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Att: CDM Executive Board

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| Your ref.: | Our ref.: | Date: |
|---|---|---|
| CDM Ref 0715 | MLEH/KCHA | 22 January 2007 |

# Response to request for review
## "Blended Cement Project with Fly Ash – Lafarge India Private Limited" (0715)

Dear Members of the CDM Executive Board,

We refer to the requests for review raised by four Board members concerning DNV's request for registration of the "Blended Cement Project with Fly Ash – Lafarge India Private Limited" (Ref 0715) and would like to provide an initial response to the issues raised in these requests for review.

***Comment #1:***

*The application and interpretation of step 0 and step 3 of the tool for assessment of additionality are not sufficiently substantiated.*

*The project claims credits retroactively. Neither the PDD nor the validation report is convincing on the documentation which was available at or prior to the start of the project, showing that CDM was seriously considered in the decision to proceed with the project activity. Moreover, since additionality is claimed based on the need to construct new equipment for PPC Circuit I and a totally new (greenfield) PPC circuit II, the starting dates of the construction of this equipment is missing as well.*

***DNV's response:***

We draw your attention to section 3.4 of DNV's validation report, which clearly states that "As the project proponent wishes to have a crediting starting prior to the registration of project activity which started before registration, it must be established that the CDM was seriously considered during project inception. The following primary documentation to this effect has been verified:

i) The purchase order for additional equipment such as air separator, bucket elevator, air slides and solid flow meter incorporated into the system in order to produce PPC from the existing mills.

ii) Internal management notes dated April 2001 mentioning the cost benefit analysis and also possibility of CDM credits for environment friendly projects in cement plants.

iii) Plant records and evidence on R&D activities and trend showing increase in percentage of fly ash addition"

The evidences of the above are enclosed to this letter in attachment 1.

As indicated in the PDD, DNV was able to confirm that implementation of additional equipments in PPC circuit #I was completed on 15 May 2001 and PPC circuit #2 was commissioned on 1 July 2002.

DNV was also able to verify that the following additional equipments have been added to PPC circuit #1 as a result of the project activity: OSPA V air separator, bucket elevator, air slides and solid flow meters, all totalling to an investment of INR 35 million.

Moreover, it was demonstrated that Lafarge has invested INR 452 million in designing, procuring and installation of the second ball mill, specifically for PPC production with incremental addition of fly ash. This is apart from INR 2.8 million invested for procuring quality control and R&D equipments in order to produce best quality PPC and high share of fly ash.

Kindly refer to attachment 1 in the response provided by the project proponent for evidences on the investments made for PPC circuits #1 and #2.

***Comment #2:***

*In the country a steady trend of increasing additives (hence decreasing the clinker content) is occurring without the assistance of CDM. Nowadays the production of PPC (Portland Pozzolanic Cement) replacing 22 – 25% of clinker by fly ash is current practice in the country. Comparing the project activity to the identified "baseline plants" it remains unclear to which extent the content of fly ash and other additives is increased in the project activity and why this increase would constitute a specific barrier."*

***DNV's response:***

The baseline has been selected by evaluating the prevailing clinker percentage in PPC manufacturing in the selected region (the states of Bihar, Jharkhand, Assam, Meghalaya, Orissa and West Bengal), which use similar inputs as the project and face similar economic, market and technical circumstances. The published data of CMA of India has been used for verification of the same.

In DNV's opinion, it is sufficiently demonstrated that the project activity is not common practice by presenting facts on the following three perspectives:

- Historically low share in consumption of blended cement in India
- Comparison of blend percentages in the region of the project activity and
- How Lafarge is overcoming the perceived barriers

We also draw your attention to the Clarification Request # 1 to 4 in in Table 3 of Appendix A to DNV's validation report and the response from Lafage which address this issue to a very large extent.

*Historically low share in consumption of blended cement in India*

While we acknowledge the fact that use of fly-ash based cement in India has grown over the last five years, it must also be noted that the project activity is all about increasing the share of additives (i.e. reduce the share of clinker) in the production of cement types beyond current practices in the country. This is in line with the applicability conditions stipulated in the approved baseline methodology (ACM005) adopted as well. The project activity is using increased level of additives, i.e. fly-ash from neighbouring thermal power plants (National Thermal Power Corporation-NTPC) to replace clinker in the manufacturing of Portland Pozzolana Cement (PPC) beyond the current levels in the eastern region.

The report by ICRA – The Indian Cement Industry 2006 (attachment 2) states several reasons behind the historically low share in consumption of blended cement in India:

- As the compressive strength of the blended cements is comparable to the 33-grade OPC, which is the lowest grade, the market perceives the blended cements as relatively lower-strength varieties.
- The cement consumer is not confident of the quality of the blended material used for manufacturing blended cements.
- The darker colour of blended cements and the colour variations in them are mistakenly attributed to impurity. For example, PPC is generally of darker colour as compared with OPC because of the carbon present in fly ash.
- Consumers are yet to realize the advantages of using blended cements in certain locations, like aggressive soils. Further, there is a wrong impression in the market that addition of blended material degrades the properties of blended cements.

The aforementioned reasons for lower share blended cement consumption in the region have also been addressed in the PDD and in DNV's validation report

*Comparison of blend percentages in the region of the project activity*

The baseline has been selected by determining the common prevailing clinker percentage of PPC in other manufacturing plants in the selected region that use similar raw material as the project and face similar economic, market and technical circumstances. The data published by the Cement Manufacturers Association of India (CMA) has been sourced for the same. As per the selection criteria stipulated in ACM0005, for selection of the region, it has been justified that,

i) 95% of total production is sold with in the region selected,

ii) The region selected includes six plants with published data from 2001, and

iii) Production in the region is more than the minimum four times of project plant's output as required by the methodology

As indicated in the PDD and in the validation report, data available from CMA of India demonstrates that the manufacturing of PPC with fly ash percentage of 22-25% in the region was a common practice at the time of project implementation. However, the project plans to increase the fly ash proportion from 30% to 35% over the crediting period, which is beyond the common practise in the region. It has been sufficiently demonstrated that increasing fly ash content is a difficult proposition because of various market related & technical barriers as indicated above and addressed in the PDD.

*How Lafarge is overcoming the perceived barriers*

While Bureau of Standards (BIS, a government body) has set a maximum limit of 35% of fly ash content in PPC, most companies have not been able to raise the percentage levels beyond 25% for the reasons stated as above. DNV was able to confirm that Lafarge has initiated the following efforts to increase the fly ash proportion beyond the common practise in the region:

- Investments towards utilization of different types of fly ash: Getting high quality fly ash that could be mixed in PPC is also a problem faced by the project promoter. Lafarge has invested towards procuring quality control and R&D equipments to handle different types of fly ash in the plant. As elucidated above for comment #1, it has been verified by DNV that INR 35 million was invested for installation of additional equipment in the existing ball mill and about INR 452 million was invested in designing, procuring and installation

of the second ball mill, specifically for PPC production with incremental addition of fly ash, in addition to INR 2.8 million for procuring quality control and R&D equipments in order to produce best quality PPC and high share of fly ash. These investments are solely for the purpose of producing PPC

- Improving market perception: Various marketing campaigns aimed towards improving customer awareness about high blend cement in the market have been verified by DNV

Kindly refer to the evidences for the above, provided in the project proponents response to the request for review

***EB comment #3:***

*No information is provided on the economical benefits of producing PPC (e.g. cost savings as a result of a decreased use of clinker), which makes it difficult to understand why additional investments are to be considered as barriers.*

***DNV's response:***

As indicated in the validation report, CDM revenues is likely to enhance the viability of the project, strengthen process control and is expected to impact the project proponent's research and marketing efforts towards overcoming the market barriers. Hence, CDM is required for initial overcoming of barriers as well as long term investment for the sustenance of the project.

Moreover, a detailed economic internal rate of return calculation as sought by the DNA in India, the Ministry of Environment and Forest's CDM cell enclosed (attachment 3) demonstrates that the economic costs and benefits accrued due to the project activity is determined to be 28%.

We sincerely hope that the Board accepts our aforementioned explanations.

Yours faithfully
for DET NORSKE VERITAS CERTIFICATION LTD

Michael Lehmann
*Technical Director*
International Climate Change Service

Chandrashekara Kumaraswamy
*Manager (South Asia)*

ATTACHMENTS:

Attachment 1: CDM consideration - evidence

Attachment 2: ICRA Cement data 2006-07

Attachment 3: Economic IRR analysis

# Attachment 1

## CAPITAL EXPENDITURE APPROVAL REQUEST FOR EXTRA EXPENDITURE

**Business Unit** : JOJOBERA CEMENT - LAFARGE INDIA LIMITED — Date of Submission : 15/05/00

**Investment Code** : F40
**Project Manager** : R GAUTAM

**Project Description** : PPC PROJECT AT JOJOBERA CEMENT PLANT.

**Project Location** : JOJOBERA CEMENT PLANT — Estimated life 15 YEARS.

**Project Scheduling** — Starting Date [dd/mm/yy ] MAY-00 — Ending Date SEP-00 [dd/mm/yy ]
Duration — COMPLETED.-ON FULL CAPACITY RUN.

**Investment Type**

| | | | |
|---|---|---|---|
| A. Development Capex | ☑ | A1 | Internal Development |
| | ☐ | A2 | External Development |
| B. Sustaining Capex | ☐ | B1 | Replacement |
| | ☑ | B2 | **Productivity and Quality Improvement & CDM** |
| | ☐ | B3 | Environment and Safety |
| | ☐ | B4 | Management Information system |
| | ☐ | B5 | Land for Mineral Reserves |

**Investment Cost** ☑ in RS. [million ]:35.825 Amount Budgeted 28 in RS. [million ]
31 (APPROVED) + 4.825 (UNAPROVED)
in USD [ million ] Amount Budgeted in USD [ million ]

**Forex Rated considered** RS./USD

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ☐ | Budgeted | Year | 2000 | Tranche | ☐ | ☐ 1 | ☐ 2 | |
| ☑ | ☐ | Unbudgeted | RS.Million 4.825 | 2000 | | | | |

**Economic Justification** NPV of EVA in RS. [million ]

**Comments**
☐ CTI approval required and obtained , Approval No..... Date.....
☐ CTI approval not required.
☑ ITEM NO 1C OF APPROVAL LIST-2000, UNDER SUSTAINING CAPEX
☑ APPROVAL FOR EXTRA EXPENDITURE OF RS.4.825 MILLION MAY BE ACCORDED ALSO

**APPROVALS**
[ Name & Signature ]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Orignated by R GAUTAM | Signature | | Date | 28/12 | Signature | | Date | |
| Recommended by AS MALL | Signature | | Date | | Signature | | Date | |
| Approved by K V GANESAN | Signature | | Date | 8/1 | Signature | | Date | |
| Approved by R IYER | Signature | | Date | | Signature | | Date | |
| Approved by T F | Signature | | Date | | Signature | | Date | |

Approved by TF

For additional sanction justification note (ANNEX NO1 )is attached here with.

COO 31/1 — CFO — CEO

RI/TF

This may be approved. The reasons for the over run is explained. ... the lessons learnt ...

# Project $CO_2$

## Mission Statement

Recognising the importance of global warming issue and in line with Lafarge Group's strategy, Lafarge India would enhance its future survivability, competitive advantage, profitability and sustained development capabilities with responsible, voluntary and proactive actions to mitigate Green House Gases, with the help of a corporate carbon management programme.

**Instead of trying to forecast and wait for the future, we will imagine and try to shape a carbon-constrained world.**

## Strategic Context

- Cement Industry is a significant contributor to man-made emissions of $CO_2$ (5% of total world-wide emissions), the principal gas responsible for climate change.
- Lafarge Group wants to play a part in curbing the global warming phenomena on voluntary basis to avoid an ecotax or harsh regulatory approaches.
- These actions will help meet goals under Kyoto Protocol, add value by lowering the energy bill, contribute to sustained development and build competitive advantage through future planning for the Group.
- Hence, Lafarge Group has set itself a target of reducing its $CO_2$ emissions per tonne of cement produced by 20% globally over 1990-2010.
- LIL's $CO_2$ Project will strive to build competitive advantage through : (a) maximum contribution to Group's commitment on $CO_2$ reduction, (b) keep the cost of $CO_2$ reduction low by using the various mitigation techniques under Kyoto Protocol like Clean Development Mechanism and Emissions Trading, (c) build and update knowledge base on the subject, (d) help the Group and the society in meeting sustainable development objectives.
  Accordingly, all future $CO_2$ reduction initiatives for LIL plants would be treated as CDM projects, with the 1st project for manufacture of PPC at Jojobera to be taken up on the same basis.

## Objectives

- ✓ Achieve at least **25%** reduction in $CO_2$ /t of cement 1990-2010 by working on the three levers of (a) Increased usage of Cementitious materials, (b) Alternate fuels and raw materials, (c) Reduced thermal energy consumption.
- ✓ Gain a competitive advantage over our competitors: Keep our cost of $CO_2$ mitigation lowest in India.
- ✓ Generate maximum credits as a part of Clean Development Mechanism/Emissions Trading – launch registration of atleast one project under CDM/ET by end 2000.
- ✓ Align our $CO_2$ strategy with Lafarge Group – Develop a strategy paper and get it approved by Lafarge Group and LIL Board at the next board meeting.

- ✓ Work proactively to help shape Government policies, product standards and marketing/manufacturing practices that enable $CO_2$ reduction strategies.
- ✓ Reinforce our image as a responsible and sustained development-oriented firm – Communicate internally and bring a brochure on $CO_2$ for circulation.
- ✓ Build and keep updating the knowledge on the subject – Set up a Knowledge Base.

**Goals, Action Plans and Timeframes for each objective**

To be discussed and finalised at the Task Force meetings, as required, and approved by the Steering Committee.

**Performance Measurement**

- ✓ $CO_2$ /t of cement produced.
- ✓ No. of Projects registered under CDM (To be verified with Lafarge Group).
- ✓ Strategy Paper accepted by Lafarge Group and LIL Board.
- ✓ Developments in the field not known to the Task Force.

**Resources and Budgets**

- Time requirement (estimated): 2 days per month for each Task Force member
- Consultants cost and other cost – to be discussed.
- Administrative Costs of each project to be submitted for CDM – On project basis.

**Organisation, Meetings and Reporting**

- Steering Committee: CEO and Executive Committee Members (EXCOM).
- Task Force: Samir Cairae (Project Leader), Ch. Venkateshwarlu, PN Singha, Gopi Ranganthan, AS Mall, MK Mishra.
- ATC Interface: Luis Cascardo; DPC Interface: Georges Chahine
- Meetings of the Task Force – Every Month; Meetings of the Steering Committee – Every Quarter at the time of MCM.
- Project Leader shall convene the meetings, set agenda and duration, circulate minutes and be the primary facilitator. Active secondary facilitation expected of each member.
- Reports – A monthly report shall be sent the Steering Committee by the Task Force Leader covering the progress on objectives, status of action plans, new developments, issues to be resolved, etc.

Annexure – I
(Revised)

## EXPANSION / MODERNISATION

Name and Address of the Unit : JOJOBERA CEMENT PLANT
Name and Address of the Owner : LAFARGE INDIA PVT. LTD.,MUMBAI

### A. Expansion

| S. No. | Project Title | Actual Cost Rs. Lacs | Building Rs.Lacs | Plant & Machinery Rs. Lacs | Pollution Control Equipment Rs.Lacs | Mill Cost Shifted from Arasmeta Rs.Lacs | Tools Rs. Lacs | Others Rs. Lacs | Total Rs. Lacs | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Phase – 1 PPC I Expansion by 5lac tons per annum by producing Hydraulic Cement ( Portland Pozzolana ). | 369.08 | 7.91 | 360.15 | 0.00 | 0.00 | 0.00 | 1.02 | 369.08 | Commercial Production from 31st December, 2000 |
| 2 | Phase- 2 PPC II Expansion by 10.7 lac ton per annum of Hydraulic Cement ( Portland Pozzolana ) | 6201.85 | | 4267.19 | 128.64 | 1660.84 | 1.90 | 143.28 | 6201.85 | Commercial Production from 1st February, 2002 |
| | Total For Expansion | 6570.93 | 7.91 | 4627.34 | 128.64 | 1660.84 | 1.90 | 144.30 | 6570.93 | |

### B. MODERNISATION

| S. No. | Description | Actual Cost Rs. Lacs | Building Rs.Lacs | Plant & Machinery Rs. Lacs | Pollution Control Equipment Rs.Lacs | Mill Cost Shifted from Arasmeta Rs.Lacs | Tools Rs. Lacs | Others Rs. Lacs | Total Rs. Lacs | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | State of art welding machine to improve roll press roll life. | 10.69 | 0.00 | 10.69 | 0.00 | 0.00 | 0.00 | 0.00 | 10.69 | Completion 20th Feb,2001 |
| 2 | UPS System for process control. | 15.42 | 0.00 | 15.42 | 0.00 | 0.00 | 0.00 | 0.00 | 15.42 | Completion 31st Mar,2001 |
| 3 | Additional belt conveyors to reduce wagon loading time. | 124.44 | 0.00 | 124.44 | 0.00 | 0.00 | 0.00 | 0.00 | 124.44 | Completion 31st May,2001. |
| 4 | Bucket Elevator to replace air lift to reduce power cons. | 98.86 | 0.00 | 98.86 | 0.00 | 0.00 | 0.00 | 0.00 | 98.86 | Completion 30th Nov. 2001 |
| 5 | Speed Control for roller press to reduce power consumption. | 11.58 | 0.00 | 11.58 | 0.00 | 0.00 | 0.00 | 0.00 | 11.58 | Completion 30th Sep.2001 |
| 6 | Close Circuiting of existing Ball Mill to reduce power consumption. | 503.00 | 0.00 | 503.00 | 0.00 | 0.00 | 0.00 | 0.00 | 503.00 | Completion 20th Aug,2002 |
| 7 | Power Factor improvement to reduce power. | 4.82 | 0.00 | 4.82 | 0.00 | 0.00 | 0.00 | 0.00 | 4.82 | Completion 15th Dec,2002 |
| 8 | Automation of Plant Lighting to reduce power consumption. | 7.48 | 0.00 | 7.48 | 0.00 | 0.00 | 0.00 | 0.00 | 7.48 | Completion 15th Dec,2001 |
| 9 | RCC road to improve Environment. | 17.18 | 17.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 17.18 | Completion 31st July,2002 |
| 10 | RCC flooring to reduce fugitive dust. | 8.61 | 0.00 | 8.61 | 0.00 | 0.00 | 0.00 | 0.00 | 8.61 | Completion 15th Dec,2000 |
| | Total Modernization | 802.08 | 17.18 | 784.90 | 0.00 | 0.00 | 0.00 | 0.00 | 802.08 | |

| GRAND TOTAL | Expansion + Modernization | Rs. 7373.01 Lacs |
|---|---|---|

Sd/- Ramji Gautam
SR. MANAGER (F P)
JOJOBERA CEMENT PLANT

f-CDM PPC - II

JOJOBERA CEMENT PLANT

CAPITAL EXPENDITURE APPROVAL REQUEST
CAPEX- YEAR-2001

| | | |
|---|---|---|
| Business Unit | JOJOBERA CEMENT PLANT- LAFARGE INDIA LIMITED | Date of Submission :16/03/0 REVISED-9TH APRIL |
| Investment Code | JJR/040/01 | |
| Project Manager | R K GUPTA | |
| Project Description | EXPANSION PROJECT PPC-II | |
| Project Location | JOJOBERA CEMENT PLANT | Estimated life : 25 years |
| Project Scheduling | Starting Date [dd/mm/yy ] | Ending Date [dd/mm/yy ] |
| | Duration Seven Months from the date of Executive Approval | |
| Investment Type | A. Development Capex | ☑ A1 Internal Development |
| | | A2 External Development |
| | B. Sustaining Capex | B1 Replacement |
| | | B2 Productivity and Quality Improvement |
| | | B3 Environment and Safety |
| | | B4 Management Information system |
| | | B5 Land for Mineral Reserves |
| Investment Cost | in RS. [million ] 500 | Amount Budgeted 474 in RS. [million ] ( Details as per Annexure I attached ) |
| | in USD [ million ] | Amount Budgeted in USD [ million ] |
| Forex Rated considered | RS./USD | |
| | Budgeted Year | 2001 Tranche 1 2 |
| | Unbudgeted | |
| Economic Justification | NPV of EVA | in RS. [million ] 988 ( Details as per Annexure II attached ) |
| Comments | CTI approval required and obtained , Approval No..... Date..... | |
| | CTI approval not required. NO | |

**APPROVALS**
[ Name & Signature ]

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Orignated by R Gautam | Signature | | Date | 16/03/01 | Signature | | Date | |
| Reviewed by RK Gupta | Signature | | Date | 16/03/01 | | | | |
| Recommended by AD Khatri | Signature | | Date | 9/4/01 | Signature | | Date | |
| Approved by KV Ganesan | Signature | | Date | 18/4 | Signature | | Date | |
| Approved by Ravi Iyer | Signature | | Date | 19/04 | Signature | | Date | |
| Approved by T Farrell | Signature | | Date | 24/04 | Signature | | Date | |

Chief Operating Officer
VP (Projects)

JJR/PROJ-APP/122/2001
Dated : 29th March,2001/9th April, 2001

**LAFARGE INDIA LTD.**
**PROJECT REPORT**

**PROJECT TITLE** : JOJOBERA EXPANSION PROJECT PPC-II
**PROJECT / SCHEME NO.** : JJR/040/01

**PROJECT MANAGER** : Mr. R.K. Gupta

**OBJECTIVE / LINKAGE TO KEY PERFORMANCE INDICATOR:**

- To enhance production capacity from existing 1.5 mtpa of PSC and 0.4 mtpa of PPC to 1.5 mtpa of PSC and 1.4 mtpa of PPC of Jojobera Cement Plant.
- To reduce $CO_2$ emission in line with the group objectives (to reduce $CO_2$ emission by 20% by 2010) & be eligible for CDM Project in future .
- To load a cement rake in five hours time so that upto four cement rakes can be loaded in a day or loading of two cement rakes simultaneously in 7-8 hrs time.
- Reduction in the distribution cost of cement in the Eastern Region at present market share of 26% (approx.).
- Improve consistency in supply of Cement to the customer.
- Improve quality of PPC and its consistency.

**PROOF OF THE NEED :**

- Jojobera Cement Plant is located in the city of Jamshedpur in Singhbhum district of Jharkhand State, India. Jamshedpur is an Industrial town where industries like integrated steel plant of TISCO,Automobile Manufacturing Industry of TELCO, Jojobera Power Plant of Tata Power Company, Cummins Engine Manufacturing of Tata Cummins, Bearings Manufacturing Industry of Timken Ltd. (manufacturing of Bearings) and several other industries like Cable Manufacturing, Tubes Manufacturing, Engineering Workshop etc. are situated.

- Jojobera Power Plant has installed capacity of 187.50 MW as of date and is further expanding by 120 MW which will be commissioned by March,2002.The fly ash generated at the Power Plant as of date is approximately 1200 tpd which will become 2000 tpd. On commissioning of the third unit of 120MW in March 2002. The Power Plant is adjacent to our Jojobera Cement Plant having same common boundary, and hence the fly ash generated at the Power Plant can be economically and efficiently used for the production of Portland Pozzolana Cement.

- The fly ash from the Power Plant as per the government notification will be given free of cost by the Power Plant. Further since the power plant is just adjacent to our Cement Plant, transportation cost for the fly ash is also almost nil. The cost of installation of the dense phase system within the power plant premises and power consumption for same to transport the fly ash from the Jojobera Power Plant to our plant will be borne by the Power Plant.

- By producing PPC at Jojobera we will save considerable clinker thereby saving considerable CO2 emission at SCP & ACP ;also we will save considerable amount of natural resources interms of limestone & fossil fuel.

- By enhancing the Production Capacity of the Jojobera Cement Plant from existing 1.9 million ton per annum to 2.9 million ton per annum, consistency in feeding to Eastern Market will improve and delivered cost will reduce by approximately Rs.380/- per ton. Details are as per Annexure – I attached.

- Contribution to EVA is positive and Net Present Value of same will be 988 million INR.

- Scenario of the Total capacity of Lafarge India Ltd. (Jojobera Cement Plant, Sonadih Cement Plant and Arasmeta Cement Plant) with zero inventory of Clinker is attached as per Annexure – III attached.

## PRESENT & TARGET SITUATION

| Parameter | Present Situation | Target Situation |
|---|---|---|
| PSC Capacity | 1.5 million tpa | 1.5 million tpa |
| PPC Capacity | 0.4 million tpa | 1.4 million tpa |
| Power Consumption ( Overall PSC + PPC ) | 41kwh/ton | 38.00kwh/ton |

## BRAINSTORMING AND SOLUTION TO ACHIEVE THE TARGET

To achieve the Target , following alternatives were evaluated :

1. Case I - Grinding in Vertical Roller Mill
2. Case II - Grinding in Roller Press followed by closed circuit Ball Mill.
3. Case III-Closed Circuit Ball Mill with or without the provision in the layout for installation of roller press before the mill in future.
4. Case IV-Closed Circuit Ball Mill of 140tph to be shifted from M/S Arasmeta Cement Plant.

The cost & power consumption analysis was done and same is tabulated herein below :

| Case No. | Case Description | Capital Cost ( Rs million INR ) | Specific Power Consumption kwh/ton grinding |
|---|---|---|---|
| Case I | Vertical Roller Mill | 720 | 22.5 |
| Case II | Roller Press followed by closed circuit ball mill | 689 | 22.5 |
| Case 3 | New Closed circuit ball mill with or without the provision in the layout for installation of roller press before the mill in future | 578 | 28.5 |
| Case 4 | Closed circuit ball mill of 140tph from Arasmeta Cement Plant | 474 | 28.5 |

Based on the above analysis and for the fact that feeding to the market from Jojobera Cement Plant , logistic cost will be less than the logistic cost for feeding to the market from Arasmeta Cement Plant , it was decided to go for Case 4 to meet the target.

## DETAILS OF THE PROJECT

- Availability of Raw Materials
  - Clinker
    Sonadih and Arasmeta Cement Plant will be able to feed Jojobera Clinker Requirement as per the Annexure III attached.
  - Gypsum
    Mineral Gypsum is received from Rajasthan.Availability of the annual gypsum requirement from Rajasthan is not a problem.Only care is to be taken to store adequate requirement of gypsum during three months of monsoon period ( July,August & September ) during which period the supply from Rajasthan is not available.Required quantity of Chemical Gypsum will be procured from Fertiliser unit of M/s Hinductan Lever Chemical at Haldia.
  - Flyash
    Total requirement of flyash 0.49( 0.14 + 0.35 )mtpa for the total production of 1.4 mtpa of PPC at Jojobera Cement Plant will be met by the flyash generated by the Jojobera Power Plant ( Tata Power Company ),considering maxm permissible addition of 35%.
- Main Machinery Sizing
  - Sizing of new grinding facility :

- Production : 1.0 mtpa of PPC using flyash
- Operating days per annum : 330
- Operating Hours per day : 21
- Grinding capacity required : 144 tph
- To meet the additional grinding capacity and to commission this facility at the earliest,shifting of closed circuit ball mill of 140tph capacity from Arasmeta Cement Plant has been considered.The 140tph new PPC grinding facility will take care of the monthly increased production after monsoon period during which the demand dips and picks up after monsoon period necessitating increased despatches.

- Packing and Dispatch
  - The existing Jojobera grinding unit has three electronic rotary packers of twin discharge.The capacity of each packer is 180tph making a total of 540tph. However, average achieved on consistent basis is 150tph per packer i.e. in total 450tph.
  - The total cement production after expansion on daily basis will be 8787 tones on the basis of 330 days of operation per annum.
  - Packing Capacity required will be 703tph based on 15hrs. operation /day with safety factor of 1.2 (8787x1.2/15).
  - Considering the emphasis of cement dispatch from Jojobera by rail,it will require two additional twin discharge rotary packer of 180tph capacity.Based on this total achievable capacity from the five packers will be 750tph which will be able to load a cement rake of 40wagons in four to five hrs. giving margin for door changing by wagon loader with additional wagon loading platform and four more wagon loading machines. Hence with this augmentation , upto four cement rakes dispatch shall be possible.

- Storage's

| Material | Requirement Perday ( tones) | Available storage Capacity (tones) | No.of Days Storage | Remarks |
|---|---|---|---|---|
| Clinker | 4730 | 20,000 effective 15000tons only due to dead stock | 3 | As clinker will come from Arasmeta & Sonadih ,additional clinker silo of 20,000t has been considerd. |
| Gypsum | 315 | 10000 | 28 | Storage capacity of 27000tons in total is required to care during monsoon season.Hence,additional gypsum storage yard with stacker /reclaimer has been considered. |
| Flyash | 1400 | 2x 750 | 1 | Additional storage of 1500t capacity has been considered. |
| Cement | 8787 | 3x7000 | 2 | In view of the two types of cement being produced a new Cement Silo of 7000t has been considered. |

- Electrical and Instrumentation
  - Power Source

    Power to the plant is being supplied from TISCO through double circuit cable connection at 33KV.The power cable in one circuit will be strengthened by laying additional run of 3x240 sq mm cable.The power supply to the plant is quite stable.Power Demand of the existing plant is 16MVA which will be increased to 22MVA to meet the requirement of the expansion.Power to the expansion project is proposed from spare feeder of double bus bar board located at indoor substation.New load centre has been considered near the cement mill to cater to the load demand

of Clinker/Gypsum handling,Cement Grinding,Packing and Dispatch.The motor comtrol centres for packing and dispatch shall be located in the existing packing plant MCC room.

- Distribution Transformers 6.6 KV SwitchBoard
  2 nos. 1.6MVA distribution transformers are being considered for LV distribution for the expansion plant.Single bus bar 6.6KV Switchboard at Cement Mill Load Centre has been considered.Switchgears shall be motor operated Vacuum or SF6 Circuit Breakers for incomer and cement mill drive.Vacuum contactors shall be provided for seperator.
- LT Distribution
  LT switchboards comprising fully drawout ,motor operated,air circuit breakers with necessary protection considered.LT Busducts for connection of power between distribution transformers and LT Switchboards considered.Motor control Centres of sheet steel enclosure,compartmentalised for clinker/gypsum handling,cement grinding,packing and dispatch considered.
- HT Motors
  Induction motors for Cement Mill shall be 6.6KV slipring motors with Liquid Rotor Starters.
  Capacitors of suitable KVAR rating and voltage grade directly connected across stator switch terminals of respective 6.6KV motors.
- Variable Speed Drives
  AC squirrel cage motors alongwith variable frequency controllers for seperator and seperator fan.
- LT Loads
  Multi-step automatic controlled capacitor banks connected at LT switchboard.
- Cable Laying
  In view of the problems faced due to laying of cables in trenches and tunnel in the existing plant,cable shall be laid over head on cable galleries.

- Process Control
  Dependable and rugged instrumentation network considered for operational safety,ease of maintenance and repairs,flexibility to adopt future development/modifications.For supervision and monitoring process parameters,the plant control system shall be augmented by adding process controllers type PLC-5/60 with RS View software from Allen Bradley.The process controller shall be located in the existing control room and I/O in the load centre and MCC rooms.Electronic weigh feeders for desired proportioning and feed rate shall be installed.For flyash feed control solid flow meter has been considered.

**IMPLEMENTATION PERIOD**

**The implementation period will be seven months from the date of finalisation of order for Civil / Structural works and the executive sanction.**

**( Note : Earlier schedule was given to start Civil / Structural work from 18th March,2001 in order to complete foundation work before monsoon. Delay in deciding Civil /Structural Work will delay the entire Project due to ensuing monsoon ).**

**PROJECT COST**

**Total Project Cost budgeted is INR 474million.Details are as per Annexure IV attached.**

**EVA: RS. 988 MILLION ( EVA CALCULATIONS ATTACHED)**

**CONCLUSION**

**The Project has no financial risk due to proximity to the market.**

**( R K GUPTA)**
**Senior Manager ( Projects )**

# LAFARGE INDIA LTD

LAFARGE

JOJOBERA CEMENT PLANT
P.O. RAHARGORA, JAMSHEDPUR, BIHAR 831016
PH: (0657) 488485 FAX: (0657) 486702

9/6/12

Stocknumber 01509452

SUPPLIER CODE : MJ072

Malik Engineering Works
104, Wazirpur Industrial Area
Delhi
PIN - 110052

## PURCHASE ORDER

Material Purchase
Direct Departmental Stores
0J0020 / 1 / 1

ORDER NO: 12-JUN-2000
DATE:

The above number must be quoted on all correspondence, Invoices, bills and marked on all packages.

QUOTATION REF: MEW/2000/Q-1129(LIL) dt.13/5/00
DATE:

Supply the following goods according to the terms, conditions and instructions specified hereon, overleaf and All goods should be consigned to Lafarge India Ltd, and not to self, and booked to Ltd, Jojobera, by Road, Freight prepaid, unless otherwise specified. A copy of packing list showing No. must be included in the packing and in addition to what is specified under Clause 8 overleaf, an extra this packing list quoting our Order should be posted direct to the Stores Department, Lafarge India Pvt Ltd, 831016.

| Our Ref. | Stock Number | DESCRIPTION | QUANTITY | RATE |
|---|---|---|---|---|
| ( ) | ( 1 ) | | 1.000 nos | 44910.00000 per nos |
| Rupees Forty Four Thousand Nine Hundred Ten and Zero paise only | | | | |
| | | Lab Ball Mill<br>Model: MEC - 263-A; Make: MEW<br>(Specification: As per your offer) | | |
| | | Delivery Schedule :-<br>1.000 by 25-JUL-2000 | | |
| ( ) | ( 2 ) | | 1.000 nos | 33750.00000 per nos |
| Rupees Thirty Three Thousa Seven Hundred Fifty and Zero paise only | | | | |
| | | Lab Jaw Crusher<br>Model:- MEC-391<br>Make: MEW<br>(Specification: as per your offer) | | |
| | | Delivery Schedule :-<br>1.000 by 25-JUL-2000 | | |
| | | Extra Charges | | |
| | | Central Sales Tax (Concessional) ( Extra ) | 4.00 % | |
| | | D.F to be issued by Acc. on bill receipt | | |
| | | Delv Mode :- To be delivered by road<br>Price Trm :- F.O.R. Jamshedpur<br>Pay Terms :- 100.00 % Payment against doc. thro SBI,Telco,Jsr.<br>Bank charges to respective a/c | | |
| | | Comments | | |
| | | Price will remain firm till completion of supply. | | |

Contd...

Delivery Required

CC: Accounts

| APP. VALUE |
|---|
| CH. A/C |
| SANCTION |

For LAFARGE INDIA LTD

AUTHORISED SIGNATORY

# Attachment 2

ICRA

ICRA Sector Analysis

# THE INDIAN CEMENT INDUSTRY

July 2006

Industry Comment

www.icra.in

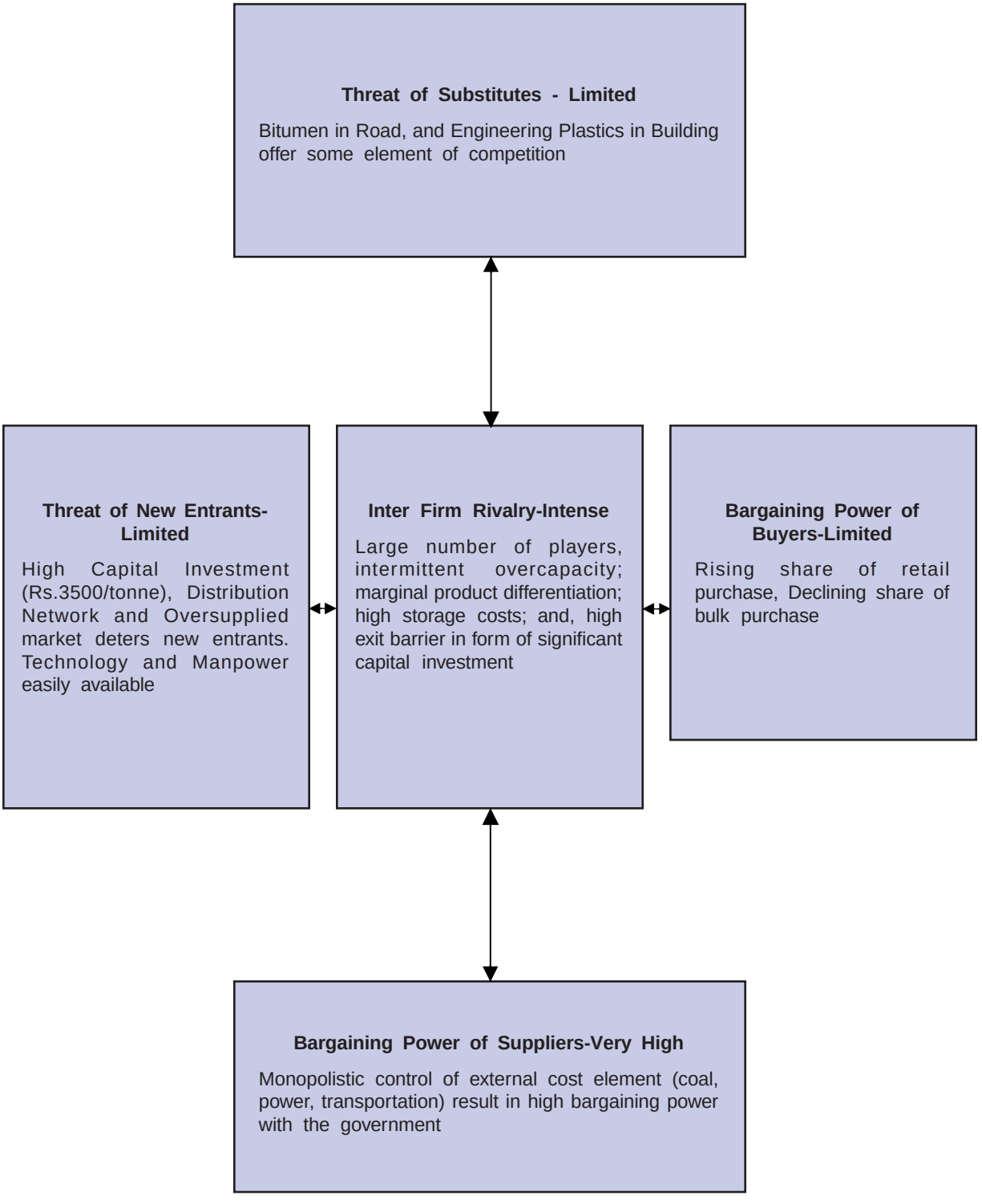
Contacts :

Vineet Nigam Assistant General Manager

Amul Gogna Executive Director

# TABLE OF CONTENTS

# ENVIRONMENT ANALYSIS—PORTER'S MODEL



# STRUCTURE OF THE INDUSTRY

## Major Players

With an installed capacity of around 157 million tonnes per annum (mtpa) at end-March 2006, large cement plants accounted for 93% of the total installed capacity in India. The installed capacity is distributed over across approximately 129 large cement plants owned by around 54 companies.

The structure of the industry is fragmented, although, the concentration at the top is increasing. The fragmented structure is a result of the low entry barriers in the post decontrol period and the ready availability of technology. However, cement plants are capital intensive and require a capital investment of over Rs. 3,500 per tonne of cement, which translates into an investment of Rs. 3,500 million for a 1 mtpa plant.

The cement industry has witnessed substantial reorganisation of capacities during the last couple of years. Some examples of the consolidation witnessed during the recent past include: Gujarat Ambuja taking a stake of 14% in ACC; Gujarat Ambuja taking over DLF Cements and Modi Cement; India Cement taking over Raasi Cement and Sri Vishnu Cement; Grasim's acquisition of the cement business of L&T; Indian Rayon's cement division merging with Grasim; Grasim taking over Sri Digvijay Cements; L&T taking over Narmada Cements; ACC taking over IDCOL.

Multinational cement companies have also initiated the acquisition process in the Indian cement market. Swiss cement major Holcim has picked up 14.8% of the promoters stake in Gujarat Ambuja Cements (GACL). In January 2006, Holderind Investments (Holcim Mauritius), an indirect, wholly-owned subsidiary of Holcim, acquired 200 million equity shares of GACL at a price of Rs.105 per share from the promoters. Post-sale, the share of promoters in the company is 9%. Holcim also made an open offer to acquire an additional 20% stake in GACL at Rs. 90.64 per share. Earlier, Holcim had entered into a strategic alliance with GACL, and acquired a 67% controlling stake in Ambuja Cement India. Through this holding company, Holcim acquired a majority in Ambuja Cement Eastern and a substantial stake in ACC. Ambuja Cement India holds a 34% share in ACC and a 97% share in Ambuja Cement Eastern. Holcim's acquisition has led to the emergence of two major groups in the Indian cement industry, the Holcim-ACC-Gujarat Ambuja Cements combine (capacity of 33.5 mt) and the Aditya Birla group through Grasim Industries and Ultratech Cement (combined capacity of 31.1 mt). Lafarge, the French cement major, had acquired the cement plants of Raymond and Tisco in the recent past, and has an installed capacity of 5 mtpa. Italy based Italcementi has acquired a stake in the K.K. Birla promoted Zuari Industries' cement plant in AP, with a capacity of 3.4 mtpa. Recently, Heidelberg Cement has entered into an equal joint-venture agreement with S P Lohia Group controlled Indo-Rama Cement. Heidelberg Cement is expected to take a 50% controlling stake in Indo-Rama's grinding plant of 0.75 mtpa at Raigad in Maharashtra.

As on March 2006, ACC was the largest player with a capacity of 18.64 mtpa. UltraTech CemCo Ltd.[1] now occupies the second slot with a capacity of 17 mtpa (which includes 1.5 mtpa of subsidiary Narmada Cement). The Gujarat Ambuja group has emerged as the third largest player with a capacity of 14.86 mtpa. Grasim ranks fourth with a capacity of 14.12 mtpa. Other leading players include India Cements, Jaypee group, Century Textiles, Madras Cements, Lafarge, and Birla Corp.

## Significant Consolidations

As discussed above, the cement industry is witnessing a number of Mergers & Acquisitions (M&As). The extent of concentration in the industry has increased over the years. This concentration is mainly because of the focus of the larger and the more efficient units to consolidate their operations by restructuring their business and taking over relatively weaker units. The relatively smaller and weaker units are finding it difficult to withstand the cyclical pressure of the cement industry. Some of the key benefits accruing to the acquiring companies from these acquisition deals include:

- economies of scale resulting from the larger size of operations
- savings in the time and cost required to set up a new unit
- access to new markets
- access to special facilities / features of the acquired company
- and, benefits of tax shelter.

[1] *The company formed subsequent to the demerger of the cement business of L&T and acquisition of the same by the Aditya Birla Group. The scheme of demerger became effective from 14/5/2004 and the cement business was transferred to UltraTech CemCo Ltd. from the Appointed Day viz. 1/4/2003.*

The relative market share of large players in the cement industry has changed significantly over the years. Consolidation of capacities has seen UltraTech, Grasim, India Cement and Gujarat Ambuja emerge as the leading players apart from ACC, which has been the market leader during all the years excepting FY2001. All the players have resorted to a combination of greenfield capacities as well as takeover of existing capacities for growth.

**Market Share of Leading Cement Producers**

| FY | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| The Associated Cement Companies Limited | 11.2% | 12.2% | 12.8% | 13.5% | 13.0% | 12.6% |
| UltraTech CemCo Ltd. | 11.9% | 11.1% | 10.5% | 10.1% | 10.1% | 9.7% |
| Gujarat Ambuja Cements Limited | 10.6% | 8.7% | 9.5% | 10.1% | 11.3% | 10.6% |
| Grasim Industries Limited. | 9.2% | 10.3% | 10.9% | 10.9% | 10.3% | 10.3% |
| Century Textiles and Industries Limited | 5.4% | 5.0% | 4.8% | 4.8% | 4.8% | 4.7% |
| Birla Corp Limited | 4.2% | 4.0% | 4.1% | 4.1% | 3.9% | 3.6% |
| The India Cements Limited | 7.3% | 5.8% | 5.4% | 5.4% | 5.1% | 5.9% |
| Jaiprakash Industries Limited | 2.3% | 3.9% | 3.8% | 3.6% | 4.3% | 4.5% |
| Lafarge | 3.8% | 3.8% | 3.4% | 3.2% | 3.4% | 3.2% |
| Others | 34.1% | 35.2% | 34.8% | 34.3% | 33.7% | 34.8% |
| **Total** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |

## Declining Role of Public Sector

Historically, cement has been one of the most important areas of operations for the Indian private sector. Unlike much of heavy industry and utilities, cement was not deemed to be the exclusive preserve of the State sector in the post-independence development strategy. Cement was also the industry of choice of many corporates diversifying away from the troubled traditional areas of jute and textiles.

Over the years, the share of the public sector in cement production has declined. While the private sector (large companies) accounts for around 95% of the total installed capacity, the share of public sector companies has declined from a level of 11% in FY1996 to around 4.4% in FY2006. The share in production of the public sector companies is even lower at 1.2% in FY2006 as compared to 6.5% in FY1996.

Among cement public sector undertakings (PSUs), Cement Corporation of India (CCI), a central PSU, is the leading player. It has 10 cement plants with a total installed capacity of 3.85 mtpa at end-FY2006. Other PSU companies manufacturing cement include State entities such as UP State Cement Corporation (3 units with total capacity of 2.16 mtpa); and Tamil Nadu Cement (2 plants with a total capacity of 0.9 mtpa).

Given the extent of losses being incurred by most of these plants, restructuring and revival through privatisation appears imminent. Accordingly, the Yerraguntla unit in Andhra Pradesh, which belonged to CCI, was taken over by India Cements in FY1998. The three units of UP State Cement Corporation have been closed since early 1998. These units were taken over by Jaypee Group in FY2006.

## The Mini-Cement Industry

In order to reduce transportation as well as capital costs, to increase regional development and to make use of smaller limestone deposits, many mini-cement plants have been set up in dispersed locations across India. Construction of such plants began in the early-1980s and their capacity (including capacities of white cement plants) aggregates about 11.1 mtpa. The main attraction of the mini-cement plant concept is the lower capital costs per tonne of capacity as compared to large plants. Against the requirement of Rs. 3500+ per tonne of capacity of large plants, capital costs for mini-cement plants come to about Rs. 1,400-1,600 per tonne. This reduces to a large extent the fixed cost per tonne of cement produced. Also, as the main market is in the vicinity of a mini-cement plant, savings are large on transportation costs.

All these benefits however are negated by other factors like diseconomies associated with small-scale operation, significant competition from large-scale units and rising cost of production. The mini-cement plants rely almost entirely on the State Electricity Boards (SEBs) for power supply, since captive generation is uneconomical for small size. A backup DG set for meeting 25% of the power is however usually provided for. Hence, even when

mini-cement plants consume fewer units their power costs are comparable to those of large cement plants. Further, reliance on SEB power implies exposure to frequent power cuts.

Primarily, the mini cement plant was conceived to utilise isolated limestone deposits too small to support a large cement plant. Strategically, the policy makers may have viewed them as a counter weight against concentration, both in terms of output and as a means of reducing the threshold entry barrier. However, most of these plants are yet to make an upgradation from mini to large cement plant. Even with the excise concession, these plants have not made any significant inroads into the Indian cement market. One reason is that the quantity produced by these plants is extremely insignificant to give any real price competition to large cement companies. The realisations achieved by mini-cement plants are lower compared to large cement plants due to the quality perceptions of the established brands of large companies.

Further, most of the mini cement plants are to some measure dependent on clinker from the large cement plants. Their flexibility to be price setters is limited by their poor financial health.

## Process Technology

While adding fresh capacities, the cement manufacturers are very conscious of the technology used. In cement production, raw materials preparation involves primary and secondary crushing of the quarried material, drying the material (for use in the dry process) or undertaking a further raw grinding through either wet or dry processes, and blending the materials.

Clinker production is the most energy-intensive step, accounting for about 80% of the energy used in cement production. Produced by burning a mixture of materials, mainly limestone, silicon oxides, aluminum, and iron oxides, clinker is made by one of two production processes: wet or dry; these terms refer to the grinding processes although other configurations and mixed forms (semi-wet, semi-dry) exist for both types.

In the dry process, the raw materials are ground, mixed, and fed into the kiln in their dry state. In the wet process, the crushed and proportioned materials are ground with water, mixed, and fed into the kiln in the form of a slurry. The choice among different processes is dictated by the characteristics and availability of raw materials. For example, a wet process may be necessary for raw materials with high moisture content (greater than 15%) or for certain chalks and alloys that can best be processed as a slurry.

The dry process is the more modern and energy-efficient configuration. In general, the dry process is much more energy efficient than the wet process, and the semi-wet somewhat more energy efficient than the semi-dry process. The semi-dry process has never played an important role in Indian cement production and accounts for less than 0.2% of total production.

In 1960, around 94% of the cement plants in India used wet process kilns. These kilns have been phased out over the past 46 years and at present, 96.3% of the kilns are dry process, 3% are wet, and only 1% are semi-dry process. Dry process kilns are typically larger, with capacities in India ranging from 300- 8,000 tonnes per day or tpd (average of 2,880 tpd). While capacities in semi-dry kilns range from 600-1,200 tpd (average 521 tpd), capacities in wet process kilns range from 200-750 tpd (average 425 tpd).

Over the last decade, increased preference is being given to the energy efficient dry process technology so as to obtain a cost advantage in a competitive market. Moreover, since the initiation of the decontrol process, many manufactures have switched over from the wet technology to the dry technology by making suitable modifications in their plants. Due to new, even more efficient technologies, the wet process is expected to be completely phased out in the near future.

Due to the dominant use of carbon intensive fuels such as coal in clinker making, the cement industry has been a major source of carbon dioxide (CO2) emissions. Besides energy consumption, the clinker making process also emits CO2 due to the calcining process. Increased atmospheric concentration of gases such as CO2, methane, and nitrous are believed to be responsible for the rise in global mean land and sea temperatures since the 1850s. The warming occurs because these so-called greenhouse gases, while they are transparent to incoming solar radiation, absorb infrared (heat) radiation from the Earth that would otherwise escape from the atmosphere into space; the greenhouse gases then re-radiate some of this heat back towards the surface of the Earth. India's per capita carbon emission rate was 0.33 tonnes during 2003, which was below the global average of 1.14 and the smallest per capita rate of any country with fossil-fuel CO2 emissions exceeding 35 mt of carbon.

The global cement industry contributes about 4% to global CO2 emissions, making the cement industry an important sector for CO2-emission mitigation strategies. In India, while CO2 emissions from cement production has increased from 7.32 mt of carbon in 1993 to 16.73 mt in 2003, its share in total CO2 emissions by India has increased from 3.3% to 4.8%. Emission mitigation options include enhancing energy efficiency; process conversion away from wet- to dry-/semi-dry processes; using blast furnace slag, power station fly ash, natural pozzolana or limestone as a constituent of the final cement thereby reducing the clinker required; shift to low carbon fuels; application of waste fuels; and increased use of additives in cement making. In India, CO2 emissions per tonne of cement production have declined with increased share of blended cements, where energy use and associated emissions are reduced; increased share of dry processes; energy efficiencies; and other emission mitigation measures. Indian cement plants are also beginning to explore the use of alternative and waste fuels, such as lignite, pet coke, tires, rice husks, groundnut shells, etc., to replace the use of coal in cement kilns.

## Scale of Operations

The cement industry has witnessed a significant change in the scale of operations. In 1961, the largest kiln in operation had a capacity of 750 tpd. In 1970, of the total 119 kilns, 1 had over 1,000 tpd capacity, with 55 having under 400 tpd capacity. In 1980, 11 of the total 141 kilns were over the 1000 tpd mark, with 1 kiln having a capacity larger than 3,000 tpd (roughly 1 mtpa). The 1990s saw still higher capacity 4500-5000 tpd (or 1.5 mtpa) kilns. The recent practice for a large size plant is to have 6,500-7,000 tpd (or 2.5 mtpa) capacity.

As of end-FY2006, there were 7 plants with a capacity exceeding 3 mtpa at a single location, and 71 plants with a capacity exceeding 1 mtpa at a single location. Plants with a capacity exceeding 1 mtpa at a single location had a cumulative installed capacity of 126.2 mtpa at end-FY2006, accounting for 80.3% of total installed capacity.

**Distribution of Single-location Plants by Installed Capacity and Production**

*FY2006*

| Plant Size by Installed Capacity | Volume (thousand tonnes) No. of plants | Installed Capacity | Production | Share of total (%) No. of plants | Installed Capacity | Production |
|---|---|---|---|---|---|---|
| >5 mtpa | 1 | 5,300 | 3,592 | 0.7 | 3.4 | 2.5 |
| 2-5 mtpa | 24 | 60,443 | 59,906 | 17.4 | 38.5 | 42.2 |
| 1-2 mtpa | 46 | 60,474 | 53,711 | 33.3 | 38.5 | 37.9 |
| <1 mtpa | 67 | 30,928 | 24,596 | 48.6 | 19.7 | 17.3 |
| **Total** | **138** | **157,146** | **141,805** | **100.0** | **100.0** | **100.0** |

The average kiln capacity of a dry process technology plant is around 2,880 tpd (0.9-1 mtpa). These large sizes contribute towards reduction in energy consumption, and provide the units with scale benefits.

The minimum economic size also appears to have risen because of the rise in investment cost per tonne of cement. This investment cost has risen from Rs. 650 per tonne in the late 1970s to around Rs. 3,500 today.

## Importance to Economy

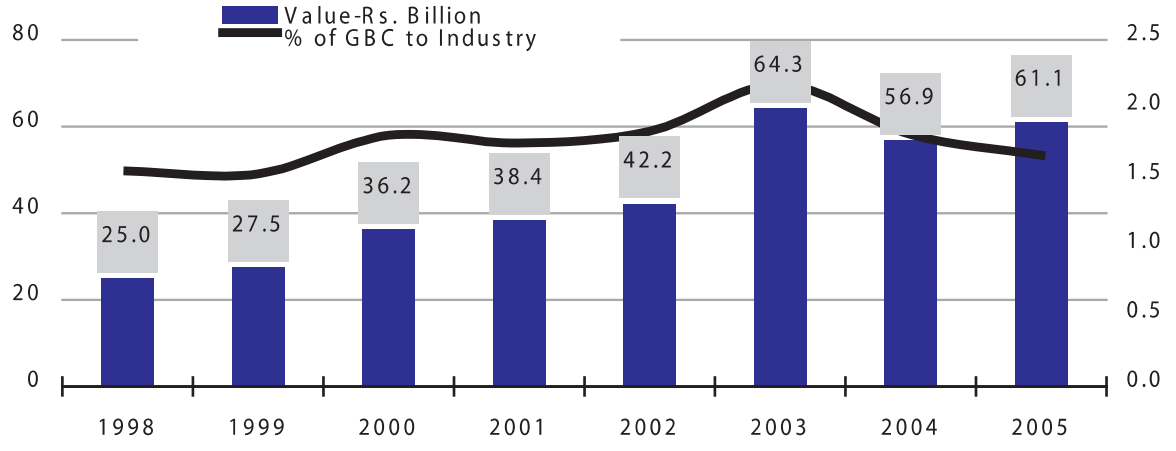
The cement industry accounts for approximately 1.3% of GDP and employs over 0.14 million people. It is a significant contributor to the revenue collected by both the central and state governments through excise and sales taxes. For example, central excise collections from cement industry aggregated Rs. 45.23 billion in FY2005 and accounted for 4.3% of total excise revenue collected by the government. Cement has consistently figured among the top 5-7 commodities. It is a heavily taxed commodity and the duties amount to around 30% of the selling price of cement.

India is the second largest producer of cement in the world. In 2005, India produced 142 mt of cement, accounting for 6.4% of global production of 2.22 billion tonnes. India is the second largest producer-behind China (1,000 mt), but ahead of the US (99 mt) and Japan (66 mt). India's cement industry-both installed capacity and actual production-has grown significantly over the past three decades, with production increasing at an average rate of 8.1% per year between 1981 and 2004-05.

In recent years, the cement sector has accounted for a declining share of gross bank credit (GBC) of scheduled commercial banks (SCBs), largely because of decline in credit during FY2004. With GBC of Rs. 61.12 billion in March 2005, the cement industry accounted for 1.67% of industry GBC of SCBs in March 2005, as compared with 1.81% in March 2000.

**GBC to Cement Industry**

*As of last Friday of March*




*Compiled by ICRA*

## Duties on Cement

Traditionally, cement has been a heavily taxed sector with both the central and the state governments levying the taxes. The major taxes/ levies comprise central excise duty; sales tax levied by the respective state governments; royalty and cess on limestone and coal; and, duties on power tariff. These duties account for around 30% of the sale price of cement or around 70% of the ex-factory price (excluding local transport and dealer margins).

**Duties on Cement**

| Item | Duty Amount |
|---|---|
| Excise | Rs. 408 per tonne |
| Royalty on Limestone | Rs. 45 per tonne |
| Limestone and Dolomite Mine Workers' Welfare Cess | Rs. 1 per tonne |
| Royalty on Lignite | Rs. 50 per tonne |
| Royalty on Non-Coking Coal | Rs. 65-165 (for CIL depending on grade), Rs. 90 per tonne for Singareni |
| Sales Tax Rates | 0-28% |

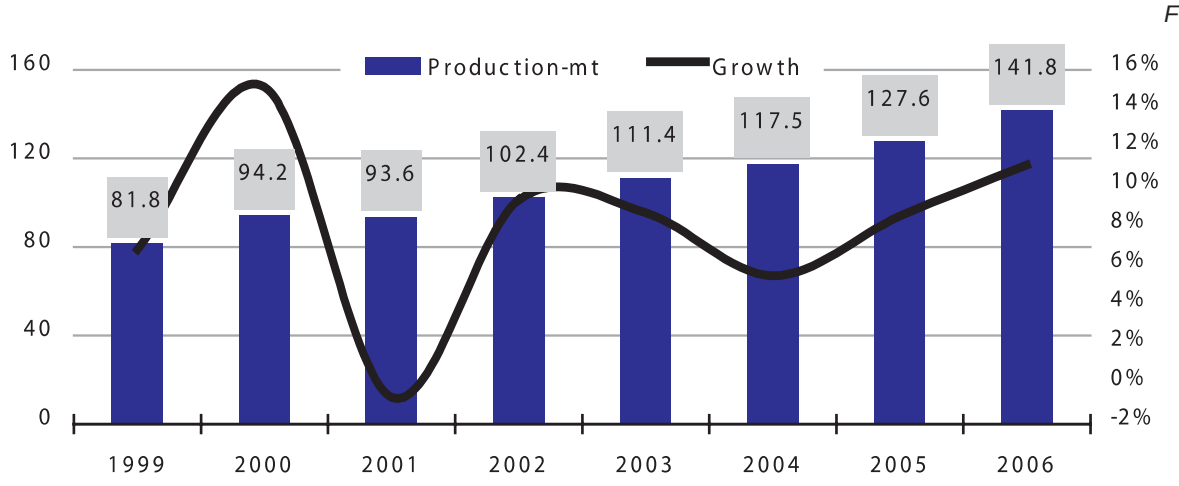
The excise duty rates on cement are on specific basis, as against ad valorem rates on most products. These specific rates have risen manifold from Rs. 65 per tonne in 1977 to the current level of Rs. 400 per tonne. The excise revenue collection from the cement Industry has shown an increasing trend over the years. The duties in India (relative to the selling price of cement) are among the highest in the world.

# DEMAND-SUPPLY POSITION

## Robust Production Growth

India's cement production increased 11.2% during FY2006 to 141.81 mt. By comparison, production increased 8.6% during FY2005, and 5.5% during FY2004. Production has increased at a 3-year compound annual growth rate (CAGR) of 8.4%. On a decadal basis, India's cement production increased at an annual average of 8.2% during FY1996-2006, as compared with 6.9% during FY1986-96.

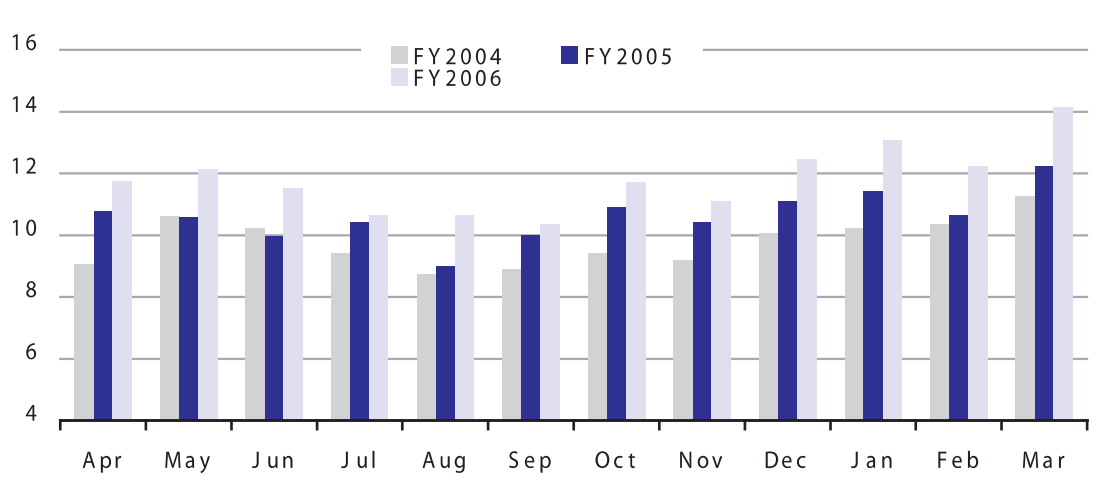
**India's Cement Production and Growth**




*Compiled by ICRA*

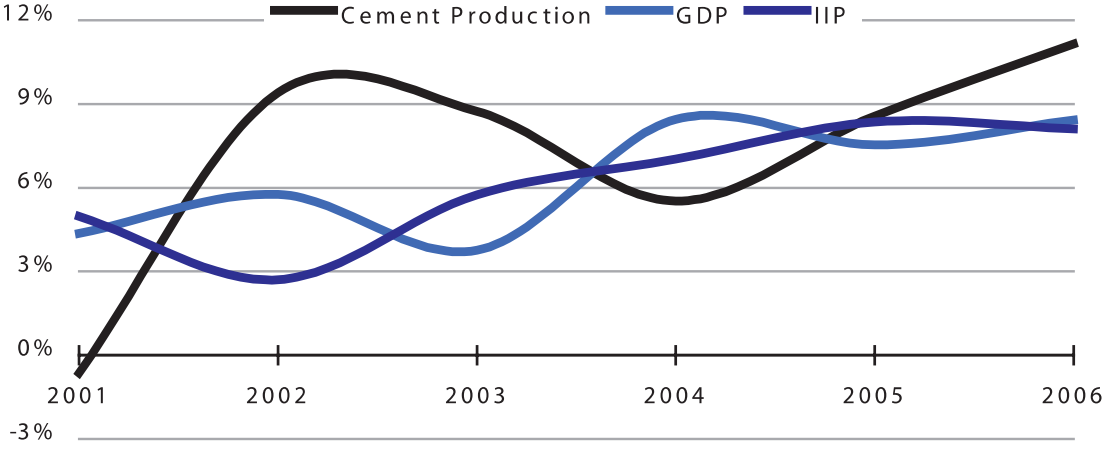
During FY2006, after the slack of the monsoon season, cement production registered high growth since October 2005. High growth in the cement sector reflected robust demand from the construction sector and high exports.

**Monthly Cement Production**



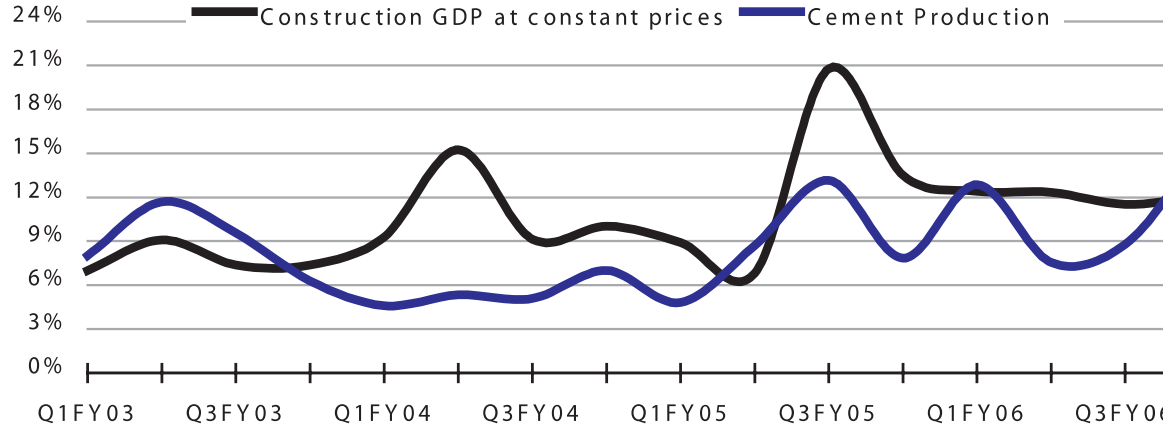

Cement production and consumption has strong co-relation with economic growth and industrial activity.

**Growth in Cement Production, GDP and Index of Industrial Production (IIP)**



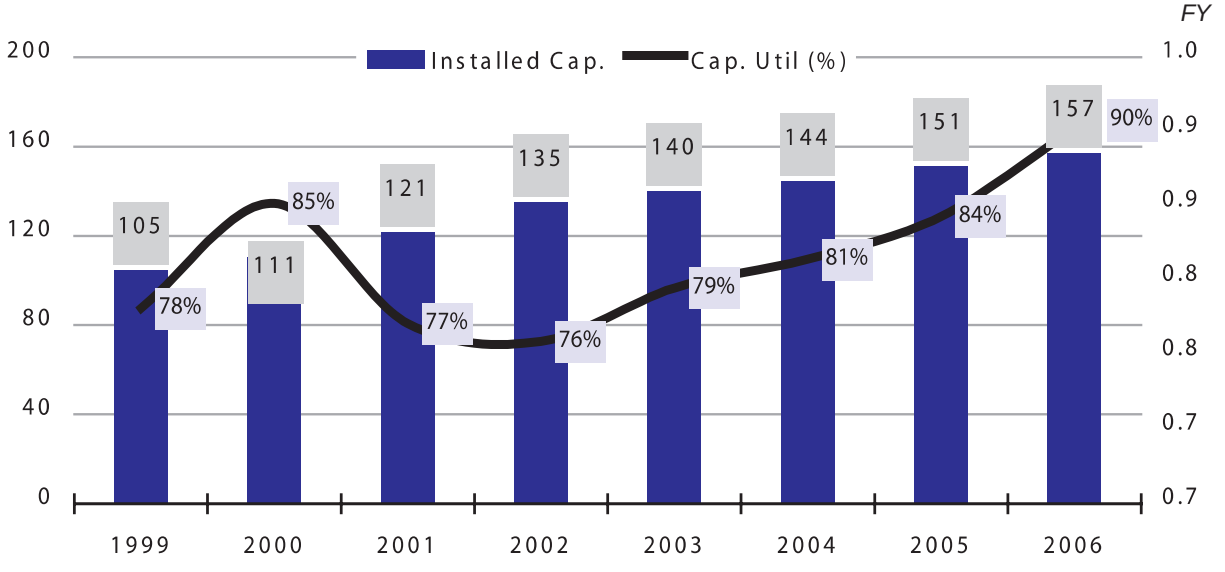
As cement is a basic construction material with virtually no substitute, it is used worldwide for all construction work. Thus, the growth in the construction industry has a direct relation with the production and consumption of cement. GDP from the construction industry has grown at a high rate over the last three years-12.1% during FY2006, 12.5% during FY2005, and 10.9% during FY2004. This has had a positive impact on cement consumption, which increased 10.1% during FY2006, as compared with 8.1% during FY2005.

**Growth in GDP from Construction and Cement Production**




The increased growth in cement consumption since 2004 has had a positive impact of the capacity utilisation of cement producers. Capacity utilisation increased from 76% in FY2002 to around 90% in FY2006.

**Installed Capacity and Capacity Utilisation**




*Compiled by ICRA*

## Low but Rising Share of Blended Cement in India

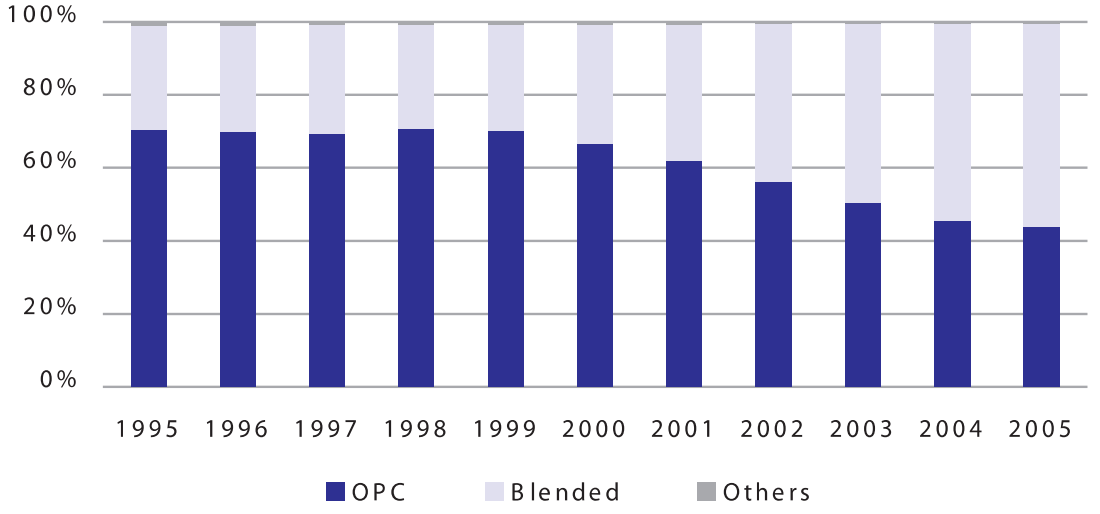
In India, about 44% of the cement produced is Ordinary Portland Cement (OPC), 47% is Pozzolana Cement (PPC), 8% is Portland Blast Furnace Slag Cement (PBFS), and the remaining 1% are special cements. Blended cement (PPC and PBFS) has a low but rising share of India's cement production. Energy usage is significantly lower in blended cement because a portion of the clinker is replaced by other materials such as fly ash or blast furnace slag. Blended cements are composite cements produced by blending clinker -which is the output of the kiln- at the grinding stage with pozzolonic or other material with cement like properties. Although compressive strength of the major types of blended cement is equivalent to that of Grade 33 OPC cement; blended cement offers a reduction in the risk of thermal cracking; superior performance under elevated temperature curing conditions; good long-term strength; higher resistance to acids, sulphates and alkali attacks, with more suitability

for coastal areas; reduced permeability with consequent improvement in durability; smoother finishing, etc.

In India, the share of blended cement in the total production had increased from 47% in 1978-79 to 76% in 1982-83. After this, the Indian cement industry witnessed a higher production of the higher grade OPC, and the production of blended cement gradually declined to 27% in 1992-93. However, this was followed by an upward trend, and the share of blended cement reached approximately 56% in 2004-05.

**Domestic Production of Cement**

*% of total*




There are several reasons behind the historically low share in consumption of blended cement in India:

- As the compressive strength of the blended cements is comparable to the 33-grade OPC, which is the lowest grade, the market perceives the blended cements as relatively lower-strength varieties.
- The cement consumer is not confident of the quality of the blended material used for manufacturing blended cements.
- The darker colour of blended cements and the colour variations in them are mistakenly attributed to impurity. For example, PPC is generally of darker colour as compared with OPC because of the carbon present in flyash.
- Consumers are yet to realise the advantages of using blended cements in certain locations, like aggressive soils. Further, there is a wrong impression in the market that addition of blended material degrades the properties of blended cements.

These perceptions on blended cement are gradually phasing out with consequent increase in consumption share of blended cement. In fact there are certain regions in India, such as Punjab, Himachal Pradesh, Jharkhand, Uttar Pradesh, West Bengal, Chattisgarh, Tamil Nadu, Kerala, Bihar, Orissa, Madhya Pradesh, and West Bengal, where blended cement is more popular and hence, more than 50% (more than 80% in some cases) of the cement produced in these states is of the blended variety.

Given the strong benefits associated with the use of blended cement, the industry can initiate corrective action for enhancing its consumption. Some of the likely ways in which this can be done are as follows:

- Improving the quality of the additive. For example, the quality of a pozzolonic material like flyash can be improved by processing it, so that its fineness and chemical composition can be assured.
- Increasing customer awareness by organising training programmes.
- The Government can also play a role by taking strategic initiatives like increasing the concession on excise duty on blended cements, or providing sales tax exemption benefits to producers of blended cement. Key benefits accruing to the country from this move would include greater pollution control (because of the effective use of waste material like slag) and preservation of the valuable limestone reserve of the country. Besides, it would also help in improving the construction quality in the country.

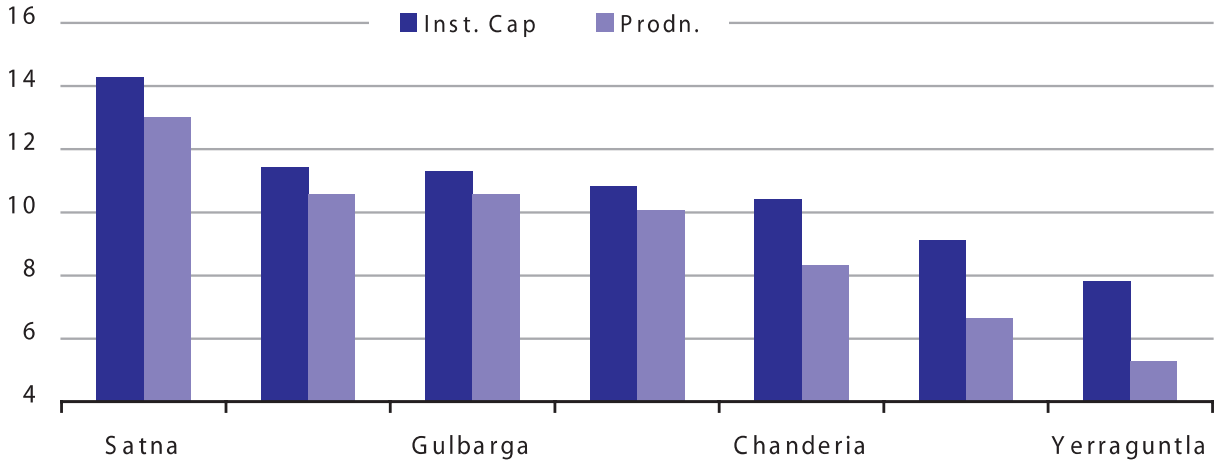
## Regional Production Patterns

The Indian cement industry is comprised of 129 large cement plants and 300 mini-cement plants, with installed capacities of 153.6 mtpa and 11.10 mtpa, respectively at end-FY2005. Since cement is a high bulk and low value commodity, the growth of the cement industry has been around the limestone deposits. Proximity to limestone deposits contributes considerably to pushing down the costs of transportation of heavy limestone. If units are located close to limestone resources, trucks can be used to move limestone instead of railways. The proximity of coal deposits constitutes another important factor in cement manufacturing. Nearly 68% of the coal required by the cement industry during FY2005 was transported by rail; the balance 32% was moved by road.

There are at present seven clusters-Satna (Madhya Pradesh), Chandrapur (North Andhra Pradesh and Maharashtra), Gulbarga (North Karnataka and East AP), Chanderia (South Rajasthan + Jawad & Neemuch in MP), Bilaspur (Chattisgarh), Yerraguntla (South AP), and Nalgonda (Central AP)-with a total capacity of 75.23 mtpa at end-March 2005, accounting for 48.4% of the total installed capacity.

**Cluster-wise Cement Capacity and Production in FY2005**

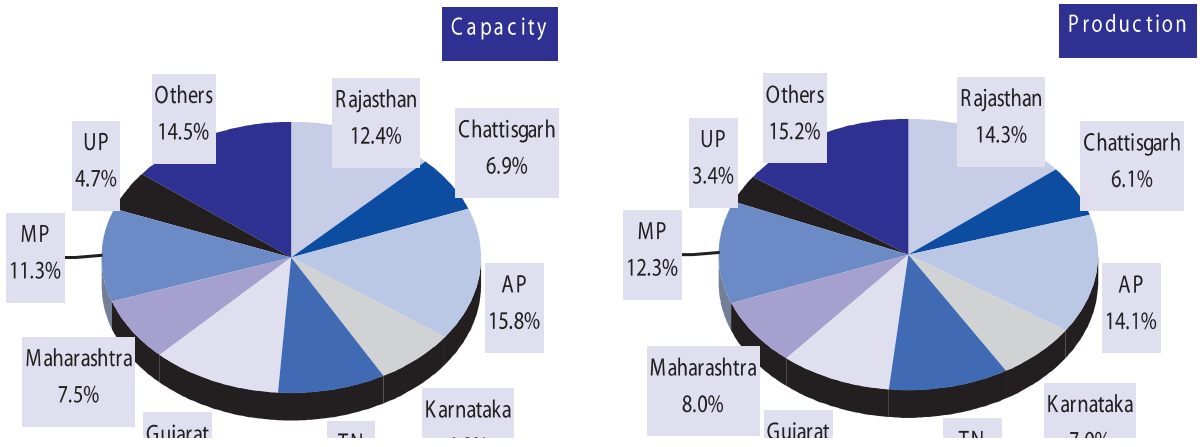
*mt*




AP is the largest cement producing state with an installed capacity of 24.9 mt. Cement production during FY2006 was 19.9 mt. Other major cement producing states include Rajasthan, Madhya Pradesh, and Gujarat.

**Major Cement Producing States**

*% of total*




In terms of regional concentration, the Southern region accounts for 32% of installed capacity, followed by Western region. MP is traditionally considered a part of the Western region although as much as 65% of cement output from this state serves the Northern and Eastern regions.

**Regional Distribution of Capacity and Production**

| FY | Million tonnes | | | Share of total | | |
|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 |
| **Capacity** | **144.30** | **151.34** | **157.15** | **100** | **100** | **100** |
| North | 25.97 | 27.36 | 29.59 | 18.0 | 18.1 | 18.8 |
| East | 22.38 | 22.81 | 22.85 | 15.5 | 15.1 | 14.5 |
| South | 46.27 | 48.06 | 50.76 | 32.1 | 31.8 | 32.3 |
| West | 27.98 | 28.92 | 28.94 | 19.4 | 19.1 | 18.4 |
| Central | 21.70 | 24.20 | 25.00 | 15.0 | 16.0 | 15.9 |
| **Production** | **117.50** | **127.57** | **141.81** | **100** | **100** | **100** |
| North | 25.22 | 26.70 | 30.17 | 21.5 | 20.9 | 21.3 |
| East | 16.67 | 18.73 | 19.54 | 14.2 | 14.7 | 13.8 |
| South | 36.13 | 38.98 | 44.88 | 30.8 | 30.6 | 31.7 |
| West | 21.00 | 22.76 | 24.93 | 17.9 | 17.8 | 17.6 |
| Central | 18.48 | 20.39 | 22.28 | 15.7 | 16.0 | 15.7 |

## Major Players

As discussed, ACC is the largest player with a capacity of 18.64 mtpa at end-March 2006. UltraTech CemCo Ltd. now occupies the second slot with a capacity of 17 mtpa (which includes 1.5 mtpa of subsidiary Narmada Cement). The Gujarat Ambuja group has emerged as the third largest player with a capacity of 14.86 mtpa. Grasim ranks fourth with a capacity of 14.12 mtpa. Other leading players include India Cements, Jaypee group, Century Textiles, Madras Cements, Lafarge, and Birla Corp.

**Major Players in Indian Cement Industry**

*Thousand tonnes*

| | FY2005 | | FY2006 | |
|---|---|---|---|---|
| | Installed Capacity | Production | Installed Capacity | Production |
| ACC | 18,228 | 16,606 | 18,640 | 17,902 |
| Gujarat Ambuja | 14,570 | 14,467 | 14,860 | 15,094 |
| Ultratech | 17,000 | 12,921 | 17,000 | 13,707 |
| Grasim | 14,115 | 13,143 | 14,115 | 14,649 |
| India Cements | 8,810 | 6,506 | 8,810 | 8,434 |
| JK Group | 6,415 | 5,769 | 6,680 | 6,174 |
| Jaypee Group | 5,600 | 5,429 | 6,531 | 6,316 |
| Century Textiles | 5,900 | 6,070 | 6,300 | 6,636 |
| Madras Cements | 5,470 | 3,663 | 5,470 | 4,550 |
| Birla Corp. | 4,780 | 5,017 | 5,113 | 5,150 |
| Lafarge | 5,000 | 4,391 | 5,000 | 4,573 |
| Others | 45,456 | 33,589 | 48,627 | 38,620 |
| **Total** | **151,344** | **127,571** | **157,146** | **141,805** |

## Locational Issues

Cement being a high bulk and low value commodity, outward freight accounts for close to one fifth of the total manufacturing cost. In addition, for every tonne of cement produced, close to 1.7 tonnes of raw material (including coal) is transported. In this scenario, the location of the cement plant becomes crucial. While deciding on the plant location, there is a trade-off between proximity to raw material sources and proximity to markets. A split-location cement plant can be a good compromise between the two options. The plant also has to address issues of logistics (evacuation of cement by rail, road or waterways), power availability in the region, and availability of materials (limestone, coal, slag, etc).

The bulk of the cement manufactured is consumed near urban centres. In the manufacture of cement, for every 1 tonne of clinker, about 1.6-1.7 tonnes of limestone and coal need to be assembled. For OPC, another 50 kg of gypsum is required while grinding the clinker down. For PPC, up to another 250 kg of pozzolonic material such as fly ash requires to be assembled. Thus, there can be two broad locational strategies, stemming from the principal objective, which is not merely to minimise unit-manufacturing cost, but to minimise unit delivered cost as well.

The first strategy is to locate manufacturing facilities near the consuming centres. In this case, outward freight is minimised and marketing flexibility enhanced at the cost of higher raw material assembly costs. The second strategy is to locate the plant close to the mineral deposits, so as to minimise raw material assembly costs. Given that 1.4-1.5 tonnes of limestone are required per tonne of clinker, locating the plant along the limestone deposits is the logical corollary. Occasionally, as in areas like Satna, Rewa, and Raipur, the coal pitheads are also quite close by.

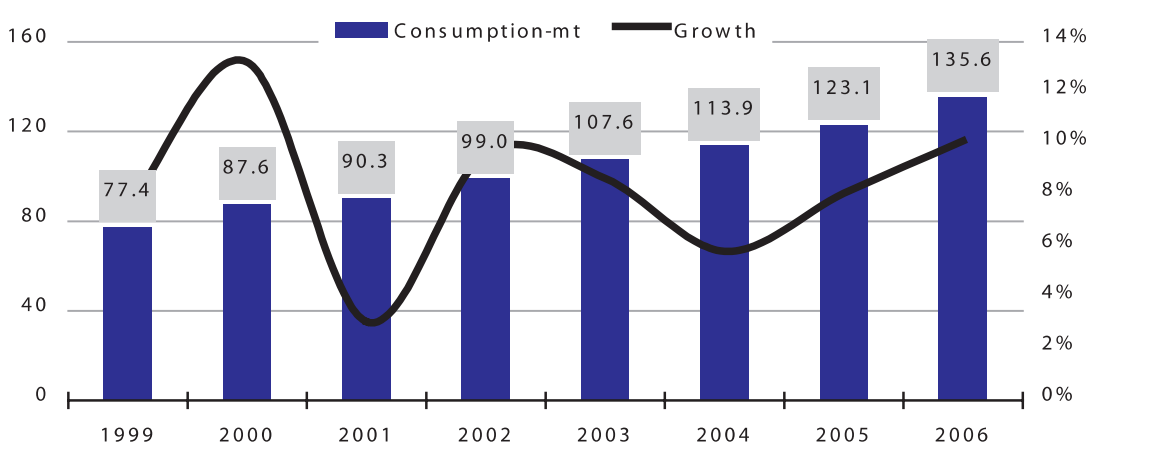
As long as retention prices were the norm, outward freight was of no concern to cement companies. All the cement plants thus naturally gravitated to one of the several large limestone bearing areas in the country. With the introduction of partial, and later full, decontrol, outward freight has become a critical issue in determining a company's profitability. However, if the list of new plants which have come up since 1982 as well as those under implementation today, is examine, it may be observed that barring some, all companies continue to opt for the limestone-deposit bias in locating new capacity.

However, a hybrid strategy exists. The clinker to cement ratio is virtually 1:1 for OPC, with the addition of gypsum being only 5%. For PPC, with fly ash addition, the clinker to cement ratio is 0.8:1. Split location plants thus become a distinct possibility, with the clinker manufacture near limestone deposits and grinding and bagging facilities near the consuming centres. The advantages of this split location strategy derive from the ease of transporting clinker in open-to-sky condition (rather than bagged cement under protective cover), lower handling losses in transit and ease of storage of clinker (as opposed to cement at the market centred grinding mills). This is especially true for PPC/PBFS, since fly ash/slag is available from the thermal power stations/steel plants, which are located in, and around the country's urban centres. Flyash disposal by power utilities has become a contentious environmental issue. Similarly, steel producers face problems in disposing slag. Therefore, utilisation of these materials in this manner can improve the cement company's profitability while benefiting the environment. By locating such grinding units close to the markets, the distribution costs are reduced to a great extent. If the grinding unit is near a port with a steel mill or power plant near by, this becomes an ideal situation for targeting the export markets. Such possibilities exist near Mangalore, Vizag and Cochin, where the clinker can also be moved economically by coastal shipping from plants located in North-western India. However, this strategy will be limited somewhat by the extent in which PPC is accepted in the market. Over the last decade, the share of PPC/PBFS has increased significantly from 28.3% in FY1995 to 55.6% in FY2005.

## High Growth in Domestic Cement Consumption

India's cement consumption increased 10.1% during FY2006 to 135.56 mt. By comparison, consumption 8.1% during FY2005, and 5.8% during FY2004. Production has increased at a 3-year compound annual growth rate (CAGR) of 8%.

**India's Cement Consumption and Growth**




*Compiled by ICRA*

On a decadal basis, India's cement consumption has increased at a 10-year CAGR of 8.2% during FY1996-06. Demand has largely been driven by a shift in housing construction preferences to concrete and the rapidly rising population. The healthy growth beginning in FY2005 is also due to increased demand from National Highway Development Projects (NHDP).

In India, the percentage of pucca houses in urban areas increased from 73% in 1991 to 75% in 2001, whereas the percentage of semi-pucca and kutcha houses in the urban areas has declined. The percentage of pucca houses in rural areas increased from 31% in 1991 to 35% in 2001. This implies that use of permanent building materials for the construction of walls and roofs is becoming more popular in rural areas also. Data from the 58th Round of Survey by National Sample Survey Organisation (NSSO) indicates that the percentage of pucca dwellings in urban areas increased from 74% in 1993 to around 77% in 2002-03. Over the same period, the percentage of pucca dwellings in rural areas increased from 32% to 36%.

**Housing Stock in India**

*Million units*

| | 1981 | | 1991 | | 2001 | |
|---|---|---|---|---|---|---|
| | Units | % of total | Units | % of total | Units | % of total |
| Urban | 27.20 | 100 | 39.40 | 100 | 52.06 | 100 |
| Pucca | 17.60 | 64.7 | 28.66 | 72.7 | 38.89 | 74.8 |
| Semi-Pucca | 5.93 | 21.8 | 6.97 | 17.7 | 9.49 | 18.2 |
| Kutcha | 3.67 | 13.5 | 3.77 | 9.6 | 3.68 | 7.0 |
| **Rural** | **87.20** | **100** | **109.00** | **100** | **135.10** | **100** |
| Pucca | 19.65 | 22.5 | 33.34 | 30.6 | 47.78 | 35.4 |
| Semi-Pucca | 32.20 | 36.9 | 38.86 | 35.6 | 49.65 | 36.7 |
| Kutcha | 35.35 | 40.5 | 36.80 | 33.8 | 37.67 | 27.9 |
| **Total** | **114.40** | **100** | **148.40** | **100** | **187.16** | **100** |
| Pucca | 37.25 | 32.6 | 62.00 | 41.8 | 86.67 | 46.3 |
| Semi-Pucca | 38.13 | 33.3 | 45.83 | 30.9 | 59.14 | 31.6 |
| Kutcha | 39.02 | 34.1 | 40.57 | 27.3 | 41.35 | 22.1 |

Housing completions in urban areas in each decade has shown an increasing trend from 11.55 million in 1971-81 to 19.53 million in 1991-2001. Similarly, housing completions in rural areas has also increased from 19.16 million to 25.61 million.

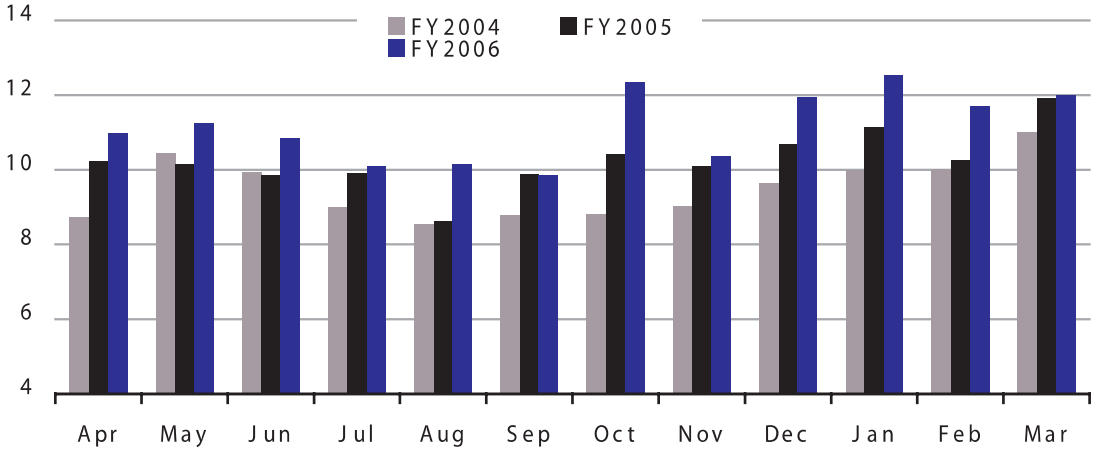
Apart from increased preference for pucca constructions, housing size has also increased in urban areas. Overall, while the share of 1-room houses has declined from 45% in 1981 to 39% in 2001, the share of 3-or more rooms has increased from 27% to 32%.

In India, cement consumption and sales follows a seasonal pattern with lean sales during the monsoon season (July-September) and higher sales during October-March.

[2] *Built of pucca materials comprising cement, concrete, oven-burnt bricks, hollow cement/ash bricks, stone, stone blocks, jack boards (cement-plastered reeds), iron, zinc or other metal sheets, timber, tiles, slate, corrugated iron, asbestos cement sheet, veneer, plywood, artificial wood of synthetic material and PVC.*

**Monthly Cement Consumption**

*mt*




In terms of regional consumption, the Southern region accounted for 29% of the total consumption of approximately 135.6 mt during FY2006, followed by Northern and Western regions. Although, there has been an year to year variation in the region-wise consumption growth rates, the relative shares of each region has more or less remain stable across the past few years.

**Regional Distribution of Cement Consumption**

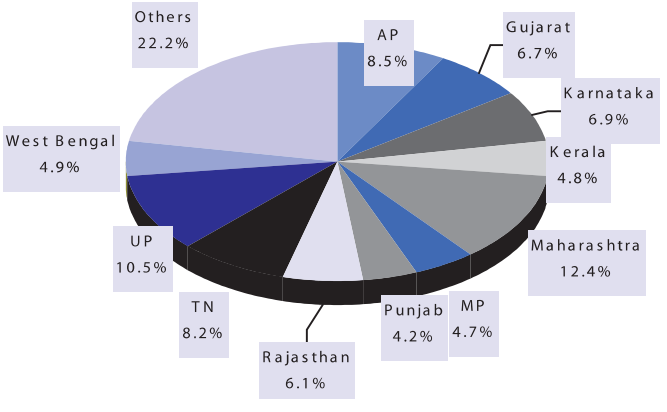
| FY | Million tonnes 2004 | 2005 | 2006 | Share of total 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| North | 22.86 | 24.26 | 27.06 | 20.1 | 19.7 | 20.0 |
| East | 17.48 | 20.40 | 22.66 | 15.3 | 16.6 | 16.7 |
| South | 32.03 | 33.43 | 39.37 | 28.1 | 27.2 | 29.0 |
| West | 22.52 | 24.59 | 25.91 | 19.8 | 20.0 | 19.1 |
| Central | 18.97 | 20.41 | 20.57 | 16.7 | 16.6 | 15.2 |
| **Total** | **113.86** | **123.08** | **135.56** | **100** | **100** | **100** |

Regional disparity has been witnessed in the consumption growth. During FY2006, the Southern region witnessed the strongest consumption growth, driven by higher construction activities from both Government and private sector projects. By comparison, while consumption in Western region increased 5.4% during FY2006, consumption in Central region increased only 0.8%.

The major consumption states for cement in India include Maharashtra (16.8 mt in FY2006), UP (14.2 mt), Andhra Pradesh (11.5 mt), and Tamil Nadu (11.1 mt). Over the last three years, consumption growth has outpaced the national average in Andhra Pradesh, Haryana, Rajasthan, and Karnataka.

**Major Cement Consuming States-FY2006**

*% of total*



## End-User Profile

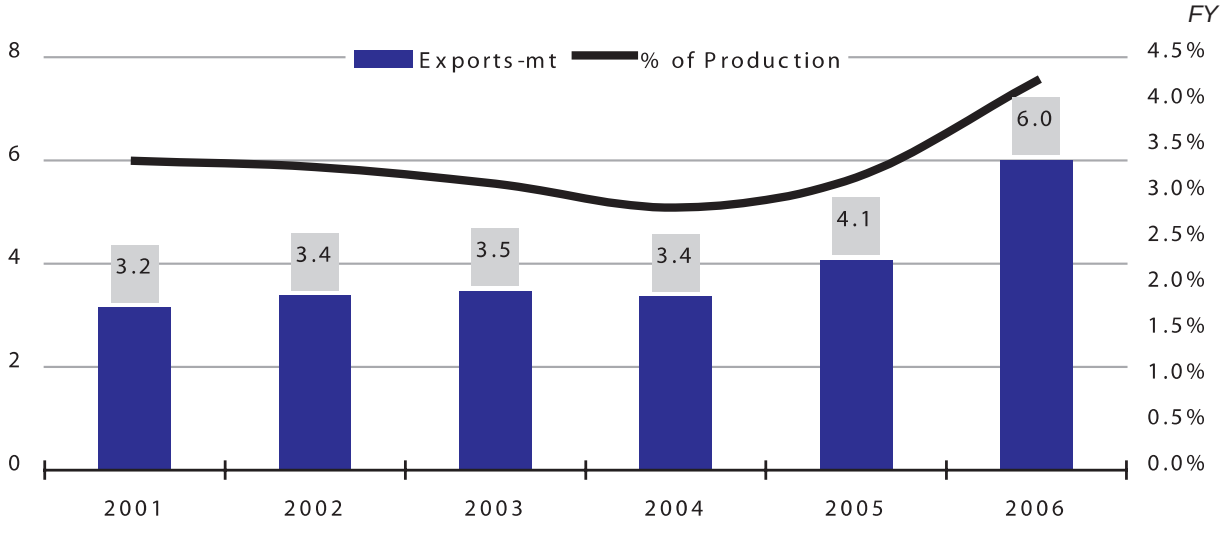
The profile of the end-user for cement has changed over the years. Till the early 1980s, the Government used to be the biggest final user, which is no longer the case. According to industry sources, till the early 1980s, the government departments and agencies accounted for over 50% of the total domestic consumption. However, with the lifting of controls and with the initiation of the privatisation programme, the private sectors' share in the total cement consumption has gone up and today, Government demand accounts for just around one fifth of the total domestic demand. Government demand declined during the last few years, following reduced spending on public works. Housing accounts for the largest share (over 55%) of the total cement consumption in India. This is largely due to the various financial sops given to this sector in the successive Union Budgets. The Housing sector is followed by Infrastructure sector (25%) and Commercial Projects (20%).

## Exports

The Indian cement industry exported around 6 mt of cement during FY2006, accounting for around 4% of the total production. There has been a significant year on year variation in the export trend, implying that Companies rely on cement exports to balance out the domestic demand supply situation.

Because of increased overseas demand, cement exports increased from 4.07 mt in FY2005 to 6.01 mt during FY2006. However, increased domestic demand resulted in clinker exports declining from 5.99 mt to 3.18 mt.

**India's Cement Exports**




*Compiled by ICRA*

As cement is a low value, high bulk commodity, freight cost becomes a significant factor in determining the landed cost of cement. This has resulted in a very low volume of international trade in cement. World cement trade has averaged just around 6-7% of the total production.

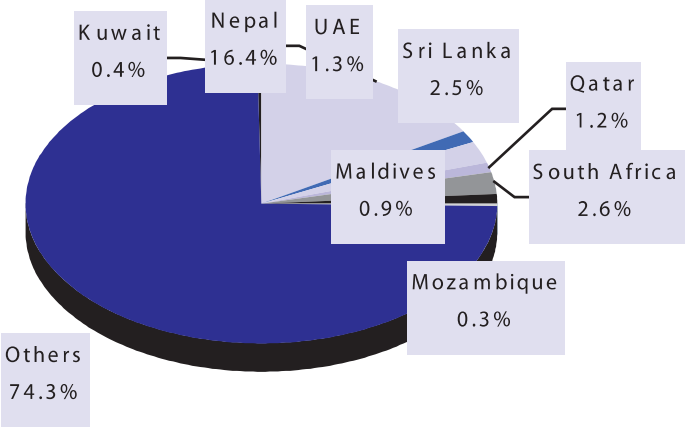
Although, world trade in cement is limited because of high freight costs, there are countries, which either import a significant share of their total consumption or export a major share of their total production. Countries, which import a significant share of their consumption, appear to be falling in the developing world category, where the public expenditure on infrastructure projects is very high. The Middle East countries (although not falling in the developing world category) have huge requirements of cement because of construction work in projects in the oil sector. Also in these countries, unfavourable conditions (for example, inadequate cement limestone reserves) have discouraged cement capacity creation.

Countries, which export a large share of their domestic production, appear to be having one thing in common. Countries with high export thrust opt for bulk transportation for exporting cement. For example, by opting for bulk transportation, Greece is in a position to export over 50% of its cement production. Bulk transportation leads to significant advantages such as savings in freight costs and packing costs, avoidance of transit loss, adulteration, pilferage, bursting of bags and damage to cement.

At the ex-factory level, Indian cement is quite competitive with many global cement producing regions. However, a plethora of duties along with infrastructure bottleneck reduces this competitiveness. As cement is primarily a regional commodity, international competitiveness is not really a serious issue. However, in times of oversupply in the domestic market, being competitive ensures access to the export market. The export performance of Indian Cement industry has been healthy in recent years and has witnessed growth at a CAGR of 20.1% during FY2004-06. During FY2006, cement exports were higher by 47.7%. There has been a significant year on year variation in the export trend, implying that companies rely on cement exports to balance out the domestic demand supply situation.

Because of freight costs, India is in a position to export cement through sea routes to countries in Indian sub-continent, South East Asia, Middle East, countries on the East coast of African continent including South Africa, Madagascar, and also Mauritius and other islands of the Indian Ocean. India can export to the neighbouring and land-locked countries such as Pakistan, Nepal and Bangladesh through rail as well as road routes. An additional route for exports to Bangladesh is the Inland Waterways on the river Brahmaputra.

**Major Destinations for India's Cement Exports-FY2005**




## Demand-Supply Position

### Overview

The cement industry has been in a surplus position since a long time. This has resulted in increased exports over the last few years. Although there exists a surplus of cement in the country, the surplus has declined from 0.42 mt in FY2005 to 0.23 mt during FY2006, mainly because of higher growth in consumption. This has resulted in capacity utilisation increasing from 84% in FY2005 to 90% in FY2006.

India's annual per capita cement production of 0.13 tonnes in FY2006 is significantly below the world average of 0.3 tonnes and China's production of 0.76 tonnes during 2004. It has been observed that cement consumption increases along with the rise in per capita income in developing countries. Thereafter, once all the major developmental projects are in place and the country has a per capita income comparable with that of the developed nations, the demand for cement stagnates/declines. Accordingly, the per capita cement consumption also stagnates/declines. Growth in population density is a minor (but steady) driver of demand growth for cement in all countries. Cement consumption has a strong co-relation with GDP growth. High GDP growth leads to high cement consumption. The reverse is true when GDP growth declines. The cement intensity of GDP (i.e. rate of growth of cement consumption relative to GDP growth) is different for different countries. For a under-developed country, the cement intensity of GDP is very low. It rises with the progress in economic development, reaches a peak level, and then starts declining once all the developmental projects are in place and the country has achieved a very high level of economic growth.

While the Indian cement industry is in a surplus position since a long time, the surplus position is gradually declining. While limited greenfield capacity is envisaged in the near to medium term, it is very easy to increase capacity through either brownfield projects or by resorting to manufacturing blended cements. As per present expansion plans, an additional 6.6 mtpa of capacity is expected to be operational in FY2007. Considering an expected production and consumption growth of 10% during FY2007, the demand supply position of the Indian cement industry is expected to improve.

### Regional Position

There exist regional surplus/shortages in the Indian cement industry. The following table details the region-wise production and consumption of cement.

**Regional Capacity, Production, and Consumption of Cement**

*mt*

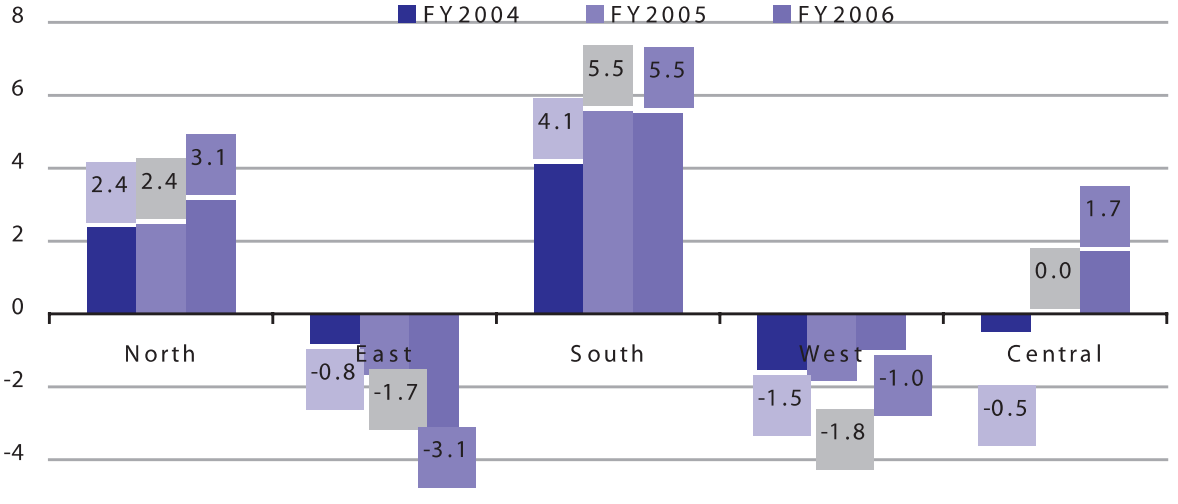
| | FY2006 | | | | FY2005 | | | |
|---|---|---|---|---|---|---|---|---|
| | Capacity | Production | Consn. | Supply Surplus | Capacity | Production | Consn. | Supply Surplus |
| North | 29.59 | 30.17 | 27.06 | 3.11 | 27.36 | 26.70 | 24.26 | 2.44 |
| East | 22.85 | 19.54 | 22.66 | -3.12 | 22.81 | 18.73 | 20.40 | -1.67 |
| South | 50.76 | 44.88 | 39.37 | 5.51 | 48.06 | 38.98 | 33.43 | 5.55 |
| West | 28.94 | 24.93 | 25.91 | -0.98 | 28.92 | 22.76 | 24.59 | -1.83 |
| Central | 25.00 | 22.28 | 20.57 | 1.71 | 24.20 | 20.39 | 20.41 | -0.02 |
| **Total** | **157.15** | **141.81** | **135.56** | **6.25** | **151.34** | **127.57** | **123.08** | **4.49** |

As can be seen from the above table, South India leads in both cement production and consumption. While demand in the eastern region is primarily driven by the housing sector; infrastructure, investments in industrial projects and the housing sector (in varying proportions) have propelled demand in the western, northern and southern regions.

The oversupply is largely in the Southern and Northern regions. By contrast, there is a supply shortage in Eastern and Western regions. There is significant inter-regional movement of cement, which plays a crucial role in the regional demand-supply dynamics. Most of the cement movement across regions takes place from North to Central (3.35 mt during FY2005), South to West (5.20 mt), Central to North (2.45 mt), and Central to East (2.51 mt).

**Regional Production minus domestic consumption**

*mt*

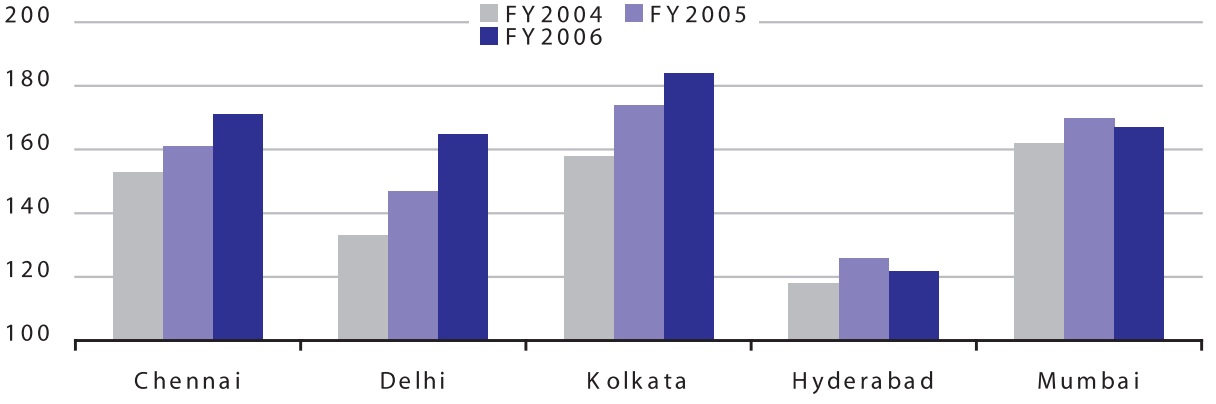



## PRICES

The regional variations in the Indian market has resulted in the cement prices across regions witnessing movement within a band, with no appreciable increase in any region. Differences in regional demand supply situation has translated into price differences across regions.

**Regional Cement Prices**

*Rs. Per 50 kg bag*

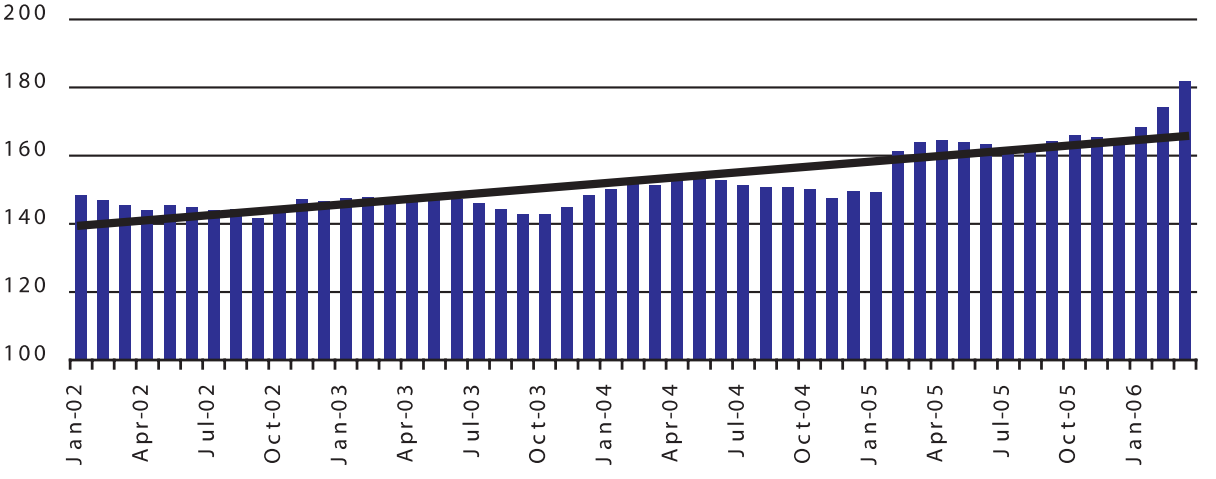



Prices are lower in Southern regions where there is normally a supply surplus. However, prices are higher in Eastern and Western regions where shortages exist.

The surplus position had resulted in significant pressure on price realisations in recent years. The cyclical trough in the late-1990s had a severe impact on the industry financials and many companies were referred to BIFR. However, cement prices have firmed up during the last few years due to improvement in demand-supply position and increasing consolidation in the industry. The Wholesale Price Index (WPI) for cement increased 3.9% during FY2005, as compared with a growth of 1.2% during FY2004. The WPI for March 2006 was 11% higher than the WPI for March 2005.

**WPI for Cement**

*1993-94=100*




ICRA's demand supply projection shows that the industry is likely to remain in a Surplus situation in the near to medium term. However, the extent of surplus is likely to decline. This coupled with the increasing consolidation in the sector suggests stabilisation of prices in a higher band. On the negative side, the cement companies are expected to continue facing the problem of rising manufacturing costs, as they do not have control on the external cost elements, such as energy and freight. Accordingly, while the earnings of the cement industry on an aggregate may improve, there may be select players in the industry who may show a relatively higher growth in earnings. This would include players, who increasingly focus on enhancing operating efficiency, have high economies of scale, are not dependent on few regional markets, have good distribution logistics and possess a good brand name.

# RAW MATERIALS

Cement is usually used in mortar or concrete. Here it is mixed with inert material (called aggregate), like sand and coarse rock. Portland cement consists of compounds of lime mixed with oxides like silica, alumina and iron oxide. There are three major raw materials for cement:

## Limestone

Limestone is the main raw material and is the source of calcium carbonate. Calcium carbonate is burnt to obtain calcium oxide (CaO). The other sources of calcium carbonate are marl, chalk, seashell and coral reef. Limestone is the most abundant source of CaO.

The other user industries for limestone are iron & steel, fertilizer and chemicals. Cement is the biggest limestone user in India accounting for over 75-80% of limestone produced in India. The composition of limestone used by the various sectors varies. For cement, the CaO content of limestone should be a minimum of 44%. Typically, 1.4-1.5 tonnes of limestone are required per tonne of clinker. Thus, for a 1 million tonne cement plant, assured availability of cement grade limestone reserves of the order of 50-60 mt in the close vicinity is important.

## Gypsum

Gypsum is used as a retarding agent. Ground clinker, on contact with water, tends to set instantaneously because of the very fast reaction between tri-calcium alluminate and water. In the presence of gypsum, the desired setting time can be achieved. Gypsum is added to the extent of 5% during the clinker grinding stage. Gypsum is naturally available in abundance in Rajasthan, Gujarat and Tamilnadu.

## Granulated Blast Furnace Slag (GBFS)

The other raw materials that are also used in the manufacture of cement are blast furnace slag (a waste product obtained from iron-smelting furnaces) and flyash (leftover ash from a thermal power station). Limestone contains about 52% of lime and about 80% of this lime is lost during ignition of the raw materials. Similarly, Clay contributes about 57% silica of which about 25% is lost during ignition.

GBFS is obtained by granulation of slag obtained as a by-product during the manufacture of steel. It is a complex calcium aluminum silicate and has latent hydraulic properties. That is why it is used in the manufacture of portland blast furnace slag cement.

## Maintenance And Stores Requirements

The two important items of stores and spares in the case of cement manufacture are refractory material and grinding media. For grinding media, high chrome grinding balls are normally used. In the case of refractory materials, companies go in for two kinds of refractory bricks-high alumina and high chrome. Typically, the life of the refractory material is 6-8 months (with the indigenously made high-alumina bricks), after which the kiln has to be stopped and the affected sections relined, a process, which takes 3-4 days. Kiln relining is normally made to coincide with the normal planned shutdown. Some companies are also experimenting with imported high-chrome bricks, which provide for a longer uninterrupted operational life of 18-24 months. In practice, this can extend the availability of calendar hours and thereby enhance the actual capacity of the plant.

# ENERGY AND TRANSPORT REQUIREMENTS

The cement industry is dependent on three major infrastructural sectors of the economy: coal, power and transport. The inputs from these three sectors account for roughly 50% of the cost of cement. Both the availability and the cost of these inputs have a vital bearing on the fortunes of the cement players. All these sectors are largely in the State sector, and, historically cement companies have had virtually no control on the cost or availability of these inputs. Hence, the industry response has largely been in the form of achieving efficiency gains and finding alternatives (captive power, use of waterways).

One additional external influencer of the cement industry performance is the taxes and levies imposed by the Central and State Governments. These together account for around 30% of the selling price of cement in the Indian context.

## Coal

Coal is an important input in cement manufacture and accounts for 15-20% of the total cost. Coal serves a dual role in cement manufacture. Firstly, the heat value in coal provides the thermal energy required for the operation of the kiln. Secondly, the mineral content in coal (basically, silica content) acts as a constituent in clinker. For every tonne of clinker, around 200-220 kg of coal is consumed. Coal consumption by cement plants has increased from 19 mt in FY2000 to around 33 mt in FY2005. Cement accounts for around 4.5% of India's coal demand. Consumption of coal for production of cement has not increased proportionately with cement production because of the switch to the dry process, efficiency improvements in cement kilns and the increased use of fly ash produced in power plants and granulated slag produced in blast furnaces of steel plants in the production of cement.

In India, overall coal distribution was statutorily governed by the Colliery Control Order of 1945. Subsequently, this order has been amended and the new Colliery Control Order 2000 has been notified according to which the price and distribution of all grades of coal have been deregulated with effect from 1.1.2000. To ensure smooth and co-ordinated supplies of coal to all consumers, the Government and the coal companies have adopted a system of linking of supply sources with consuming units and their requirement. All consumers are broadly classified into two different categories viz. core sector and non-core sector. Cement comes under the core sector. Each consumer is given a linkage (allocation) of quantity on an appropriate field. The linkages to cement plants and power utilities are decided by the Standing Linkage Committee (SLC). Key members of the SLC include representatives from the Ministry of Coal, the Ministry of Railways, the Ministry of Power/Industry, the Planning Commission, the coal companies and the Central Fuel Research Institute (CFRI).

The quantity, and the coalfields from where the coal is to be supplied to a particular cement plant, is decided by the SLC even before the cement plant is commissioned. The actual movement programme is, however, drawn up by the SLC every quarter indicating the quantities to be moved, the mode of transport and the coal Fields/ coal company with which the cement company is to be linked.

To meet the requirement of Indian consumers, there are seven grades of coal available from Indian collieries. The classification is done based on the Useful Heat Value content of coal, as mentioned below:

**Classification of Indian Coal**

| Grade | Useful Heat Value (Kcal/kg) |
|---|---|
| A | Over 6200 |
| B | 5600-6200 |
| C | 4940-5600 |
| D | 4200-4940 |
| E | 3360-4200 |
| F | 2400-3360 |
| G | 1300-2400 |

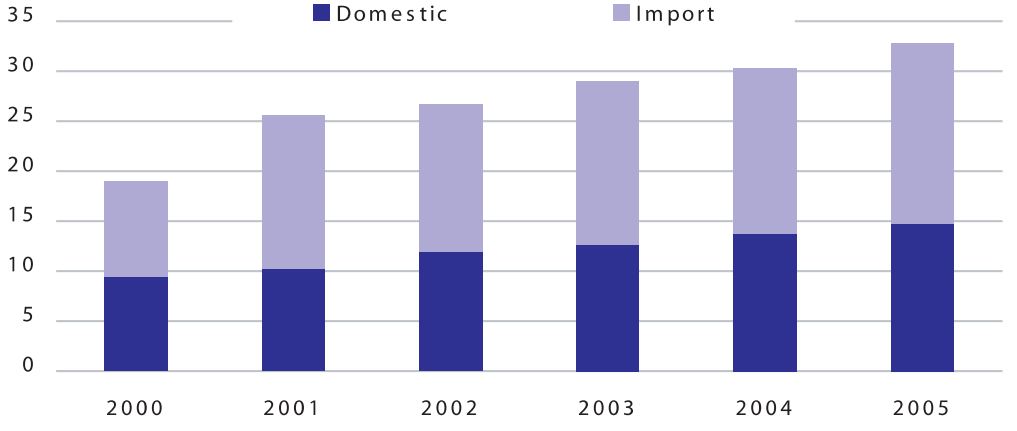
Cement plants are allocated grades D, E and F. Given that the bulk of the output is in these grades, most users, including the power sector, consume the same low grade coal. Grades notwithstanding, the quality of Indian coal is quite poor, and has deteriorated over the years. In addition to the deteriorating quality of Indian coal, coal prices have also increased in recent years. These rises in the price of domestic coal grades along with the rise in rail and road tariffs are expected to force the Indian cement industry to look at alternative sources of coal/energy in the future.

The shortage in domestic coal production coupled with the poor quality has resulted in cement companies resorting to importing coal, or going in for open market purchase of coal, or using alternative fuel such as lignite or petcoke.

Use of imported coal has become an essential feature of the Indian cement industry and has shown a rising trend during the last few years.

**Estimated Demand for Coal by Indian Cement Industry**

*Mt*




## Power

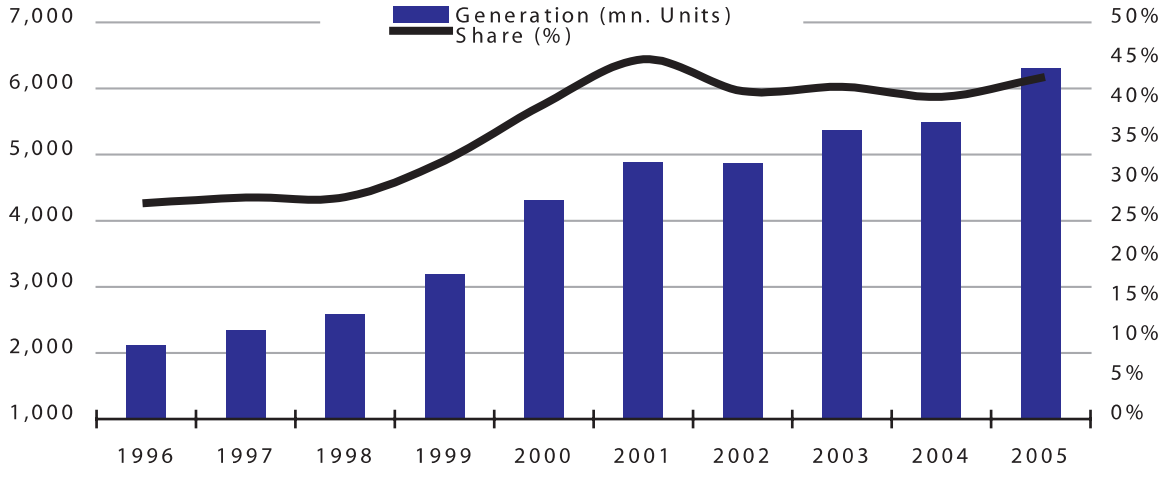
Cement is a power intensive industry requiring on an average 110-120 units of power per tonne of cement produced. Significantly power accounts for 15-20% of the variable cost of cement manufacturing. Cement manufacturing consumes power mainly for three purposes: raw meal grinding, kiln rotation and clinker grinding. Each stage accounts for roughly one third of the total power consumption. A dry process plant typically has an average connected load of 15 MW. Based on the present installed capacity of 157 mtpa of cement, the total industry requirement is roughly 2300 MW. This is just around 2% of India's total current power generating capacity.

Over the years, the cement industry has consistently suffered from power cuts. In fact, availability and quality of power have always been crucial issues for cement companies. Further, price increases by State Electricity Boards (SEBs) have meant that even their poor quality power comes at a high cost.

Rising power tariffs have reduced the diseconomies associated with self-generation through Diesel Generating (DG) sets. Accordingly, to insulate themselves from power cuts, cement units had initially installed captive DG sets as a standby. However, with the increase in the frequency of power cuts and rising power tariffs, many cement companies are meeting 60-100% of their power requirement through captive facilities. The captive power generation capacity of cement plants is presently estimated at around 1,800 MW. During FY2005, roughly 43% of the total domestic cement production was undertaken using captive power as against only 21% in FY1995. Thus, the share of cement production using captive power has only increased over the years.

**Captive Power Generation by Cement Plants and Share of Captive Generation to Total Requirement by Cement Plants**

*FY*



Of the total captive generation capacity, DG sets account for around 65% while the balance 35% is accounted for by thermal power plants. There is increasing focus on setting up thermal power plants as against DG sets since operating costs for the latter are lower. The industry initially opted for DG sets, which typically have smaller capacity (4-6 MW against 15-20 MW for thermal sets). This was because of the smaller size of the earlier plants, and moreover the DG sets were meant for backup purposes only.

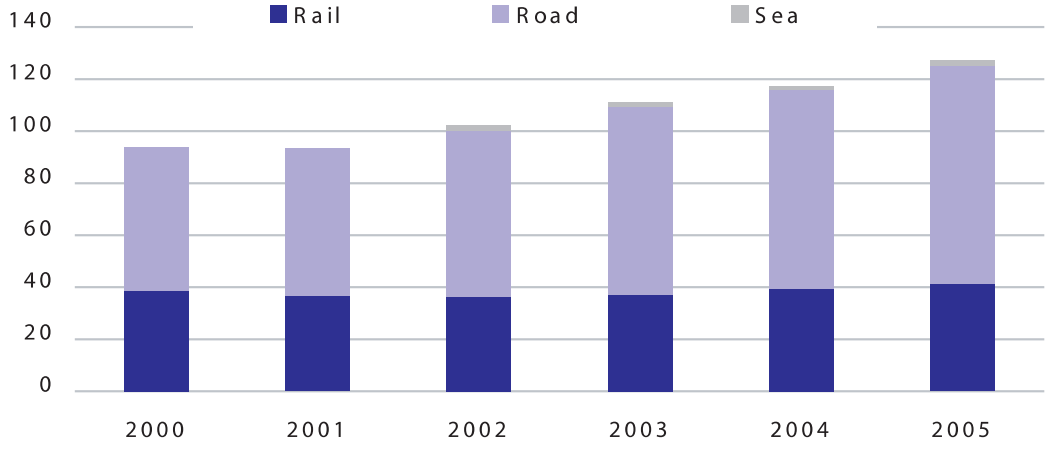
## Transportation

Outward freight on cement is an important element in the operating cost of a cement plant. It accounts for around one third of the total variable costs. Most of the cement plants in India are located in and around the limestone clusters. These clusters are distant from the collieries and the markets for cement. Cement has an average lead of around 535 km. Thus, cement companies have to rely on extensive transportation for moving coal from the coal pitheads to the cement plants and for despatching cement from the plant to the markets. As both coal and cement are of low value and bulky in nature, freight costs are considerably high for cement plants.

Cement companies use both road and rail transport to transport cement and to receive coal. Rail despatches amount for about 33% while roads carry the balance 66%. The balance 1% is accounted by Sea transporation. The share of road over rail has only gone up over the years. For coal transportation, the dependence on rail network is still very high and accounts for around 70% of coal movement.

**Cement Despatches by Rail, Road and Sea**

*Mt*




Although rail transportation is more economical for distances beyond 250-300 km, cement companies have started preferring road transportation even for longer distances because of several reasons. Rising railway traffic coupled with insufficient investments by the railways for increased wagon supplies and the fact that the cement industry is not an important customer of the Railways (cement cargo accounts for just 7-8% of the total railway freight) have resulted in a shortage of wagon supply to the cement industry. The railways had launched the "Own Your Wagon" scheme-a scheme where companies could buy wagons and lease it to the Railways and the Railways would in turn operate these wagons and ensure their availability to the owner. But the unfavourable terms and conditions of this scheme prevented its successful commercialisation. The The Railways have also increased their tariff on a regular basis (often higher than the increases in the road sector), making them uneconomical vis-à-vis road tariffs even for longer distances.

## NEW/EXPANSION PROJECTS

- During FY2007, ACC plans to expand capacity at its Rajasthan plant from 0.6 mtpa to 1.6 mtpa at a cost of Rs. 4 billion. It is also expected to invest in expansion of grinding capacities at various plants. With these brownfield expansions, the company's installed capacity is expected to increase by around 2 mtpa in FY2007.
- Grasim Industries is planning to expand capacity by 8 mtpa in both greenfield and brownfield projects in Rajasthan at an estimated cost of Rs. 24.75 billion.

- Madras Cements is planning to set up a 2 mtpa greenfield unit in TN at a cost of Rs. 6.12 billion, and an additional clinker facility at its existing plant in AP at a cost of Rs. 4.39 billion. The clinker facility is expected to result in increase in cement production capacity at its AP unit from 1.6 mtpa to 3.6 mtpa. The new unit and the clinker facility are expected to be operational during Q4FY2008 and Q2FY2008, respectively.
- India Cements plans to set up a 2 mtpa plant in HP at a cost of Rs. 7.5 billion. The plant is expected to be operational in 2010-11. India Cement is also expanding capacity at its existing plants by 2 mtpa.
- Shree Cement plans to set up a new 1.5 mtpa plant at Rajasthan at an approximate cost of Rs. 4 billion. The plant is expected to be operational by FY2008.
- OCL India plans to increase its capacity by 2.4 mtpa at its existing plant in Orissa at an investment of Rs. 7 billion. The project is expected to be commissioned by September 2009.
- Gujarat Ambuja group company-Ambuja Cement Eastern-is expanding capacity at its clinker unit in Sankrail, West Bengal at an investment of Rs. 8 billion. It is also setting up a greenfield plant in West Bengal. Post-completion by end-FY2007, the company's installed capacity is expected to increase from 2 mtpa to 3 mtpa.
- Heidelberg Cement plans to expand its capacity to 5-10 mtpa over the next three years.
- Lafarge is planning to expand capacity by 2 mtpa at its Sonadih plant in Chattisgarh.
- Binani Cement plans to increase capacity by 2 mtpa at its cement plant in Sirohi, Rajasthan.
- The Jaypee group plans to invest Rs. 30 billion by 2007 to increase capacity from 6.5 mtpa to 15 mtpa.

# FINANCIAL PERFORMANCE

## Cost Structure

The cement industry is one of the most energy-intensive sector within the Indian economy. Clinker production is the most energy intensive step, accounting for nearly 75% of the energy used in cement production. In India, an estimated 90-94% of the thermal energy requirement in cement manufacturing is met by coal. The remaining is met by fuel oil and high-speed diesel oil. For each kg. of clinker, the cement industry on an average requires 800 K. Cal of coal for dry process and 1350 K. Cal. of coal for wet process. Over the years, there has been deterioration in the quality of coal. In particular, the ash content has increased implying lower calorific values for coal, and improper and inefficient burning, etc. Coal consumption thus increased resulting in higher fuel and transportation costs. In order to reduce these problems, the cement industry started implementing coal washeries which reduce the ash content of the coal at the mine itself.

Generally, the cement industry in India on an average requires 90-105 units of power in the wet process, and 100-110 units of power in the dry process to produce one tonne of cement. The energy costs and cement freight costs are the two most important elements in the cost structure of a cement company. While, the share of energy costs has increased marginally, freight cost has experienced a decline in its share of total operating costs. The share of other costs (such as stores & spares, manufacturing overheads, and administrative expenses) have declined. The share of costs on account of material, repair and maintenance, employees and selling expenses have more or less remained stable.

**Cost Structure**

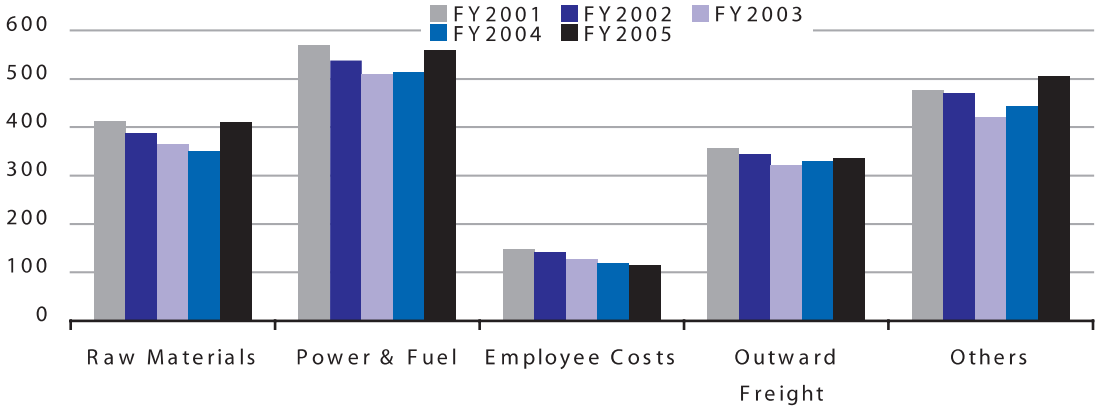
*% of Cost of Sales*

| FY | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|
| Raw Material Cost | 21.0 | 20.6 | 20.9 | 20.0 | 21.2 |
| Power & Fuel | 29.1 | 28.6 | 29.2 | 29.2 | 29.4 |
| Employee Costs | 7.5 | 7.5 | 7.3 | 6.8 | 6.0 |
| Other Manufacturing | 12.1 | 11.9 | 12.0 | 13.5 | 14.7 |
| Outward Freight | 18.2 | 18.3 | 18.5 | 18.7 | 17.4 |
| Other Operating Costs | 12.2 | 13.0 | 12.1 | 11.8 | 11.4 |

The average energy costs for cement companies have increased from Rs. 482/tonne (of cement production) in FY1994 to Rs. 637/tonne in FY1998. This represents a CAGR of 7.3%. The costs increased despite successful efforts by the companies to reduce specific energy consumption in cement manufacture. Since then, the average energy cost per tonne have however declined from Rs. 590 in FY2000 to Rs. 568 in FY2005. Cost control measures such as: increased reliance on imported coal; greater stress on producing cement through captive power; and focus on reducing power consumption have resulted in this development.

**Major Costs per tonne of Production**

*Rs. per tonne*




However, inspite of energy efficiencies, energy costs have increased during FY2005 mainly because of significant rise in costs of coal and liquid fuels. Raw material costs have also increased because of increase in royalty on limestone from Rs. 40 per tonne to Rs. 45 per tonne from October 14, 2004.

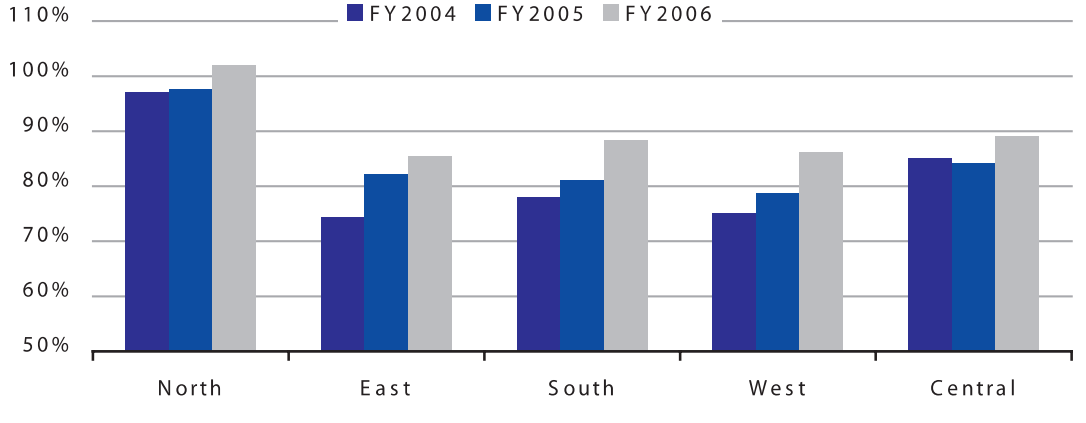
## Volume Growth and Capacity Utilisation

The cumulative cement production of the large cement plants in India increased 11.2% during FY2006 to 141.8 mt, as compared with a growth of 8.6% during FY2005. Despatches also increased 11.4% during FY2006 to 141.6 mt, as compared with a growth of 8.5% during FY2005, and 5.5% during FY2002. After a 0.6% decline in production during FY2001, the cement industry has now enjoyed five years of moderate to healthy growth, with growth accelerating during FY2005-06. The healthy increase in cement production and despatches during FY2005-06 was on account of an increase in domestic consumption (on account of buoyant economic growth, and increased spending on construction projects). Exports have also witnessed high growth during FY2005-06.

In response to the healthy growth in consumption during the last few years, the capacity utilisation of Indian cement industry has also increased from 81.4% during FY2004 to 84.3% during FY2005, and 90.2% during FY2006. Although all regions have reported improved capacity utilisation, capacity utilisation in the Northern region exceeded 100% during FY2006.

**Region-wise Capacity Utilisation**

*Rs. per tonne*

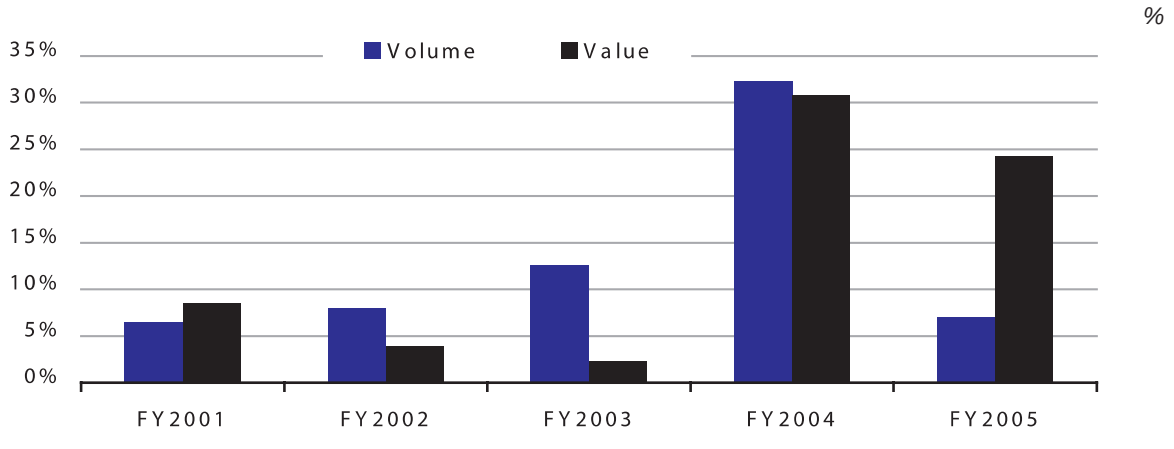


## Margins

Cement prices have firmed up during the last few years due to improvement in demand-supply position and increasing consolidation in the industry. The trend in gross sales realisation is similar for the cement companies in our sample (comprising pure cement companies accounting for around two-thirds of industry production and sales).

The operating profits and margins for cement companies are most sensitive to cement sales realisations. During FY2004-05, riding on high average sales realisations, the cement companies posted increased operating profits and margins. This reversed the decline in operating profits and margins during FY2002-03. This was mainly because of excess capacity and the consequent low price realisations. While sales volume of the sample companies improved 7%, operating income (OI) increased 24.2% to Rs. 183.45 billion.

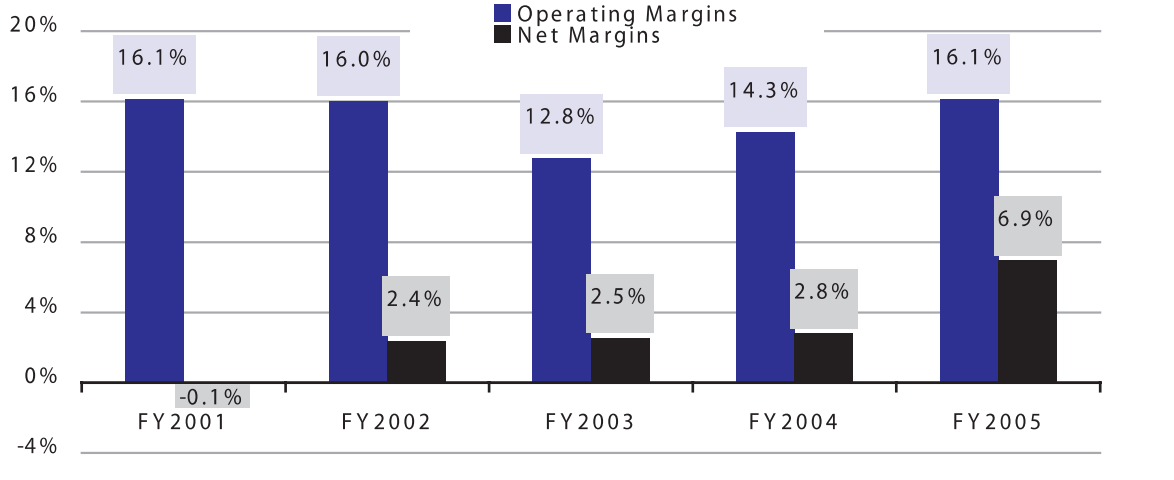
**Growth in Sales Volume and Value**




Although operating costs increased 21.5% during FY2005, the higher increase in sales value resulted in an improvement in operating margins from 14.3% during FY2004 to 16.1% during FY2005. Operating profits per tonne of sales increased from Rs. 249 in FY2003 to Rs. 275 in FY2004 and to Rs. 361 in FY2005.

Although debt levels increased during FY2005, interest costs declined in FY2005 mainly because of lower interest rates. The significant decline in interest costs (as % of OI) resulted in a significant increase in net margins from 2.8% during FY2004 to 6.9% during FY2005. Net profit per tonne of sales improved from Rs. 49 in FY2003 to Rs. 54 in FY2004, and to Rs. 155 in FY2005. Significantly, all the companies in the sample (except GACL) reported improved net profits per tonne/lower net losses per tonne during FY2001. By contrast, only five (out of 15) reported increased profits per tonne/lower net losses per tonne during FY2000.

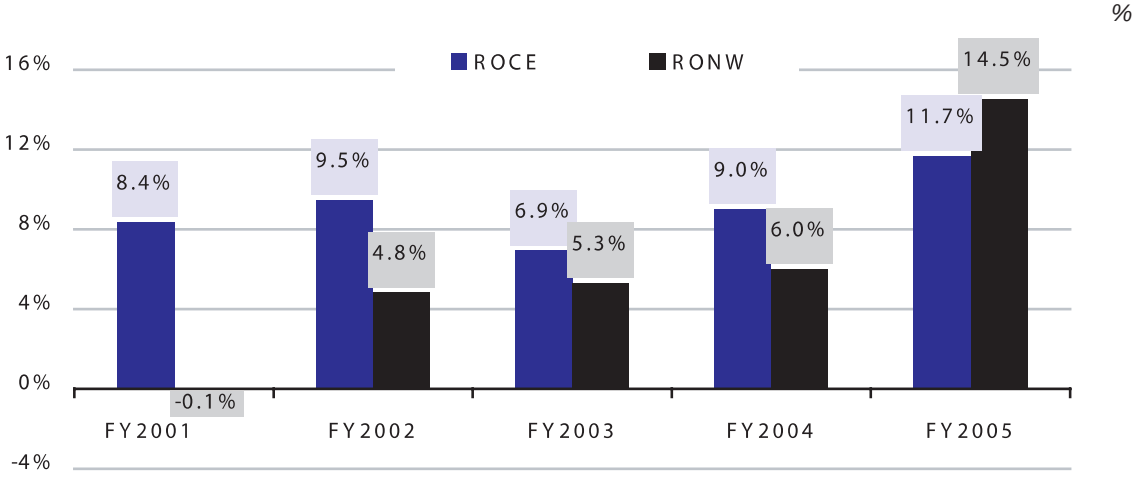
**Operating and Net Margins**



## Returns

The fluctuating fortunes of the Indian cement industry are very typical of a commodity industry. The companies make bumper returns during the boom years (FY1994-96, and FY2003-06) while the performance goes down drastically during the lean years (FY1997-2001). The returns have improved significantly since FY2003 because of higher capacity utilisations, operational efficiency and cost control measures supplemented with higher sales realisations.

**Return on Capital Employed (ROCE) and Return on Net Worth (RONW)**




## Financial Performance during FY2006

During 12MFY2006 (April 2005-March 2006), the cement companies reported higher revenues and improved their profitability. However, the smaller companies were not able to improve their topline and wilted under pressure of higher expenses reporting net losses. Sales of ICRA's sample of 23 listed cement companies increased 23.8% (yoy) to Rs. 217.86 billion during 12MFY2006. An increase in energy costs on account of higher fuel prices was more than offset by higher increase in prices. As a result, operating profits increased 46.3% (yoy). Operating margins increased from 16.1% during 12MFY2005 to 19% during 12MFY2006. Lower interest and depreciation costs resulted in a 83.9% (yoy) increase in net profits. Net margins improved significantly from 7.3% during 12MFY2005 to 10.8% during 12MFY2006.

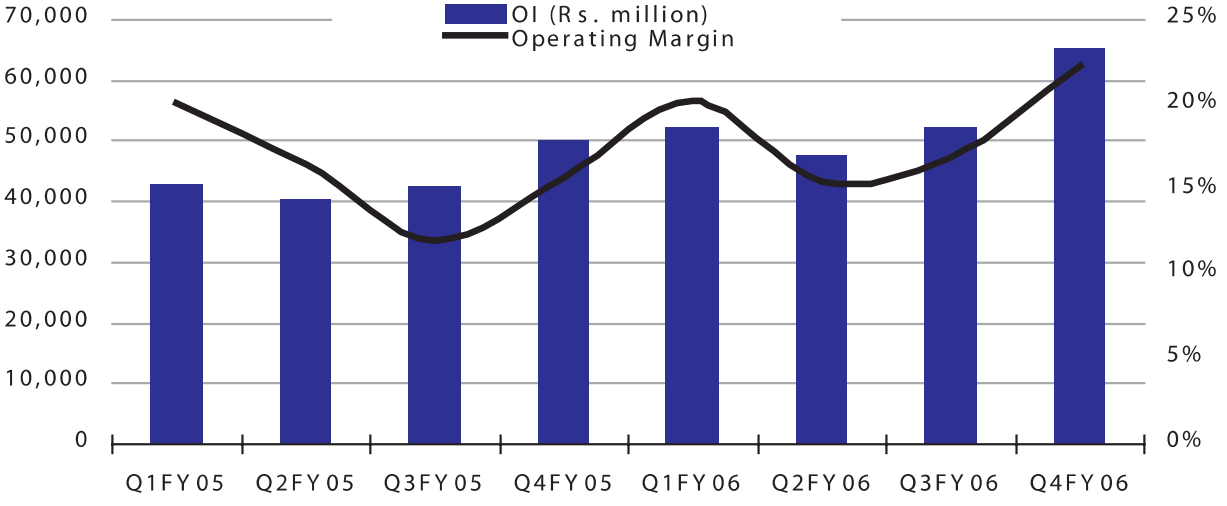
**Financial Performance of Indian Cement Industry-12MFY2006**

*Rs. Million, except percentages*

| 12 months ended March | Rs. Million 2006 | Rs. Million 2005 | Change (%) | % of OI 2006 | % of OI 2005 |
|---|---|---|---|---|---|
| **Net Sales/OI** | **217,855** | **175,976** | **23.8** | **100.0** | **100.0** |
| Raw Material Cost | 33,153 | 28,787 | 15.2 | 15.2 | 16.4 |
| Employee Costs | 10,850 | 9,277 | 17.0 | 5.0 | 5.3 |
| Power & Fuel Costs | 54,905 | 49,009 | 12.0 | 165.6 | 170.2 |
| Other Operating Costs | 77,540 | 60,604 | 27.9 | 35.6 | 34.4 |
| **Cost of Sales** | **176,448** | **147,678** | **19.5** | **81.0** | **83.9** |
| **OPBDIT** | **41,406** | **28,298** | **46.3** | **19.0** | **16.1** |
| Interest | 7,755 | 8,073 | -3.9 | 3.6 | 4.6 |
| Depreciation | 12,245 | 11,777 | 4.0 | 5.6 | 6.7 |
| **OPBT** | **21,406** | **8,448** | **153.4** | **9.8** | **4.8** |
| Other Income | 8,630 | 6,147 | 40.4 | 4.0 | 3.5 |
| **PBT** | **30,036** | **14,595** | **105.8** | **13.8** | **8.3** |
| Tax | 6,517 | 1,803 | 261.4 | 3.0 | 1.0 |
| **PAT** | **23,519** | **12,791** | **83.9** | **10.8** | **7.3** |

Healthy demand growth during FY2007, and sustained price growth is expected to have a positive impact on revenues, profits, and margins during FY2007. However, the location of the plant and the trend in its operating costs would be the other determinants of the actual profitability.

**Trends in Gross Sales and Operating Margins for Indian Cement Industry**




## OUTLOOK

The cement sector is expected to witness strong production and consumption growth of 10% during FY2007 in line with the economic growth because of the strong co-relation with GDP and the increased activity in the construction sector. Future drivers of cement demand growth in India would be increased spending on road and housing projects. The Union Budget for FY2007 has provided further thrust to the infrastructure sector through several initiatives, such as:

- Budget support on the National Highways Development Programme (NHDP) increased from Rs. 93.20 billion in 2005-06 to Rs. 99.45 billion in 2006-07. The NHDP envisages an investment of Rs. 2,200 billion on concessions/contracts to be awarded by 2012;
- Special accelerated road development programme for the North Eastern region at an estimated cost of Rs.46.18 billion has been approved. The Government has also decided to develop 1,000 kms of access-controlled Expressways.
- 'Bharat Nirman' to focus on 6 components of rural infrastructure including irrigation, roads, water supply, housing, rural electrification and rural telecom connectivity.
- Outlay on `Bharat Nirman' increased from Rs. 121.60 billion to Rs. 186.96 billion.
- Increase in outlay from Rs. 45 billion to Rs. 71.21 billion with the objective of improving the pace of implementation of irrigation projects.

The housing sector, which accounts for around 55-60% of total demand, is likely to continue to be the driving force behind cement demand. It is estimated that requirement of new dwelling units over a period of 25 years (1996-97 to 2020-21) will be around 140 million units requiring an investment of approximately Rs. 20,000 billion. Besides, demand from infrastructure projects and industrial/commercial ventures account for 20% each. Even as NHDP-I (comprising the Golden Quadrilateral or GQ and North-East-South-West or NESW) near completion (GQ by end-2006, and NESW by 2009), demand in the port and airport segments may pick up, keeping demand buoyant. Further, NDHP-III to NHDP-VII (2006-15) envisages construction of another 36,000 kms of roads at an estimated cost of Rs. 1,270 billion.

Overall, from the demand perspective, the fundamentals look bright, and cement demand in the medium term is expected to grow by around 9%. The Planning Commission's Working Group on Cement Industry predicts

cement production in India to grow at a rate of 10% during the Tenth Five-Year Plan (2002-2007). By comparison, the cement industry is expected to grow at around 8-10% during the 2003-07 period. Growth of 9% per annum from FY2006-10 would result in cement production increasing to around 196 mt in FY2010. By comparison, consumption could increase to 190 mt in FY2010. China, the world's largest producer of cement, has seen sustained cement production average annual growth of 10% since 1980, mostly due to the enormous infrastructure development that country has experienced over this period.

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# Attachment 3

# Economic IRR submitted to Ministry of Environment and Forest Government of India to show the economic benefits of the project

| Economic Rate of Return (ERR) Analysis for Blended Cement Project in Lafarge Jojobera Plant (PPC) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Yr.0 | Yr 1 | Yr 2 | Yr 3 | Yr 4 | Yr 5 | Yr 6 | Yr 7 | Yr 8 | Yr 9 | Yr 10 |
| **Production Projection** | | | | | | | | | | | | |
| Production of PPC | KT | | **684** | **843** | **950** | **1,000** | **1,000** | **1,000** | **1,000** | **1,000** | **1,000** | **1,000** |
| Fly ash used | % | | 31% | 32% | 33% | 33% | 34% | 34% | 34% | 34% | 34% | 34% |
| Fly ash used | KT | | 212 | 270 | 314 | 330 | 340 | 340 | 340 | 340 | 340 | 340 |
| | | | | | | | | | | | | |
| **Base case - Ordinary Portland Cement (OCP ) grade generation** | | | | | | | | | | | | |
| Cash Flow - Nominal | M INR | | 313 | 416 | 510 | 499 | 511 | 523 | 535 | 546 | 557 | 557 |
| Environmental cost for clinker | M INR | | 34 | 42 | 47 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Environmental cost for disposal of Flyash | M INR | | 45 | 57 | 67 | 70 | 72 | 72 | 72 | 72 | 72 | 72 |
| Total Economic Baseline Cash flow | M INR | 0 | 233 | 316 | 396 | 378 | 389 | 401 | 412 | 423 | 434 | 434 |
| **NPV** | 2,060 | | | | | | | | | | | |
| **Project case- PPC generation** | | | | | | | | | | | | |
| **Project Economic Cash Flow - Nominal** | M INR | -487 | 388 | 474 | 554 | 530 | 531 | 533 | 542 | 551 | 561 | 558 |
| **NPV** | $2,133.54 | | | | | | | | | | | |
| **Nett Economic Flows** | M INR | 487 | -155 | -158 | -158 | -151 | -142 | -132 | -130 | -128 | -127 | -124 |
| **Global environmental benefits (ton CO2)** | 457,502 | | 12,225 | 67,433 | 62,510 | 82,418 | 51,318 | 50,607 | 38,615 | 34,949 | 29,280 | 28,147 |
| | | | | | | | | | | | | |
| **Incremental cost ( M INR)** | -73 | | | | | | | | | | | |
| **Incremental cost (benefit) per ton CO2 (M INR/ton CO2)** | -0.000160 | | | | | | | | | | | |
| **ERR** | **28%** | | | | | | | | | | | |