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◆ REFERENCES
(1.1) **INTRODUCTION:-**

Telecommunication, petroleum, coal, fertilizer, iron, steel and cement etc. are the key infrastructure sectors of India. Cement industry is also plays a significant role, in the rapid growth and development of a country because cement is a fundamental requirement of all constructions activities. Cement is used in housing, dams, bridges, industrial construction, roads etc, so cement is basic material which is used in all types of constructions.

In the growth of Indian manufacturing industries, egalitarian considerations of a nation, building objectives have had limited attraction as objectives for industrialization. It was mainly the profit-centre that have determine their proliferation and continues to do so even after intendance, expect for what the public sector has been doing but not with much consideration for productivity or profitability.

These observations apply not only in jute and textiles or iron and steel, but also in cement, automobiles, sugar and even perhaps the paper industries, particularly in the respect of the private sector leviathan. The impact of economic factors like the supply of raw materials, cost of labour, cost of infrastructure and economic of location have all determine the growth and development of Indian industries but one major factor has always been the profit incentive.

In olden days, various types of building materials were used for construction of public historical and religious buildings sand, stone and in the special case; marbles were used for this purpose. The house of ordinary citizens was usually made of mud and thin bricks. In few cases lime and pazzolona were used for getting beautiful finishing for the interior surface. There were very good builders and mesons that have created beautiful & excellent temples, buildings and bathing ghats thousand of years ago, still they are famous for their work and shape.

However, gradually cement and new types of material had developed in Europe. In 1824 an English man Joseph Aspadin, patented on artificial made by calcinations of an argillaceous limestone known as Portland cement. Because concrete made from it
resembled a famous building stone obtained from the ISLE of Portland near England. This was the beginning of Portland cement industry as it is known today.

Cement is a powdered material with water forms a paste that hardens slowly. It is made by sintering a mixture of various raw materials. The main raw material composed in the mixture is calcium carbonates as limestone and other alumina, silicates as clay or shale. During the sintering process chemical reaction takes place, produces nodules, called a clinkers which consists of calcium silicates and aluminates when the clinker is pulverized with a small amount of gypsum as a reader the resulting powder is called Portland cement.

Cement is basic material for all types of construction works and it is widely used in construction from smallest building to largest structures like dams, irrigation works, bridge, industrial complex etc. In short, it can be said that cement as well as steel are sinequa-non for that development of construction activities in the country. It must be interesting to know how cement is made today vis-a-vis the historical background.

Ever since civilizations stepped in the earth, people sought a material that would bind stones into a solid, formed mass. The Assyrians and Babylonians used clay for this purpose, and the Egyptians advanced to the discovery of lime and gypsum mortar as a binding agent for building such structures as the Pyramids. The Greeks made further improvements and finally the Romans developed cement that produced structures of remarkable durability. The secret of Roman success in making cement was traced to the mixing of slaked lime with Pozzolona, a volcanic ash from Mount Vesuvius. This process produced cement capable of hardening under water. During the middle Ages this art was lost and it was not until the scientific spirit of inquiry revived that we rediscovered the secret of hydraulic cement-cement that will harden under water. Most of the building foundations in the Roman Forum were constructed of a form of concrete, placed in some locations to a depth of 12 feet. The great Roman baths built about 27 B.C., the Coliseum, and the huge Basilica of Constantine are examples of early Roman architecture in which cement mortar was used. Portland cement today, as in Aspdin's day, is a predetermined and carefully proportioned chemical combination of calcium, silicon, iron, and aluminum. Natural cement gave way to Portland cement, which is a predictable, known product of consistently high quality. Aspadin
established a plant in Wakefield to manufacture Portland cement, some of which was used in 1828 in the construction of the Thames River Tunnel. But it was almost 20 years later when J.D. White and Sons set up a prosperous factory in Kent that the Portland cement industry saw its greatest period of early expansion, not only in England but also in Belgium and Germany. Portland cement was used to build the London sewer system in 1859-1867. Thomas A. Edison was a pioneer in the further development of the rotary kiln. In 1902, in his Edison Portland Cement Works in New village, N.J., he introduced the first long kilns used in the industry—150 feet long in contrast to the customary 60 to 80 feet. Today, some kilns are more than 500 feet long. Parallel improvements in crushing and grinding equipment also influenced the rapid increase in production. Since grinding process consumes most of the energy various grinding systems like ball mill/vertical roller mill/Roller presses has been the result of technological developments. Blending takes place in silos with air blown in from the bottom to aerate the contents. Various new designs were also developed to increase the efficiency of mixing.

The cement industry plays a vital role in the growth and development of a country as it provides required infrastructure for economic development of the country. In our country, a large population lives in villages. Roads, buildings and other infrastructure provide means for the enlistment of the economic level of a vast rural population. Unfortunately, the past setup of leading cement units was unable to meet the rising demand of cement in comparison with their counter parts in the other countries. Therefore, it is assumed that in the factor which are obstruction the profitability vis-a-vis liquidity position of cement units could manage properly then units would come out with a better working result.

This study based on the secondary data derived from annual published reports of selected cement companies or computer data. Various researchers have been conducted under Accountancy, Commerce, Management, Economics etc. faculty of Saurashtra University. However, no research has been conducted. "A Comparative Analysis of profitability vis-avis liquidity performance in cement industry of India." Thus this study would be an original contribution to the problem of the study in unique every respect.
1.2 DEFINITION OF CEMENT:-
Cement is a hydraulic made of finely ground nonmetallic, inorganic material when mixed with water it forms a paste that sets and hardens by hydration which retains its strength and stability even under water.
Cement is produced by grinding and mixing of argillaceous and calcareous materials like clay and limestone and then burning the mix at very high temperature (approx 1450 c) for calcinations.
➢ The cochineal product is known as clinker.
➢ The clinker is cooled and small quantity of gypsum added which is finally ground.

1.3 HISTORY AND GROWTH OF CEMENT INDUSTRY IN INDIA:
1.3.1 Where it is heading?
The boom-and-bust syndrome normally characterizes a typical cyclical industry. A huge potential market and rapid growth in the early stages lead to a surge in interest and a flurry of research. The projected growth rates point to a lucrative market. The buoyant markets and huge profits raked in by players tempt more players into the market. Capacities increase in excess of demand and a glut in capacity is created. Competition increases, prices fall and margins come under pressure. Capacity addition comes to a halt; weaker players shut shot or sell off to larger ones. Demand catches up and the cycle is repeated all over again. Perhaps, of all the cyclical industries, the Indian cement industry exhibits this boom-and-bust cycle most visibly. Consider the following:

Temptation:
A huge potential market, easy availability of raw material and cheap labour leads to a flurry of activity and a surge in interest. The easiest way to estimate the potential that exists is the per capita consumption of cement, which is abnormally low in India at 85 kegs. as against a world average of 256 kegs and the Asian average of 200 kegs. Although the growth of the industry depends more on the level of consumer spending rather than on the per capita consumption, nevertheless, it serves as an easy benchmark to estimate the potential that exists.
**Fuel to Fire:**

The projected growth rates in demand (based on the potential per capital consumption growth or other demand drivers like the expected GDP growth rate) fuels stock market rallies. Consider the boom in cement stocks in 1994. Every cement company was attracting valuations it never dreamt about. Scarcity induced by lower capacities and to a large extent on non-availability of power, drove cement prices to the hilt. The kind of money minted by most cement companies as well as investors in that period drove strategists to plan enormous increase in capacity. This explains why capacity creation starting 1994, was so enormous.

**The Rush:**

The amounts of profits that are being raked tempt more players into the industry. Contagious enthusiasm sweeps the industry and suddenly there is a glut of new players. Capacities start increasing at a rate greater than the demand growth rates. A scenario of excess supply to demand becomes imminent. Average annual capacity addition during the three-year period 1994-95 to 1996-97 was 8.33 mt., while that for the five years till 1994-95 was just 3.3 mt. Against demand growth rate of 8 per cent capacity addition rose at over 10 per cent during 1995-96 and 1996-97, and over 9 per cent in 1997-98.

**The Anguish:**

With competition increasing and growth in supply exceeding demand growth, prices begin to fall. This is also the time when players realize that Greenfield capacity addition would be to their own detriment. Consolidation within the industry starts. Most of the players weakened during the excess supply induced recession sell off to larger and stronger players. Hostile takeovers are also witnessed during this period as the only way to expand is by take-over. The slew of takeovers in the last two years culminating in Gujarat Ambuja taking a stake in ACC, the largest cement company in India bears ample testimony to this fact. Till now, over 12 mt. has changed hands, excluding Indian Rayon’s transfer of 3 mt to group company Grasim.
### 1.3.2 Cement Map of India – Large Plants

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<th>Company</th>
<th>Location</th>
<th>Annual Installed (Capacity Million tons)</th>
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### 1.3.3 How cement is made?

Two main methods of cement manufacturing were prominent, the dry process and the wet process. Dry process now has almost replaced the wet process since wet process consumes high thermal energy for drying the moisture. When rock is the principal raw material, the first step after quarrying in both processes is the primary crushing. Mountains of rock are fed through crushers capable of handling pieces as large as an oil drum. The first crushing reduces the rock to a maximum size of about 6 inches. The rock then goes to secondary crushers or hammer mills for reduction to about 3 inches or smaller. It is then ground in ball mill to fine powder with other ingredients like clay/iron ore/bauxite to create a combination of values for silica/alumina/lime etc. in the mixture. If the process is wet, the grinding goes on in with water so that slurry
is resulted after grinding. This slurry is further mixed in mixers and pumped to the kiln. For a dry process kiln, the ground powder is sent to blending silos for uniform mixing of components added during the grinding stage. This blended material is fed to the preheated/claimer. The preheated is a group of cyclones placed over one another wherein material comes down and hot gases goes up heating the material and claiming it in the process. Calcinations mean liberating carbon dioxide and converting calcium carbonate to calcium oxide. Claimer is nothing but a duct added to give more reaction time to material for calcinations. This partially claimed material then comes to the kiln, which is refractory lined rotating tube having burner fitted in the other end. This burner fires coal/oil/natural gas to create a temperature of 1600°C. At the discharge ends. As the material in the kiln rolls down towards the discharge end, various reactions take place amongst the components resulting in a mass known as clinker. This clinker is then cooled in coolers. The coolers are either planetary type or grate type. Grate coolers of modern times are much efficient resulting in better heat recuperation and allows reusing this heat in the kiln. The cooled clinker then either goes to storage silo or clinker yard. From the clinker yard it is taken for grinding. In case Ordinary Portland cement is made only gypsum (4-6%) is added before grinding. In case of Portland Pozzolona cement additives like fly ash/brick etc. are added. Grinding again is same like for raw material grinding with ball mill or with latest technologies like vertical mill/Roller press etc. The cement powder then taken to packing plant or discharged from silo to a bulk loader directly.

1.3.4 How concrete is made?
The combination of cement, water, sand, and coarse aggregates (particles of gravel or rushed stone) as normally occurs in the process of concrete mixing is perhaps best described in terms of a simple three-part system:
1. Portland cement + water = cement paste
2. Cement paste + sand = mortar
3. Coarse aggregates + mortar = concrete
The cement paste component functions in the first instance to coat and "lubricate" the individual grains of sand, thereby imparting "workability" to the mortar phase. In turn, the mortar serves to lubricate the coarse aggregate particles and so give workability to the fresh concrete. The quantities of cement paste and mortar necessary to achieve adequate levels of workability will depend on the amounts of sand and coarse
aggregate present in the concrete, on the associated "grading" of constituent particle sizes, and on the actual level of workability required for the job. If there is insufficient mortar or cement paste the mix will tend to be "harsh" and unworkable. Conversely, too much mortar or cement paste will promote the likelihood of "segregation" effects whereby the coarser aggregate fractions tend to separate out from the remainder of the mix. Contrary to popular belief, concrete does not set and harden through a physical drying-out process. Setting and hardening is due instead to a series of chemical reactions between the Portland cement and water present in the mix; as a result of this so-called hydration process the original cement paste phase is transformed into a sort of "mineral glue" which acts to bind the sand and coarse aggregate fractions together. Most natural aggregates are a good deal stronger than the sort of cement pastes found in typical concretes; i.e. the "mineral glue" tends to function as the weakest link. Accordingly, the strength of a hardened concrete is normally controlled by the strength of its cement paste phase. In turn, for any given quantity of cement, the associated paste strength is governed first and foremost by the water content of the original mix; thus, the lower is the total amount of mix water employed, the greater is the ultimate strength potential of mortar (and vice versa). Conversely, if the total mix water is held constant, the higher (or lower) is the level of cement usage, the higher (or lower) becomes the potential strength capacity of the cement paste phase. The actual quantity of cement paste has no real influence here; rather, it is the amount of cement as compared to the amount of water, which is the main factor. Concrete aggregates should be relatively clean. (The squeezing of "dirty" sand will generally produce a noticeable stain on the palm). Dirty or dusty aggregates tend to require far more mixing water; unless correspondingly higher levels of cement usage match this additional "water demand," strength losses are likely. The presence of dusts, silts, or clays can also inhibit the degree of bond between individual coarse aggregate particles and the surrounding mortar, again to the ultimate detriment of strength; in certain circumstances the adverse effects of using dirty aggregates may even extend to interference with the normal processes of cement hydration. It is often supposed that aggregates serve to "enhance" the strength of concrete. While this rarely applies in practice, neither is it the case that the aggregate fractions merely function in the role of cheap fillers. If or when a concrete dries out, the associated cement paste phase will shrink to some extent; the greater is the original water content of the cement paste, the higher is its shrinkage potential. Normal aggregates, on the other hand, show little or
no shrinkage on drying. Accordingly, the greater are the amounts of sand and coarse aggregate materials present in a concrete mix, the lesser will be the net influence of paste shrinkage. For a typical concrete in which the combined

1.4 TYPES OF CEMENT:

- Ordinary Portland cement (O.P.C)
- Portland Pazzolona Cement (P.P.C)
- Special cement

1.4.1 Ordinary Portland cement:
This type of cement gives enough comprehensive strength after soaking in water for 3 days, 7 days and 28 days. This is suitable for all types of modern civil engineering constructions.

The Ordinary Portland Cement is popularly known as grey cement, which is produced by grinding clinker with 5 per cent gypsum. It is used in all general concrete construction, mass and reinforced concrete. It accounts for about 70.60 per cent of the total production.

Indian Standard has classified OPC in three grades based on the strength of cement. These grades are:
(1) Grade - 33-IS-269-1989
(2) Grade - 43-IS-6112-1989
(3) Grade - 53-IS-12269-1987

These types of cement are suited for all modern types of constructions including all kinds of masonry and concrete works such as pre-cast and pre-stressed concrete. They are also suitable for all kinds of repair works in masonry and concreting. The higher the grade of cement used, the greater would be the economy, durability and technical advantages. Moreover construction time is also reduced.
TABLE: 1.1
CHEMICAL COMPOSITION OF ORDINARY PORTLAND CEMENT

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particular</th>
<th>Chemical Formula</th>
<th>Avg. %</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lime</td>
<td>-Cao</td>
<td>63</td>
<td>62 to 67</td>
</tr>
<tr>
<td>2</td>
<td>silica</td>
<td>SiO₂</td>
<td>22</td>
<td>17 to 25</td>
</tr>
<tr>
<td>3</td>
<td>alumina</td>
<td>Al₂O₃</td>
<td>05</td>
<td>03 to 08</td>
</tr>
<tr>
<td>4</td>
<td>Calcium Sulphate</td>
<td>CaSO₄</td>
<td>03</td>
<td>03 to 04</td>
</tr>
<tr>
<td>5</td>
<td>Iron Oxide</td>
<td>Fe₂O₃</td>
<td>03</td>
<td>03 to 04</td>
</tr>
<tr>
<td>6</td>
<td>Magnesia</td>
<td>MgO</td>
<td>02</td>
<td>0.1 to 03</td>
</tr>
<tr>
<td>7</td>
<td>Sulphur</td>
<td>SO₃</td>
<td>01</td>
<td>0.1 to 03</td>
</tr>
<tr>
<td>8</td>
<td>Alkalies</td>
<td></td>
<td>01</td>
<td>0.2 to 01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>-----</td>
</tr>
</tbody>
</table>

1.4.2 Portland Pozzolona Cement:
It is grayish in color and made by grinding of limestone and clay. Burning of limestone and clay at very high temperature and cooling the resultant product is called clinker, grinding the clinker with of gypsum in ball mill to a finally ground powder. This is known as Portland cement. This cement is produced by adding 10 to 25 % pozzolanic materials to the one clinker then grinding together.
It is cheaply manufactured because it uses fly ash/burnt clay/coal waste as the main ingredient. PPC has a lower heat of hydration, which is of advantage in preventing cracks where large volumes are being cast. PPC accounts for 18.3 per cent of the production.

1.4.3 Special Cement:
There are six Types of special cement the types are:
(1) Hydrophobic Cement:
It is obtained by adding water replant firm forming substance such as satiric acid and oleic acid by grinding Portland cement clinker. This type of cement is reduces wetting ability of cement grains. Hence it imparts more time for mixing, transporting, compacting & finishing etc.
(2) **Low heat Cement:**
This type of cement is used for larger mass concrete works in dams, Piers etc. It is necessary to have a much lower heat of hydration, so that chances of developing construction cracks are minimized. This can be done either by adding some pozzolanic material and granulated blast furnace slag to the cement while grinding by changing the chemical composition of the cement.

(3) **Rapid Hardwearing Cement:**
This type of Portland cement gives the desired strength in 3.7 and 28 days if soaked in water. But sometimes cement is required high strength in 24 hours as is given by ordinary Portland cement at 3 days. This type of cement is called rapid hardening cement or high early strengthening cement. This sets and hardens much quickly than ordinary Portland cement.

(4) **Quick Setting Cement:**
The % of gypsum added reduced, which accelerate the setting action. The setting action of this cement is very fast. This type of cement is used for the underwater constructions.

(5) **Sulphate Resistance Cement:**
This cement is prone is liable for deterioration under sulphate environments. Thus a Portland cement, which less than 5% of C₃A is highly resistant to sulphatic action. This cement is known as sulphate resistant cement. This cement used for sea shore structure canal lining, culverts etc.

(6) **White Cement:**
Portland cement is grayish in color. The color is due to complex formed with iron oxide present in the cement. The proportion of Iron oxide in the cement is reduced to less than 0.4% the color of the cement becomes white. Iron oxide present in cement raw mix helps in improving the burning conditions of cement clinker. White cement is generally used for decorative works only in view of its high cost.

**Portland Blast Furnace Slag Cement (PBFSC):**
It is made by grinding granulated blast furnace slag/steel industry by product (up to 65%), gypsum (5%) and clinker (balance). PBFSC has a heat of hydration even lower
than PPC and is generally used in construction of dams and similar massive construction. It contributes nearly 10 per cent to the total.

**Specialized Cement:**

Oil Well Cement: is made from clinker with special additives to prevent any porosity.

**Rapid Hardening Portland cement:**

It is similar to OPC, except that it is ground much finer, so that on casting the compressible strength increases rapidly.

**Water proof Cement:**

OPC with small portion of calcium stearate or non-saponifibale oil to impart waterproofing properties

1. **Blended Cement:**

Mixing Portland clinker, gypsum and other insert materials in suitable proportions and grinding the mixture to get a thorough and intimate mix obtain it.

Portland Pozzolona Cement (PPC) - Clinker + Gypsum + Pozzolona (Flyash, burnt clay etc)

Portland blast furnace slag - Cement Clinker + Gypsum + granulated’ slag

Masonry Cement- Cement Clinker + Gypsum +Pozzolona (Limestone Powder admixtures etc

**PPC :-** Suitable for most of the applications as stated in OPC ideally suited for domestic consumption like plastering, brickwork, mass concerting works like dams, large foundation. This cement enhances the impermeability and cohesiveness of concrete.

As a result durability is enhanced. It also generates low heat of hydration.

It is cheaply manufactured because it uses flyash/burnt clay/coal waste as the main ingredient. PPC has a lower heat of advantage in preventing cracks where large volumes are being cast. PPC Account for 18.3% of the production.

2. **Slag Cement:**

Common application is similar to those of OPC. However besides that it has more sulphate resistance properties than OPC and is suitable for coastal construction. It is
made by grinding granulated blast furnace slag, still industry by product (up to 65%), gypsum (5%) and clinker (balance). PBFSC has a heat of hydration even lower than PPC and is generally used in construction of dams and similar massive construction. It contributes nearly 10 per cent to the total.

3. **Masonry Cement:**
Exclusively mines for masonry works and plaster only.

4. **Low heat Portland cements:**
Grinding and chemical composition are similar to those of OPC. All applications requiring very early strength, very high early removal of from works, very high handling of pre-cast element, high grade precast and prestressed concrete product, slip form, cooling tower and pill tower.

5. **Sulphat Resistant Cement:**
The chemical composition is designed in such a manner that C3A content in cement restricted to 5 per cent and other chemical constituents are similar to OPC. Used in structures in contact with soil or water having enough Sulphat concentration.

6. **Oil Well Cement:**
This is a special kind of cement for use in the drilling of wells to fill the space between the steel lining tubes and the well wall. It sets slowly in order to give the slurry made with it sufficient time to reach the large depths of the oil wells. However once set it develops strength rapidly and remains stable at high temperature.

7. **Super Sulphat cement:**
Intergrading makes super Sulphat cement, a mixture of 80-85 per cent selected granulated slag with 10-15 per cent calcium Sulphat and about 5 per cent of Portland clinker. It may be applied where high Sulphat, acid and organic oil attacks on structure is expected.

8. **High alumina cement:**
The chemical composition is designed in such a manner that the total alumina content is at least 32 per cent. This cement is ideally suited for high temperature cast able refractory.
9. Grey Portland cement:
Chemical composition is similar to OPC expect the following limitations, which ensures very strength, increased cohesiveness and increased durability factor towards chemical attack. All applications where high-strength concrete is required ideally suited for railway prestressed concrete sleepers, bridges and slip form construction.
Description Limits as per IRST -40 OPC as per IS-Spec
LSF 0.8-1.02 0.66-1.02
C3S45%Min –
C3A 10% Max –
Fineness 3700 Min –

1.5 SALIENT CHARACTERISTICS OF CEMENT:
1.5.1 Physical Characteristics:

(A) Setting Time:
The time interval for which the cement products remain plastic condition is known as the setting time. The setting of cement can be understood through initial setting and final setting time.

(B) Initial Setting:
The time elapsed between the moments that the water is added to the cement to that paste starts losing its plasticity.

(C) Final Setting:
The time elapsed between the movement the water is added to the cement and time when the paste has completely lost its plasticity and has attained sufficient firmness to resist certain definite pressure.

2 to 4 % Gypsum is added during grinding of clinker to provide sufficient time for workability. If Gypsum is not added cement sets quickly.

As per IS: 269, 8112, 12269, and 1489
Initial setting: Min. 30 minute
Final setting: Max. 600 minute. *
1.5.2 Strength:
Strength of cement is not measured on neat cement paste because of cement is carried out with standard sand cement mortar. It is very important characteristic of cement. Strength is measured after 3 days, 7 days and 28 days for OPC is Kg/Cm or Map.

<table>
<thead>
<tr>
<th>Strength</th>
<th>33 G OPC</th>
<th>43 G OPC</th>
<th>53 G OPC</th>
<th>PPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 days</td>
<td>16 Map</td>
<td>23 Map</td>
<td>27 Map</td>
<td>16 Map</td>
</tr>
<tr>
<td>7 days</td>
<td>22 Map</td>
<td>33 Map</td>
<td>37 Map</td>
<td>22 Map</td>
</tr>
<tr>
<td>28 days</td>
<td>33 Map</td>
<td>43 Map</td>
<td>53 Map</td>
<td>33 Map</td>
</tr>
</tbody>
</table>

1 Map = 10 Kg/Cm².
(Source: Saurashtra cement Ltd. Technical service department publication)

1.5.3 Soundless:
It is an appreciable change of the volume and there by loosening or even destroying of the hardened cement structure. It takes a long time to complete the reaction process.
Unsouness in cement is due to the presence of excess lime which can be tasted by Le Chatelier soundless test. If the magnesia content is more than 3% the cement is to be cheeked for soundness by autoclave test.
Excess Gypsum (more than 2 to 3%) can also cause the expansion and distraction of set cement structure.
It can be due to excess of lime, magnesia, excess sulphate.
As per Is: 269, 8112, 12269, and 1489.
Auto clave Expansion: Max. 0.8% for free magnesia content. Le Chatelier Expansion: Max 10 mm for free lime content.

1.5.4 Fineness:
It is measure by how fine the cement is grounded. It shows the surface area. It is important for setting and strength. Higher the fineness, strength and early setting achieved.
As per is: 269 (OPC 33G), 8112 (OPC 43G), 12269 (OPC 53G) Specified: finesse > 225 M₂/Kg
As per Is: 1489 (PPC)
Specified: Fineness > 300 M₂/Kg,
1.5.5 **Standard Consistency:**
It is measured by water required for 33 mm to 35 mm penetration of needle or plunger in vacate apparatus. It is required for all further tests of cement i.e. setting test, soundness test, and strength test.

1.6 **GRADE OF CEMENT:**
Grade of cement indicates the minimum compressive strength at the age of 28 days in (Map) as per the specifications of Bureau of Indian standards i.e. for 43 G. OPC cement must give min. 43 Map compressive strength there are mainly three grade cement available in market i.e. 33 G, 43 G, 53 G.
It is observed and well recommended that the 43 G, OPC is very much suitable and sufficient for general construction work like brick work, plastering, and RCC structures.
53 grades is mainly recommended to use for pre cast and prestressed civil works like grills, pipes, poles, railway slippers, hollow or solid bricks, concrete road. High early strength is achieved due to higher C3S content. It imparts high heat of hydration so careful & extensive curing after, construction is required.
It is fact that higher grade cement more C3S than C2S. C3S produces more heat and Ca(OH)₂ (Calcium Hydroxide) which is not desirable product in mass concrete because it is soluble in water and get leached out of concrete making concrete porous and thus reduces the durability.

**Reaction of C₃S with water is as under:**
\[
2 (3 \text{ CaO, SiO}_2) + 6 \text{ H}_2\text{O} \rightarrow 3\text{CaO.2SiO}_2.3\text{H}_2\text{O}+3\text{Ca (OH)}_2 \quad 2\text{C}_3\text{S}+ 6\text{H} \rightarrow \text{C}_3\text{S}_2\text{H}_3 + 3\text{Ca (OH)}_2 (100) + (24) - (75) + (49)
\]

**Reaction of C₂S with water is as under:**
As per molecular formula it is evident the more C₃S₂H₃ and less Ca (OH) 2 is formed when C₂S reacts with water. This is more desirable product which increases durability. The product of CAS will give more comprehensive strength but less quantity of final product as compared to C₂S.

1.7 **PROFILE OF THE CEMENT INDUSTRY IN THE WORLD:**
The record of changes in man and nations is called history. The past few decades were just one of these momentous times which have changed the world. In this fast development of the world, the revolutions in the geographical, political and economic
area were achieved and new innovations, and alignments were brings made and remade day-by-day and year-by-year. Many years ago, various types of building materials were used for construction of public and religious building are send, mortar, brick, lime, gypsum, and in a special case marbles. The house of ordinary citizens was usually made of mud and that same times of special type of thin bricks backed by means of wood fire. In few cases lime and pazzolona were used for getting beautiful finishing for the interior surface. There were very skilled builders and mason who have created temples, building and bathing Ghats, thousands of years ago still, testifying to the high standards of architectural design and construction in ancient India.

The story of the invention of Portland cement is not easy to dissent angle. However slowly and gradually, cement and new types of material developed in Europe. James frost patented cement in 1811 and established works at swanscombe, the first in the London district. However the usual contribution to aspedin's first patent is dated 21st Oct. 1924. He patented artificial cement made by calcinations of an argillaceous limestone which is known as Portland cement because concrete made from it resembled a famous building stone obtained from the island at Portland near England. This was the beginning of Portland cement industry.

Cement is a powered material with water forms a paste that hardens slowly. Sintering a mixture of various raw materials makes it. The main raw material composed in the mixture is calcium carbonate as limestone and other eliminates as clay or shale. During the sintering process reaction takes place, produce, noodles, called clinkers which consist of calcium silicates and aluminates, when the clinker is pulverized with a small amount of gypsum as reader the resulting powder is called Portland cement.

Cement is a basic material, which is used in all types of construction activities, industrial construction, housing, dams, bridges etc. The cement industry, therefore, plays a significant role in the economic development and it is considered as one of the core sectors of the economy.

1.8 PROFILE OF THE CEMENT INDUSTRY IN INDIA:
Cement industry is one of the key industries in India. It plays a dominant role in the national economy. Form the point of view of economic development of the country,
Cement industry ranks second very next to the Iron and steel industry. Cement is indispensable in building and construction works. The production and consumption of cement to a large extent, indicates a country's progress. In a developing country like India the need for a well established cement industry is of paramount importance.

The Indian cement industry continues to suffer from excessive production capacity a time when demand growth continues to be sluggish. The industry remains highly fragmented and profit have been impaired by a series of debilitating price wars as well as from steadily rising costs. The recent arrival of Lafarge may herald some much needed industry consolidation. Meanwhile cement capacity levels continue to be swollen by a sizeable new building programmed.

<table>
<thead>
<tr>
<th>Population :</th>
<th>935.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density :</td>
<td>314</td>
</tr>
<tr>
<td>Area :</td>
<td>279190</td>
</tr>
<tr>
<td>Capital City :</td>
<td>New Delhi</td>
</tr>
<tr>
<td>GNP Per Capita :</td>
<td>US$310</td>
</tr>
<tr>
<td>Urbanization :</td>
<td>26 per cent</td>
</tr>
<tr>
<td>Per Capita Cement Consumption :</td>
<td>79kg</td>
</tr>
<tr>
<td>Official Language :</td>
<td>Hindi, English</td>
</tr>
<tr>
<td>Currency :</td>
<td>Rupee</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Consumption</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>48.9</td>
<td>48.9</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>53.61</td>
<td>53.61</td>
<td>0.4</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>53.37</td>
<td>49.86</td>
<td>1.18</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>54.09</td>
<td>52.91</td>
<td>2.83</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>58.35</td>
<td>56.67</td>
<td>3.58</td>
<td>0</td>
</tr>
<tr>
<td>2004</td>
<td>69.32</td>
<td>60.64</td>
<td>4.8</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>69.55</td>
<td>67.17</td>
<td>2.38</td>
<td>0</td>
</tr>
<tr>
<td>2006</td>
<td>76.22</td>
<td>73.52</td>
<td>2.7</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>80</td>
<td>75.66</td>
<td>4.24</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>84</td>
<td>80.6</td>
<td>3.4</td>
<td>0</td>
</tr>
</tbody>
</table>
1.8.1 Cement Production in India:
Following China, Japan and the US, India is the fourth largest cement producing country in the world. In 1996 around 115 large cement plant including 57 cement companies and about 300 small plants produced 76.2 million tones cement per annum. Ownership is mostly private (85% installed capacity) and centralized for the large plants with four production houses controlling most of the units. This has lead to financial and administrative integration of different factories installed capacity increased considerably between 1970 to 1996, particularly in the last few years following complete deregulation of the cement sector which in the two decade period from 1970 to 1990 total installed capacity rose by around 47 million tons from 17 million tons to 64 million tones, within only 6 years between 1990 and 1996 it increased by another 41 million tons to 105 million tones of installed capacity.

Production and installed capacity of small & large cement plants:
Production, however, did not increase accordingly due to high frequency of power failures, shortage of coal inadequate availability of wagons for rail transportation, limited availability of furnace oil etc. capacity utilization decreased steadily from as high as 90% in 1978 to a low paint of 67% in 1980-81. Following policy changes toward deregulation in the early and late 1980s capacity utilization reemployed to 82% in 1991-92, yet, since then it has again shown a decreasing trend to 72% in 1996-97. Figure 1.1 shows installed capacity and production of large as well as small plants. Appendix a gives production capacity utilization from 1970-96 for India as a whole and table 1.2 region for 1995-96,

### TABLE: 1.2
Region wise cement production capacity, and capacity utilization (million tons). Year 1995-96

<table>
<thead>
<tr>
<th>Region</th>
<th>Capacity</th>
<th>Production</th>
<th>Capacity Utilization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>18.3</td>
<td>12.1</td>
<td>66</td>
</tr>
<tr>
<td>East</td>
<td>7.3</td>
<td>4.6</td>
<td>63</td>
</tr>
<tr>
<td>West</td>
<td>38.6</td>
<td>25.9</td>
<td>67</td>
</tr>
<tr>
<td>South</td>
<td>23.9</td>
<td>21.7</td>
<td>91</td>
</tr>
<tr>
<td>All India</td>
<td>88.2</td>
<td>64.4</td>
<td>73</td>
</tr>
</tbody>
</table>

Source Karwa (1998)
The viability of the location plays the major role in the economics of cement manufacturing. It is determined by the factors such as porosity to raw materials, limestone, and coal, distance of market areas as well as availability of continuous power supply. Porosity to limestone deposit contributes considerably to pushing down costs in transportation of heavy limestone. If units are located close enough to limestone resources, trucks can be used to move limestone over the short distance instead of relying on scarce railway capacity.

The proximity of coal deposits continues another important factor in cement manufacturing. Generally, coal is transported by railway throughout the country. Coal distribution and coal prices are strictly controlled by the Government. Although coal deposits are located all over the country constraints in availability of wagons for railway transportation have led to major shortfalls in the amount of coal received against the quota assigned to the cement industry for the year 1973, Chakravarty (1989) computed bases in cement production due to coal shortages of up 37% however, they were considerably lower at 10% in 1981 and have since steadily decreased in 1987, coal shortage accounted for only 0.4% of production losses.
In order to reduce transportation as well as capital costs, to increase regional development and to make use of smaller limestone deposits many small and mini cement plants with a capacity of up to 650 tons per day were setup in dispersed location in India. As seen in figure 1.2, construction of such plants began in the early 1980s and amounted to 180 mini cement plants in 1992 together producing 3 mt. (about 6% of total cement production) and 311 plants producing 5 mt (7.3/%% of total cement) in 1996.

Despite of the advantages, there were several drawbacks associated with the setting up of units in dispersed areas; mainly due to increased distance to market areas other than the local markets limit in transportation capacity, particularly in rail transport, constrained the storage capacity (silos) at the production site producers were often forced to cut back cement production. Only in recent year Government finally allowed the cement industry to purchase and own rail wagons to overcome these problems.

Demand for cement has been growing at rates of up 10% p.a. in the past. While in 1987 demand was about 37 million tons (mt), it reached 53 mt. in 1993 and further increased to more than 65 mt. in 1995. Providing a main input for construction cement consumption is highly dependent on actives in the construction sector which are in turn dependent on Governmental and private investment in infrastructure and buildings. Appendix 13 provides gross value added in the construction production. Therefore, imports lode to fill the balance. Since 1987 lower cement production has increased and India reached self Sufficiency. More recently exports, particularly to neighboring countries, have been increasing.

At present the Indian cement industry produces 13 different varieties of cement employing three different process types. Amongst varieties, Ordinary Portland cement (OPC), Portland pazzolina cement (PPC) and Portland slag cement (PSC) constitute the major shares accounting for almost 99% in total production. Ordinary Portland cement is most commonly used in India. It holds a share of about 70% in total production PPC of only 11%. Generally, the two varieties, PSC and OPC, used for same purpose, white PPC cannot used for prestressed and high strength concrete as used in bridge and airports.
Cement is produced using the wet, the semi-dry, and the dry processes. The share of the wet process in total installed capacity has declined from over 90% in 1960 to only 12% in 1996 (Table 1.3). The wet process has been substituted by the significantly less energy using dry process over time. Following the oil price shocks the shift technology mix has become substantial. The dry process nowadays accounts for the majority (86%) of India's cement production. Due to new, even more efficient technologies, the wet process is expected to be completely pushed out in the near future.

The semi-dry process never played an important role in the cement production of India. Its share in total installed cement capacity has been small over time. It currently accounts for 2% of total production mini cement plant usually use vertical shaft kilns for cement production.

### Table 1.3

<table>
<thead>
<tr>
<th>Technology Mix (1%) for Cement Production in India</th>
</tr>
</thead>
<tbody>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td>Dry process</td>
</tr>
<tr>
<td>Semi dry process</td>
</tr>
<tr>
<td>wet process</td>
</tr>
</tbody>
</table>


### 1.8.2 Government Policy:

The Indian cement sector has been under strict Government control for almost the whole period since independence in 1947. Government intervention took place both directly and indirectly. Direct intervention happened in the form of Government control over production capacity and distribution of cement, while indirect intervention was in the form of price control.

Table 1.4 provides a summary overview of major policy changes between 1951 and today. Three significant periods can be distinguished; first, the period of total control where both prices and distribution of output were strictly regulated by the Government, second the period of piratical decontrol staring in February 1982 and finally the period since 1989 when all price and distribution controls were withdrawn.
The price and distribution control system on cement, implemented after liberalization in 1956, aimed at ensuring fair prices to producers and consumers all over the country. Thus reducing regional imbalance, and at reaching self-sufficiency within a short time horizon. Because of slow growth in capacity expansion and continued cost increases, the government had to increase the fix price several times. However, these price increases as well as financial incentives (tax returns on capital) to hence investment showed little to no effect on the industry. In 1977, higher prices were allowed for cement produced by new plants of major expansions of existing plants. Due to sustain slow development the uniform price imposed by the government was substituted by a three tier price system in 1979, different prices were assigned to cement produced in low, medium and high cost plants.

However, further increases of input costs (including these that likewise regulated by the government such as fuel and power cases as well as wages.) count not be neutralized adequately and in time. Thus, the controlled price did not reflect the true economic cost and profit margins dwindled increasingly deterring essential investments in capacity and production expansion. The permit system introduced by 14 states and union territories in the 1970 comprised direct control over public distribution of cement to ensure fair supplies to priority sectors, discourage consumption of cement for non-priority and essential purpose. Furthermore, it was thought to facilitate cement availability to small users and to eliminate black marketing. However, the system resulted in artificial shortages, extensive black marketing and corruption in the civil supply department of the government.

The system of price control was accompanied by a policy of freight pooling. The price control fixed a uniform price according to estimated production costs of which cement was required to be sold all over the country. These prices contained a freight component that was averaged over the country as a whole. If the actual freight component experienced by to pass on the pool a sum representing the difference between the uniform price freight component and the freight incurred by them. On the other hand, if the actual freight incidence was lighter than the freight elements accounted for the uniform price, producers were reimbursed the difference.

The freight pooling system promoted equal industrial development all over the country. It supported regional dissemination and ensured that cement was available at
equal price in any part of the country yet; it also implied that producers had no incentive in locating production such that transportation costs of cement would be minimized. Market distance becomes a less important issue. As a result of non optimal location of industries, average costs of production as well as demand for scarce railway capacity increased.

**TABLE: 1.4**
Overview Of Policies Regarding the Cement Industry of India.

<table>
<thead>
<tr>
<th>Period</th>
<th>Policy</th>
<th>Specifics</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>Price and Distribution Control</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>April 1975</td>
<td>---</td>
<td>14% tax return on capital employed</td>
<td>Did not show any noticeable impact on industry.</td>
</tr>
<tr>
<td>19777</td>
<td>---</td>
<td>12% post tax return on net worth</td>
<td>Showed effect on output</td>
</tr>
<tr>
<td>Unit 1978</td>
<td>---</td>
<td>Uniform retention price</td>
<td>---</td>
</tr>
<tr>
<td>May 1979</td>
<td>---</td>
<td>Three tier price system</td>
<td>---</td>
</tr>
<tr>
<td>February 1982</td>
<td>Partial decontrol</td>
<td>Levy obligation, uniform retention price</td>
<td>Retention price slightly 10 per for PPC than OPC, specific mini units exempted for price and distribution control.</td>
</tr>
<tr>
<td>1982</td>
<td>---</td>
<td>Progressive</td>
<td>See table below</td>
</tr>
</tbody>
</table>
On account of these difficulties in the cement industry the government of India introduced a system of particle decontrol in 1982. A levy quota of 66.6% for sales to government and small house builders was imposed on existing until while for new sick units a lower quota at 50% was established. Levy cement was fined uniformly for PPC and slightly lower for PPC. The balance of 33.4% could be sold in the free open market to general consumers. A selling price was set for sales in the open market in order to protect consumers from unreasonable light-pricing. Under the system of partial decontrol non levy cement was no longer covered by freight pooling. Furthermore, specific mini cement units were completely treading from price and distributor controls. Although, overall profitability increased substantially immediately after the introduction of partial decontrol, profits obtained through non levy sales decreased with greater availability of cement in the market and continuously rising input costs.

To sustain an accelerating course of government subsequently introduced changes in levy obligations and retention prices. At four paints in time the government simultaneously reduced levy quotas and increased retention prices. As a result late 1988 the levy quota was as low as 30% four units established before 1982 and the retention price had increased substantially. In addition during 1982 and 1987 the ceiling on non-levy price was increased occasionally. In 1987, the cement
manufacture association and the government decided that there was no further need for a maximum price ceiling finally, in 1989 the industry was considered to prepared for free market competition and all price and distribution controls were withdrawn. The system of freight pooling was abandoned a subsidy scheme to ensure availability of cement at reasonable price. By removing all controls in the cement sector, the government looped to accelerate growth and induces further modernization and expansion investments.

1.8.3 Total Factor Productivity in India:
Total factor productivity relates the input factors capital and labour to gross value added. It measures the growth in gross value added (GVA) that cannot be explained by the growth of a weighted combination of the two inputs capital and labour. Figure 1.2 shows the development of total factor productivity as measured by the Kendrick, Solow and translong Indices over time. In addition, the table gives total factor productivity growth for different time periods. The growth rates for the Kendrick and the Solo indices are estimated as compound rates. The Tran slog index, however, is based on the assumption of exponent in growth due to its begarithmic, non-linear nature Graph: 1.2 index of total factor productivity is as under:
The three indices are related in their patterns. The Tran log index fluctuates in between the Kendrick and the Solow index. The division into three sub periods reveals similar behavior of total factor productivity to partial productivity. The period 1973-1983 on Solow: 1.49% and minimal positive growth at 0.16% for the Kendrick index. In contrast, the second period 1981-93, gives very positive factor productivity growth at 7.75% (Traslog) 6.04 % and 8.04 (Kendrick) with a strong peak for all indices in 1991 following this peak total factor of productivity decrease rapidly at high rates of 26.42% to 30.23%

**TABLE: 1.5**

<table>
<thead>
<tr>
<th>Growth</th>
<th>Tran slog</th>
<th>Solow</th>
<th>Kendrick</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973-93</td>
<td>-0.03</td>
<td>-1.66</td>
<td>0.16</td>
</tr>
<tr>
<td>1973-83</td>
<td>-0.22</td>
<td>-1.49</td>
<td>0.26</td>
</tr>
<tr>
<td>1983-91</td>
<td>7.75</td>
<td>6.04</td>
<td>8.04</td>
</tr>
<tr>
<td>Time Trend 1973-93</td>
<td>0.09</td>
<td>-1.82</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Source: CMA Data on Cement Industry 1973 & 1993
Note: Tran slog: Exponential growth: Solow, Kendrick: compound growth trend rate calculated as semi log matrix time trend on 5% level.

1.8.4 Total Productivity:
Total productivity measure the growth in gross value of output in excess of the growth of weighted combination on the input capital, labour, energy and material. As with total factor productivity we consider three different indices for measuring total productivity.

Table 1.4 and figure 1.3 present the growth of the three indices their evolution over time. The patterns differ slightly from total factor productivity estimates due to the more modest development of value of output over compared to the development of gross value added; figure 1.3 best supports the division into the three.
Sub periods 1973-83, 1983-91 and 1991-93 all three indices show fluctuating behavior for the first time period, according for a decrease in total productivity of 1.66% (Tran slog). -2.50 (Solow) and -1.47 (Kendrick). Reaching a low point in 1983 total productivity increase steadily thereafter total productivity growth of around 4.8% for all indicates.

Supports the notion of overall progress in the cement industry between 1983 and 1991 following a peak in 1991, total productivity drags in 1992 and then again recovers slightly.

For the whole time period under consideration two indices, Tran slog and Kendrick, indicate a slight increase in total productivity of 0.26% and 0.47%. The slow index shows a decrease for -0.28% p.a. As explained above this growth is driven by a very positive in the mid 1980s to the beginning of the 1990s which sets the losses in the remaining years. To see why these three distinctive time periods can be extracted and which factor underline the specific development section will in more detail discuss the results in the context of overall economic and policy changes at specific paint of the time.
Table: 1.6
Total Productivity Growth (Selected times, Periods)

<table>
<thead>
<tr>
<th>Growth</th>
<th>Tran slog</th>
<th>Solow</th>
<th>Kendrick</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973-93</td>
<td>0.77</td>
<td>0.28</td>
<td>0.90</td>
</tr>
<tr>
<td>1973-83</td>
<td>-1.66</td>
<td>-2.50</td>
<td>-1.47</td>
</tr>
<tr>
<td>1983-91</td>
<td>4.17</td>
<td>4.80</td>
<td>0.504</td>
</tr>
<tr>
<td>1991-93</td>
<td>-2.84</td>
<td>-3.32</td>
<td>-3.28</td>
</tr>
<tr>
<td>Time Trend</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973-93</td>
<td>0.28</td>
<td>-0.28</td>
<td>0.47</td>
</tr>
</tbody>
</table>


Note: Tran slog: Exponential growth, Kendrick: compound growth. Trend Rate calculated as semi-logarithmic time trend, significant 5% level.

1.8.5 Decomposition of Growth in Value of Output:
Avery insightful way of looking at growth in output is to decompose growth into the contribution of factor input changes and total productivity growth. Generally, growth in production is two older consisting of increased use of outputs and some additional changes (gain or loss) in productivity. As mentioned, growth in productivity there by includes technological change, learning, education, organization and management improvements etc. The two folded base of growth in out-put can naturally imply that growth in output is accompanied by increase in factor output and decrease in productivity, by decrease in factor input and increase in productivity or increase in both factor input and productivity.

1.8.6 Industry Overview: Construction Machinery:
The demand for new construction equipment in India increased from USD 1.4 billion in 2003 to USD 1.7 billion in 2004. Demand is expected to increase to USD 2.1 billion by the end of 2005. During the following three years, the Indian construction equipment industry is projected to grow 20 per cent each year. Similarly, U.S. imports that now stand at USD 81 million are expected to grow 27 per cent in each of the coming three years.
Since the onset of "economic liberalization" that occurred during Indian fiscal years (FY) 1996-97, the Government of India has adopted industrial policy changes that have permitted deregulation. Consequently, Indian companies have restructured and modernized. Except for a few strategic industries, the private sector can establish joint ventures with foreign firms. Now, the Government of India allows majority foreign equity ownership for such ventures. Joint ventures with higher-level participation can also be considered if there are substantial benefits to the Indian economy. In particular, the GOI also encourages infrastructure ventures involving the private sector. These initiatives have opened huge market and investment opportunities for the private sector. Many global players are developing industrial and infrastructure projects either individually or jointly with leading Indian firms.

1.8.7 Industry Overview: Cement Producers:
India was the fourth largest producer of cement in the world with 115 large plants with installed capacity of 96 Mt/yr belonging to 57 companies, 300 mini cement plants each with less than 2,00,000 t/yr overall installed capacity in 2002 was about 105 Mt/yr (World Cement, 2002).
Redland PLC, based in the United Kingdom, was negotiating with the Birla Group to set up a joint venture to produce ready-mix concrete for the Delhi area, which has been undergoing considerable growth. If realized, then both companies would have a 50 per cent equity share (Industrial Minerals, 200).

Problems of Cement industry:
The main impediments to the growth of cement industry in India may be broadly listed as follows:

1. Shortage of capital:
The cement industry is capital-intensive in nature. On account of its record on declining profitability, it is unable to raise the required finance from the capital market.

2. Power shortage:
Power is an important infrastructure, which the cement industry needs. The cement industry is being adversely affected with the State Electricity Boards (SEBs), raising costs year after year accompanied by diminishing quality of power supplied, in terms of frequent voltage fluctuations, power cuts and interruptions.
By installing captive power plants the Indian cement industry is today supplementing grid power supply as a result, capacity has crossed 700MW.

3. Location problems:
Cement industries are mainly situated in Western and Southern regions producing about 71 per cent of the total output, while the Northern and Eastern regions account for 29 per cent of total output. The Southern and western regions consume only 57 percent of their total output, while the Northern and Eastern regions consume 43 percent of their total production. There is excess production in the Southern and Western regions while there is excess demand from Northern and Eastern regions. These factors lead to heavy transport cost.

4. Shortage of coal:
Coal shortage affects production of cement industry resulting in idle capacity and under utilization of capacity. Coal requirement by the industry today, stands at 13mt, which is just 6 per cent of the total cost produced in India. As a result, industry sources say that, cement manufactures are left at the mercy of traders in coal, who charge exorbitant prices. By 2005 AD, the need for coal will go up to 25mt per annum.

The availability and movement of coal has been a perennial problem of the cement industry. Ninety per cent of the coal deposits occur in the four states of Bihar, Orissa, West Bengal and Madhya Pradesh. Barring Madhya Pradesh, none of the other states have any limestone deposits and hence coal has to be hauled over very long distances.

Keeping in view the likely production of 737mt of cement in 2001, coal requirement will have to be doubled to level of 21mt and about 15mt will have to be moved by rail against 8 mt by rail in 1996.

<table>
<thead>
<tr>
<th>year</th>
<th>Estimated Cement Production(Mt.)</th>
<th>Estimated Coal Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>54</td>
<td>14.0</td>
</tr>
<tr>
<td>2001</td>
<td>57</td>
<td>15.0</td>
</tr>
<tr>
<td>2002</td>
<td>62</td>
<td>16.5</td>
</tr>
</tbody>
</table>

Requirement of coal during 1995
<table>
<thead>
<tr>
<th>Year</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>67</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>72</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>76</td>
<td>20.5</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>80</td>
<td>22.1</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>87</td>
<td>23.7</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>N.A.</td>
<td>24.1</td>
<td></td>
</tr>
</tbody>
</table>

5. Non-availability of railway wagons:
Non-availability of railway wagons leads to considerable delay in bringing in the raw materials and in dispatching the cement to various potential markets. Sending cement by open railway wagons leads to pilferage and damage by rain. 55 per cent of cement is dispatched by rail and 45 per cent by road.

6. Defective method of transport:
Methods of cement bagging and its transportation in India are primitive which marketing inefficient and uneconomical. Hardly any quantity of cement at present is handled in bulk.

7. Negligible share in world trade:
India's share in world trade is negligible. Currently, India exports only about 3.5 lakh tones in a year.

8. Technological obsolescence:
The industry is in need of change in the production process. There is a need for conversion from wet process to dry process.
Apart from a modernization programmed involving Rs. 300 crore, latest technologies for, computerized control systems, X-ray analyzers, pollution control devices, captive power plants, upgrading quarry operations, etc, have all been adopted by the industry.

Quality: - In order o meet the challenge of globalization, the Indian cement industry will have to adopt the ISO 9000/IS 14000 series of standards and the Total Quality Management (TQM) system.

So far, only about 10 per cent of cement plants have gone in for this international certification.
Cement manufactured in India is subjected to quality assurance checks within the plant, and further scrutinized and certified by the autonomous Bureau of Indian Standards (BIS). India is one of the few counties to have set up a limit of 0.5 per cent by weight, for chloride ions in cement for use in long span reinforced concrete and priestesses concrete structures.

With eco-labeling and ISO-labeling, becoming major issues in several countries, the Indian cement industry will have to conform to stiff norms for international and environmental acceptance.

**Cost factor:** - The single major item of expenditure is the cost of fuel (viz. furnace oil/LSHS), which constitutes at least 60 per cent of the variable cost. The industry has to find some means to reduce consumption of fuel oil of it is to survive in the long term.

Modern packing material will have to be introduced, which are strong enough, but at the same time cheaper to counter the increasing price of jute and paper. Quality improvement and usage applications are major thrusts of the R & D effort, to benefit usage in India and abroad. Identified areas for future research and development include coal beneficiaries, quality modulation, improved burners etc.

**Mini Cement Plants:**

Mini cement plants play a vital role in socio-economic development. In India, sizeable deposits of limestone, which is the main raw material required for the production of cement, are spread over the country. In those places where there are limited quantities of time stone available, and it is not possible to set up large plants, the Government has decided to start mini plants.

**Process of Cement Manufacturing:**

**Wet Process:**

It is the oldest process and it was originally used for easily crumbly materials because it can help to control accurate mix of raw material. In this process, the raw material is broken up and incorporated in wash mills. This usually consists circular hall, covers inside by bricks or concrete and containing a framework of iron in the walls to prevent the passing of raw materials otherwise it will reduce the proportion of chalk and clay which are fed in the required proportion in the wash mill together with
sufficient water to form materials which are reduced to a fine state of decision and pass as a slurry through the screens in walls of the pit. The flints, which are included in the chalk, remain at the bottom to the wash of mill and are removed periodically. In the modern methods, the raw materials are usually reduced in size by treatment in another wash mill with finer screens in centrifugal screening mills, or by passing it through a tube mill. If the raw material contains harder limestone and shells the wash mill is not enough to affect the reduction.

In this case the raw material are crushed and passed into large tube mills after adding the water to the mill, in an adequate quantity to form the slurry, if the hard limestone and clay are the raw materials, the clay is passed through the tube mill already dispersed in the water. At the same time it is ensured that the finished slurry does not contain more than a few percent of materials remaining on a 170 mesh and the water content in it varies from 35-40 per cent with different raw material. The slurry is pumped to slurry tanks or pool and mixed by compressed air to keep the mixture homogeneous. To keep the limestone in good proportion in the mix it is controlled by analysis and the supply to the wash mill of tube mills is adjusted periodically as required. The final step to adjustment of composition is often obtained by mixing the slurry from two basins one of which is kept slightly high and on slightly low in time.

The wet process is known as rotary of kilns in which the cement is burnt. It is a long cylinder mixing on its axis which separates the materials supplied at the upper and travels slowly to the lower end. The fuel is blown inside by an air blast and fired in it. In the upper part of the kilns chains are fixed to assist in the transfer of the heat from kilns gases to the raw materials. The slurry is dried in the upper part of the kilns and water driven out as steam and then as it descends the kiln, the dry slurry undergoes a series of reactions forming in the most strongly heated zone hard granular masses mostly form 1/8 inch to % inch diameter known as clinker mill where small quantity of gypsum is added during cement passes to silos from which it is drawn for packing.

**Dry Process:**

In this process the raw materials are crushed and dried by rotary driers, proportional and ground in tube mills consisting of rotating steel cylinders contain balls of different sizes. The mill is continuous in operation, and supplying raw material at one end discharging the ground material at the order. The dried powder is transported to
storage in silos from where it is supplied to the kiln. In this process it must be decided whether to use rotary kiln or not. The use of any other device will practically give the same results as drive form the use of rotary kiln, the choice in this case will depend upon the cost factor, the space, specific requirement and lastly the fuel. Shaft kilns required to slop fuel and can, therefore only be employed in places where coke or anthracite is readily available. Rotary kilns can fire with pulverized fat coal gas or oil.

**Semi Dry Process:**
Next process of drying is called semidry process, the shaft kilns are suitable filled with various types of discharge gates. It must discharge the clinker from the kiln continuously at a uniform rate. The clinker, which formed in the kiln, must be broken up while being discharged. The raw material and fuel are mixed in a correct proportion and this mixture is then agglomerated into nodules in conjunction with the addition of a suitable quantity of water, the quantity of water is in the range of 8 to 14 per cent depending upon the nature of meal. Some types of machines for agglomerating the raw material may be mentioned as disenoduliser, drumnoduliser, edge runner with perforated runner tracks, rings in which run heavy rollers which pass the material through the holes. In certain cases it is sufficient nearly to moisten the raw meal in simple paddle worn conveyor. For high capacity shaft kilns, the raw meal and fuel are nodules in a special revolving drum or in an inclined revolving disc or pan. The finally divided material or agglomerate by the nodulising into small balls or nodules, and has in present years come to a general use as a most suitable method of preparing the raw materials for shaft kiln. To pass the material through the sintering zone as rapidly as possible, it is necessary to supply and distribute air adequately. The shaft kilns are constructed with clear internal diameter of 2-3 meter and the height of shaft in 8 to 10 meter for output

1.9 **FUTURE DEVELOPMENT OF THE CEMENT INDUSTRY:**

1. **Ongoing Changes in Cement Industry:**
Ambitions modernization and expansion programs are currently under way in the Indian cement industry. Through adoption of modern technology and equipments, input substitution, output modification, organizational changes as well as other
progress specific measures India is trying to increase output at the same time as to improve efficiency, conserve energy and control pollution. Process conversion presents a noteworthy example of energy conservation in the history of Indian cement industry. Over the last 30 years, the energy - intensive wet process of cement production has been virtually phased out. Other process specific measures that have increasingly found application in the Indian cement industry include multi-stage suspension pre-heaters, pre-calciners, cyclone, and improved burners. Most of these measures are related to energy - intensive primary processing step in cement production, while fewer measures are effective for the grinding and driving steps. In cement production, which fewer measures are effective for the grinding and drying steps? However, the use of more advanced grinding mills, such as roller or light pressure roller mills instead of rod and ball mills also show substantial power saving potentials.

**TABLE: 1.7**

<table>
<thead>
<tr>
<th>No. of units</th>
<th>Capacity (mt)</th>
<th>Units Now</th>
<th>Expansion</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>20.6</td>
<td>14</td>
<td>05</td>
<td>Undrape montation proposed</td>
</tr>
<tr>
<td>35</td>
<td>45.5</td>
<td>30</td>
<td>05</td>
<td></td>
</tr>
</tbody>
</table>

Source: karwa (1998)

Table 1.7:

Presents major cement projects in terms of both additions to existing unit as well as new unit that are proposed or already under implementation as of 1997. The 19 units that are under implementation will add another 20.6 million tones of capacity. As mentioned construction activities are the main driver of cement demand which enhances cement production with little foreign trade. Cement demand is taken approximately equal to cement production assumed to grow at 6.2% p.a. (1990-95 trend trade) GDP construction has been growing at 4.4% p.a. between 1992 and 1995. For the analysis it is assumed to grow at an average 5.6% between 1992 and 1997 and 6% thereafter (das and kandpal, 1997) projections based on these assumptions.
As well as the average of the production estimate are given in table 1.8. Detailed regression results are presented in appendix.

**TABLE: 1.8 Project Cement Demand.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cement Demand (mt/annum) based on GDP Total</th>
<th>GDP Industry</th>
<th>GDP Construction</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>103.0</td>
<td>107.6</td>
<td>106.2</td>
<td>105.6</td>
</tr>
<tr>
<td>2006</td>
<td>139.5</td>
<td>148.7</td>
<td>150.8</td>
<td>146.3</td>
</tr>
<tr>
<td>2011</td>
<td>186.9</td>
<td>204.2</td>
<td>210.4</td>
<td>200.5</td>
</tr>
</tbody>
</table>


Talking the average of the estimates, cement demand (and thus production) is expected to increase by about 39% to slightly over 100 mt p.a. by the year 200%. It will increase in future at an average rate of 6.5% p.a. to 146.3 mt p.a. in 2006 and to almost twice the amount of 2001, 200.5 mt p.a., by the year 2011, growing at a slightly lower rate of 6.3% p.a. considering the expansion plans, these estimate are to be taken as upper boundaries.

(2) **Features of the Schemes:**

A specified percentage of the capacity of cement units is treated as levy-cement and continues under a system of price and distribution control. Accordingly, output equal to two thirds of the installed capacity was to be sold to the government for public distribution and for priority sectors the remaining production treated as non-levy cement could be sold by the factories in the open market. The heavy quota for new unites which started production after January 1, 1982 and for sick units were fixed at 50 percent of installed capacity, and effective from February 28, 1982, an uniform retention price of levy cement was fixed at Rs. 320 per ton for ordinary Portland cement (ope). The earlier three tire pricing system was discontinued.

The committee headed by Dr. A. K. Gosh, the chairman of the BICP, recommended the revision of retention price for every, six months. However, between February 27, 1982 and July 18, 1984, there was no link in the retention price. In the meantime there were several and successive increases in outputs costs. But the industry had to absorb the cost increases already taken place with affect from varying envisaged in the
retention prices as fixed by the government have already been eroded leaving the cement units in poor financial state. It was only effective from July 18, 1984 after a lapse of two years; the retention prices for levy cement were revised upward at Rs. 360 per ton for PPC and Rs. 375 per ton for OPC. But the revised prices according to the industry did not fully neutralize the rise in input costs affected during the intervening on the same date. The levy quota for old units was reduced to 65 percent and new units and sink units to 45 percent as the installed capacity. IN June 1985, these quotas were reduced to 60 percent and 40 percent respectively but were linked to actual production instead of installed capacity.

For the second time since introduction of practical decontrol policy, the union Government increased the retention price of levy cement by Rs. 24.50 per ton to Rs. 384.50 per ton for PPC and to Rs. 399.50 per ton for OPC with effect from December 15, 1986. The percent increase of Rs. 24.50 a ton in the retention price would not be passed on to the consumer in the form of increased retail price. The increased retention price would be paid from the fund accumulated in the cement regulation account. Another change was the decision to discontinue the scheme under which the industry contributed Rs. 9/-per ton on production of non levy cement to the Cement Regulation on Account (CRA). This decision was ported by the Government assessment that fund position with CRA had improved.

Similarly the levy quota on the cement industry has been reduced by some percent. The units which came into production before 1982 would have levy obligation reduced from 60 percent to 50 percent of actual production. Unit which came into production after 1982 as well as those declared sick units have their levy quota reduced from 40 percent to 30 percent. This was the third time the government has reduced the levy quota since February 28, 1982. This decision has been taken by the Government with a view to providing further movement for the growth of the cement industry. However, the relief granted to the cement industry are inadequate and don't completely compensate the like in input costs according to the industry circles. They say that as against the increase of Rs.36.37 per tones in retention price sought by them, the Government has given only a relief of Rs. 24.50 per ton by way of increased retention price, which would meet the cost escalation up to January 1986 only since which cost have gone up by another Rs. 25 per ton.
The future of the industry received a boost with significant shifts in Government policy in the form of partial decontrol in 1982 and complete decontrol in 1989. Consequently, the industries fared well in 1990-91 and 1991-92. The industry's encouraging performance led to the setting up to many new plants and also induced several established companies to diversify into the production of cement.

### Trend in Cement Production & Capacity Utilization (million)

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Installed Capacity</th>
<th>Production</th>
<th>Capacity Utilization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950–51</td>
<td>3.3</td>
<td>3.0</td>
<td>90.90</td>
</tr>
<tr>
<td>1955–56</td>
<td>4.8</td>
<td>4.6</td>
<td>95.80</td>
</tr>
<tr>
<td>1960–61</td>
<td>8.9</td>
<td>8.0</td>
<td>89.90</td>
</tr>
<tr>
<td>1965–66</td>
<td>11.6</td>
<td>10.80</td>
<td>93.10</td>
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<tr>
<td>1968–69</td>
<td>14.4</td>
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<td>84.70</td>
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<tr>
<td>1973–74</td>
<td>19.70</td>
<td>14.70</td>
<td>74.60</td>
</tr>
<tr>
<td>1974–75</td>
<td>19.90</td>
<td>18.80</td>
<td>74.40</td>
</tr>
<tr>
<td>1975–76</td>
<td>20.60</td>
<td>17.30</td>
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</tr>
<tr>
<td>1976–77</td>
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</tr>
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<td>1977–78</td>
<td>21.80</td>
<td>19.40</td>
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<tr>
<td>1978–79</td>
<td>22-30</td>
<td>19-40</td>
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</tr>
<tr>
<td>1979–80</td>
<td>24.30</td>
<td>17.60</td>
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<tr>
<td>1980-81</td>
<td>26.80</td>
<td>18.70</td>
<td>68.80</td>
</tr>
<tr>
<td>1981–82</td>
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<td>1987–88</td>
<td>54.51</td>
<td>37.41</td>
<td>68.60</td>
</tr>
<tr>
<td>1988–89</td>
<td>55.04</td>
<td>41.75</td>
<td>75.60</td>
</tr>
</tbody>
</table>
1989 – 90 | 56.96 | 42.91 | 75.30  
1990 – 91 | 59.12 | 45.76 | 77.40  
1991 – 92 | 61.31 | 50.61 | 82.50  
1992 – 93 | 64.94 | 50.72 | 78.10  
1993 – 94 | 71.26 | 54.09 | 75.90  
1994 – 95 | 78.09 | 58.35 | 74.70  
1995 – 96 | 86.76 | 64.53 | 74.40  
1996 – 97 | 96.25 | 69.98 | 72.70  
1997 – 98 | 101.51 | 76.57 | 75.40  
1998 – 99 | 109.97 | 81.83 | 74.40  
1999 – 2000 | 110.10 | 94.21 | 85.60  
2000 – 2001 | 121.90 | 93.52 | 76.70  
2001 – 2001 | 134.00 | 102.35 | 76.40  

**Source:** (1) Cement industry - 1987.  
(2) Indian express - 02-10-1993  
(3) CMA Data on Cement Industry 2001  

However, the introduction of multi-tier retention price formula assuring a post-tax return of 12% on net worth and the scheme of partial decontrol introduced in Feb. 1982 have attracted new investment. Consequently, unprecedented progress took place in the cement industry in terms of capacity and production the capacity, which was 33.50 million tons in 1982-83 reached 54.51 million tons in 1987-88, it reached 134.00 million tons in 2001-02 and cement production also increased from 23.30 million tons to 37.40 million tones and 102.35 million tons during the same period. The installed capacity rose attain annual compound growth rate of 12.00 % during the 6th plane as against percent during the 5th plane. Other side installed capacity growth rate of 13.08 find out during the 8th place as against the 7th plane.

A similar trend was seen in respect of production also, (Table 1.9) what is interesting is that within a short period of four years( 1982-83 to 1985-86), the cement industry added more than half the capacity it attained during the preceding three decades. Also the country has come out of the acute shortage and black marketing in cement. A compared to 1982-83 to 1991-92, in one decoded the cement industry added twice
capacity from 29.2 million tons to 61.31 million tones. In 2001-02 it reached at 134.00 million tones capacity.

**Cement Import / Export Status**

<table>
<thead>
<tr>
<th>Year</th>
<th>Import</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979 – 80</td>
<td>2.23</td>
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<tr>
<td>1980 – 81</td>
<td>1.45</td>
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<tr>
<td>1982 – 83</td>
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<td>-</td>
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<tr>
<td>1983 – 84</td>
<td>0.45</td>
<td>-</td>
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<tr>
<td>1984 – 85</td>
<td>-</td>
<td>-</td>
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<tr>
<td>1985 – 86</td>
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<td>1986 – 87</td>
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<td>1987 – 88</td>
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<td>-</td>
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<tr>
<td>1988 – 89</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1989 – 90</td>
<td>-</td>
<td>0.16</td>
</tr>
<tr>
<td>1990 – 94</td>
<td>-</td>
<td>0.26</td>
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<tr>
<td>1991 – 92</td>
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<td>0.36</td>
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<tr>
<td>1992 – 93</td>
<td>-</td>
<td>1.18</td>
</tr>
<tr>
<td>1993 – 94</td>
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<td>2.85</td>
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<tr>
<td>1994 – 95</td>
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<td>3.17</td>
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<tr>
<td>1995 – 96</td>
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<td>2.38</td>
</tr>
<tr>
<td>1996 – 97</td>
<td>-</td>
<td>2.72</td>
</tr>
<tr>
<td>1997 – 98</td>
<td>-</td>
<td>4.40</td>
</tr>
<tr>
<td>1998 – 99</td>
<td>-</td>
<td>3.15</td>
</tr>
<tr>
<td>1999 – 2000</td>
<td>-</td>
<td>3.14</td>
</tr>
<tr>
<td>2000 – 2001</td>
<td>-</td>
<td>5.15</td>
</tr>
</tbody>
</table>

Source: CMA data on cement Industry - 2001

Feb. 28, 1982, is a golden day in the history of Indian cement industry. The dual price policy was bid adieu and partial decontrol took the seat. The expectations by the Gov.
on this account from the industry were high as a Gov. Press note released on the day revealed.

India ranks second in the world in terms of population and cement production, the first in both the case being China. The constant efforts put in by the industry, of course, with the support of Gov. liberalization policies, not only led the nation towards self sufficiency, but also opened the gates of the port for export. Thus the country which was importing cement as late as 1985, made its debut in global market by 1989. The Indian cement import, export status is furnished in Table 1.10. Thus in the history of Indian cement industry - years pre 1985 were era of Import, years 1985 to 1989 were era of self sufficiency and years 1990 onwards era of Exports.
1.10 CEMENT INDUSTRY UNDER STUDY:

1.10.1 GUJARAT AMBUJA CEMENT:

Object and activities: Manufacture of cement.

Incorporation and promotion:
The company was incorporated on 20th October, 1981 as Ambuja Cements Pvt. Ltd. It was jointly promoted by Gujarat Industrial Investment Corporation Ltd. N.S. Sekharia and his associates Vinod K. Neotia and Suresh Mulani for setting up a cement project in the joint sector. The company was converted into a public limited company on 19th March 1983 and its name was changed to Gujarat Ambuja Cement Ltd. on 19th May, 1983.

Process and technology:
The company adopted the latest dry process precalcination technology incorporating five stages preheated for the main processing system of the cement plant. For grinding the raw material the company undertook to install the latest air swept roller mills of polysious designs, which were for extremely energy efficient. A computerized process control system with field instruments supplied by Larsen and Turbo were also being installed to give consistently high quality cement with maximum productivity. In addition, electronic packing material machine were being obtained from Havre & Becker, West Germany and reserve air bughouse equipment from Zurn Industries USA.

Foreign collaborations:
The Company entered into an agreement with Krupp Polysius AG, West Germany (KP) for supply of plant equipment and service for the project. KP agreed to supply raw material and coal grinding vertical roller mills, homogenizing and kilns kid burning, cooling and coal firing equipment and pneumatic transport pumps. KP has a collaboration agreement with Backau Wolf India, Ltd. who is supplying the balance items of the main plant as per KP design. The scope of the agreement with KP provides for complete engineering of plant, technical documentation and information and supervision of erection and commissioning of the project.
Project site and construction:
The company undertook to set up a project for the manufacture of cement with a licensed capacity of 5, 00,000 tones per annum. The plant location was initially contemplated at Mahuav Taluka in Bhavnagar district of Gujarat. On the basis of the preliminary report of limestone availability at the site, orders were placed for plant and equipment with a capacity of 6, 25,000 tons per annum. Due to delay and difficulty in acquiring land, the location of the plant was shifted to Ambuja Nagar, Vadnagar village in Kodinagar Taluka of Amreli district a notified backward area in Gujarat. In view of the better quality of limestone at the new site the company had sought an increase in the licensed capacity to 7 lakh ton per annum. 193 acres of land was acquired and major civil work at the site was started. Owing to delay in completion of the 33 km. Long 132 k high lens ion power line, the project could not be commissioned as per the original schedule. The kiln was fired in June 1986 and commercial production commencement in October 1986.

Operations:
Since the commencement of commercial production up to 30th June 1987, the company produced 3,37,017 tones of cement, 3,52,902 tones of cement worth Rs. 40.52 crore was sold in 87-88, the company produced 3,20,185 tones of cement which worked out to a capacity utilization of 117 per cent. 8, 10,046 tons of cement valued at Rs. 90.14 crore was sold. Power supply situation during the year was reasonably satisfactory.

Total production during the year 2002-03 clinker 9.19 lakh tones and cement to 9.58 lakh tones. Sales during the year 2002-03 were 5.06 mt, as against 4.09 mt in the previous year. During the year 2002-03 Asia had been in the midst of an unforeseen economic crisis. In spite of this, they had been able to further step their cement export that year from 4.77 lakh tones to 5.40 lakh tones. The total value of export was Rs. 83.95 crore as compared to Rs. 83.83 crore last year. During the year 2002-03 they had put up a 40 mw power plant in just 8 months at a low cost. With the commissioning of this power plant the total power generation capacity at Ambuja Nagar had gone up to 58 mw. They also put up a new 12 mw power plant at Himachal Pradesh during the year 2002-03. With the existing 12 mw the total capacity of the
power plant at Himachal Pradesh had now been enhanced to 24 mw. During the year 2003-04, the company had made a profit of Rs. 150.47 crore.

During the year 2003-04 they had pushed cement production up by a hoping 1 mt over the previous year. The production of cement was 11.17 lakh tones and Clinker was 10.89 lakh tones during the year. Sale pushed up from 18.65 lakh tones in the previous year to 22.53 lakh tones during the year 2003-04. Cement exports during the year 2003-04 accounted for 5.04 lakh tones as against 5.40 lakh tones in the previous year. In value this amounted to Rs. 52.59 core as against the previous year Rs. 81.37 crore.

**Future plans:**
After seeing the satisfactory results of the enhancement at their Himachal plant, their engineers have now drawn plans for doing the same at their Ambuja Nagar plants. The orders for plant and equipment have been placed. Their entire scheme is likely to be implemented by the end of year 2005 at an estimated expenditure of about Rs. 100 crore. After the implementation, their total clinker manufacturing capacity at Ambuja Nagar will increase by about 1 mt per annum.

**Capital outlay:**
The project cost was estimated at Rs. 62.50 crore of which a sum of Rs. 9.15 crore was for land and building Rs.38.60 crore for plant, machinery and erection, and Rs. 75 lakh for working capital margins. This was being met by share capital of Rs. 14.65 crore terms loans from financial institutions and banks of Rs. 44.60 crore, Rs. 3 crore as loan from GIIC against sales tax department benefit and Rs. 25 lakh as central and state subsidy.

Subsequently, the cost of the project went up by Rs. 16.50 crore to Rs. 81 crore. This cost overrun was proposed to be met through additional term loans from financial institution of Rs. 13.15 crore issue of rights equity shares for Rs. 1.80 crore contribution towards equity share capital by Private Promoters and this association of Rs. 20 crore and the balance of Rs. 3.35 crore through excess subscription retained by the company out of the public issue.
1.10.2 SANGHI CEMENT PVT.LTD:

Sanghi Cement is produced at the world's largest single-stream cement plant located at Sanghipuram in the Abdasa Taluka of Kutch district in Gujarat. This fully automated plant with state-of-the-art technology from Fuller International, USA, has revolutionized the way cement is produced and has several firsts to its credit. First plant in India to install cross belt analyzer for micro analyzing of limestone to ensure consistent superior quality of cement

- First plant in India to install stacker and reclaimed for uniform homogenizing of raw materials.
- First plant in India to have an alkali bypass system ensures low alkali content in cement and hence eliminates alkali aggregate reactions to safeguard against cracks in the cement paste.
- Only Indian company to achieve export house status in the first eight months of commencement of operations
- Cement grade high quality captive limestone mines with mining through latest eco-friendly and state-of-the-art surface miners.
- Production capacity of 2.6 MTPA
- First company in India to have fully fledged infrastructure, from day one, such as 58 MW power plant, own jetty to cater the needs of sea route transportation, desalination plant and road network

Sanghi Industries Limited is the flagship company of the Ravi Sanghi Group. It has emerged as a major cement player in western India over the last few years. Company's 3 million tons per annum capacity plant in the Abdasa Taluka of Kutch district in Gujarat is ranked as the second largest cement plant at one location in India. It is one of the top 3 players in Gujarat and is now increasing its presence in Maharashtra, Rajasthan and Madhya Pradesh.

Sanghi Industries has several firsts to its credit: First plant in India to install cross belt analyzer for micro analysis of limestone to ensure consistent superior quality of cement. First to install stacker and reclaimed for uniform homogenizing of each raw material and the first plant to have 100% robotic control systems to ensure consistently superior strength and quality of operations. Only Indian Cement Company to achieve export house status in the first eight month of commencement of
operations first company in India to have a full fledged infrastructure, from day one, such as 58 MW power plant, own jetty to cater the needs of sea route transportation, desalination plant and road network.

It was amongst the first few cement players to focus on branding a commodity product like cement in India. Today, the 'Sanghi Cement' brand is a household name across Gujarat. It is now focusing on emulating this success story in the neighboring states. Unique initiatives like its 'Toll Free Service', 'Customer Care Centers’ and 'Shakti Raths' have further cemented the Sanghi Cement brands recall value amongst retail as well as institutional customers.

**Please tell us about the recently announced capacity expansion at Sanghipuram?**

We plan to increase our current capacity of 3 MTPA to 7 MTPA over the next few years through a mix of debt and equity funding.

**How is the Indian cement industry compared in the global market?**

Global cement production has been growing at an average rate of 6.4% in the last five years from 2.57 billion tones in 2006 to 3.29 billion tones in 2010. China, with an average annual growth of 11% and India, with an average annual growth of around 10% have been the major growth drivers of the global cement output. India is the second largest cement producer in world after China.

The turnover of the Indian cement industry has been estimated at $25 billion in 2010-11. During the last five years (2006-2011), while installed capacity increased at an average annual rate of 13.6%, production witnessed an increase of 9.1% during this period. Total capacity that is expected to be created /commissioned at the end of Eleventh Five Year Plan by 2011-12 is 331 million tones, about 10% higher than the plan target. Since there has been a slowdown in the GDP growth and a drop in the demand for cement, particularly in the period 2009-12, this additional capacity has led to lower capacity utilization. Capacity utilization has come down from around 94% during 2006-07 to about 84% during 2009-10 and is expected at around 75% in 2011-12.
With terms like inflation, downturn, poor sales crowding the air what is the real situation of the cement industry today? How are the companies coping with the situation especially in terms of energy sources?

Year 2011 has been a bumpy ride for the Indian cement sector. The impediments which have created the impact on the industry are recent devaluation of rupee and costlier bank fund which further led to a rise in freight and logistics cost. The transportation cost, which account for 25% to 30% of the total cement cost, has been increasing due to recent increase in rail freight rates and a moderate increase in road freight. Power and fuel costs, which are 30-35% of overall cost structure have increased significantly over the last few years. The rupee depreciation has made imported coal even more costly.

The year 2011-12 has also proved to be a difficult year for the industry due to excess capacities and higher input costs. Cement production capacities at over 300 million tone currently are significantly higher than the 220-240 million tpa demand projected for 2012. Supply is expected to outstrip demand for the next two years, as an incremental cement capacity of around 75 million tpa is going to get added, most of which will be in the south and central regions.

**Deposit:**

The Company has not accepted any deposits within the meaning of Section 58A of the Companies Act, 1956.

**Corporate Governance:**

The Company has complied with the Corporate Governance Code as stipulated under the Listing Agreement executed with the Stock Exchanges. A separate section on the Corporate Governance Practices followed by the Company together with the certificate from the Company's Auditors confirming compliance is set out in the Annexure forming part of this report.

**Listing:**

The Company's securities are listed with the Stock Exchanges at National Stock Exchange and Bombay Stock Exchange. The Company has paid the listing fees for the year 2012-13 to the Stock Exchanges.
Particulars of Employees:
As required by the provisions of Section 217(2A) of the Companies Act, 1956 read with the Companies (Particulars of Employees) Rules, 1975 as amended, the names and other particulars of employees are set out in the Annexure to the Directors' Report. However, as per the provisions of Section 219(l) (b) (IV) of the said Act, the Annual Report and Abridged Accounts are being sent to all the shareholders of the Company excluding the said information. Any shareholder interested in obtaining a copy of this statement may write to the Company Secretary at the Registered Office of the Company.

Auditors:
M/s. Ankit & Company, Chartered Accountants, Hyderabad and M/s. Haribhakti & Company, Chartered Accountants, Ahmadabad, the Joint Statutory Auditors of the Company hold office until the conclusion of the ensuing Annual General Meeting. The Company has also received confirmation from them to the effect that their appointment, if made by the Company for the year 2012-13, would be within the limits prescribed under Section 224(1 -B) of the Companies Act, 1956. Your Board of Directors recommends their appointment as Joint Statutory Auditors of the Company.

Foreign Exchange Earnings and Outgo:
Particulars with regard to Foreign Exchange Earnings and Outgo are set out in Note 1, Para II (m) of the Notes on Accounts of Annual Report.

Social Responsibilities:
Your Company enjoys the distinction of being one of the first cement companies in India to be awarded SA: 8000:2001 i.e. Social Accountability Certificate for its plant for the last three years. Social Accounting is a process of ongoing monitoring, evaluation and accountability which helps an organization to measure its performance against social, environmental and economic objectives and ensures that its working is in accordance with its values.

This certification is a result of the sincere and untiring efforts put in by the management for fulfilling its Corporate Social Responsibility over the last decade for

- Creating green revolution in the desert of Kutch region by cultivating land for growing trees, fruits, vegetables and flowers
Providing educational facilities through a CBSE affiliated School.
Providing hospitals and first aid facilities within few hundred kilometers
Conducting social awareness programmed on various issues.

Environment and Pollution Control:
Your plant is certified for Environment Management System ISO: 14001:2004. Stringent internal environmental measures are adopted, adhered to and maintained to run the plant operations in an eco-efficient manner.

Some of these measures include:
- VVFD Drive installed at ESP fan in cement mills and at kiln feed for dedusting bag filter
- Rain Water Harvesting on large scale with interconnection of all reservoirs with total pipe length of 3.5 km to reduce the water cost substantially
- Installation of RO Plant to improve water quality and reduce use of desalination process
- Mix of fly ash for PPC grinding, enabling safe disposal of fly ash
- Plantation of new trees and shrubs to control airborne particles and beautify the premises
- Adoption of designing processes and cleaner technologies for minimizing the adverse environmental impact
- Optimizing resource efficiency in plant operations to minimize waste while maximizing treatment of inevitable wastes in an environmentally compatible manner
- Optimum utilization of resources including mineral, chemical, water, energy and other non-renewable resources

Efforts to improve the green cover and for conservation of bio-diversity and natural environment multi-purpose trees including mango grafts are planted and nurtured for tackling the natural adversity of the local environment such as scarcity of water, saline land, shortfall of minerals etc.

- Adopting sound emergency preparedness and resources programme.
- Encouraging the recycling of inevitable wastes including from other industrial units
- Efficient Surface mining at captive mines and use of flyash in operations for reducing the environmental impact
➢ Collection and treatment of entire sewage generated from various places of the Plant/Colony through Root Zone Technology System (RZTS) for augmenting the supply of water for gardening, plantation and green belt development within the premises.

➢ Environmental Audit is being conducted by Det Norske Veritas (DNV) (Authorised Independent Management System Auditors) since the last few years for conforming to and improving the environmental standards adopted at Plant.

➢ Efforts to reduce the green house effect on environment are continuously made by adopting the Clean Development Mechanism Cell (CDM).

➢ The Company has developed environment friendly and safe mining practices and has received various awards for its mining practices over the years as follows:

➢ Noise, Vibration and Aesthetic beauty for Limestone Mines

➢ Overall Best Performance for all Captive Mines.


**Conservation of Energy:**

The MIS Cell and Energy Steering Committee analyses the energy consumption parameter on daily basis with an intention to reduce the high and ever rising cost of energy in the manufacturing process, as well as to reduce its adverse impact on the environment. The Committee constantly updates itself with the new developments in the field of energy including use of alternative resources and its viability for the use in our Plant. Apart from implementing the measures which were initiated last year, the following new measures have been implemented during the year.

1. Interlocks installed in Raw Material handling Belts and Pre-Heater to reduce the consumption of electrical and thermal energy.

2. Power saving drives installed to reduce energy consumption in Clinker and Cement Grinding Units as well as Thermal Power Plant.

3. Installation of new CG - VFD and new APH tubes to reduce auxiliary power consumption in Captive Power-Plant.

4. Reconstruction of internal roads to reduce fuel consumption of internal vehicle movement.

5. Installation of web based energy monitoring system at all facilities.
Technology Absorption, Adaptation and Innovation:
Your Company adopts value engineering techniques for enhancing productivity and cost effectiveness. All efforts are made to explore the possibility of replacing certain imported parts of machineries with indigenous parts for reducing the cost and level of inventory considering the easy availability on time.
Your Company continues to make conscious efforts to evaluate opportunities for technological innovation, upgradation for improving level of operations resulting into savings in cost and enhanced efficiencies.

Industrial Relations:
Industrial relations continued to be cordial throughout the year under review. Your Directors wish to place on record their appreciation for the excellent team work with which the workers and officers of the Company at all levels have contributed individually and collectively to the performance of the Company.
1.10.3 SHREE DIGVIJAY CEMENT PVT. LTD:

Company Profile:
Shree Digvijay cement co ltd., established in 1942 at sikka – Jamnagar and one of the pioneers in the cement business, is a flagship company of votorantim. A fully computer controlled plant; it has a production capacity of 1.30 million tons per annum.

Its basket of product includes special cements like oil well cement, Sulphat resisting Portland cement and railway sleeper manufacturing cement in addition to other varieties of ordinary Portland cement etc.

Well connected by road, air and sea, Digvijay has its own port. Digvijay prolific experience in the domestic and international markets is now further honed with the votorantim group management skills and technology.

Our Brand:
“KAMAL” cement is a well-known name in the cement industry. We have a significant market share in Gujarat and internationally in SAARK countries, Middle East and east Africa.

Location:
Sikka is situated in the state of Gujarat, India on western coast at the Gulf of Kutch. The rich culture of sikka is drawn from the famous Dwaraka temple of lord Krishna, 120 Kms away from it. It is also a proud neighbor to the city of Jamnagar, an industrial hub. Traditionally it has been a costal township famous for fishing and pearl trade. Today it boasts of a world famed marine park and sanctuary, the abode of rare marine life.

History of Company:
Presently as a part of votorantim group, Digvijay witnessed various up and downs since inception as indicated below:
1944  Digvijay traces its origin 6th November by bangers.
1947  Started commercial production with 1 lace M.T capacity per annum.
1953  Fixed expansion making total capacity to 2 laces M.T per annum.
1954  Construction of aerial ropeway, unique system in the country transportation
Of Sea-sand from jetty to plant

1956 Second expansion to increase the production capacity to 4 lack M.T per annum.
1957 Ropeway put in to operation.
1958 West coast paper mills ltd commissioned with financial help of Digvijay.
1959 Clinker grinding plant commissioned at Mumbai known as “Bombay Cement Mills” with annual capacity of 1 lakh M.T
1960 Asbestos plant installed at Ahmadabad known as “asbestos product Division”
1964 Ropeway system installed for transportation of clinker and cement directly to ship from factory
1966 Commissioned cement grinding unit at Ahmadabad known as Ahmadabad Cement mills.
1967 Enhancement of cement production capacity to 6 lack M.T per annum.
1979 Beware cement project initiated with financial help of Digvijay.
1982 Amalgamation of Hastings jute mill, shreeram silk mill and relax on.
1984 Conversion of meter gauge line in to broad gauge line.
1985 ➢ Dry process plant commissioned.
➢ Lockout at Bombay cement mill.
1989 Digvijay become sick and registered with BIFR first time.
1992 Digvijay came out of BIFR through profit and equity infusion.
1994 Demerger of fiber product division, Ahmadabad cement mill, shreeram Silk mill and relax on from Digvijay.
1998 ➢ Hastings just mills sold
➢ Grasim acquire management control of Digvijay.
➢ Digvijay became sick second time.
2000 Installation of captive power plant (DG Seat) and upgradation of Cement mill to reduce cost.
2001 Digvijay was badly affected in earthquake.
2002 Downsizing of manpower through VRS
2007 Digvijay came out from BIFR.
2008 Cimpor acquired management control of Digvijay.
2013 Votorantim acquired management control of Digvijay.
Whistle Blowing System:
Votorantim has an ombudsman in order to learn about, analyze and solve issues regarding its code of conduct. This channel may be accessed both by internal and external audience.
Impartial and transparent, the ombudsman ensures the confidentiality of all information, preserving the identity of people involved, and collaboration to promote a better environment for everyone. The ombudsman may be contacted to clarify doubts regarding the interpretation of the code of conduct, and to make complaint of violation of the code of conduct, such as corruption, bribery, fraud, environmental aggression false information, inadequate accounting records, and poor use of the company’s assets, discrimination by race, color, religion, sex, physical or social condition, and unethical behavior and procedures.

Product:
We are leading manufacturer & exporter for the product which also includes ordinary Portland cement 43 grade & ordinary Portland cement 53 grade since 2004
➢ Ordinary Portland cement 53 Grade (OPC) as per BIS/ASTM/SLS Standards.
➢ Ordinary Portland cement 43 Grade (OPC)
➢ Sulphate Resisting Portland cement (SRPC)
➢ Oil Well Cement Class ‘G’ Grade HSR (as per API specification 10A)
➢ Portland Pozzolona Cement

➢ Ordinary Portland cement 53 Grade:
53 Grade Cement is prime brand cement with a remarkably high C3S (Tri Calcium Silicate providing long-lasting durability to concrete structures.

Ideal Applications:
High-rise buildings, residential, commercial & industrial complexes, roads, runway, bridges and flyovers.
For heavy defense structures like bunkers pre-stressed concrete structures.

➢ Ordinary Portland cement 43 Grade (OPC):
43 Grade cement is the popular brand cement with low heat of hydration and long life of concrete structures.
Advantages:

- Develops early strength at 3 and 7 days with exceptionally high 28 days strength from work of slabs and beams can be removed much earlier which result in increased speed of construction.
- Unbeatable consistency in quality gives better accountability for mix design.
- The higher characteristics strength of concrete leads to higher bond strength minimizing the possibility of slippage of reinforcement.
- The dense and least permeable concrete prevent leakage/seepage problems.
- Its high fineness offers better workability for given water cement ratio ensuring very dense, compact and durable concrete.
- Being the low alkali cement it provides insurance against alkali-aggregate reaction, this result in durable structures.

Ideal Applications:

- Residential and commercial complex
- PPC solid and hollow blocks
- Defense construction
- Airport - Runway.
- Cement tanks.
- Asbestos cement products
- Concrete roads and Ferro-cement concrete elements

Sulphat Resisting Portland cement (SRPC):

Concrete made with Sulphat resisting cement is less vulnerable to Sulphat attacks because its C3A is lower than 5% thereby reducing the formation of ettringite (expansive hydrates). Sulphat resisting cement is manufacturing from a synthesis of different specific standard raw materials of high purity under strict supervision of an expert technical team.

Advantages:

- Complete assurance against Sulphat attack.
- Enhanced life and durability of structure under aggressive conditions
- Progressive high compressive strength
- Corrosion resistance of steel by preventing Sulphat and chloride attack
Ideal Applications:

- Ports, Harbors, Docks
- Dams exposed to saline and polluted water
- Construction activity in saline land
- Construction exposed to sea water, e.g. sea walls, break water, tetra pods
- Constructions of sewage and drainage system
- Effluent treatment plants
- Chimney, cooling towers
- Chemicals industries, water storage, underground foundations, etc.

- Oil Well Cement Class ‘G’ Grade HSR (as per API specification 10A)

Oil well cement is commonly used in the form of cement slurry for cementing oil wells under extreme conditions of high temperature and pressure under sea etc.

BUSINESS:

Domestics:

We have a significant presence in Gujarat. Our market share in Gujarat is about 10-11%. We have an enhanced presence in the special cement segment. Our market share for 2004-05 for oil well cement was 40% for 53-S, it was 15% and for SRPC it was 10%.

International:

The company backed by its prolific experience, management skills and commitment along with state of the art technology makes its product presence in the international business and quest to meet the requirement of discerning customers and a concrete ambition to build a stronger globe. The company had successfully established its presence by exporting varieties of cement & cement clinker to the following:

- U.A.E, Somalia, Yemen, Bangladesh, Qatar, Srilanka, Iraq, Kuwait, Behrin, Philippines, Other SAARC and African Countries

By its meritorious performance on the export front the company has been recognized by the government of India and the international organizations of repute.

Quality Policy:

We at shri Digvijay Cement Co. Ltd., believe that the purpose of our business and existence in society at large “Total customer satisfaction”
In pursuit of excellence, we commit to:

- Manufacture & Supply of cement as per customer requirement, complying with National and/or international standards
- Continually improve effectiveness of quality management system through Productivity improvement, cost reduction, use of eco-friendly, and safe Technology.
- Promote work culture of team building and employees involvement at all levels.

**Occupational Health & Safety Policy:**

“Maintain safe and healthy work environment “

**Our Commitment:**

- Compliance with all applicable legislation and regulations
- Continual improvement in hygienic, health and safety standards

**Our Endeavour:**

- To detect and prevent accidents
- To control occupational health hazards.
- To ensure operational safety and reduce risks to human being, machinery and Business as a whole
- To inculcate safety culture through awareness, training and involvement of all concerned

**ENVIRONMENT POLICY:**

**Our Aims:**

Work for a clean and green environment, following the concept of sustainable development.

**Our Commitments:**

- Compliance with all applicable legislation and regulations
- Continual improvement in our environmental performance and to cooperate with the Surrounding communities
- Prevention of pollution in our activities

**Our Endeavour:**

- Conservation of natural resources
- Reduction in dust emission, spillage & waste
Our Value Added Services:
- Concrete mix design and cube testing facility.
- Non-destructive testing of concrete and testing facilities for building materials
- Training programmed for masons, site supervisors & engineers on good construction practices.
- Mobile concrete lab services
- Field visits by qualified civil engineers.
- Educating individual household building on various aspect of building material and Construction
- Any other customer specific services

Vision:
To ensure continuous growth as a major family owned company that is respected and recognized in the communities in which it operates, with a focus on creating economic, environment and social value through:
- Ethical values that guide responsible corporate conduct
- Highly competitive business
- Search for creative and innovative solutions for its portfolio.
- People motivated to perform at the highest levels.

Aspiration:
Attain long-term growth with sustainable development. Reach world-class operation and management standards comparable to those of the best global enterprises.

Values:
Votorantim values permeate all of its actions, decisions and relationships with its various audiences:
SOLIDNESS: Pursuing sustainable growth and value creation.
ETHICS: Always acting responsibly and transparently.
RESPECT: Respecting people and always being ready to learn.
ENTERPRENEURSHIP: Growing with the courage to do, innovate and invest.
UNITY: The whole is stronger than the sum of parts.
BELIEFS:

Cultivating Talents: We believe in and trust people, we invest time and resources cultivating their talents.

Meritocracy: We believe that people are unique and, thus, deserve to be valued fairly and in accordance with their accomplishments and deliverables.

Excellence: We believe we can do more and better, overcoming challenges with Discipline, humanity, and simplicity

Pragmatism: We believe that it is essential to concentrate efforts on what is relevant, in an objective manner without losing sight of the big picture and the future.

Open Dialogue: We believe that an environment of trust favors open dialogue and a forum to speak and be heard in, where a diversity of opinion can create better solutions.

Alliance: We believe our success is the outcome of the joint construction, strengthened by genuine relationships and win-win alliances.

Sense of Ownership: We believe in those who take on responsibilities, who work with passion and walk the talk, celebrate achievements and turn mistakes in to learning experience.

Sustainability Principals:
Continuation and growth of its business in the long term, anticipating the motivations of interested parties, and incorporating them into its objectives this means: Being recognized by society as a socially and environmentally responsible company having sustainability as a strategy, guiding corporate governance, management, education, decisions and investments creating value consistently improving economic, social and environmental results, pursuing efficiency and reliability in operations according to world-class standards.

Being recognized as a company that attracts, develops and retains talented people to generate value and build a fair and inclusive society. Being committed to the well-being, health and safety of its employees, clients and partners contribution to the development of the communities in which the group operates.
Encouraging the cooperation and participation of all employees and interested parties in building partnerships and stimulating teamwork, in order to create mutual value

People:

Quality in human resources management is one of the pillars in the votorantim group’s management model. In order to ensure such quality, the votorantim development system (SDV, in Portuguese) develops a culture of excellence in operations, focus on results, respect for the corporate values, adopting meritocracy at all levels. Attracting and retaining talented people involves offering opportunities for personal and professional growth to all employees, as well as remuneration and benefit policies, health and safety, and quality of life. One of the initiatives is the academy of excellence, which is a kind of corporate university which helps to develop leadership and technical improvement. The movement’s project completes the development model, organizing the mobility of professionals within the companies of the group.

The alert movement was created to ensure a standardized communication related to safety at industrial plants. It outlines the rules that can help preventing risk exposure. It compliment the golden rules established to highlight specific procedures and to guarantee that operations are conducted according to most rigid safety standard.

Code of Conduct:

The board members and senior managers shall observe the highest standards of ethical conduct and integrity and shall work to the best of their ability and judgment.

The board members and the senior managers of the company,

(1) Shall maintain and help company in maintaining highest degree of corporate governance practices.
(2) Shall act in utmost good faith and exercise due care, diligence and integrity in performing their office duties.
(3) Shall ensure that they use the company’s assets, properties, and information and intellectual right for official purpose only or as per the terms of their appointment.
(4) From company’s business associates, which can be perceived as being given to gain favor or dealing with the company and shall ensure that the company’s interests are never compromised.

(5) Shall maintain confidentiality of information entrusted by the company or acquired during performance of their duties and shall not use for personal gain or advantage.

(6) Shall not commit any offences involving moral turpitude or any act contrary to law or opposed to the public policy.

(7) Shall not communicate with any member of the press or publicity media or any other outside Agency on matter concerning the company, except through the designated Spokespersons or authorized otherwise

(8) Shall not without the prior approval of the board or senior management, as the case may be accept employment or a position of responsibility with any other organization for remuneration or otherwise that are prejudicial to the interest of the company and shall not allow personal interest to conflict with the interest of the company

(9) Shall in conformity with applicable legal provisions disclose personal and/or financial interest in any business dealings concerning the company and shall declare information about their relatives (spouse, dependent children and dependent parents) including transactions, if any entered in to with them.

(10) Shall ensure compliance of the prescribed safety & environment related norms And other applicable codes, laws, rules regulations and statutes, which if not Complied with May, otherwise, disqualify him/ her from his/ her association with The company,

(11) Shall ensure compliance with SEBI (prohibition of insider trading) Regulations, 1992 as also other regulations as may become applicable to them From time to time,

**Annual Compliance Reporting:**

Board member and senior manager shall affirm compliance with this code on an annual basis as at the end of the each financial year of the company (as per appendix I within 7 days of the close of every financial year).
Acknowledgement of Receipt of the Code:
Each board member and senior manager both present and future shall acknowledgement receipt of the code or any modification thereto, in the acknowledgement from annexed to this code as appendix-II and forward the same to the compliance officer.

Any breach of the aforesaid code brought to the notice of the compliance officer or any member of the board or senior management shall be reported to the board of directors of the company for necessary action.

Shree Digvijay cement co ltd, establishment on November 6, 1949 at sikka- Jamnagar and one of the pioneers in the cement business, is a flagship company of the Cimpor group. Cimpor acquired management control of the company in the year 2008.

Its basket of products includes special cement like oil well cement, sulphate resisting Portland cement and railway sleeper manufacturing cement in addition to other varieties of ordinary Portland cement etc. it has a fully computer controlled plant and has a production capacity of 1.30 million tons per annum.

Well connected by road, rail, air, and sea, Digvijay has its own port. Digvijay’s prolific experience in the domestic and international markets is now further honed with the Cimpor group’s management skills and technology.

The company’s brand ‘KAMAL’ Cement is a well-known name in the cement industries. They have a significant market share in Gujarat and internationally in SAARC countries, Middle East and east Africa.

The company backed by its prolific experience, management skills and commitment along with state of the art technology makes its products presence in the international business and quest to meet the requirement of discerning customers and a concrete ambition to build a stronger globe.

The company had successfully established its presence by exporting varieties of cement & cement clinker to the following countries: UAE, Somalia, Yemen, Bangladesh, Qatar, Srilanka, Iraq, and Kuwait, Behrin, Philippines and other SAARC and African countries.
Awards & Achievement:

National Awards Won By Digvijay:
- 1982- National Productivity Award
- 1996- National Productivity Award
- 2003- National Energy Conservation Award
- 2004- National Energy Conservation Award
- 2005- National Energy Conservation Award, Certificate of merit
- 2006- National Energy Conservation Award

Other Awards/ Certification:
- 1989- American Petroleum Institute Certification
- 1996- ISO-9002 Accreditation
- 2002- Bharat shell’s Lubricant Excellency Awards
- 2003- Century International Quality Era Award in Gold Category
- 2005- ISO-14001 (Environment Management system) Certification
- 2005- OHSAS 18001 Certification

Awards/ Certification on Export Front:
- 1994- Recognition as ‘Export House’ 1995 Golden Jubilee Year
- 1995- Recognition of Merit for Meritorious Export Performance
- 1997- Certificate of Merit for Export Achievement
- 2005- CAPEXIL Special Export Award
- 2006- CAPEXIL Special Export Award

Port- Sikka Potty:
To cater to the international market, we have our captive all weather working port- Sikka jetty under Bedi Group of ports situated at Sikka, Gujarat, and west coast of India at a distance of about 1.70 Kms from our plant. The jetty at Sikka offers excellence tranquility condition for safe and low cost vessels operations at anchorage with no waiting period where available draughts ranging from 9 meters to 25 meters. The load / discharge rate, which is available from/ wharf operation.
<table>
<thead>
<tr>
<th>COMMODITY</th>
<th>LOAD/ DISCHARGE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement (bagged)</td>
<td>1500 MT PWWD</td>
</tr>
<tr>
<td>Clinker (in bulk)</td>
<td>8000 MT PWWD</td>
</tr>
<tr>
<td>Coal (in bulk)</td>
<td>8000 MT PWWD</td>
</tr>
</tbody>
</table>

The wharf is a shallow depth wharf of 135 M long operative at high water conditions. An approach road of 846 meters long connects the wharf to the shore. During high tide, water draught ranging from 3.5 meters to 4.2 meters is available at the wharf operation.

The loading and unloading operations take place through lighter age operations by barges, where the mother vessels are anchored at a distance of 3.5 to 6 Kms depending on the available draught of the vessel.

Lighted buoys for safe navigation mark the channel in the Gulf of Kutch. Safe anchorage with 12 meter of water is available at a distance of 5.5 Kms from the port/wharf site for anchoring 3000-35000 DWT vessels and for 20-25 meter of water is available at a distance of 10 Kms from the port site for anchoring 100000 DWT vessels.

Facilities Available:
- **Stock yard:** SDCC owned stock yard having capacity to store 2 laces MT cargo.
- **Distance from wharf approx. To stock:** 1.5 Kms yard.
- **Weighment:** SDCC owned weight bridge (2 Nos) in the stock yard itself.
- **Transport facility:** Trucks- sufficient numbers of trucks are available with stevedores and local transporter at sikka. Railway – SDCC has its private railway siding in its premises. Railway station- sikka (under western railway)
- **Security:** Security agencies are available.
- **Other facilities:** Water sprinkling and firefighting equipment are available.
- **Government agency:** Customs, Port, Bank and Post office etc. are available in the company premises itself.

**Service with Smile, Round the Clock:**
To give our valued customers and construction professionals, suitable technical advice and support, we have a dedicated service cell TASC (technical assistance and service to customers) for round the clock service.
**Investor Centers:**
We have created this investor center for our shareholders to know the financial data, company reports, shareholder information, forms and contact details they need. The data is simple and reader friendly.

**Board of Directors:**
1 Mr. A.K Chhatwani- Independent Director (Chairman)
1 Mr. A.Kumaresan – Independent Director
2 Mr. Osvaldo Ayres Filho
3 Mr. Carlos Eduardo De Arruda Boggio
4 Mr. Sven Erik Oppelstrup Madsen
5 Mr. Chain Singh Jasol (Whole time director)

**Audit Committee of Directors:**
1 Mr. A.K Chhatwani (Chairman)
2 Mr. A.Kumaresan Independent Director
3 Mr. Osvaldo Ayres Filho

**Remuneration Committee of Directors:**
1 Mr. A.Kumaresan (Chairman)
2 Mr. A.K Chhatwani
3 Mr. Carlos Eduardo De Arruda Boggio

**Share Transfer and Shareholders/ Investors Grievance Committee:**
1 Mr. A.Kumaresan (Chairman)
2 Mr. Carlos Eduardo De Arruda Boggio
3 Mr. Chain Singh Jasol
1.10.4 ULTRATECH CEMENT PVT.LTD:

The roots of the Aditya Birla Group date back to the 19th century in the picturesque town of Pilani, set amidst the Rajasthan desert. It was here that Seth Shiv Narayan Birla started trading in cotton, laying the foundation for the House of Birla's.

Through India's arduous times of the 1850s, the Birla business expanded rapidly. In the early part of the 20th century, our Group's founding father, Ghanshyamdas Birla, set up industries in critical sectors such as textiles and fiber, aluminum, cement and chemicals. As a close confidante of Mahatma Gandhi, he played an active role in the Indian freedom struggle. He represented India at the first and second round-table conference in London, along with Gandhi. It was at "Birla House" in Delhi that the luminaries of the Indian freedom struggle often met to plot the downfall of the British Raj.

Ghanshyamdas Birla found no contradiction in pursuing business goals with the dedication of a saint, emerging as one of the foremost industrialists of pre-independence India. The principles by which he lived were soaked up by his grandson, Aditya Vikram Birla, our Group's legendary leader.

Aditya Vikram Birla: putting India on the world map

A formidable force in Indian industry, Mr. Aditya Birla dared to dream of setting up a global business empire at the age of 24. He was the first to put Indian business on the world map, as far back as 1969, long before globalization became a buzzword in India.

In the then vibrant and free market South East Asian countries, he ventured to set up world-class production bases. He had foreseen the winds of change and staked the future of his business on a competitive, free market driven economy order. He put Indian business on the globe, 22 years before economic liberalization was formally introduced by the former Prime Minister, Mr. Narasimha Rao and the former Union Finance Minister, Dr. Manmohan Singh. He set up 19 companies outside India, in Thailand, Malaysia, Indonesia, the Philippines and Egypt.

Interestingly, for Mr. Aditya Birla, globalization meant more than just geographic reach. He believed that a business could be global even whilst being based in India.
Therefore, back in his home-territory, he drove single-mindedly to put together the building blocks to make our Indian business a global force.

Under his stewardship, his companies rose to be the world's largest producer of viscose staple fiber, the largest refiner of palm oil, the third-largest producer of insulators and the sixth-largest producer of carbon black. In India, they attained the status of the largest single producer of viscose filament yarn, apart from being a producer of cement, grey cement and rayon grade pulp. The Group is also the largest producer of aluminum in the private sector, the lowest first cost producers in the world and the only producer of linen in the textile industry in India.

At the time of his untimely demise in 1995, the Group's revenues crossed Rs.8,000 crore globally, with assets of over Rs.9,000 crore, comprising of 55 benchmark quality plants, an employee strength of 75,000 and a shareholder community of 600,000.

Most importantly, his companies earned respect and admiration of the people, as one of India's finest business houses, and the first Indian international Group globally. Through this outstanding record of enterprise, he helped create enormous wealth for the nation, and respect for Indian entrepreneurship in South East Asia. In his time, his success was unmatched by any other industrialist in India.

That India attains respectable rank among the developed nations was a dream he forever cherished. He was proud of India and took equal pride in being an Indian.

**Overview:**

UltraTech is India's largest exporter of cement clinker spanning export markets in countries across the Indian Ocean, Africa, Europe and the Middle East. UltraTech and its subsidiaries have a presence in 5 countries through 11 integrated plants, 1 white cement plant, 1 clinkerisation plant, 15 grinding units, 2 rail and 3 coastal terminals and 101 RMC plants. Most of the plants have ISO 9001, ISO 14001 and OHSAS 18001 certification. In addition, two plants have received ISO 27001 certification and four have received SA 8000 certification.

The certification process is currently underway for the remaining plants. The company exports over 2.5 million tons per annum, which is about 30 per cent of the
country's total exports. Ultratech products include Ordinary Portland cement, Portland Pozzolona cement and Portland blast-furnace slag cement.

Ultratech Cement is the ultimate 360° building materials destination, providing an array of products ranging from grey cement to white cement, from building products to building solutions and an assortment of ready mix concretes catering to varied needs and applications.

**Footprint:**

Ultratech is the 10th largest cement manufacturer in the world making it a significant global player. It has grinding units, jetties, bulk terminals and integrated plants all across the world. Ultratech Cement is the country's largest cement clinker exporter, catering to export markets in countries across the Indian Ocean, Africa, Europe and the Middle East. Such diverse presence across countries has helped Ultratech leverage economies of scale and enabled it to become a name to reckon with in the international market.

**Projects:**

Ultratech is proud to be associated with some of India's largest infrastructural projects, contributing to them through the supply of its high quality cement, concrete and allied products. Being The Engineer's Choice' has made Ultratech the preferred brand for large infrastructural projects of repute that contribute to India's growth story. Realizing the criticality and linkage of these projects to nation building, Ultratech has set up dedicated plants at project sites to cater to the projects' concrete and cement requirements, customizing the product as per required quality standards and providing it in real time. Bandra Worli Sea Link, Mumbai Metro, Bangalore Metro and Kolkata Metro are all built on the robustness and high quality standards of Ultratech Cement.

**Environment:**

Ultratech believes in building a sustainable business that is environmentally conscious. The progress of Ultratech eco-friendly initiatives is measured through set parameters. In the last few years, there have been many noteworthy achievements. And goals for a greener future have already been set.
Ultratech has taken several pro-environment initiatives as part of its sustainability campaign. These include: 19.63 percent of net specific CO2 emissions have been reduced till 2012 in comparison with the base line of 2000. 19.642.39 million gigajoules (GJ) of energy has been produced through alternative fuels (excluding pet-coke) during 2010-12.

Waste materials constituted 13.75 percent of the total Raw Materials consumed in 2011-2012. 8.5 hectares of mining land has been reclaimed in the area near the Jaffrabad plant in Gujarat, along a freshwater lake, by planting many varieties of trees and shrubs.

A 6.51 hectare freshwater lake has been created in the mined-out pits after the extraction of lime stone in Jaffrabad. An forestation programme has been initiated on 19.6 hectares of land at the Kovaya plant in Gujarat.

**Social Project:**

Mainstreaming CSR into our businesses and delivering societal value has given Ultratech tremendous returns, albeit of a different kind - the turnaround of human lives, lifting tens of thousands of people out of stark poverty. Ultratech works with numerous rural and tribal communities across India. It has already turned many villages into model villages that are completely self-sufficient.

**Towards Inclusive Growth:**

In the last two decades, India as a nation has been successful in pulling up a significant number of people from below the poverty line. Unfortunately, we still have a quite a large number of our people living below the poverty line - that is on less that US $ 1.25 a day. This is a problem. The Government of India has an ambitious vision for inclusive growth. There is the overwhelming challenge to improve the lives of the poor. However much it hurts, we have to reckon with the fact that we have the largest concentration of the poor in the world. Today, more than ever it is necessary to look into societal issues and it behoves corporate to proactively partner with the government to see that inclusive growth happens.
Ultratech Cement is proud to be part of a legacy of the Aditya Birla Group, where caring for the underserved is an unwritten edict that has been followed by generation after generation.

Ultratech endeavors to bring in inclusive growth are channelized through the Aditya Birla Centre for Community Initiatives and Rural Development, of which, Mrs. Rajashree Birla is the Chairperson. This year the coveted Asian CSR Award was conferred on Vikram Cement for its excellent work in healthcare at their Awards ceremony held in Malaysia. Likewise, the prestigious Golden Peacock Award (India) for CSR was conferred on Birla White.

Above all this year the President of India bestowed the Padma Bhushan Award on Mrs. Birla in recognition of her exemplary social work. She was also the recipient of the Golden Peacock Life Time Achievement Award for Community Development, which she received in Portugal at the hands of the honorable former Prime Minister of Sweden Mr. Ola Ullsten.

The Company's CSR activities are concentrated in 407 villages, in proximity to its 22 Plants, across the country.

Vision:

"To actively contribute to the social and economic development of the communities in which we operate. In so doing, build a better, sustainable way of life for the weaker sections of society and raise the country's Human Development Index."

Mrs. Rajashree Birla, Chairperson, the Aditya Birla Centre for Community Initiatives and Rural Development

Stagey:

Our projects are carried out under the aegis of the 'Aditya Birla Centre for Community Initiatives and Rural Development', led by Mrs. Rajashree Birla. The centre provides the strategic direction and the thrust areas for our work, while also ensuring performance management. Our focus is on the all-round development of the communities based around our plants, most of which are located in distant rural areas and tribal belts.
**Project identification mechanism:**

All projects are planned in a participatory manner, in consultation with the community. The process involves interacting with them and gauging their basic needs. We take recourse to 'participatory rural appraisal', which is a mapping process.

Furthermore, based on a consensus and in discussion with the village panchayats, we priorities requirements thus, a project is created. Implementation is the responsibility of the community and our team. And so is the monitoring of milestones and other aspects. Monitoring entails physical verification of the progress and the actual output of the project.

Village meetings are held periodically to receive feedback on the benefits of our community programmers and on the areas where these need to be revised. We try to ensure, that even though in the short term we have to put in enormous efforts, eventually, the projects will be made sustainable by the efforts of the beneficiaries themselves. Once the project becomes self-sustaining, complete control is handed over to the villagers. This transfer of responsibility ensures a culture of independence and self-reliance.

**Model villages:**

One of our unique initiatives is to develop model villages. Hence each of our major companies is working towards the total transformation of a number of villages in proximity of their plants. A model village entails ensuring self-reliance in all aspects viz. education, health care, family welfare, infrastructure, agriculture, watershed management and sustainable livelihood options. The fundamental aim is to ensure that their development reaches a stage where the village committees take over complete responsibility and our teams become dispensable.

Of the 3,000 villages that we are associated with, we have selected 300 villages that we hope to turn into model villages. Over a period of time, we expect to see a major transformation of these villages. More than 80 villages in the hinterlands have already become model villages. The social situation in many villages has gone from dependence to freedom and from backwardness to progress.
Share Transfer and Investors Services:

Share transfers in the physical form are presently registered and returned to the shareholders within 12 days of receipt of valid documents. The company's equity shares are available for trading in the dematerialized mode only. The equity shares have been admitted with The National Security Depository Ltd., and Central Depository Services (1) Ltd., bearing ISIN NO.INE481G01011. Request for share transfer, sub-division, consolidation, transmission, issue of duplicate share certificates and any investor grievances can be addressed to the registered office or to the Office of the Registrar & Transfer Agents.

Logistics:

Ultratech Cement has more than 200 sales offices across the country, which handles a combined load of around 14,000 orders per day. They do so through their efficient logistics department. Ultratech uses the latest technology to ensure that all stakeholders can track the delivery status of their orders in real time. Vehicle-based GPS technology is also being used to increase the efficiency of the fleet.

Milestones:

Ultratech inception can be traced back to the mid-1980s with the establishment of Grasim's first cement plant at Jawad in Madhya Pradesh. In 2001, with the objective of increasing its reach, Grasim acquired a stake in L&T Cement Ltd. The stake was further increased to a majority stake in 2003 thereby giving Grasim a pan-India presence and an increased market share. In 2004, the demerger of L&T's cement business was completed and Grasim acquired a controlling stake in L&T Cement Ltd and the name was subsequently changed to Ultratech cement. The cement business of Grasim was demerged and vested in Samruddhi Cement Limited in May 2010, with Samruddhi Cement Limited consequently being amalgamated with Ultratech Cement Limited in July 2010. In September 2010, Ultratech Cement Middle East Investments Limited, a wholly owned subsidiary of Ultratech Cement acquired management control of ETA Star Cement Company, along with its operations in the UAE, Bahrain and Bangladesh, thereby putting Ultratech on the global map.
Our Products:

Today, Ultratech Cement is the tenth largest producer of cement globally. It has a diverse presence across the globe. The company has eleven integrated plants, one white cement plant and one clinkerisation plant, which is based in the UAE. Furthermore, Ultratech has 15 grinding units across the world: 11 in India, 2 in UAE and 1 each in Bahrain and Bangladesh. It also has 2 rail bulk terminals in India, 3 coastal terminals, out of which 2 are located in India and one in Sri Lanka. Ultratech has 101 concrete plants across 35 locations in India.

Cement Ordinary Portland cement:

Ordinary Portland cement is the most commonly used cement for a wide range of applications. These applications cover dry-lean mixes, general-purpose ready-mixes and even high strength pre-cast and pre-stressed concrete.

Portland blast-furnace slag cement:

Portland blast-furnace slag cement contains up to 70 percent of finely ground, granulated blast-furnace slag, a nonmetallic product essentially consisting of silicates and aluminum-silicates.

Portland Pozzolana cement:

Portland Pozzolana cement is ordinary Portland cement blended with pozzolanic materials (power-station fly ash, burnt clays, ash from burnt plant material or salacious earths), either together or separately. Portland clinker is ground with gypsum and pozzolanic materials which, though they do not have cementing properties in themselves, they

Education:

To foster the girl child, our units support the cause of Girl Child education through their engagement with the Kasturba Gandhi Balika Vidhyalayas (KGBV) - residential schools for girls. So far, 532 girls who had dropped out from their schools in the villages were reenrolled in schools in Awarpur, Hirmi, Malkhed and Kharia Khangar. Uniforms, books and bags have been distributed to 14,546 children in the rural areas. Visual educational aids and lab equipment were given to the schools in Awarpur,
Hirmi, Kovaya, Tadipatri, Jharsuguda, Jaffrabad, Khor, Rawan, Durgapur, Ratnagiri, Sambhupura, Arakkonam and Magdalla.

The school enrollment programme covering 1,735 beginners at Hirmi, Kovaya, Jharsuguda, Jaffrabad and Awarpur have been a great help to students. At our balwadis, 520 children learn the basics of pre-primary education.

Our talent search programmes and Pratibha Protshahan Samaroha drew 963 students from Reddipalyam, Rawan, Malkhed, Hirmi, Tadipatri, Awarpur and Kovaya.

Free coaching classes at Rawan, Kotputli, Hirmi, Tadipatri, Kovaya, Sambhura and Awarpur proved a boon to 1,849 students.

We also provided career counseling services to 841 students in Jaffrabad, Hirmi, Awarpur and Kovaya.

Our computer education programme attracted 341 participants at Khor, Kharia Khangar, Awarpur and Arakkonam.

Our support to sports in schools encouraged 9,107 students to participate in sporting events at Rawan, Tadipatri, Hirmi and Kovaya.

At Malkhed, we also began yoga classes which were attended by 2,498 students.

Export Initiatives:

Ultratech Cement recently bagged an award for being the highest exporter of the year from CAPEXIL for the eighth time in a row for its sterling performance during 2003-2004. A leading cement exporter, its plants have also received various awards for environment protection, social awareness, safety and management of better industrial relations.

The company has been credited with boosting its exports of cement and clinker last year by 25 per cent to 3.5 million tons from 2.8 million tons in 2002-2003. According to a company official, stringent quality control and testing in the best laboratories ensure that cement and clinker produced from its plants conform to and surpass international standards. The laboratory is equipped to test cement as per ASTM, British and Euro standards. All the plants are ISO 9001 certified for the latest production process and 14001 certified for environmental management. The cement
The company has a captive jetty at the Gujarat plant. The jetty length of 337 meters and width of 23 meters is capable of handling ships of 45,000 DWT with 11 meters draft. Loading of cement and clinker onto the ship is carried out by a ship loader, which is fed by a four km long conveyor belt that connects the plant to the jetty. Ultratech Cement is the first and only Indian cement company to obtain an EC certification for this plant. The accreditation, given by Bureau Veritas, is a prerequisite to supply cement to EC member countries. Ultratech is one of the few Asian cement companies to receive this recognition.

The Hirmi Cement Works in Chhattisgarh and the Jharsuguda Cement Works in Orissa make them ideal locations for export of cement and clinker to Nepal and Bangladesh. With captive railway sidings to facilitate loading of railway rakes and a high-tech production facility for cement and clinker, Ultratech Cement has found wide acceptance in these neighboring countries.

Elaborating his growth strategy, Mr. Puranmalka says: "We will leverage synergies and further strengthen our ability to compete in the Indian and the overseas markets. We expect Ultratech to grow faster than the market and to improve the market shares. At the same time, developing beachheads overseas through a profitable exports business is a priority for all of us."

**Financial:**

Net Sales stood at 5,075 crores as compared to 4,352 crores in the corresponding period of the previous year. Profit before Interest, Depreciation and Tax is 1,377 crores and Profit after Tax is 778 crores vis-a-vis 1,252 crores and 683 crores respectively, in the corresponding period of the previous year.

The combined domestic cement and clinker sales was 9.94 MnT (9.48 MnT) while it was 2.25 LMT (1.93 LMT) for white cement and wall care putty.

The variable cost rose by 10% as compared to Q1FY12. This was mainly on account of higher energy and raw material prices which are linked to the last increase in
railway freight and increase in diesel prices. Although imported coal prices softened by around 19%, the depreciation in rupee by 21% offset the benefit.

**Foreign Exchange Risk:**

The Company's Policy is to hedge its long-term foreign exchange risk as well as short-term exposures within the defined parameters. Currently, the Company has long term foreign exchange liability of Rs.89.23 crores. The short term exposures are covered from time to time. The Company's aggregate exports stood at Rs.490.25 crores and imports at Rs.243.11 crores in FY06. As exports exceed imports, the Company has suitably hedged the difference.

**Governance Philosophy:**

The Aditya Birla Group is committed to the adoption of the best governance practices and their adherence in spirit. Our governance practices stem from an inherent desire to provide full disclosure of material information. Our governance philosophy rests on five basic tenets viz., Board accountability to the Company and shareholders, strategic guidance and effective monitoring by the Board, protection of minority interests and rights, equitable treatment of all shareholders as well as superior transparency and timely disclosure. In line with this philosophy, UltraTech Cement Limited continuously strives to adopt the best governance and disclosure practices. Revised Clause 49 of the Listing Agreement with stock exchanges which deals with Corporate Governance is applicable to your Company with effect from 1st January, 2006 and your Company is compliant with its provisions.

**Subsidiary Companies:**

At least one independent director on the Board of Directors of the holding company shall be a director on the Board of Directors of a material non-listed Indian subsidiary company. The Audit Committee of the listed holding company shall also review the financial statements, in particular, the investments made by the unlisted subsidiary company. The minutes of the Board meetings of the unlisted subsidiary company shall be placed at the Board meeting of the listed holding company. The management should periodically bring to the attention of the Board of Directors of the listed holding company, a statement of all significant transactions and arrangements entered into by the unlisted subsidiary company.
Review of Operations:

During the year under review, your Company's aggregate sales volumes recorded a growth of 2.5 %, increasing from 15.17 MMT in the previous year to 15.55 MMT. Realization was also up by 23.50 %. The exports mix saw arising share of cement, which constitutes 57% of exports. Lower clinker exports and extended shutdowns at your Company's plants have resulted in lower effective capacity utilization at 89% compared to 91% during the previous year. Unprecedented floods in Maharashtra and Gujarat, which constitute around 50% of your Company's domestic market, constrained the performance of your Company during the second quarter of the year under reviewed
1.10.5 BINANI CEMENT PVT.LTD:

The journey began with Binani Industries Limited (BIL), an ambitious organization that aimed to be a pioneer in all its endeavors and set benchmarks while focusing on sustainable growth. This ensured the progress and transformation of BIL from its humble beginnings to its present day global stature. The Braj Binani Group traces its beginnings to 1872, when Seth Pragdas Binani, a trader in metal utensils, began an enterprise with his son Seth Mathuradas to import and export metals. This enterprise grew from strength to strength until 1941, which is considered a watershed year in the Group's history. It was in this year, Seth Govardhandas, Seth Mathuradas’ son, made the bold decision to move from trading to manufacturing. The journey of Binani Metal Works started with a plant at Howrah. Taking on the mantle from his father, Ghanshyam Binani, the son of Seth Govardhandas, founded Binani Zinc. The Company's inherent attributes of visioneering and continual improvement helped shift focus towards R&D, thus modernizing and expanding its capacity. It was under the dynamic leadership of Mr. Braj Binani as its Chairman that the Company truly began to explore uncharted horizons and scale new heights. Following the restructuring of the Braj Binani Group, between 1996 and 2004, Binani Industries Limited (BIL) was founded to serve as the holding company for Cement Limited, Binani Zinc Limited, and Goa Glass Fiber Limited BT Composites Limited. Over its eventful journey, the core values, of the Company have remained unchanged. The Braj Binani Group is still driven by the same ambition to succeed and the need for continual improvement that transformed Seth Pragdas Binani metal trading house into one of India’s largest business conglomerates. After establishing its footprint in India, China and Dubai, the Braj Binani Group is now envisioning to explore newer global horizons. Setting its sights on emerging markets like South Africa, East Africa Mauritius, and the Group is endeavoring to establish a strong network of Binani Cement presence across the globe. The Braj Binani Group’s focused continual improvement has been recognized with internationally accepted certifications for its various ventures.

Profile:
The Company has operations in India, China and Dubai where it has already scripted a success story. It has now set its sights on emerging markets in Africa. For the Binani Group, cement business is a means to transform imagination and vision into reality.
Binani Cement has already set global benchmarks, in its existing operations and is poised to achieve the same stature worldwide.

Binani Cement Limited is the flagship subsidiary of Binani Industries Limited (BIL), representing the Braj Binani Group. The cement business started operations in 1997, Sirohi District, Rajasthan with a 1.65 MTPA integrated cement facility and a 25 MW captive power plant with technological support from F. L. Smidth, Denmark and Larsen & Toubro Ltd.

The capacity was raised to 2.25 MTPA in 2005 through advanced in-house R&D and de-bottlenecking and the Company was also certified to ISO 9001, ISO 14001 and OHSAS 18001 within a short span.

From common cement of operation this is an achievement that clearly illustrates the management's commitment to quality, efficiency, environment, health and safety. In 2008, a split-grinding unit at Neem Ka Thana was commissioned, boosting the capacity in India to 6.25 MTPA.

Today, Binani Cement has established itself as one of the top companies in the industry in terms of efficiency and performance. What truly sets Binani Cement apart is its clear focus on the core attributes of quality, strength and reliability of the end product. These have paid rich dividends and seen brand 'Binani' growing in prominence and stature, poised to capture increasing market share globally.

**Binani Cement Ltd. has a consolidated global asset base of $ 616 million and gross income of $ 550 million for the year ended 31st March '10.**

**Location & Capacity:**
Spread over an area of approx 0.49 million sq.mtr’s, the plant is strategically located in Shandong within close proximity to the two operating port, Rizhao and Lanshan and the upcoming port of Dongjiakou, in Shandong Province and it will be operational in 2013-14. In 2008 the Clinker Plant was upgraded from 1100 to 1600 TPD with addition of an O.Smtpa Cement Grinding Unit. Currently, the clinkerisation is running at 140% capacity with the help of technological enhancements producing O.Smtpa. Since 2007 SBRCCL has also been actively exporting its products to UAE, and recently shifted focus to the domestic market.
In 2010 Binani increased its shareholding from 70% to 90% by investing US$100 million and in Dec 2011 SBRCC completed its Brownfield expansion of 2Mtpa clinkerisation plant bringing the total capacity to 2.5mtpa from a single location with 0.5mtpa of cement grinding. The 2nd state of the art clinkerisation plant with 12MW waste heat recovery attached to the new line was commissioned in Dec 2011 and has already started producing and selling clinker under trial to grinding units in the area. The new plant is also being fed limestone via the old mine located 200mtrs away and should last till 2014, after which the limestone from new mines will be extracted. The Plant has been designed for running on all kinds of coal including Indonesian High Moisture coal mix to help keep its energy cost under control.

**Expansion under Way:**

SBRCCL is currently in the final phase of implementing its 12MW waste heat recovery system scheduled for commercial production in Mar 2012. The unit will produce 30% of power requirement of SBRCC clinker units and shall produce 65 million KW power per annum. This will help the company save massively on its power bill, as well as achieve international norms of emission.

Work has already commenced on a 4km Limestone Conveyor System which is scheduled to be implemented by Mar 2013. This conveyor will bring Limestone for both the clinker Lines from the new mines. This conveyor belt to be built at a cost of RMB40 million will be the 1st of its kind in the area and shall envisage huge cost savings for the company. This will also help the company to reduce its dependence on fossil fuel used in trucking and reduce carbon emission of trucks. It is estimated that 57600 trucks trips per annum on 11km road shall be saved, which will help in saving 600,000 kms of trucking a year. Necessary approvals for the conveyor have been received from the local government and turnkey order has been placed in Dec 2011. The conveyor has been designed to transport approx 16000 tons of limestone per day. The conveyor is schedule for completion by mid 2013 and this will help the company to smoothly transfer its raw material from old to new mine without any hiccups and much ahead of the scheduled completion of its current mine in 2014.

A Greenfield state of the art 1.4mtpa split grinding unit has been planned, 75kms from the clinkerisation plant, in close proximity to Dongjiakou Port for which necessary
land has been acquired from the government. The split grinding unit is also just 70kms from Qingdao, a major city and consumption centre for cement. The company has recently obtained environmental clearance and is now awaiting License. Instead of conventional cement mill the grinding will be via Vertical Grinding Unit (VRM) and Roll Press combination giving flexibility for SBRCC to produce OPC, PPC, slag cement and pure slag for its customer. The company will invest close to RMBISO million for this grinding facility. The Split Grinding Unit shall be owned via a subsidiary structure to take subsidy and tax benefits available from the local government.

**Salient Features of the Expansions Projects:**
The original Expansion of China Plant was planned at an investment of USD 115 million which includes Clinker Manufacturing of 2MTPA, 12MW Waste Heat Recovery System and on site Cement Grinding Capacity of 0.98 million tones.

With the additional investment in split grinding unit and 4km limestone conveyor, the investment will now stand at US$145 million. The current clinkerisation plant is capable for supply to Binani grinding units in China, UAE, Mauritius and East Coast of India and increases the Company's brand presence in these areas.

Estimated Limestone reserves close to 142 million tones ensures supply for the next 25 years. Limestone conveyor and Waste Heat Recovery will entail substantial cost savings to the Company and will decrease the emission of greenhouse gases. The plant has been designed to give the best energy conversation and shall be one of the few plants in China, which will have the lowest energy consumption for production of clinker and cement.

SBRCCL, China has many accolades to its credit. It has received awards like Best Enterprise of Provincial Cement Quality, Excellent Enterprise of Cement Quality and Excellent Credit Industrial Enterprise from various Organizations.

**Middle East:**
The Binani Cement Factory LLC, established in 1996, is located in the Jebel Ali Industrial Area. With its close proximity to the major ports, and a construction hub, it serves as a perfect vantage point for Binani Cement to tap into potential markets. In 2006, responding to the ever increasing demands, Binani Cement showcased its
unmatched capabilities by expanding the capacity of its plant from 0.5 million tones to an overwhelming 1 million tons of OPC and GGBFS. Subsequently, in 2007 grinding capacity was increased to 1.2 MTPA.

In 2009, slag-grinding facility has been added and total production capacity increased to 2 MTPA by adding third clinker grinding line.

A subsidiary, Binani Cement Factory (SFZ) Ltd. has been established in Sudan for marketing cement produced in Dubai plant. To capitalize on the demand of Cement in East African and other neighboring countries, the Company has set up marketing offices through its subsidiaries in Sudan, Djibouti, Ethiopia, Tanzania, Kuwait and other East African countries.

**Africa / Mauritius:**

Binani Cement Factory (Mauritius) Limited, is a wholly owned subsidiary of Binani Cement Factory LLC, Dubai, UAE. It will shortly commence the implementation of Mauritius' first Freeport, Greenfield, Grinding & Packaging Factory unit in Fort George, Port Louis.

The plant with a capital expenditure of USD 30 million will have an installed cement manufacturing capacity of 1 MTPA.

The plant in Mauritius is part of Binani Cement's aggressive overseas expansion plans and it will create employment for various local communities and will also generate additional revenue for both the port as well as the economy of Mauritius. The project will also position Mauritius as an industry hub that has the capability to cater to the markets of SADC, COMES A and EAC region.

**Project Progress:**

For this project, the Mauritius Government has already allotted and identified 6.5 hectares of homogenous land keeping in mind the optimum capacity sizing of the plant and prospects of future expansions to meet the increasing demand of cement in and around the region. The project is in the process of completing all statutory formalities and will soon commence work on the site.
Environment Management:
Binani Cement Limited has implemented effective environment friendly measures in order to keep up with its initiative of always observing green norms to combat Global Warming and adhere to the best eco-friendly practices. The plant in Mauritius will not have any discharge of gases, effluents or waste material.

Market:
Cement is sold under the brand name 'Binani'. The strong brand is skillfully supported by a widespread distribution network comprising of 2808 dealers and 76 market organizers. The Company pioneered the cash and carry system in its markets as against the normal credit policy followed by the Industry.

In domestic markets, the Company is one of the leading players in the Northern India and parts of Western India. It is also one of the leaders in Rajasthan with a market share of 13.9% and that of 10.2% in Gujarat. The Company is active in the OPC as well as the PPC markets, with an OPC: PPC product mix of about 71:29 in FY 2005, 63:37 in FY 2006, and 51:49 in FY 2007 and 43:57 in FY 2008.

Binani Cement Limited (BSE Scrip Code: 532849), a key leader in the Indian cement industry, is expanding its operations aggressively in International Markets to attain competitive advantage in terms of cost, logistics, resources etc. and to increase its presence across the globe.

Binani International Cement is known for its high level of quality and consistency and is the most preferred brand in various countries like UAE, Sudan, South Africa, Tanzania, Madagascar and Namibia. Binani Cement will soon be available in Mauritius. This would give a strong boost to the infrastructure and real estate industry giving them access to the best International Quality Cement from Binani.

Sirohi Rajasthan:
The Binani Cement Plant in Pindwara, District Sirohi, and Rajasthan is in close proximity to the customers in the State and also caters extensively to markets in Gujarat, Haryana and North Central Region. The nearest airport is at Udaipur, which is situated at a distance of 105 km from the plant.
The Company has two limestone mines in village Amlí and Thandiberi located at a distance of 2 Km and 7Km respectively from the plant premises. These mines are leased to the Company by the Government of Rajasthan initially for a period of 20 years which is renewable after every 20 years. The total estimated reserves in both the mines till date is 175 million tones.

**Sirohi Plant - Successive Stages of Growth:**

The Binani Cement plant was set up in April 1997 with an initial production capacity of 1.65 MTPA cement. 

Installed capacity of the Plant was increased to 4.85 MTPA through modifications and de-bottlenecking. 

In order to achieve the Company's objective of increasing its presence in North Indian Markets, it increased its clinker production capacity by 2.3 MTPA with the commissioning of one separate cement manufacturing facility (Line-2) at the existing sites in July 2007 along with a 44.6 MW (2 x 22.3 MW) captive power plant. 

Clinker manufacturing capacity was further increased to 2.7 Million TPA in May 2010 through process improvement.

**Technology Partners:**

Major equipment and technology for cement plant was sourced from M/s FL Smidth, Denmark while those in the Thermal Plants were sourced from M/s Shin Nippon, Japan, M/s Cethar Vessels Ltd., M/s AEG Siemens and M/s Stork Cattle, Sweden.

**Clinker Grinding Unit, Neemkathana:**

Clinker Grinding Unit, Neem Ka Thana is located at village Bhagega, Tehsil Neem Ka Thana, District Sikar (Rajasthan). The plant lies in close proximity to the customers of Eastern Rajasthan and nearby states of Northern India. The facility is well connected by road and rail. The nearest railway station is Neem Ka Thana at about 7 Km. and the nearest airport is at Jaipur, which is about 130 km. from the plant.

**Overview:**

The plant was set up with the technical support from M/s F.L. Smidth, Denmark. The unit commenced its commercial production in March, 2008 with an installed capacity of 1.40 million TPA cement grinding. The units acquired stand alone third party
certifications conforming to ISO 9001, ISO 14001 and OHSAS 18001 for its Quality. Environment and OHS management systems respectively from M/s Intertek Systems Certification, Ahmadabad in July 2009
The unit has obtained separate Environment Clearance from the Ministry of Environment & Forests, New Delhi and all other Consents from the State Pollution Control Board for manufacturing 1.40 million tons of cement per annum. The environmental performance of the unit in terms of control on Air, Water and Land pollution is quite excellent and is being monitored by the MoEF and RSPCB.
The Company's product portfolio includes Ordinary Portland Cement, Pozzolona Portland Cement and Ground Granulated Blast furnace Slag (GGBFS). 'Binani brand has become a name synonymous with cement in India. With subsidiaries in Dubai, China and Africa. Binani Cement is well and truly set on the path of becoming a global brand.
Binani Cement Ltd. produces cement of two grades:
Grade 43 Grade 53 PPC (Portland Pozzolona Cement)

Manufacturing Process:
Major plant & machinery consists of One Cement Mill (180 TPH capacity), One Electronic Packer (240 TPH capacity), Clinker, Fly Ash, Cement storage silos etc. The unit has its own railway siding, which was commissioned in mid 2009.
The unit is licensed to manufacture Ordinary Portland Cement (OPC 43 and 53 Grades) and Portland Pozzolona Cement (PPC). Currently it is producing 100% PPC for which Clinker is supplied from the parent unit, i.e.; Binani Cement Limited, Binanigram while Fly Ash is sourced from the Thermal Power plants located at NTPC, Dadri (Haryana), Suratgarh (Rajasthan), Bhatinda etc.
The unit, during the year 2009-10, produced 1.12 million tons of cement (PPC).

Indian Operations:
ITC CII Sustainability Award 2009 - for its significant contribution in the field of sustainable development encompassing environment, society and economics - the three pillars of triple bottom line. The Company received this award during 2008 as well whereby it became the first Indian Cement Company to receive this prestigious award.
Genentech Environment Excellence Gold Award 2009 - BCL received this award consecutively in a row for 2008 & 2009 in recognition of its exemplary initiatives in Environment Management.

National Award for Excellence in Water Management 2009 - BCL was rated as the 'Excellent Water Efficient Unit' to have been conferred this prestigious national award instituted by the CII Soharabji Godrej Green Business Centre, Hyderabad.

National Award for Excellence in Energy Management 2009 - BCL was rated as the 'Energy Efficient Unit' on being conferred this annual award instituted by the CII Godrej Green Business Centre, Hyderabad.

Certificate of Merit for 2007-08 for Productivity Improvements - The award which has been instituted by the Rajasthan State Productivity Council, Jaipur was conferred to BCL in recognition of the Company's sustained initiatives towards productivity improvements.

Certificate of Excellence - Best Employer Award Competition 2008 - This award was conferred to BCL in recognition of company's excellence towards maintaining good Employee-Employer Relationship for the year 2008.

Udyog Bharati Award 2009 and Indian Achievers Award for Quality Excellence - These awards have been instituted by the All India Business & Community Foundation (AIBCF) for entrepreneurship development leading to economic growth that greatly contributes to generate long term opportunities for the communities.

**China Operations:**

Awards won by Shandong Binani Rongan Cement Co. Ltd. (SBRCCL), China during the year 2008 & 2009 - Symbols of Global Recognition

Best Enterprise of Provincial Cement Quality Competition from Shandong Cement Quality Supervision Station in March 2010.

Best Enterprise of Provincial Cement Quality Competition from Shandong Cement Quality Supervision Station in March 2010.

Contribution Award in the Economic Work from Dongguan Town Government and Dongguan Party committee in March 2010

Silver Medal of economic work & cash prize of RMB 50,000 from Ju County Party Committee and Ju People's Government in February 2010
Excellent Credit Industrial Enterprise from Ju County Party committee and Ju People's Government in January 2010.
Model Enterprises of Safety Production from Youth League of Ju Committee and Safety Production Supervision Bureau in July 2009.
Excellent Private Enterprise from Dongguan Town government and Dongguan Party Committee in February 2009
Excellent Credit Industrial Enterprise from Ju County Party committee and Ju People's Government in January 2009.
Leading Enterprise for Foreign Trade Export from Ju County Party Committee and Ju People's Government in January 2009
Special Contribution of Foreign Investment from Ju County Party Committee and Ju People's Government in January 2009.
Model Enterprise of Safety Production from the Safety Production Committee of Rizhao City in March 2008.
Bronze Medal for contribution to Economic work issued by Party Committee of Ju County and People's Government of Ju County in January of 2008.

**UAE Operations:**

**Composition:**
The Company's Board comprises of Non-Executive Promoter Director as Chairman, 1 Executive Director as Whole time Director, 2 Independent Directors and 2 Non Executive Non Independent Directors
The Board functions both as a full Board and through Committees. The Board of Directors and the Committees meet at regular intervals. There are 5 Committees which oversee operational issues. The Committees are
Audit Committee, Shareholders' / Investors

**Audit Committee:**
Audit Committee of the Board was constituted in the year 2000 and has been reconstituted. From time to time the Company has complied with the requirements of
Section 292 A of the Companies Act, 1956 and Clause 49 of the Listing agreement relating to the composition and terms of reference of the Audit Committee. The Committee comprised of two independent none executive Directors one of whom is the chairman and one non independent non Executive Director. Audit Committee is responsible for the financial reporting and ensuring compliances with accounting standards and reviewing financial policies of the Company and to recommend the appointment of Statutory Auditors, Internal auditors, Tax Auditors and Cost Auditors and fix their fees. The Audit Committee is responsible for the financial reporting and ensuring compliances with accounting standards and reviewing financial policies of the Company and to recommend the appointment of Statutory Auditors, Internal Auditors and fix their fees, the Committee examines in detail the reports of the Internal Auditors of the company as well as those of the subsidiaries. The Committee reviews the risk management reports on quarterly basis. The Committee also reviews all the unaudited quarterly financial results and the audited results including that of Subsidiaries before submission to the Board.

The Audit Committee met 4(four) times during the year under review on 21st April, 2011, 25th July 2011, 21st October, 2011 and 27th January, 2012. The gap between two meetings was not more than four months. The Chairman and all the members of the Audit Committee attended the last AGM.

**Subsidiary Companies:**

The Company now has six overseas subsidiaries namely Mukundan Holdings Limited, Krishna Holdings Pvt. Limited, Murari Holdings Limited, Shandong Binani Rongan Cement Co. Limited, Binani Cement LLC, Dubai and Bhumi Resources (Singapore) Pvt. Limited and Three Indian Subsidiaries namely Swiss Merchandise Infrastructure Limited, Merit Plaza Limited and Binani Ready Mix Concrete limited. Which are non material non listed subsidiaries? The Audit Committee has now reviewed the Financial Statements of all the Subsidiaries. The Minutes of the subsidiary companies are also being placed before the Board of Directors of the Company on a regular basis.
**PRESENT STATUS OF INDIAN CEMENT INDUSTRY:**

1. World's second largest.
2. Modern up-to-date technology.
3. Quality comparable to world's best.
6. Production over 100 mints. (31-03-2002)
8. Per capita consumption - 100 kg.
9. India's second highest -
   - Excise duty over Rs.3, 500/- crores per annum.
   - Sales taxes more than 3,500/- crores Rs.
   - Royalties, octroi 85 other cesses-1450 crores Rs.
10. Industry employs a large work-force:
    - 1.5 lakh people work directly.
    - 1.2 million people engaged indirectly.
11. Cement Demand:
    - Key driver for growth.
    - Demand is up, Prices down.
13. The Indian cement industry in transition.

**SOURCE:** India Cement Review, Annual 2012.
REFERENCES:

5. World Energy Council - 1995