Koraput	23.48	78.50	231.80	333.78	194.33
2	Sambalpur	1.57	7.15	153.84	162.56	83.50
3	Sudargarh	62.31	10.18	24.91	97.40	81.89
Total		87.36	95.83	410.55	593.74	359.72
Rajasthan						
1	Ajmer	0.00	99.14	268.87	368.01	203.83
2	Alwar	0.00	0.00	27.00	27.00	13.50
3	Banswara	0.00	395.00	125.00	520.00	339.00
4	Bhilwara	30.78	22.00	78.00	130.78	85.18
5	Bundi	92.40	116.83	1200.86	1410.09	774.61
6	Chittorgarh	249.52	583.87	645.35	1478.74	980.90
7	Jaipur	26.54	390.00	0.00	416.54	299.54
8	Jhunjhunu	0.00	122.79	125.52	248.31	148.71
9	Jhalawar	0.00	0.00	32.50	32.50	16.25
10	Jodhpur	0.00	8.23	14.08	22.31	12.80
11	Jaisalmer	0.00	1120.00	50.00	1170.00	809.00
12	Kota	75.00	114.70	29.00	218.70	169.79
13	Nagaur	10.27	0.00	124.26	134.53	72.40
14	Pali	0.00	47.37	296.70	344.07	181.51
15	Sirohi	60.00	0.00	427.80	487.80	273.90
16	Sawai Madhopur	9.00	63.94	0.00	72.94	53.76
17	Sikar	0.00	29.98	0.00	29.98	20.99
18	Udaipur	10.29	207.44	266.33	484.06	288.66
Total		563.80	3321.29	3711.27	7596.36	4744.33
Tamil Nadu						
1	Anna	63.32	24.23	144.27	231.82	152.42
2	Coimbatore	36.58	29.11	29.92	95.61	71.92
3	Kamarajar	83.42	5.33	17.89	106.64	96.10
4	Madurai	3.15	2.24	11.54	16.93	10.48
5	Ramanathapuram	0.00	41.10	0.00	41.10	28.77
6	Salem	62.72	43.10	25.24	131.06	105.51

Sl. No	District	Reserves in mn.t			Total	Proved Equivalent
7	South Arcot & Pondicherry	0.00	6.04	13.59	19.63	11.02
8	Tirunelveli	32.55	52.97	85.49	171.01	112.37
9	Tiruchirapalli	468.72	78.63	126.33	673.68	586.93
Total		750.46	282.75	454.27	1487.48	1175.52
Uttaranchal						
1	Almora	9.00	34.77	0.00	43.77	33.34
2	Dehradun	76.60	546.42	360.43	983.45	639.31
3	Tehri-Garhwal	79.6	573.00	0.00	652.60	480.70
4	Pithoragarh	16.00	63.00	93.00	172.00	106.60
Total		181.20	1217.19	453.43	1851.82	1259.95
Uttar Pradesh						
1	Sonbhadra	327.90	412.02	225.13	965.05	728.88
Total		327.90	412.02	225.13	965.05	728.88
Grand Total		21832.64	20861.79	53247.75	95938.85	63056.57

Grand Total of Gross Reserves (in Mn t) = 95939

Gross of Proved Equivalent (in Mn t) = 63057

LIMESTONE INVENTORY AND MINI CEMENT PLANTS

SUB-GROUP – IV



Part - II

MINI CEMENT PLANTS

Part II – Mini Cement Plants

1.0 Introduction

1.1 The prevailing scenario of acute cement scarcity in mid seventies with inadequate investment in this core sector, led to the Government policy for promotion of mini cement plants which could fulfill many objectives in addition to producing cement to meet the local needs. Taking into account various factors which were prevailing at that time the Government of India came out with the policy for promotion / establishment of mini cement plants in early 1979. In addition to the several incentives and concessions offered by the Government for establishing mini cement plants, the policy also entailed fulfillment of certain socio-economic objectives by setting up the mini cement plants.

1.2 The policy of the Govt. of India to encourage the establishment of mini cement plants first announced on 04 January 1979, through a press note, had the following incentives for establishment of mini cement plants:

- The capacity for a mini cement plant will be limited to 200 tonnes per day (tpd) or 66000 tonnes per annum (TPA)
- Mini cement plant will be allowed a rebate in the payment of excise duty upto 50% for a period of five years

1.3 In August 1986, Govt. of India enhanced the capacity and definition of mini cement plants based on rotary kiln technology to 300 tpd or 99000 TPA.

1.4 On 30 June 1987, Govt. of India permitted the existing licensed mini cement plant to expand their capacity upto 600 tpd or 1,98,000 TPA by installation of pre-calculator / balancing equipment or by way of modernization but in no case by addition of another kiln or by substitution of the existing kiln by a kiln of a larger size.

1.5 Further, a notification No. 20/99-Central Excise dated 7th May 1999 was issued by the Govt. of India notifying the enhancement of the installed capacity of Mini Cement Plants increased to 900 tpd or 2,97,000 TPA.

1.6 Vide its notification No. 5/94 - Central Excises dated 1 March 1994 Govt. of India clarified that "The concession for central excise is not available to cement manufactured in a factory from the clinker not manufactured from the same factory".

1.7 The Govt. of India vide their notification No. 12/95-CE; dated 16 March 1995 further clarified that the concession for central excise is not available to cement bearing a brand name or trade name of another person.

1.8 The excise duty structure on cement from 1979 till date is shown in table below:

Date	Excise Duty, Rs. Per Tonne	
	Mini Cement Plants	Large Plants
4.1.1979	32.50	68.25
28.2.1982	Partial Decontrol Introduced	
1.3.1983	100.00	135.00
28.2.1984	170.00	205.00
28.2.1985	205.00	205.00
28.2.1988	225.00	225.00
6.10.1988	215.00	215.25
28.2.1989	Full Decontrol Introduced	
28.2.1990	90.00	225.75
28.2.1992	165.00	333.50
28.2.1994	185.00	330.00
14.3 1995 Onwards	200.00	350.00

1.9 As a result of the Government's encouragement and by the technical and technological support extended by the National R&D laboratories in the country, a number of mini cement plants came up in different parts of the country, mostly on Rotary Kiln and Vertical Shaft Kiln technologies.

1.10 The first VSK based (30 tpd CRI-MVSK) mini cement plant became operational in early 1981; whereas the first (200 tpd) mini cement plant based on rotary kiln technology went on stream in 1982. In addition, some VSK plants mostly in small-scale sector came up, whose plant and machinery were supplied by M/s Shree Engineers, Jodhpur.

1.11 During the past two decades, mini cement plants in general, have played a significant role in the growth of Indian Cement Industry and have also substantially contributed to the stated objectives of socio-economic development by making cement available locally at a relatively lower investment, utilization of small limestone deposits etc, leading to overall economic upliftment of surrounding localities. However, the locational objectives of setting up these

plants in remote areas, where large cement plants cannot be set up due to the lack of infrastructure, has not been fulfilled to the required extent.

1.12 The Working Group on Mini Cement Plants for the IX Five Year Plan (1997-2002) had made an optimistic estimate of 15 mn.t of installed capacity per annum and a corresponding production estimate of 11.25 mn.t, by the terminal year of IX Five Year Plan (2001-02). Further, the Working Group had noted, that even in the absence of any new project coming up in this sector, a more conservative estimate of the operating capacity may be over 10 mn.t per annum with a production of about 7.5 mn.t by the end of the IX Five Year Plan.

2.0 Fulfillment of Objectives by Mini Cement Plants

2.1 The Government, while enunciating the policy for promotion of mini cement plants, had identified the following objectives to be fulfilled by these cement manufacturing units :

- Cement industry is brought within the financial access of smaller entrepreneurs.
- A sense of ownership is cultivated in entrepreneurs with relatively smaller means.
- Creation of increased employment opportunities in rural areas on a well-dispersed basis.
- Contribution to uplifting the local economy and development.
- Realisation of quicker returns on capital invested because of low gestation period.
- Exploitation of smaller deposits of limestone scattered all over the country.
- Economic utilization of industrial wastes and byproducts in certain cases.
- Development of cement industry in terrains where movement of machinery and cement are difficult.
- Reduction of strain on country's transportation infrastructure.
- Lower capital investment per unit capacity.

2.2 So far as the fulfillment of the objectives set by the Government for promotion of mini cement plants is concerned, it is generally felt that objectives like development of new generation of entrepreneurs, socio-economic upliftment of the local areas, making cement available locally without long distance of transportation etc., have been fulfilled by mini cement plants to a significant

extent. However the locational objectives of setting up these plants in remote areas, where large cement plants cannot be set up due to the lack of infrastructure, has not been fulfilled to the required extent. It is important to note that despite the guidelines provided by the Government, many mini cement plants have been setup / operating in close vicinity of the large cement plants, resulting in marketing problems and transportation of cement over longer distances for mini cement plants.

3.0 Status of Mini Cement Plants - A Review

3.1 Unlike the large cement plants there is no single agency for collection of data pertaining to the mini cement plant sector. However, as per the data available with NCB and updated with the information provided by the associations of mini cement plants, it appears that as on 31st March 2001, only about 132 mini cement plants out of a total of 365 units set up, with a capacity of about 11 mn.t, were reported to be in operation with a capacity of 6 mn.t, producing about 4 mn.t of cement per annum, as indicated in table below:

Sl No	Technology	Cement Plants				
		Set Up		In Operation		
		Nos.	Installed Capacity (LTPA)	Nos.	Installed Capacity (LTPA)	Production (LTPA)
1	Rotary Kiln	31	40.03	24	34.11	23.88
2	NCB-MVSK	101	33.54	30	11.79	8.25
3	RRL-VSK	31	2.86	-	-	-
4	Saboo-VSK	202	34.49	78	13.78	6.89
	Total	365	110.92	132	59.68	39.02

VSK - Vertical Shaft Kiln

RRL- Regional Research Laboratory (Jorhat)

Note : In addition there are some VSK plants, whose technologies are not based on any of the above three sources. The Working Group could not collect any reliable information pertaining to these plants.

3.2 Location of Rotary Kiln & Vertical Shaft Kiln mini cement plants alongwith sources of fuel are shown at Fig 1 & Fig 2 respectively. Details of mini cement plants (state-wise) are given at *Annexures I to IV*.

3.3 This is in contrast to the scenario prevailing as on 31st March 1996, when 267 mini cement plants (out of 311 mini cement plants) were in operation,

contributing a production of about 5.50 mn.t with an installed capacity of 7.73 mn.t, as given in the table below:

Sl. No.	Technology	Set Up		In Operation		Under Implementation	
		Nos.	Installed Capacity (LTPA)	Nos.	Installed Capacity (LTPA)	Nos.	Installed Capacity (LTPA)
1	RK	31	34.85	22	28.25	5	8.94
2	CRI-MVSK	97	27.47	71	22.35	26	12.59
3	RRL-VSK	17	1.75	13	1.42	17	1.40
4	Saboo-VSK	166	26.12	161	25.32	26	7.62
	Total	311	90.19	267	77.34	74	30.55

Production : 5.50 mn.t.

Note : In addition there are some VSK plants, whose technologies are not based on any of the above three sources. The Working Group could not collect any reliable information pertaining to these plants.

3.4 Thus it could be seen that during the IX Five Year Plan, though there has been an addition of 54 plants, of mostly 30-50 tpd capacity, totaling about 2 mn.t capacity, there is a substantial reduction in terms of operating plants (132) and production (4 mn.t).

3.5 Over the period, a number of technological developments in several areas, both in the case of VSK technology and rotary kiln technology have taken place. With the result, the VSK mini cement plants, which were set up in the later years, are having kilns of 100 tpd capacities. As a result of the continuous technological upgradation and developments in the VSK technology, the mini cement plants that were set up in the recent past are having capacity of 200/300 tpd with a battery of 100 tpd vertical shaft kilns (VSK). Similarly, in the case of rotary kiln based mini cement plants, some of the new plants that have been recently commissioned with precalcinator system are of 900 tpd capacity.

4.0 Performance of Mini Cement Plants - A Review

4.1 A review of the performance of the mini cement plants indicates that:

- Capacity of Mini Cement Plant was limited to 200 tpd at the time of conceptual stage in 1979 for both VSK and Rotary Kiln Technologies
- The limits prescribed by the financial institutions for the grant of term loan, during their implementation stage, made these plants to compromise in the quality of plant and machinery which had resulted in more manual operation and higher cost of production
- Rising cost of fuel and its non-availability for VSK mini cement plant i.e. Coke breeze from steel plants
- Poor quality of electrical power as they are connected to rural feeders (low voltage and frequent power stoppage)
- High turnover of trained man-power
- Non-availability of adequate funds for working capital and term loans for modernization / upgradation or expansion are some of the main constraints, faced by this sector, which needs urgent attention.

4.2 The energy consumption level (specific electrical energy and specific thermal energy consumption) and their achievable level in rotary kiln mini plants, vertical shaft kiln and large cement plants (Dry process) have been shown in the table below:

Item	Rotary Kiln Mini Plant			Vertical Shaft Kiln			Large Cement Plant (Dry Process)		
	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
Specific Power Consumption (kWh/t Cement)	90	140	127	95	140	115	69	124	91
Achievable Level (kWh/t Cement)	90-95			90-100			65-69		
Specific Thermal Energy Consumption (Kcal/kg Clinker)	805	1350	950	990	1270	1111	677	1084	750
Achievable Level (Kcal/kg Clinker)	750-800			850-950			650-677		

4.3 As it could be seen, the specific electrical energy and thermal energy consumption levels for both rotary kiln mini plants and vertical shaft kiln plants are higher as compared to large cement plants, resulting in higher cost of production per tonne of cement.

4.4 Out of the various technical constraints being faced by mini cement plants, the non-availability of low volatile fuel (like coke breeze) at a reasonable cost is the most prominent one for VSK plants. This is due to the fact that the price of coke breeze has gone up by 15 times since 1980. (The average landed cost of coke breeze - which was Rs. 200 per tonne in 1980, Rs 500 in 1985, Rs 1000 in 1990, Rs. 2000 in 1995, has gone up to Rs 3000-3500 per tonne as on date, for the plants located in Karnataka, Rajasthan and Gujarat).

4.5 NCB has carried out detailed studies in the past, which have resulted in the identification of alternate natural fuel, SLV coal from Jharia Coalfields of BCCL. Though the estimated mineable reserves of SLV coal, is over 50 mn.t, but presently it is not being mined systematically.

4.6 However presently, in view of availability of pet coke from Reliance Petroleum Ltd (RPL) in Gujarat, which is a substitute of coke breeze, 23 out of 31 mini cement plants have been revived mainly due to low cost of fuel - Rs 1200/- to Rs 1500/- per tonne.

4.7 So far as the mini cement plants based on Rotary kiln technology are concerned, the problem faced by these plants is more or less similar to the large plants:

- High ash content and poor quality coal. Most of the mini cement plants based on rotary kiln technology are having preheater system and have higher specific heat consumption levels. Further, the specific output of kiln is also low resulting in higher ash absorption in clinker. Hence the poor quality of coal affects the kiln operations as well as quality of clinker.
- Unlike large cement plants, there is no proper linkage for supply and transportation of coal for these mini cement plants.

4.8 Some of the other limitations of the mini cement plants sector are :

- Most of the rotary kiln mini cement plants and some VSK plants of larger capacities have installed captive DG sets of various sizes to meet about 30 to 80 percent of their power requirements. However,

non-availability of adequate funds to many of these mini cement plants for installing captive power plants has been yet another constraint/ limiting factor ,

- Mini Cement Plants by virtue of their concept are required to market their product within an economical radius of 100/200 km. While some plants are able to market their product within this range, many cement plants because of their location mismatch, are required to transport their production over longer distance resulting in marketing problem.
- There is a general perception in the mind of consumer that cement produced by VSK mini cement plants is not of good quality as compared to branded cements. Hence consumers' preference is always for branded cement, which again make it difficult for mini cement plants to market their cement, resulting in low realisation.

5.0 Technology Support for Improving the Performance

5.1 Mini Cement Plants Based on Rotary Kiln Technology

5.1.1 Many of these cement plants have capacity ranging from 200 tpd to 900 tpd, with suspension preheater / precalciner system. As many of these plants are more than 15 years old, there is considerable scope for technological upgradation and modernization, which can improve their overall productivity, performance and reduce production cost.

5.1.2 Most of the suspension preheater kilns have always some potential for extra capacity, which can be utilized economically to increase kiln production. This can be done by increasing the volumetric loading or thermal load of burning zone inside the cement rotary kiln. To achieve this, most common ways of modernisation and upgradation include :

- **Installation of precalcinator in the circuit**
- **Addition of 2nd string of preheater with precalcinator**
- **Cyclone design modifications for better efficiency and lower pressure loss**
- **Varying number of stages of cyclone preheater**
- **Grate cooler modifications / retrofitting**
- **Improved burners with multi-channel firing systems**
- **Advanced automation and process control systems**

- **Manufacture of masonry cement / oil well cement**
- **Retrofitting and adoption of energy efficient equipment**
- **Kiln simulator for process optimization**

5.1.3 Experience show, that while attempting to increase the output from the rotary kiln the traditional bottlenecks are capacity of ID fans, pressure drop across preheater, size of calciner, high clinker outlet temperature, inadequate rating of kiln drive and inadequate capacity of dust filter equipment etc., while kiln proper is seldom a limiting factor.

5.1.4 While upgrading the pyrosystem, the upstream and downstream equipment can also be suitably upgraded depending upon the existing installation. The ball mill grinding systems can be upgraded by installing high efficiency separators in closed circuit, using horizontal impact crushers or roller press as precrushers and pregrinder or replacing with energy efficient vertical roller mills.

5.1.5 Depending upon the layout and present installations, the potential for increasing the output need to be worked out on a case-to-case basis. NCB can assist these plants in identifying the bottlenecks in the process and provide all the necessary technological support for upgrading the technology to achieve higher energy efficiency and productivity resulting in improved economic viability.

5.2 Mini Cement Plants Based on Vertical Shaft Kiln Technology

5.2.1 There have also been significant technological upgradations in the VSK technology in order to improve the quality of clinker. Some of the notable features are :

- **Automatic raw materials proportioning through electronic weigh feeders**
- **Kiln process control measurements**
- **Off-line optimisation through CRI-MVSK simulator**
- **Double collar noduliser for improvement in green strength of nodules and thermal stability**
- **Gamma ray controlled material block tube for clinker discharge system.**

- **Closed loop microprocessor control system for noduliser, combustion, and bed level controls**
- **Carbon monoxide alarm system**
- **Identification of alternate fuels**
- **Utilisation of lime-sludge to manufacture clinker / lime.**

5.2.2 Though these developments were primarily aimed at mitigating the inherent disadvantages in VSK, however, most of the VSK mini cement plants could only avail some of these benefits, due to financial constraints.

5.2.3 NCB is continuing its efforts towards further technological developments for improving the performance of both VSK as well as Rotary Kiln mini cement plants. Some of the technologies being developed / identified are :

- **Development of a multi fuel burner for VSK, where conventional coal can be used in gaseous form**
- **Technology absorption and transfer of Fluidized Bed Kiln System (FBCK) for both Rotary and VSK plants**
- **Technology absorption and transfer for medium capacity vertical roller mills for rotary kiln mini cement plants to improve the economic viability through capacity enhancement**
- **Development of small / mini roller press for productivity improvement and energy saving**

6.0 Measures for Growth of Mini Cement Plants

6.1 In order to attain a level of excellence compared to large cement plants, the following measures are required to be adopted for upgradation of Mini Cement Plants :

- **Optimum Capacity vis-à-vis Technology**
- **Reduction in Energy consumption Levels**
- **Reduction in Emission Levels**
- **Upgrading the Skills of Manpower and**
- **Product Diversification**

6.2 It is possible to achieve specific electrical energy consumption of 90-95 and 90-100 kwh/t Cement for Rotary Kiln Mini Cement Plants and Vertical Shaft Kiln respectively and specific thermal energy consumption of 750-800 and 850-950 Kcals / kg Clinker for Rotary Kiln Mini Cement Plants and Vertical Shaft Kiln cement plants respectively by adopting these available most modern technologies to attain the level of excellence.

6.3 Retrofitting of pollution control equipment in existing mini cement plants and provision of pollution control equipment in case of new plants should be ensured for the reduction in emission levels as prescribed by the regulatory authorities.

6.4 There is an urgent need to provide adequate training to the operators for which NCB and other agencies should organize plant-based training programs. Moreover, suitable orientation programs must also be organised for the promoters and Chief Executives of the plants under operation / implementation, so that they may appreciate the requirements for setting up cement plant and thereafter manage their plant operations in a more efficient manner.

6.5 Further, these mini cement plants are to be encouraged for product diversification for manufacture of blended cement, masonry cement, utilizing industrial wastes / mine rejects.

6.6 Keeping in view the above, the working group recommends the following measures :

6.6.1 Capacity Enhancement

6.6.1.1 The upper limits on the capacity of mini cement plants shall be reviewed from time to time, taking into account the technological developments and with a view to make them economically viable, while meeting the norms of pollution control and energy efficiency.

6.6.1.2 At present the limits prescribed by the Government on the installed capacity for the purpose of eligibility towards excise rebate is 900 tonnes per day (tpd) for the rotary kiln mini cement plants, whereas for the VSK mini cement plants, this has been fixed at 300 tpd.

6.6.1.3 Towards ensuring sustainability of the operating plants, the Working Group recommends the following measures :

Rotary Mini Cement Plants

- These plants should be allowed to expand to their full capacity of upto 1200 tpd.
- To facilitate these plants to expand to the full capacity, the definition of mini cement plants capacity should be revised to 1200 tpd from the existing 900 tpd.
- Accordingly the present limit on production i.e. 99000 tonnes per annum for availing concession in excise duty may be reviewed for further enhancement.

Vertical Shaft Kiln (VSK) Mini Cement Plants

- Most of the VSK plants (other than CRI-MVSK) are of 20 tpd capacity should be encouraged to go in for expansion to minimum capacity of 100 tpd to improve their viability.
- VSK plants of capacity 100 tpd or above (mostly CRI-MVSK) should be encouraged to expand upto the capacity of 400 tpd.
- To facilitate this expansion, the definition of mini cement plants capacity is to be revised to 400 tpd from the existing 300 tpd.
- Accordingly the present limit on production i.e. 99000 tonnes per annum for availing concession in excise duty may be reviewed for further enhancement.

6.6.2 **Fuel**

6.6.2.1 These mini cement plants are using coal, petcoke and low volatile fuels as fuel. Having assessed the critical situations in regard to the fuel availability to these mini cement plants, it is recommended as under:

- **Rotary Mini Cement Plants:** It is recommended that a standing committee be set up for allocation of coal and railway linkage in line with arrangement for large cement plants.

- **VSK Mini Cement Plants:** Most of the mini cement plants in India starting from Jammu & Kashmir to Tamilnadu are already using petcoke from Reliance Petroleum Ltd (RPL). Presently RPL is producing 2.5 MTPA of pet coke from their refineries at Jamnagar, Gujarat. In view of availability of pet coke many vertical shaft kiln mini cement plants have already been revived. It is further recommended to adopt the following measures:
 - Reliance Petroleum Limited be advised to create dumps to supply pet coke to the clusters of mini cement plants at an affordable price (2.5 MTPA).
 - Indian Oil Corporation Ltd should also allocate raw and calcined pet coke from their refineries at a fixed price to the mini cement plants of respective regions (230 MTPA).
 - CIL coke which is similar to coke breeze available at Dankuni coal chemical complex, Calcutta be made available (3.5 LTPA)
 - Bharat Coking Coal Limited (BCCL) be advised to mine and supply a consistent quality of low volatile coal (50 Mn.t Mineable Reserves)

6.6.3 Technology

6.6.3.1 Mini Cement Plants which were set up in the initial years stages need immediate attention in the area of technological upgradation covering plant and machinery, process control, instrumentation etc. number of technological developments have taken place both in the case of rotary kiln as well as vertical shaft kiln mini cement plants. Some of them are given below:

- Technology Absorption And Transfer
- Fluidized Bed Kiln System
- Medium Capacity Vertical Roller Mills
- Mini / Medium Roller Presses
- Multi Fuel Burners

6.6.4 Marketing

6.6.4.1 The present excise concession is given to mini cement plants to offset the cost of production and not for marketing. Mini plants may be encouraged to consolidate marketing in association with the large plants, or combining with each other. Therefore the restriction that mini cement plants are not eligible for concession if they sell the cement under the name of other brand should be removed.

6.6.5 Product Diversification

- These plants should be encouraged for product diversification for manufacture of blended cements/ masonry cement / oil well cement etc.
- To encourage increased utilization of industrial wastes / mine rejects etc, incentives in the form of reduction in excise duty or transport subsidy be considered.

6.6.6 Technological Upgradation cum Expansion of operating plants and Promotion of Green Field Plants

6.6.6.1 The Government of India and many State Governments are focusing on infrastructural projects, rural development and housing, which could result in increased demand for cement. Towards meeting this demand, the cement industry is poised for an annual growth rate of 10% during the X Five Year Plan period. Mini Cement Plants can play their complimentary role in supplying cement to meet the local requirements. Towards consolidating the mini cement plant sector, two strategies are required to be adopted:

- Ensuring that the plants, which are in operation, are allowed to modernise/expand, to improve their viability.
- Promotion of greenfield cement plants, on a selective basis in cement deficient states like North eastern states, Jammu & Kashmir, parts of Himachal Pradesh, where scattered limestone deposits are already identified.

6.6.6.2 As only 24 rotary kiln plants and about 30 VSK plants mostly of (100 tpd and above capacity) with an installed capacity of 3.4 mn.t and 1.2 mn.t respectively, are effectively contributing to cement production, a detailed study should be conducted to assess their modernization / capacity enhancement needs vis-à-vis their financial requirements.

6.6.6.3 It is estimated that the modernisation/ expansion of 24 rotary kiln plants, would result in additional capacity of about 3.0 mn.t and similarly the expansion of 30 VSK cement plants (with present capacity of 100 tpd and above) will result in 2.0 mn.t capacity, i.e. a total of 5.0 mn.t through modernisation cum expansion of operating Mini Cement Plants.

6.6.6.4 In addition, out of 21 potential limestone deposits identified as at Annexure-V, in the cement deficient States of H P, J&K and North-eastern states - Assam, Meghalaya, Nagaland; green-field cement units - 400 tpd capacity VSK plants and 1000 / 1200 tpd capacity rotary plants be encouraged, on a selective basis. Some of the greenfield units could be in production by the terminal year of the X Five Year Plan (2006-07), if financial assistance is made available for setting up these cement units. Thus new capacity to be generated in these regions through green field plants will be about 2.5 mn.t.

6.6.6.5 With this approach, on an optimistic estimates, an additional capacity of 7.50 mn.t is expected to become operational by the terminal year of the X Plan period with a production of 5.00 mn.t. Accordingly the total installed capacity of Mini Cement Plant sector by the end of Tenth Five Year Plan will be around 18.60 mn.t with a production of 13.00 mn.t.

6.6.6.6 However, on a conservative approach, it is estimated that an additional capacity through green field projects could be of the order of 1.5 mn.t and about 3.5 mn.t is expected through modernisation and expansion of operating plants i.e. a total of 5 mn.t additional capacity is expected by the end of the tenth Five Year Plan. Accordingly the total installed capacity of Mini Cement Plant sector by the end of Tenth Five Year Plan will be around 16.10 mn.t with a production of 7.00 mn.t. which could go up to 9.00 mn.t. if alternative fuels (including waste derived fuel) are available at an economical price.

6.6.7 Financial Support

6.6.7.1 Financial institutions which are averse to extend financial assistance to MCP sector, should be advised by the Govt. to work out a suitable package, so that these plants become stronger and healthier, after modernisation/ expansion. The Working Group recommends that the financial institutions should formulate policies to extend term loan and working capital assistance on case-to-case basis for the growth of this sector.

6.6.7.2 It is estimated that based on the current prices, on optimistic estimates an investment of about Rs 1500 crores will be required, comprising, Rs 700 crores for green field projects of about 2.5 mn.t capacity and about Rs 800 crores for modernization and expansion, resulting in capacity addition of about 5 mn.t from the existing and operating units.

6.6.7.3 Similarly, on a conservative approach it is estimated that an investment of the order of Rs 1000 crores, will be required, comprising, Rs 450 crores for green field projects of about 1.5 mn.t capacity and about Rs 550 crores for modernization and expansion, resulting in capacity addition of about 3.50 mn.t from the existing and operating units.

6.6.7.4 Such mini cement plants should also be allowed to be set up in other locations close to raw materials, fuel and adequate local market on case-to-case basis.

6.6.8 Regional Training Centre

6.6.8.1 For the promoters of mini cement plants in North Eastern Region, there is a need to organize orientation training programmes to apprise them of the technological developments, efficient plant operation and quality control etc. for day-to-day implementation in their respective plants.

6.6.8.2 To achieve this, working group recommends setting up a Regional Training Centre at an appropriate location in the North Eastern Region.

**State-wise List of Mini Cement Plants
(No. of Installed Plants)**

Name of State	Technology			
	Rotary	CRI-MVSK	Saboo-VSK	RRL VSK
Andhra Pradesh	10	13	3	9
Arunachal Pradesh	-	1	-	-
Assam	2	3	-	2
Bihar	1	5	1	2
Gujarat	7	4	20	6
Haryana	-	-	6	1
Himachal Pradesh	-	1	7	4
Jammu & Kashmir	-	4	1	-
Karnataka	5	27	2	-
Madhya Pradesh	3	18	7	3
Maharashtra	-	2	6	1
Manipur	-	1	-	-
Nagaland	-	1	-	-
Orissa	2	4	17	-
Rajasthan	1	7	107	2
Tamil Nadu	-	5	-	1
Uttar Pradesh	-	3	19	-
West Bengal	-	-	1	-
Meghalaya	-	2	2	-
Kerala	-	-	2	-
Goa	-	-	1	-
Total	31	101	202	31

**State-wise List of Mini Cement Plants
(Installed Capacity - LTPA)**

Name of State	Technology			
	Rotary	CRI-MVSK	Saboo-VSK	RRL VSK
Andhra Pradesh	20.08	5.21	1.16	0.74
Arunachal Pradesh	-	0.09	-	-
Assam	2.89	1.32	-	0.16
Bihar	1.09	1.32	0.16	0.16
Gujarat	5.61	1.65	3.14	0.78
Haryana	-	-	1.16	0.08
Himachal Pradesh	-	0.07	0.94	0.33
Jammu & Kashmir	-	1.22	0.06	-
Karnataka	3.63	5.41	0.15	-
Madhya Pradesh	4.59	6.24	0.73	0.25
Maharashtra	-	1.52	0.60	0.12
Manipur	-	0.17	-	-
Nagaland	-	0.17	-	-
Orissa	1.48	0.86	2.90	-
Rajasthan	0.66	3.63	18.39	0.16
Tamil Nadu	-	2.67	-	0.08
Uttar Pradesh	-	0.92	3.03	-
West Bengal	-	-	0.33	-
Meghalaya	-	1.07	0.50	-
Kerala	-	-	0.58	-
Goa	-	-	0.66	-
Total	40.03	33.54	34.49	2.86

Annexure - III**Statewise List of Mini Cement Plants
(No. of Operating Plants)**

Name of State	Technology			
	Rotary	CRI-MVSK	Saboo-VSK	RRL VSK
Andhra Pradesh	9	5	3	-
Arunachal Pradesh	-	-	-	-
Assam	2	3	-	-
Bihar	1	1	1	-
Gujarat	4	2	17	-
Haryana	-	-	2	-
Himachal Pradesh	-	-	-	-
Jammu & Kashmir	-	4	-	-
Karnataka	3	5	1	-
Madhya Pradesh	3	4	2	-
Maharashtra	-	-	3	-
Manipur	-	-	-	-
Nagaland	-	1	-	-
Orissa	1	-	14	-
Rajasthan	1	1	26	-
Tamil Nadu	-	1	-	-
Uttar Pradesh	-	1	3	-
West Bengal	-	-	1	-
Meghalaya	-	2	2	-
Kerala	-	-	2	-
Goa	-	-	1	-
Total	24	30	78	-

**Statewise List of Mini Cement Plants
(Operating Capacity - LTPA)**

Name of State	Technology			
	Rotary	CRI-MVSK	Saboo-VSK	RRL VSK
Andhra Pradesh	19.08	2.48	1.16	-
Arunachal Pradesh	-	-	-	-
Assam	2.89	1.32	-	-
Bihar	1.09	0.33	0.16	-
Gujarat	2.67	0.99	2.64	-
Haryana	-	-	0.33	-
Himachal Pradesh	-	-	-	-
Jammu & Kashmir	-	1.21	-	-
Karnataka	2.31	1.25	0.06	-
Madhya Pradesh	4.59	1.65	0.40	-
Maharashtra	-	-	0.40	-
Manipur	-	-	-	-
Nagaland	-	0.17	-	-
Orissa	0.82	-	1.91	-
Rajasthan	0.66	0.33	4.29	-
Tamil Nadu	-	0.66	-	-
Uttar Pradesh	-	0.33	0.36	-
West Bengal	-	-	0.33	-
Meghalaya	-	1.07	0.50	-
Kerala	-	-	0.58	-
Goa	-	-	0.66	-
Total	34.11	11.79	13.78	-

Annexure -V

**List of Potential Limestone Deposits Identified for Setting
up Mini Cement Plants in Cement Deficit States**

Sl No.	State / District Location	Reserves in Mn.t				Potential Capacity - TPD
		Proved	Probable	Possible	(Proved Equivalent)	
I	ASSAM District: <u>North Cachar Hills</u>					
1	Timbung	4.50	--	--	4.50	150
2	Garampani	31.10	--	--	31.10	1000
II	MEGHALAYA District : <u>Jaintia Hills</u>					
3	Syndai	--	--	26.50	13.25	400
	District : <u>East Khasi Hills</u>					
4	Mawmluh- Mawasmai	31.15	--	8.50	35.40	600
	District : <u>West Khasi Hills</u>					
5	Borsora	--	37.00	--	25.90	1000
6	Dopgiri Chokpot	2.77	32.23	--	25.33	400
III	NAGALAND District : <u>Phek</u>					
7	Satuza	--	--	6.00	3.00	100
8	Moke	--	--	8.50	4.25	150
IV	UTTAR PRADESH District : <u>Sonbhadra</u>					
9	Jurawani	--	--	11.50	5.75	200
V	DIU					
10	Diu	48.84	--	--	48.84	1600
VI	HIMACHAL PRADESH District : <u>Kangra</u>					
11	Dharamkot-Bal Block	9.60	--	--	9.60	300
	District : <u>Kullu</u>					
12	Largi	--	--	15.00	7.50	300
	District : <u>Shimla</u>					
13	Pipalthu-Malgi	--	--	26.74	13.37	400
	District : <u>Sirmaur</u>					
14	Nauradhar	3.00	--	--	3.00	300

VII	JAMMU & KASHMIR					
	District : Anantnag					
15	Bawan			24.00	12.00	400
16	Tiserkar			4.45	2.27	100
17	Doru			5.90	2.95	100
	District : Baramula					
18	Ajas	--	--	4.50	2.25	100
19	Kunan Baba Gund			4.75	2.38	100
	District : Rajauri					
20	Kalakot-Jangalgali		9.40	--	6.60	300
21	Met Ka- Mahogala		5.76	--	4.00	200
						Total 8,200 TPD or 2.70 mn.t

Note : The above potential sites have been identified based on the data received from various sources/agencies. To ensure that the limestone reserves for each cement plant location, meets the requirements both in terms of quality and quantity, detailed exploration and assessment is to be carried out, prior to setting up a cement plant.

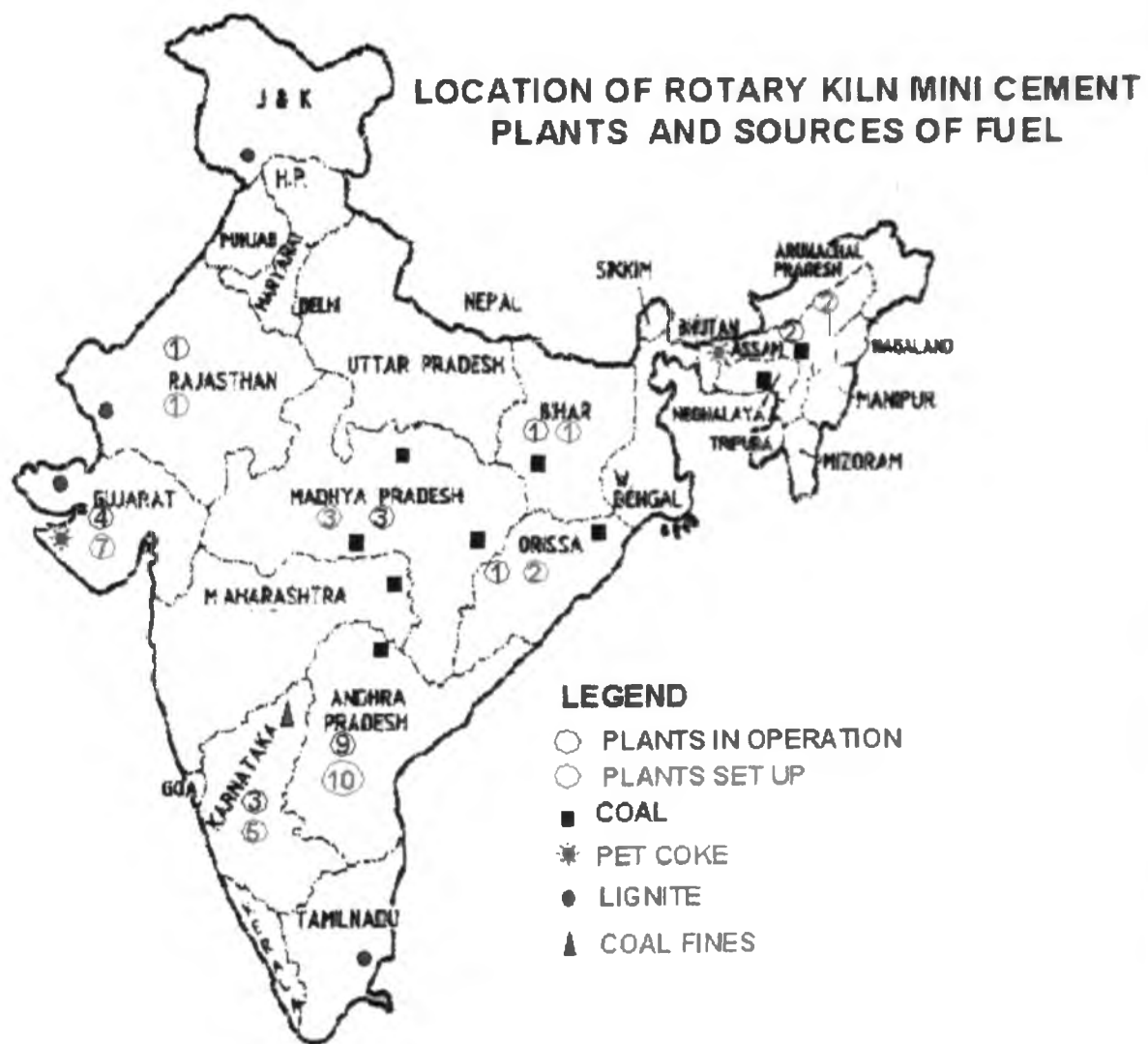


Fig 1

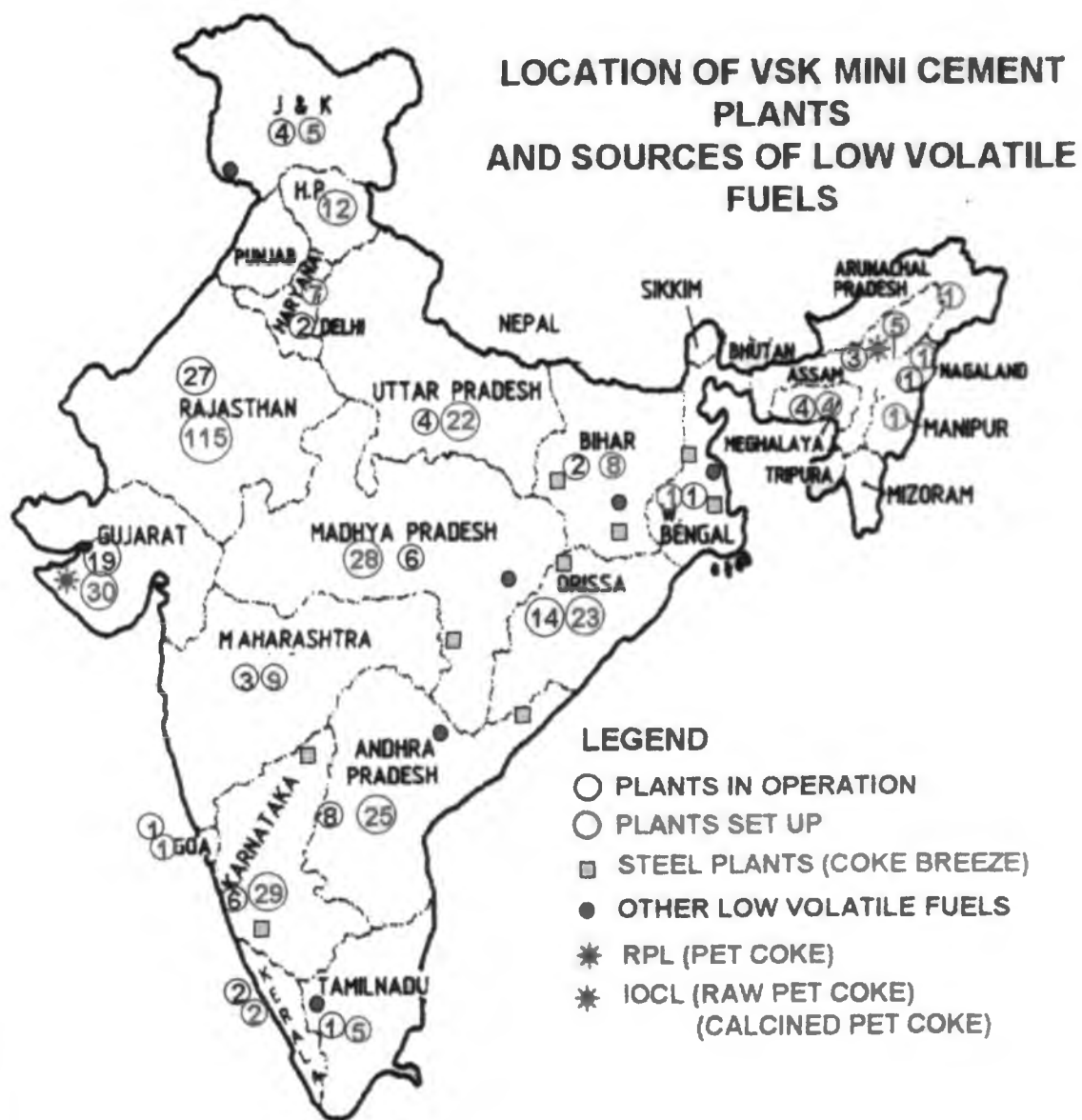


Fig 2

POLLUTION CONTROL AND USE OF WASTE MATERIALS

SUB-GROUP - V



Mining by Surface Miner



Bag Filter for Coal Mill



ESP for Cement Mill

V. POLLUTION CONTROL AND USE OF WASTE MATERIALS

1.0 Introduction

1.1 Cement manufacture inherently contributes to atmospheric pollution in the form of particulates and green-house gases besides ecological concern arising from the degradation of mined out area. The particulate pollution is caused by fine powders handled at each stage of cement manufacturing process starting from Limestone excavation to final packing of cement. However, with the state-of-the-art-technology pollution control equipment adopted in many cement plants, contribution to the atmospheric pollution has been considerably reduced. It may be pertinent to add that cement industry does not add any toxic or hazardous wastes in the form of effluents.

1.2 Indian cement industry has been very proactive in adopting various technological advancements taking place all over the world. Most of the cement plants now use very efficient dust collection devices and dust emission-monitoring equipment to control pollution. The suspended particulate matters (SPM) emission in many of the plants is quite low. Considerable efforts have been put in by Indian cement industry to control particulate emission. In the 60's and 70's cyclone dust collectors were predominantly used for air pollution control in kiln, mills, etc. and levels of emission were controlled within the then stipulated levels of 2.5 gm/Nm³. Since then, there has been considerable progress in installing ESPs and fabric filters in various sections of cement plants especially after the promulgation of the legislation in 1981 and 1986. Growing awareness of the environmental problems and adoption of latest technologies have led to progressively lower emission levels.

2.0 Emission Levels

2.1 The Centrai Pollution Control Board (CPCB), has brought out the standards for emission levels for particulate matter from stacks in cement plants.

Particulate Emission Norms in India

Capacity	Emission Limit (mg/Nm ³)	
	Protected Area	Other Area
<200 TPD	250	400
>200 TPD	150	250

The level of permissible dust emission in India for operating plants is 150 mg/Nm³. However, for new plant, environmental clearance desires 50 mg/Nm³, which is even lower than in some developed countries such as Japan.

2.2 The norms of particulate emission for India and other countries are as shown below :

Country	Emission Limit (mg/Nm ³)
Australia	50
Germany	50
South Africa	120
Switzerland	50
Japan	100
U.S.A.	100/50
Portugal	100 (Existing Kilns) 50 (New Kilns)

2.3 There is a need to have a fresh look at the prescribed SPM levels by the authorities. It is proposed that emission limit of 100 mg/Nm³ for the new plants is stipulated to be achieved gradually in the next 10 years. So far as VSK cement plants are concerned, the emission limit of 250 mg/Nm³ may be continued.

2.4 In a survey conducted in 1993 by the CPCB for operating cement plants, 55 plants were found to be fully complying with pollution control norms out of total 97 plants surveyed. According to the latest survey (2000), 58 plants are fully complying with the norms as indicated below

Item	1993	2000
Cement Plants surveyed	97	113
Fully complying with pollution norms	55	58
Partially complying	20	25
Not complying	14	16
Not operating	8	14

Source CPCB

3.0 Constraints in compliance with Emission Levels

3.1 Constraints faced by the cement industry in complying with the emission regulations are manifold. These may be classified as external ones like

poor quality of coal and power etc., which need to be tackled at the national level; and internal ones, such as constraints of layout to accommodate dust collection equipment within the existing space, non-availability of water.

3.2 There is a wide variation in the quality of coal received by Indian cement plants, which leads to improper and ever-changing combustion conditions, difficulty in proper control of air flow rate, which, in turn causes a high concentration of CO in the exit gas which may cause explosion in ESP. Very often the CO concentration even exceeds the permissible limit, mainly due to the poor and variable quality of coal. As a safety precaution, the ESP trips, thereby temporarily causing high dust emission through the stack.

3.2.1 The various options available to overcome this problem are :

- **Installation of coal blending system to get uniform quality of coal feed**
- **Installation of coal washeries either at the pithead or near cement plant clusters to decrease ash content of coal.**
- **Allocation of coal of better quality and consistency to cement plants and also speeding up privatization of collieries for captive consumption of cement plants should be considered.**
- **Import duty on coal to be brought down alongwith freight subsidy for land locked plants.**

3.2.2 Further, to have better understanding and compliance of emission norms the following are recommended :

- **Continuous stack monitoring installations with data logging facilities may be provided to ensure compliance by the industry. The Indian cement industry has been consciously trying out various technologies for continuous stack monitoring and has still not been able to achieve the required level of confidence and it is working towards the same.**
- **Possibility of interlocking of pollution control equipment and main process equipment needs detailed examination. In view of poor quality of coal and power supply the interlocking of pollution control equipment will lead to more polluting scenario and should not be made mandatory.**

3.3 For proper operation of ESP, continuous and good quality power is a pre-requisite. Long durations of low voltage, fluctuation in voltage and frequency, unscheduled power cuts, etc. have an adverse effect on the efficiency of the ESP, resulting in higher emission. In order to overcome these constraints, plants may be equipped with captive power units, of sufficient capacity for clinkerization and provide power for associated equipment to make them operative continuously. State Governments be directed to relax restrictions imposed for installation of captive power generation, provided these units meet the environmental standards.

4.0 Greenhouse Gas Emission (GHG)

4.1 Concern has been mounting the world over on the increasing emission of greenhouse gases (GHG) such as CO₂. Cement industry with an annual production of 99 mn.t of cement contributes about 89 mn.t CO₂ emission @ 0.9 tonne of CO₂/tonne of cement. CO₂ emission levels in some countries are given as under :

Country	CO ₂ Emission (mn.t.)	Cement Production (mn.t.)	CO ₂ /tonne of Cement
Japan	37.71	83.47	0.45
USA	41.07	85	0.47
China	249.48	573	0.43
India	89	99	0.90

4.2 The CO₂ emission levels in some of the efficient cement plants in some of the states in India are shown below :

State	CO ₂ Emission (mn.t.)	Cement Production (mn.t.)	CO ₂ Emission, tonne/tonne of Cement
Tamil Nadu	0.59	0.76	0.77
M P	1.35	1.93	0.70
Gujarat	0.5	0.65	0.77
Rajasthan	1.05	1.29	0.81

It can be seen that though the average CO₂ emission level in India is 0.9 tonne/tonne of cement, some of the efficient cement plants have achieved levels as low as 0.7 tonne of CO₂/tonne of cement.

4.3 The basic reason for lower CO₂/tonne of cement in Japan and European countries is prominence of blended cements. CO₂ is predominantly generated during clinkerisation stage and therefore production of higher tonnage of cement (through blended cement) from same quantity of clinker would reduce the CO₂/tonne of cement.

4.4 It is proposed to bring down CO₂ emission level in the next five years (2002-07) to about 80 mn.t out of the projected cement production of 158.56 mn.t (CO₂ emission of 0.50 tonne/tonne of cement) by adopting the following measures:

- Increased production of blended cements and promotion of its use in large quantities.
- Optimising the pyro-processing system and avenues for reduction in electrical power consumption.
- Increased afforestation and sink potential for CO₂.
- Recovery of waste heat for cogeneration of power. The cost of such an installation is very high and government should consider import duty exemption and other financial/fiscal incentives.
- Optimizing particle size distribution of fine coal.
- Use of Alternate fuel (Oil, Gas) / waste derived fuel.
- Increased use of marginal grade limestone.
- Manufacture of reactive belite cement.

5.0 Gaseous Emissions

5.1 The Central Pollution Control Board is now considering fixing emission levels for SO₂ and NO_x. Gaseous emissions like SO₂ and NO_x need to be studied and a detailed inventory of SO₂ and NO_x generation from the kiln stacks need to be carried out. These levels, including the technologies available should then be considered as the basis for fixing the norms for SO₂ and NO_x in consultation with the cement industry.

5.2 Most of the developed countries have already introduced norms for SO₂ and NO_x emission as below :

Country	Limits (mg/Nm ³)
Nox Emission	
Australia (Federal)	500
Australia (Queensland and Victoria only)	2290
Singapore	2000
U.K.	2290
Japan	
For gas flow > 100,000 Nm ³ /hr	500
For gas flow < 100,000 Nm ³ /hr	700
Germany	1300-1800
European Union	1300-1800
Switzerland	800
SO₂ Emission	
Germany	400
Switzerland	500
European Union	400-800

Note : While fixing the air quality levels for the cement industry, the authorities should also consider the ambient air quality.

6.0 Environmental Improvement and Environment Audit

6.1 Ministry of Environment and Forests, Government of India, vide gazette Notification No. 155 dated the 28 April 1993, have made it mandatory for all major industries, including cement industry, to submit environment statement (audit report) to respective State Pollution Control Boards on or before 30 September every year, for the previous financial year.

The primary need for environment audit in a cement plant is to find out efficient utilization of materials, pyro-processing, and waste reduction during various operations resulting in environmental improvements in and around cement plants and limestone mines, in addition to check compliance with regulatory requirements. As the stack emission is dependent upon operation of the kiln system, any measure, resulting in smoother kiln operation, would contribute to environmental improvement. Transportation of cement in bulk will also reduce pollution.

6.2 Environmental Management System (EMS) certification is an opportunity that can enable companies to acquire the recognition of environmentally sound enterprises and also derive the benefits of improved performance. As on date, 27 plants are accredited to ISO 14001 certification.

More than 80 cement plants are proposed to be accredited with ISO 14001 by initiating and implementing EMS during the X Five Year Plan.

6.3 The objective of the environment audit (Statement) is to provide assurance to top management that all stipulated regulatory norms are being met in accordance with Central/State Pollution Control Board. It is also a statutory requirement to conduct environment audit for existing plants once a year and submit the environment statement to the concerned State Pollution Control Board.

6.4 Social forestry, reclamation of old mines into water bodies, orchard or habitat, is a common phenomenon with Indian cement industry. As on date 19 million trees have been planted by Indian cement industry under social forestry scheme and it is proposed to plant 35 million trees in the next five years (2002-07).

6.5 Surface miners are successfully operating in some cement plants. Adoption of surface miners wherever feasible in limestone mines will reduce dust emission. Incentives for improvement in environmental performance is being encouraged by way of giving various awards like FICCI award, TERI Award, National Award for prevention of pollution instituted by Ministry of Environment and Forests and NCB Award for Environmental Excellence.

6.6 Indian Cement Industry is making its best efforts for environmental improvement by stressing the need for reduction of dust emission from stacks, fugitive generation and reduction of noise levels. These will be further intensified during the X Five Year Plan. Necessary measures to control gaseous pollutants will need to be undertaken. The measures suggested above will go a long way in controlling pollution load on the environment.

6.7 Since the cement industry does not generate any toxic or hazardous wastes in the form of effluents, it should be deleted from the list of hazardous industries.

7.0 Use of Waste Materials

7.1 The present raw material base for the cement industry is not going to last forever and the use of various industrial, agricultural, urban and rural wastes, generated to the tune of 3650 mn.t annually, need to be exploited as alternate sources of raw materials. Manufacture of cement based on various industrial wastes should be further encouraged to conserve natural resources.

7.2 Many cementitious waste materials like pozzolana (fly ash, silica fume) and blast furnace slag are commonly being used for blending with OPC. Such blending ensures effective use of waste materials besides reducing the problem of waste disposal, which would otherwise be a menace for the environment. Quality of the product, however, is not deteriorated; on the other hand, certain properties of durability like reduced heat of hydration, resistance to chlorides/sulphates in blended cement are superior to OPC. Use of waste materials reduces the cost of production and conserves valuable limestone.

7.3 Substantial quantities of such wastes are generated in our country, which have similar chemical composition as the principal raw material i.e. limestone or cement. The volume of various industrial, agricultural and urban wastes produced annually in India are :

Industrial and mining wastes	- 150 mn.t
Agricultural wastes	- 500 mn.t
Rural and Urban wastes	- 3000 mn.t

7.4 The generation and utilisation of some important industrial wastes in India are shown in the table :

Materials	Generation Mn.t./year	Utilisation mn.t./year
Fly Ash	90	3.5
Blast Furnace Slag	10	5.5
Steel Slag	4.0	0.5
Phosphogypsum	6.0	2.5
Phosphochalk	3.0	0.5
Lime Sludge	4.5	0.5
Red Mud	3.3	0.5

(Source: NCB – As on March 2001)

Out of around 120 mn.t of wastes generated, only about 13.5 mn.t (11.5%) is being presently used by the Indian cement industry.

7.5 The major industrial wastes used in cement manufacture and allied building materials are fly ash, blast furnace slag, lime sludges and phosphogypsum.

7.5.1 Fly Ash: Fly ash obtained from thermal power plants is a valuable industrial waste because of its mineral value. Simultaneously, its use in many known applications leads to savings in energy. The In-depth R & D work carried out at various national laboratories has suggested its gainful use in the following prominent areas:

- As a blending component for the manufacture of Portland Pozzolana Cement
- As a raw material for manufacture of Clinker
- As a component for manufacture of Masonry Cement
- Bricks and Blocks
- Pozzolana Metallurgical Cement
- Fly ash Activated Cements
- Sintered Light Weight aggregates
- Fly Ash concrete
- Road Construction
- Ready Mix Concrete

7.5.2 Blast Furnace Slag: Slags are by-products generated from steel industry. An estimated quantity of 10.0 mn.t. blast furnace slag is generated annually out of which about 5.5 mn.t. has been used in cement manufacture and allied building materials. Slags from copper, zinc and nickel plants, though available in relatively smaller quantities, are of worth consideration in terms of their mineral and economic values.

Granulated Blast Furnace Slag is being used in :

- Slag Cement
- Super Sulphated Cement
- Non-Portland Cement
- Expansive Cement, Oil Well Cement, Coloured Clinker, High early strength cement, Metallurgical cement, etc.
- Refractory and ceramics
- Slag bricks, concrete units and building blocks
- Glass sand for manufacture of glasses

Air Cooled Slag is being used in :

- As an aggregate in concrete
- Rail Road ballast
- As a filler

7.5.3 Lime Sludge and Phosphochalk: It is a by-product generated from paper, fertilizer, acetylene and sugar industries and has calcium carbonate as the major component. An estimated quantity of 7.5 mn.t. is generated annually out of which about 1.0 mn.t. is being used presently and its major portion remains unutilized. These sludges contain 40-50 percent moisture and are disposed off in the form of slurry in nearby places for drying. These materials have been used as:

- Part substitute to limestone in cement manufacture
- Source of sweetener for upgrading marginal grade and lower grade limestone
- Raw Material for mini cement plants
- Recycling in the paper industry
- Manufacture of building lime, lime-pozzolana, masonry cement and calcium silicate based products.

7.5.4 Phosphogypsum: Phosphogypsum is the by-product in the manufacture of phosphoric acid. For every tonne of phosphoric acid manufactured, approximately 4.5-5 tonnes of phosphogypsum is generated. Over 6 mn.t. of phosphogypsum is generated every year in India out of this 40-45 % is utilized in cement production and 15% in agriculture. The remaining 35-40% of phosphogypsum remains unutilized. Phosphogypsum can be used as :

- a set controller in cement manufacture
- a mineralizer
- in making hemi-hydrate, anhydrite etc.

7.6 Reasons for Lower Utilisation of Industrial Wastes

- Non-availability of these wastes in dry state e.g. there is need to encourage dry collection of fly ash as against wet slurry disposal to facilitate its use by cement plants. While it is the government policy to sanction all new power plants with dry collection system, existing plants having wet collection can be easily retrofitted with

dry collection system. Most of the existing power plants with such wet collection are in the Public sector and they can be given suitable instructions alongwith incentives / grants for such retrofitting.

- Transportation Problems
- Quality variations
- Financial constraints in drying industrial wastes.
- Lack of promotional efforts
- Lack of engineering services
- R & D support and extension programmes
- Lack of awareness among consumers regarding the benefits of their use.

7.7 Measures to Increase Utilisation of Industrial Wastes

- Availability in dry form
- Arrangements of transport of wastes in dedicated wagons. Transport subsidy may be considered for encouraging the use of waste materials.
- Proper collection/classification/processing system to obtain industrial wastes of consistent quality
- Wide publicity regarding advantages of waste products
- Providing fiscal and financial incentives for the use of wastes
- Land adjoining the waste generating plant be given on long lease to the plant utilizing waste with necessary infrastructure such as water, power etc.
- Duty free import of machinery required for setting up wastes processing plants.
- Incentives and soft loans be granted for setting up wastes processing plants.
- Use of waste materials must be promoted by allowing suitable incentives for environment friendly products/technologies.

7.8 Utilization of Industrial Wastes in India

7.8.1 The Japanese cement industry utilize almost 100% of the industrial wastes generated whereas Indian cement industry utilise only about 11% of industrial wastes in cement manufacture during 2000-01 as per the details:

(mn.t.)

Country	Slag	Fly Ash	Chemical Gypsum	Others	Total	Cement Production
Japan	14.5 (100%)	5.8 (94%)	2.7 (100%)	4.4 (100%)	27.4 (100%)	82
India	5.5 (55 %)	3.5 (4 %)	2.5 (42 %)	2.0 (13.5 %)	13.15 (11 %)	93.61

7.8.2 As already reported earlier the lower utilization of fly ash in India is because of non-availability of consistent quality of fly ash in dry form for use in cement industry. Therefore the concerned thermal power plants should install facilities for collection, storage and supply of dry fly ash.

7.9 Technologies Developed/Available for Wastes Utilization

7.9.1 The following technologies have been developed by National Council for Cement and Building Material (NCB) on laboratory & pilot scale and are available for commercial use:

At Laboratory Scale

- Manufacture of Masonry Cement from Sludges
- Sintered Fly ash light weight Aggregates
- Fly ash as Water Reducer in Concrete
- Fly Ash for Soil Stabilization
- Manufacture of OPC and PSC from Steel Slag
- Utilization of Red Mud for the manufacture of OPC
- Roller Compacted Concrete
- High Performance Concrete
- Manufacture of OPC from Carbide Sludge
- Manufacture of PSC from Phosphorous Furnace Slag
- Manufacture of OPC and Masonry Cement from Phosphochalk

At Pilot Scale

- Manufacture of Lime and OPC from Lime Sludge from Paper Industry

7.9.2 Adoption of technologies for use of slags like steel slag, phosphorus furnace slag etc. is feasible subject to BIS modifying the relevant standards.

7.10 Projected Generation and Utilization of Industrial Wastes during X Five Year Plan

The estimated generation of industrial wastes and their projected utilization in cement manufacture during X Five Year Plan is presented below :

Waste Material	Generation mn.t./year	Utilization mn.t./year
Fly Ash	120.0	20.0
Blast Furnace Slag	14.0	10.0
Steel Slag	6.0	2.5
Phosphogypsum	8.0	5.0
Phosphochalk	3.0	2.0
Lime Sludge	6.0	3.0
Red Mud	4.5	2.5
Total	161.5	45.0

7.11 Measures for Increasing Utilization of Industrial Wastes during X Five Year Plan

7.11.1 In order to increase the level of utilization of various industrial wastes during the X plan, the following technologies need upgradation

Pilot Scale Studies for

- Manufacture of OPC/Blended Cement/Masonry Cement from :
 - Steel Slag
 - Red Mud
 - Lime Sludges
 - Phosphochalk
 - Mine Wastes
 - Waste Derived Fuels
- Production of liquid fuel (dimethyl fuel) using CO₂ emission.

Setting up of Demonstration Units for

- Manufacture of Lime and Cement from Lime Sludge from Paper Industry
- Manufacture of Lime and Cement from Phosphochalk from Fertilizer Industry
- Utilisation of Municipal Solid Wastes using new generation Binders/Solidifiers
- Manufacture of Green Coal from Municipal Solid Wastes.

GOVERNMENT NOTIFICATIONS

**No.I&M-3 (13)2000
Government of India
Planning Commission
(I&M Division)**

**Yojana Bhavan, Sansad Marg,
New Delhi the 7th September, 2001**

ORDER

Subject: Working-Group on Cement Industry for the Tenth Plan(2002-07).

In the context of the formulation of the Tenth Five Year Plan 2002-2007, it has been decided to set up a Working Group on Cement Industry. The terms of reference and composition of the Working Group are as follows:

I. Terms and Reference:

- 1. To review the status of Cement Industry during the Ninth Plan highlighting the achievements and reasons for any shortfall in the fulfilment of targets.**
- 2. To project production and demand for Cement Industry for the Tenth Plan and to recommend measures for achievement of these projections through modernization, expansion, setting up of new cement units etc.**
- 3. To examine State-wise, region-wise and sector-wise requirement of cement and to suggest innovative uses of cement.**
- 4. To evaluate the potential export markets, its demand and competitive sources of supply and to suggest measures to promote cement exports to these markets.**
- 5. To examine cement imports and implications of WTO on cement industry.**
- 6. To review the existing technology and identify the needs for further R&D activities to upgrade technology.**
- 7. To assess availability of skilled manpower, facilities for training and human resource development.**
- 8. To explore energy saving methods and alternate sources of energy like Pet Coke, LNG, CNG, organic waste materials etc.**
- 9. To suggest measures for pollution control in cement plants.**

10. To examine and recommend measures for using industrial waste and effluents in the cement industry and fiscal and other measures for accelerated use of waste products (like fly-ash, slag, effluent from paper industry etc.).
11. To review the performance of mini-cement plants and recommend measures for the growth of this sector.
12. To update national inventory of limestone.
13. To examine the status of bulk transportation of cement and recommend measures for increased bulk transportation.
14. To bench mark the indigenous cement industry against international industry and suggest measures for bridging the gaps, where necessary

II. Composition of the Working Group

- | | |
|--|------------------|
| 1. Secretary,
Deptt. of Industrial Policy & Promotion | Chairman |
| 2. Representative of Planning Commission
(Industries Division) | Member |
| 3. Representative of Planning Commission
(Transport Division) | Member |
| 4. Representative of Planning Commission
(PP Division) | Member |
| 5. Joint Secretary, Deptt. of Industrial Policy
& Promotion | Member-Secretary |
| 6. Representative of Deptt. of Expenditure
(Plan Finance) | Member |
| 7. Representative of Ministry of Urban Development
and Poverty Alleviation. | Member |
| 8. Representative of Ministry of Rural Development | Member |
| 9. Representative of Ministry of Coal | Member |
| 10. Representative of Ministry of Surface Transport | Member |

11. Representative of Ministry of Environment & Forests	Member
12. Representative of Railway Board	Member
13. Representative of National Highways Authority of India(NHAI)	Member
14. Representative of Central Road Research Institute(CRRI)	Member
15. Representative of IDBI	Member
16. Representative of HUDCO	Member
17. President Cement Manufacturers' Association	Member
18. Director General. National Council for Cement & Building Materials (NCCBM)	Member
19. President, All-India Mini Cement Manufacturers' Association	Member

The Working Group may co-opt such official(s) or non-official(s) as member of the Group as considered necessary. The Working Group may also constitute sub-group(s), if so desired.

The expenditure on TA/DA in connection with the meetings of the Working Group will be borne by the parent Department/Ministry to which the official belongs. The non-official members of the Working Group will be entitled to TA/DA as permissible to Grade I officers of the Government of India and this expenditure will be borne by the Planning Commission.

"Shri Jagdish Chander, Deputy Adviser, Room No.144, Yojana Bhavan, Sansad Marg, New Delhi-110001. (Tel. No.3357230) will act as the Nodal Officer and any further communication/clarification in this regard may be made with the Nodal Officer".

The Working Group will submit its report within three months from the date of issue of this order.


(T.R. Meena)
Deputy Secretary(Admn.)

To all the Members

Copy for information to:

**JS to Prime Minister
PS to Deputy Chairman, Planning Commission
PSs to Members
Heads of Divisions of Planning Commission
Director, Administration
All Officers of Industries Division
Under Secretary(Admn.I)**



**(T.R. Meena)
Deputy Secretary(Admn.)**

No. 13(36)/2001-Cem.II
Government of India
Ministry of Commerce & Industry
Deptt. of Industrial Policy & Promotion
(Cement Section)

New Delhi, the 9th Oct., 2001.

OFFICE MEMORANDUM

Sub:- Working Group on Cement Industry for the 10th Five Year Plan (2002-2007) – Constitution of Sub-Groups for the same.

As decided in the first meeting of the Working Group on Cement Industry held on 5.10.2001 under the Chairmanship of Secretary, Department of Industrial Policy & Promotion for the formulation of the 10th Five Year Plan, the following Sub-Groups are constituted to look into the various aspects of the industry:-

1. **SUB-GROUP-I** CAPACITY, DEMAND, PRODUCTION AND INFRASTRUCTURE
2. **SUB-GROUP-II** TECHNOLOGY, ENERGY, CONSERVATION, BENCH MARKING, R&D NEEDS AND MANPOWER
3. **SUB-GROUP-III** BULK STRANSPORT, CEMENT EXPORT, CEMENT IMPORT AND WTO
4. **SUB-GROUP-IV** LIMESTONE INVENTORY AND MINI CEMENT PLANTS
5. **SUB-GROUP-V** POLLUTION CONTROL AND USE OF WASTE PRODUCTS

The composition and terms of reference of each Sub-Group are given in the Annexure applicable to that Sub-Group. Chairman of the Sub-Group is free to associate any other expert personnel/institution on the subject as member, if deemed necessary. The Sub-Groups will expedite the finalisation of their report and submit it to the Working Group.

It is requested that the name(s) of the representative(s) of organisations mentioned in the annexure may kindly be communicated to the Member-Secretary of the Working Group as well as to the Chairman of the Sub-Group immediately.


(RENUKA KUMAR)
DIRECTOR

To

All members of the Sub-Groups.

SUB-GROUP - I CAPACITY, DEMAND, PRODUCTION AND INFRASTRUCTURE

Terms of Reference

1. To review the status of cement industry during the Ninth Plan highlighting the achievements and reasons for any shortfall in the fulfillment of targets.
2. To project production and demand for cement industry for the Tenth Plan and to recommend measures for achievement of these projections through modernization, expansion, setting up of new cement units etc.
3. To examine State-wise, region-wise and sector-wise requirement of cement and to suggest innovative uses of cement.

Composition

Shri N. Srinivasan, VC&MD, India Cements Ltd.	Chairman
Shri Deepak Razdan, VP (Mktg. & Comml.), L&T	Member
Shri O.P. Puranmalka, Sr. President, Mktg. & Strategy, Grasim Inds.	Member
Shri A.K. Jain, President – Marketing, ACC	Member
Shri S. Chouksey, Jt. President (Comml.), Lakshmi Cement	Member
Shri Kiran Nanda, Chief Economist, Gujarat Ambuja Cement	Member
Shri V. Jagannathan, Sr. VP (Mktg.), Madras Cements	Member
Shri K.V. Ganesan, Chief Operating Officer, Lafarge India Ltd.	Member
Representative from Ministry of Urban Development	Member
Representative from Ministry of Rural Development	Member
Director, Ministry of Coal	Member
Representative from Ministry of Power	Member
Shri R.C. Wasan/Dr. Rajkumar, NCB	Member
Shri R.D. Tripathy, ED (TT), Ministry of Railways	Member
Director, Ministry of Surface Transport	Member
Representative from Housing and Urban Development Corpn. (HUDCO)	Member
Representative from National Highway Authority of India (NHAI)	Member
Representative from Planning Commission (Shri E.R. Charyulu, Jt. Adviser)	Member
Representative from Industrial Development Bank of India (IDBI)	Member
Representative from Infrastructure Development Finance Corpn (IDFC)	Member
Representative from Investment Leasing & Financial Service (IL&FS)	Member

Representative from Indian Institute of Management (IIM)
Representative from CRISIL

Member
Member

Shri A.V. Srinivasan, Secretary General, CMA

Convenor

SUB-GROUP-II TECHNOLOGY, ENERGY CONSERVATION, BENCH MARKING, R&D NEEDS AND MANPOWER

Terms of Reference

1. To review the existing technology and identify the needs for further R&D activities to upgrade technology.
2. To assess availability of skilled manpower, facilities for training and human resource development.
3. To explore energy saving methods and alternate sources of energy like Pet Coke, LNG, CNG, organic waste materials etc.
4. To bench mark the indigenous cement industry against international industry and suggest measures for bridging the gaps, where necessary.

Composition

Shri M.L. Narula, Research & Consultancy Directorate-ACC	Chairman
Shri M.A.M.R. Muthiah, MD, Chettinad Cement Corpn. Ltd.	Member
Shri A.K. Sinha, Director (Tech.) , CCI	Member
Shri M.L. Gupta, Chief Corporate Advisor, The ACC Ltd.	Member
Dr. K.C. Narang, ED (R&D), Dalmia Cement (B) Ltd.	Member
Shri Kamal Kumar, Sr. GM (Process Engineering), HOLTEC	Member
Dr. S.P. Ghosh, Advisor (Technical), CMA	Member
Representative from Ministry of Surface Transport	Member
Representative from Ministry of Urban Development	Member
Representative from Ministry of Power	Member
Shri S.C. Lahiri, Planning Commission	Member
Shri T.N. Tewari, President (Tech), The ACC Ltd.	Member
Representative from ONGC	Member
Representative from MCD - Commissioner	Member
Shri S.J. Raina, Additional Director, NCB	Member CONVENOR
Shri Y.K. Arora, Jt. Director, NCB	Member

SUB-GROUP – III**BULK TRANSPORT, CEMENT EXPORT,
CEMENT IMPORT AND WTO****Terms of Reference**

1. To examine the status of bulk transportation of cement and recommend measures for increased bulk transportation.
2. To examine cement imports and implications of WTO on cement industry.
3. To evaluate the potential export markets, its demand and competitive sources of supply and to suggest measures to promote cement exports to these markets.

Composition

Shri A.K. Jain, President (Mktg.), The ACC Ltd	Chairman
Shri Deepak Razdan, VP (Mktg & Comm.), L&T Ltd	Member
Shri T.S. Raghupathy, President (Mktg), India Cements Ltd	Member
Shri A.K. Jain, Sr. VP, Grasim Inds.Ltd	Member
Shri Anil Kaul, Joint-President, Gujarat Ambuja Cements Ltd.	Member
Shri M.S. Gilotra, MD, Saurashtra Cement	Member
Dr. S. Ghosh, Advisor (Tech.), CMA	Member
Shri Ranjit Mathur/ Shri R.K. Tangri, CMA	Member
Director, Ministry of Commerce	Member
Representative from Planning Commission	Member
Shri A. Pal, Joint Director, Chemical and Allied Products Export Promotion Council (CAPEXIL)	Member
Shri Umesh Sachdeva, Supdtg. Engineer, M.C.D.	Member
Mr. Subramanian, EXIM	Member
Representative from Railways	Member
Representative from Deptt. of Revenue	Member
Shri Siddhartha Shankar, Chief Executive, ACC – Bulk Cement Corporation	Convenor

SUB-GROUP – IV

LIMESTONE INVENTORY AND MINI CEMENT PLANTS

Terms of Reference

1. To review the performance of mini cement plants and recommend measures for the growth of this sector.
2. To update national inventory of limestone.

Composition

Shri DBN Rao, DG, NCB	Chairman
Representative from Ministry of Mines	Member
Representative from Indian Bureau of Mines (IBM)	Member
Representative from Planning Commission	Member
President, All India Mini Cement Mfrs. Association	Member
Representative from Tiny Cement Manufacturers' Association	Member
Shri NL Murthy, NCB	Convenor

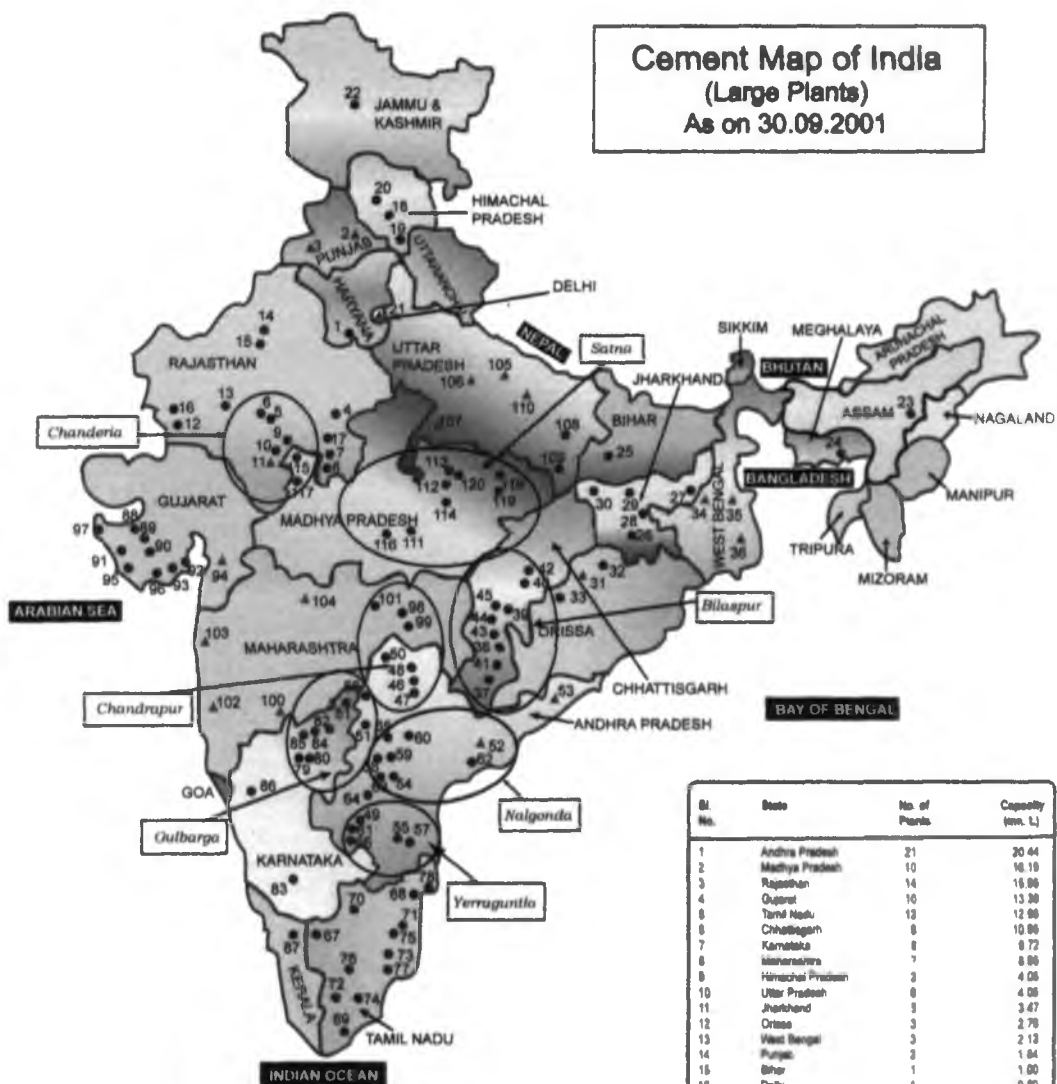
SUB-GROUP – V**POLLUTION CONTROL AND USE OF
WASTE PRODUCTS****Terms of Reference**

1. To suggest measures for pollution control in cement industry.
2. To examine and recommend measures for using industrial waste and effluents in the cement industry and fiscal and other measure for accelerated use of waste products (like fly-ash, slag, effluent from paper industry etc.).

Composition

Shri OP Puranmalka, Sr. President, Mktg.& Strategy, Grasim Inds.	Chairman
Shri S. Kumar, Sr. Vice President (Tech.), Grasim Inds.Ltd	Member
Dr. K.M. Kavadia, GM (Projects), Gujarat Ambuja Cement	Member
Shri P.L. Subramaniam, VP (Tech.), India Cements Ltd	Member
Representative from Ministry of Environment & Forest	Member
Representative from Central Pollution Control Board (CPCB)	Member
Representative from National Thermal Power Corporation (NTPC)	Member
Representative from CPPRI (Paper Industry)	Member
Representative from Vertical Shaft Kiln (VSK) Association	Member
Representative from Bureau of Industrial Finance and Reconstruction (BIFR)	Member
Dr. S. Chatterjee, ED, EXCELON Techno Engineers (P) Ltd	Member
Dr. K. Mohan, NCB	Convenor

Cement Map of India (Large Plants) As on 30.09.2001



- ▲ Grinding Unit
- Cement Plant
- Clusters

Sl. No.	State	No. of Plants	Capacity (mn. t.)
1	Andhra Pradesh	21	20.44
2	Madhya Pradesh	10	10.19
3	Rajasthan	14	15.90
4	Gujarat	10	13.30
5	Tamil Nadu	12	12.80
6	Chhattisgarh	8	10.80
7	Karnataka	8	9.72
8	Kerala	1	0.80
9	Himachal Pradesh	3	4.05
10	Uttar Pradesh	8	4.05
11	Jharkhand	3	3.47
12	Orissa	3	2.78
13	West Bengal	3	2.13
14	Punjab	3	1.64
15	Bihar	1	1.00
16	Delhi	1	0.80
17	Kerala	1	0.42
18	Jammu & Kashmir	1	0.30
19	Assam	1	0.20
20	Meghalaya	1	0.20
21	Mizoram	1	0.17
Total		120	120.43

CEMENT CAPACITY AS ON 31.9.2001 (Large Plants)

Sl. No.	Region/State	Location	Installed Capacity (Million Tonnes)		Sl. No.	Region/State	Location	Installed Capacity (Million Tonnes)	
NORTHERN REGION				22.61					
HARYANA					55	India Cements	Chilamkur	1 30	
1	CCI Ltd	Charkhi-Dadri	0 17	0.17	56	India Cements- Visaka	Tandur	1 12	
PUNJAB					57	India Cements	Yerraguntla	0 52	
2	Gujarat Ambuja Ltd (G)	Ropar	1 34		58	Raasi Cement	Wadapally	2 30	
3	Gujarat Ambuja Ltd (G)	Bhatinda	0 50	1.84	59	Sri Vishnu Cement	Sitapuram	1 20	
RAJASTHAN					60	Madras Cements	Jaggayyapet	1 10	
4	ACC Ltd	Lakheri	0 60		61	L & T - A P	Tadipatri	2 60	
5	Birla Cement	Chittorgarh	0 60		62	Kistna	Kistna	0 22	
6	Chittor Cement	Chittorgarh	0 80		63	KCP Ltd	Macherla	0 58	
7	Mangalam Cement	Morak	0 40		64	Panyam Cements	Bugganipalle	0 53	
8	Neer Shree Cement	Morak	0 60		65	Priyadarshini	Ramapuram	0 60	
9	Aditya Cement	Shambhupura	1 75		66	Penna Cement	Tadipatri	1 00	20.44
10	J K Cement	Nimbahera	2 40	TAMIL NADU					
11	J K Cement (G)	Mangrol	0 21		67	ACC Ltd	Madukkarai	0 96	
12	Lakshmi Cement	Sirohi Road	2 23		68	Grasim South	Reddipalayam	1 03	
13	J K Udaipur Udyog	Udaipur	0 90		69	India Cements	Tulsiyuth	1 55	
14	Ambuja Cement Raj Ltd	Pali	1 50		70	India Cements	Sankaridurg	0 72	
15	Shree Cement	Beawar	2 00		71	India Cements	Trichy	1 30	
16	Binani Cement	Sirohi	1 65		72	Tamil Nadu Cements	Alangulam	0 40	
17	Shriram Cement	Kota	0 20	15.84	73	Tamil Nadu Cements	Ariyalur	0 50	
HIMACHAL PRADESH					74	Madras Cements	R S Raja Nagar	0 75	
18	ACC Ltd	Gagal	2 70		75	Madras Cements	Alathiyur	3 12	
19	CCI Ltd	Rajban	0 20		76	Chettinad Cement	Karur	0 60	
20	Gujarat Ambuja Ltd	Darlaghat	1 16	4.06	77	Dalma Cements	Dalmiapuram	1 03	
DELHI					78	L & T - ARCW (G)	Arakonam	1 00	12 96
21	CCI Ltd (G)	Tughlakabad	0 50		KARNATAKA				
JAMMU & KASHMIR				0.20	79	ACC Ltd	Wadi	2 05	
22	J & K Cements	Khrew	0 20		80	ACC Ltd -New	Wadi	2 60	
EASTERN REGION				20.71	81	Vasavadatta Cement	Sedam	1 20	
ASSAM					82	Rajashree Cement	Malikhet	2 30	
23	CCI Ltd	Bokajan	0 20	0 20	83	Mysore Cements	Ammasandra	0 57	
MEGHALAYA					84	CCI Ltd	Kurkunta	0 20	
24	Mawmluh Cherra	Cherrapunji	0 20	0 20	85	HMP Cements Ltd	Shahubad	0 47	
BIHAR					86	Kanona Industries	Bagalkot	0 33	9 72
25	Kalyanpur Cement	Banjan	1 00	1 00	KERALA				
JHARKHAND						87	Malabar Cements	Palghat	0 42
26	ACC Ltd	Chaibasa	0 61		WESTERN REGION				
27	ACC Ltd	Smidri	0 60		GUJARAT				22.33
28	Lafarge (G)	Singhbhum	1 90		88	Sikka	Sikka	1 08	
29	Lemos Cement	Khalan	0 11		89	Saurashtra Cement	Ranavav	1 16	
30	Sone Valley	Japla	0 25	3 47	90	Gujarat Sidhee Cement	Veraval	1 20	
ORISSA					91	HMP Cements Ltd	Porbandar	0 20	
31	L & T Ltd (G)	Jharsuguda	0 80		92	L & T Ltd	Pipavav	4 20	
32	OCL India Ltd	Rajgangpur	1 00		93	Narmada Cement	Jafraabad	0 40	
33	IDCOL Cement	Bargarh	0 96	2.76	94	Narmada Cement (G)	Magdalla	0 70	
WEST BENGAL					95	Ambuja Cement	Kodinar	1 50	
34	Damodhar Cmt & Slag(G)	Purulia	0 53		96	Gujambuja Cement	Kodinar	2 50	
35	Birla Corpn Ltd (G)	Durgapur	0 60		97	Tata Chemicals Ltd	Mithapur	0 44	13.38
36	Gujarat Ambuja Ltd (G)	Sankrail	1 00	2.13	MAHARASHTRA				
CHHATTISGARH						98	ACC Ltd	Chanda	1 00
37	ACC Ltd	Jamul	1 58		99	Manikgarh Cement	Manikgarh	1 50	
38	Century Cement	Tilda	1 20		100	Rajashree Cement (G)	Hotgi	1 35	
39	Grasim Cement	Raipur	1 90		101	L & T Ltd (ACW)	Chandrapur	3 00	
40	CCI Ltd	Akaltara	0 40		102	Narmada Cement (G)	Ratnagin	0 40	
41	CCI Ltd	Mandhar	0 38		103	Indo Rama Cement (G)	Raigad	1 00	
42	Lafarge-Arasmeta	Bilaspur	2 24		104	Orient Cement (G)	Jalgaon	0 70	8.95
43	L & T Ltd	Hirmi	1 90		CENTRAL REGION				
44	AmbujaCmt Eastern Ltd	Bhatapara	1 00		UTTAR PRADESH				20.24
45	Lafarge	Sonadih	0 35	10.95	105	ACC Ltd (G)	Tikana	0 60	
SOUTHERN REGION						106	Birla Cement (G)	Raebareilly	0 36
ANDHRA PRADESH					107	Diamond Cement (G)	Jhansi	0 50	
46	ACC Ltd	Macherla	0 31		108	U P State Cement	Charkhi	0 48	
47	Kesoram Cement	Ramagundam	0 90		109	U P State Cement	Dalia	0 43	
48	Orient Cement	Devapur	1 30		110	U P State Cement (G)	Chunar	0 68	
49	Zuan Cement	Krishna Nagar	2 20		MADHYA PRADESH				16.19
50	CCI Ltd	Adilabad	0 40		111	ACC Ltd	Kalyan	1 70	
51	CCI Ltd	Fandur	1 00		112	Birla Vikas	Satna	0 75	
52	Andhra Cement (G)	Vijayawada	0 24		113	Sama Cement	Patna	2 00	
53	Andhra Cement (G)	Vishakhapatnam	0 50		114	Mahar Cement	Mahar	3 00	
54	Andhra Cement	Nadikode	0 50		115	Vikram Cement	Jaland Road	1 03	
					116	Diamond Cement	Daman	0 40	
					117	CCI Ltd	Neemuch	2 50	
					118	Jaypee Cement	Rewa	1 50	
					119	Jaypee Cement	Bela	2 51	
					120	Prism Cement	Sama		
					Grand Total : (120 Plants)				129.43