Grasim Cement – Raipur
(A Unit of Grasim Industries Limited)

(i) Unit Profile:

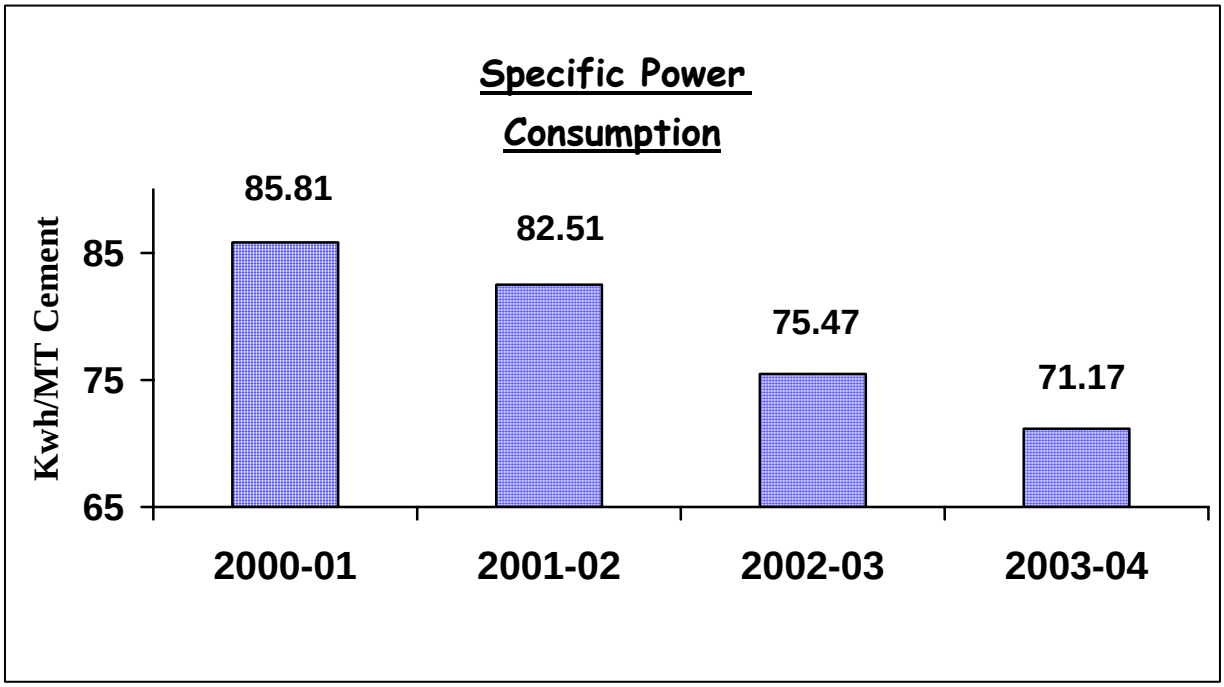
Grasim Cement, an ISO-9002, ISO-14001, OHSAS 18001 & SA 8000 certified company of Aditya Birla Group, is located at village Rawan of Dist. Raipur in Chattishgarh State. The Cement plant of 1 MTPA capacity was successfully commissioned in March 1995 with most advanced State-of-Art technology available in the world. The plant capacity was soon enhanced to 1.7 MTPA by putting up a separate Slag Grinding & Mixing Unit. Presently the unit has reached the capacity of 2.16 MTPA after several minor modifications. Our Unit manufactures high quality OPC (Ordinary Portland Cement), Blended Cement (PPC & PSC) and IRST-40 Railway Sleeper Cement with greater consistency keeping customer at the center of business. Our prime aim is to produce more blended cement so as to utilise the Granulated Blast Furnace Slag & Flyash, the wastes of Steel Plants & Thermal Power Plants respectively.

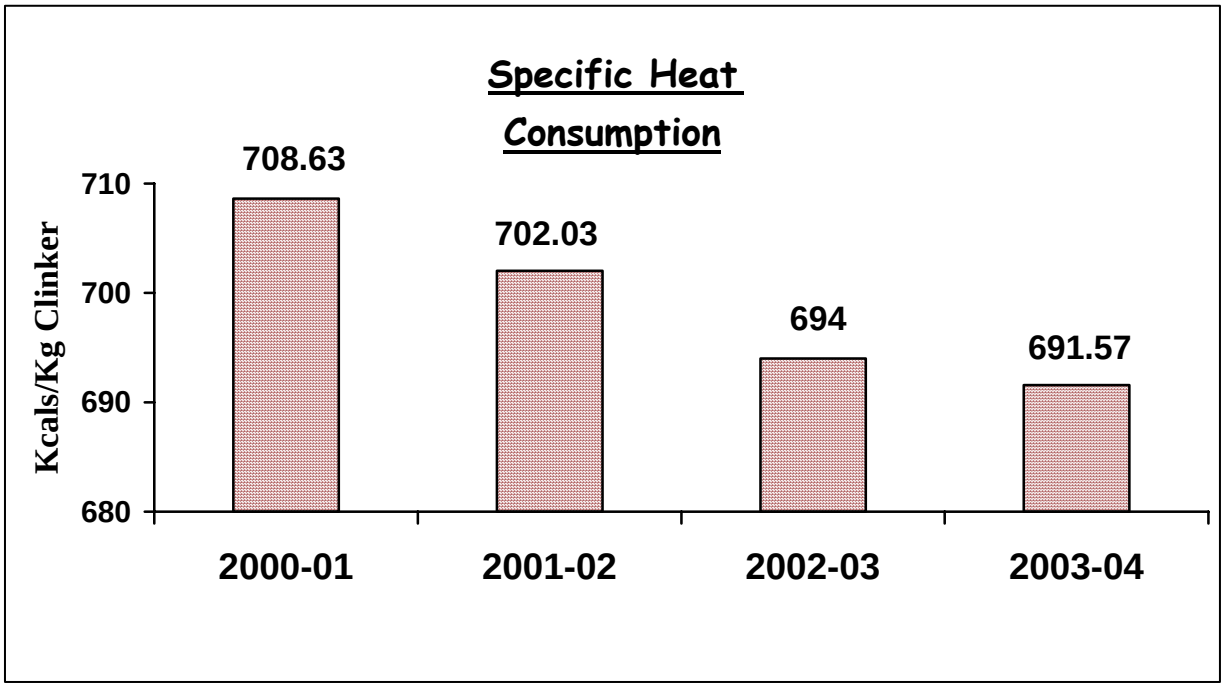
(ii) Energy Consumption:

The Cement Industry is highly energy intensive. The primary energy inputs are in the form of Coal for Clinkerisation, Furnace Oil for DG sets (Captive power generation) and Electrical power from State Electricity Board and captive power plant. As a result of implementation of various energy conservation measures on continual basis, there is a steady decline of specific energy consumption. Last four years' specific energy consumption figures are shown in the table and graphs as below:

Performance Indicator

SL No	DESCRIPTION	Unit	2000-01	2001-02	2002-03	2003-04
1.	Electrical Energy	Kwh/T Cement	85.81	82.51	75.47	71.17
2.	Thermal Energy	Kcal/Kg Clinker	708.63	702.03	694	691.57
3.	Total cost of production	Rs. Lakhs	24289	23819	25199	25729
4.	Total Energy Bill	Rs. Lakhs	7189.21	7076.62	6816.5	7147.28
5.	Energy as percentage of total cost of production.	%	29.6	29.71	27.05	27.77

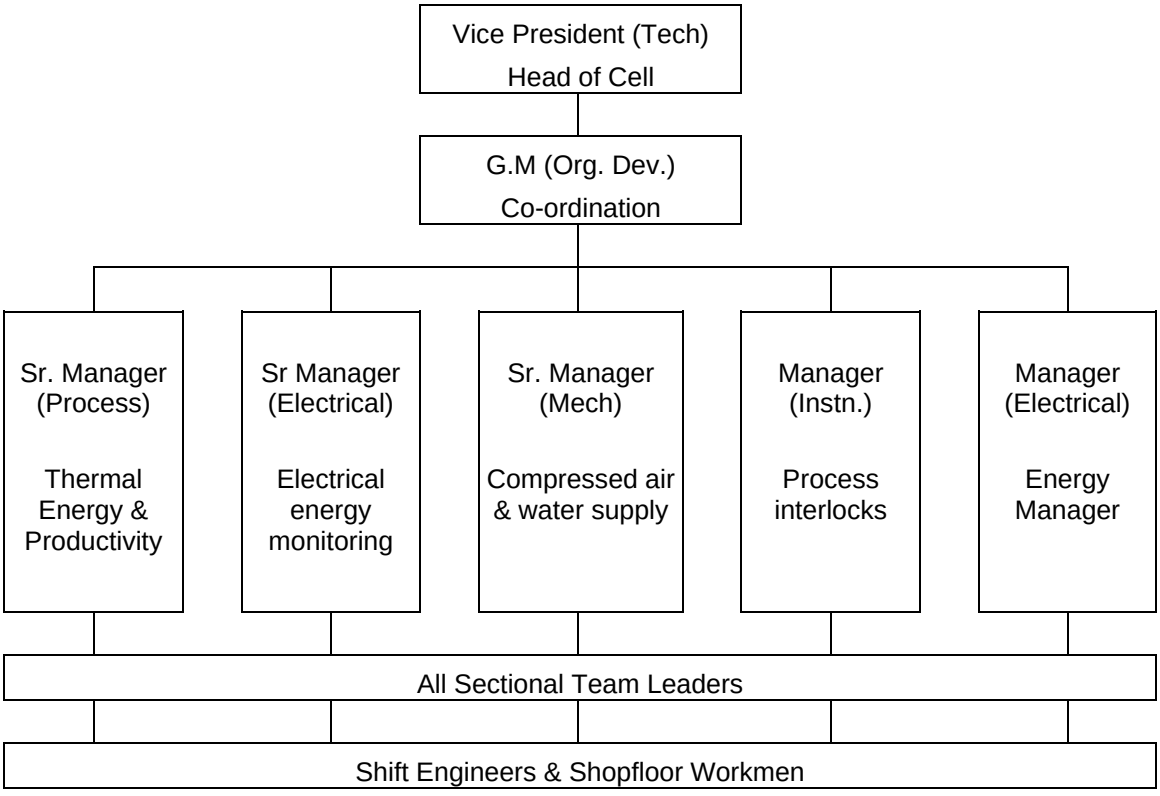

Specific Power Consumption
Kwh/MT Cement
85
75
65
85.81
82.51
75.47
71.17
2000-01
2001-02
2002-03
2003-04


Specific Heat Consumption
Kcals/Kg Clinker
710
700
690
680
708.63
702.03
694
691.57
2000-01
2001-02
2002-03
2003-04

(iii) Energy Conservation, commitment, Policy & Set up:

The management is fully committed to conserve the fast depleting energy resources and measures for energy conservation have been followed from design stage of the plant itself. We have been continuously striving for reduction in energy consumption since inception of the plant. To achieve this goal, a daily Technical co-ordination meeting is held in which day to day energy parameters are monitored and analysed. The Cross Functional teams for each section monitor and analyse energy consumption at drive level every day and give feedback to Unit Head. The concept of energy conservation is percolated down the line through WCM team leaders. Workers/ Staff contribute in reduction in energy consumption through Suggestion Scheme also. Good Suggestions are rewarded to motivate the people. Energy Performance parameters are also reviewed by Unit Head every month in Technical MPR (Monthly Performance Review) meeting. Energy Audits are also conducted by agencies like CTC (Central Technical Center, AV Birla Group) annually and other competent agencies like NCBM.
Please also refer **Annexure – G** for the details of energy conservation activities and methodology and **Annexure – H** for energy conservation policy.

Energy conservation cell structure



(iv) Energy Conservation Achievements:

Due to implementation of various energy conservation measures, the unit has been able to reduce its specific power consumption from 131.80 Kwh/tonne-cement in year 1995-96 to 71.17 Kwh / tonne-cement in year 2003-2004 and

specific Heat consumption from 827 Kcal/ kg-clinker in year 1995-96 to 691.57 Kcal/kg-clinker in year 2003-2004.

The write up on the energy conservation and other projects completed during the year 2003-04 are given in **Annexure – D.**

(v) Energy Conservation Plans & Targets:

We are fully committed to our energy conservation drive and planning to implement following projects for further reduction in energy consumption:

1 Grate cooler Upgradation
2 Hot duct for slag HAG from cooler
3 On-line Energy monitoring system
4 Expert operating system for Cement mill
5 Replacement of DAG cooling Blower motor from 7.5 KW to 3.5 KW
6 Re-engineering of cement mill feeding system by removing one bucket elevator and two belt conveyors
7 Replacement of GCT pump motor with lower rating by 20 KW
8 Retrofitting with high efficiency impellor in coal mill booster fan
9 EPIC II controller for Raw mill ESP

We have planned to achieve the specific electrical energy consumption of 68.5 Kwh/mt of cement and Specific thermal energy consumption of 675 Kcals/Kg of clinker by 2005-06.

(v) Environment & Safety:

Grasim is dedicated towards ethics organization discharges its public responsibility simply by "Do what you say" motto. Therefore, "Fair Policies" have become core competency of Grasim.

Company has firm commitment towards public health and safety, environmental protection and waste management which is evident by:

1) Awarded ISO-14001 in Feb-98 for Environment Management System by maintaining World Class Environment i.e. pollution free, accident free, with elaborate Environmental Management Programmes.

2) Elaborate Safety Management Aiming at "Zero Accident" Disaster Management Plan. Grasim Cement is certified OHSAS 18001 company. The unit has carried out a detailed section/ area wise hazard identification. We are proud to inform that we did not have any fatal accident for the past four years.

To achieve these objectives company has developed following:

a) High tech electrostatic Precipitator and Bag filters for particulate matter control in stock at various stages and monitoring mechanism to control emission well below permissible limits.

b) Water spray devices at various places where dust emissions is possible.

c) Oil separator / traps in effluent water.

d) Well-equipped sophisticated environment laboratory with training personnel.

e) Strict Monitoring schedule including the near miss accidents

f) Environmental Audits / Safety Audits / Waste Management Audits.

g) Fire fighting tender and trained personnel / Mock drills.

h) Community satisfaction on surveys on Environmental Management Systems.

Following are some of the environment conservation activities:

- The water harvesting schemes in place by creating ponds having total capacity of 113000 M3 for collection of monsoon rain water. The ponds area made in catchments area.

- Rain water harvesting systems installed in shopping complex and hospital roof top for collection and recharge to bore well to maintain ground water.

- The treated water from the Sewage treatment plant is used in horticultural activity through separate pipe lines.

- The domestic waste are segregated into bio degradable and non-biodegradable. The biodegradable waste is converted to manure by burying them in the pits. The non-biodegradable waste is segregated into polythene, metal & others to be sold for recycling purposes.

- Plant uses the old conveyor belts as constraints for localizing the dust as well as suppressing with water spray

- First time in Chattissgarh area Grasim has been transporting fly ash by closed tankers

- Fine iron metal particles segregated from slag grinding process are collected and turned into useful material for alloy making.
- Collection of traces of oil from the water used for working main equipment by installing oil separators and using the same for burning in pre-calciner of pyro-system

- Grasim has carried out massive plantation program and has 75000 sapling per year as target.

- Material conservation

    1. Fly ash, the solid wastes from thermal power plant and Slag, waste from steel making plant are used to manufacture blended cement. This replaces clinker in cement to an extent of 25% & 50 %. By manufacture of cement from clinker to an extent of 1.42 times , saves on the natural resource limestone as with less limestone more cement is produced.

    2. Iron ore used is reject material from sponge iron instead of direct material from iron ore mines.

    3. Use of by-product gypsum from fertilizer industry in-place of mineral gypsum.

    4. De-silted mine pit water is used for industrial cooling. All the plant water consumption is from the mines pit water.

As show case of the efforts taken, Grasim cement has bagged several national and state level awards in energy conservation and environment protection.

“We continually strive to conserve energy and natural resources”

******

GRASIM
ADITYA BIRLA GROUP

ENERGY POLICY

We at Grasim Cement commit ourselves to improve our energy performance in all our activities, products and services on continual basis keeping environment sustenance in focus.

Our mission is :

To be the lowest specific energy consumer in the industry we operate.

We shall accomplish our mission by :

- Benchmarking our performance against the best in the world.
- Managing efficiently the utilization of energy resources and Upgrading the hardware.
- Imparting continuous and appropriate training to the employees.
- Carrying out regular internal and external audits to identify areas for improvement.
- Adopting cleaner and more energy efficient technology to all our projects.
- Reducing specific energy consumption atleast by 2% annually.

EFFECTIVE DATE :
19 SEPTEMBER, 2003

R.M. GUPTA
SR.EXECUTIVE PRESIDENT

1. **Reduction of coal firing blower RPM rpm from 2000 to 1460 and pipeline from 200nb to 175nb.**

The coal firing system is consisting of FK pump connected to a bellow blower and coal-conveying pipe, which is connected to the multi-channel burner. The Coal firing system was designed at 13 tph originally. The actual coal consumption doesn't exceed 8 TPH even with max kiln production of 4500 MT. The conveying air, which is going into the kiln, was higher. The conveying pipe and FK pump blowers capacity can be reduced to a lower level.

The conveying air requirement for 10tph coal is 3200 m3 and the velocity to be maintained at conveying line is minimum 28 m/s. The Blower capacity was 4800 m3 FAD can be reduced to 3200 m3 FAD by changing rpm of the blower by adjusting the drive pulley. This saved on purchase of new blower. The velocity can be maintained in the conveying pipe by reducing the pipe size from 200NB to 175nb. The investment for the project is Rs 7.2 Lacs and we could achieve by way of reduction in power consumption Rs 6.97 lacs. In addition we could have advantages viz., the reduction in heat in small quantum, more steady flame, interchangeability of blower, etc.

2. Installation of VVVF drive in 150 KW / 1000 rpm cooler fan

The cooler Fan H the volume requirement for operation is 1140 M3/minute, where as the fan capacity is 1749 M3/minute. The fan was operated with inlet damper closed condition to an extent of 35%. The power consumed by the fan can be reduced if we incorporate a speed control device in the motor.

VFD for Cooler Fan

Since the drive motor of the fan is AC, variable frequency drive was proposed. The VVVF drive was installed with an investment of Rs 7 lacs and gave a saving of Rs 11.16 Lacs. In addition to this the fan control become smooth resulting in consistent process performance.

3. **Installation of water spray system in precalcinator stringe down comer:**

The kiln was operating with Precalcinator fan at its maximum design capacity, leaving no cushion for any minor process fluctuations. The plant operation was becoming unstable resulting in forced reduction of feed rate into the system to keep operation stable. This problem had two solutions viz., increase the PC fan capacity or reduce the volume flow to the fan for smooth handling without compromising the feed rate to the kiln system.

The cost effective proposal was to install a water spray system for gas conditioning at PC down comer i.e., before fan inlet. An 8 KL/Hr capacity water atomizer spray system consisting of high-pressure special nozzles are provided at a cost of Rs 23 Lacs. This resulted in saving of power consumption to the tune of 1.99 Lac KWH and saving of Rs 6.71 Lacs per year. This also gave non-tangible benefits of stable kiln operation, optimum production level and reduction in water spray at Gas condition tower up stream.

4. **Reduction of false air in Raw Mill & Coal Mill:**

The false air ingress in the cement plant system is an energy-sapping phenomenon. This is a waste of energy. The coal mill and Raw mill area, we found during regular monitoring, the false air ingress were to the tune of 30% and 15% respectively. On details investigation, it was observed that the source of false air in raw mill could be arrested in house through innovative Kaizen. In coal mill the investment were required to arrest the air intake through coal feeding system into the mill. There it was proposed to install isolating two flap gates and slide gate in other route to seal during its non-operation period.

The cost of the total investment was Rs 1.00 lacs and obtained saving of Rs 9.81 Lacs. This also improved the output of the both the systems to some extent.

Coal feeding double flap gate

Slide gate for other circuit

5. **Reduction of Energy consumption in Raw Mill:**

The Raw Mill was operating with 340 TPH, 7,20,000 M3/Hr gas flow through the mill system and an energy consumption of 18.5 Kwh/MT of material. Also frequent mill tripping due to high vibration (10-12 mm/sec) with damage to the mechanical part (crack formation is classifier body), had become a regular features. A task force was formed to study the root cause and arrive at cost effective solution. The solution emerged after deliberation, covered various aspects of raw mill grinding system. The proposal were retrofitting of high efficiency impeller in raw mill fan, modification of dam ring inside mill, profiling of the roller tyres, reduce gap between tyre and dam ring by welding square bar and profiling of table liner.

Raw roller & table liner profiled

After carrying out all these modifications at cost of Rs 36.55 lacs, Raw mill could operate with capacity of + 350TPH, 6,80,000 m3/hr gas flow through the mill system, vibration to the range of 7-9 mm/sec and power consumption at 17.5 Kwh/MT of material. In addition the mill operation become smooth so that the operator could put the operation in auto-control-mode and improved the availability. The net saving on account of these modifications is Rs 36.9 lacs per year.

Raw mill modified dam ring

6. **Reduction of Energy consumption through enhanced blended cement manufacturing:**

The blended cement has more benefits compared to the conventional OPC category of cement in its application by way of durability of structures. Also it allows use of waste material from the steel plant (Blast furnace slag) and power plant (Flyash) as additives in cement grinding replacing the costly clinker. To enhance the blended cement, marketing was geared up to create awareness among the customer about the immense benefits of the blended cement usage in civil structures. Though large quantity of fly ash available from the near by area, the non-polluting transportation, storage and handling were the main infrastructure requirement.

Grasim Cement encouraged the transportation contractors to employ closed tanker (upto 50MT) for dry fly ash movement and installed closed silos with pneumatic handling system including unloading from the tanker. The project cost was of Rs 32.13 lacs with a saving of Rs 22.8 Lacs per annum. The other benefits were improved product quality due to dry flyash, reduced fugitive emission in the plant and surroundings and improved cement mill output.

.

7. Reduction of Energy consumption in utility section:

The main high-energy consuming devices in utility are air compressor and also the costliest waste is the compressed air. On daily monitoring of energy consumption of utility section revealed that the wastage of energy through compressed air leakages and in dryer system. A short-term task force was constituted to study and arrive at solution for energy reduction.

The proposed modification and correction are installation of refrigerant type dryer which consume less air and plugging of compressed air leakage points in all post clinkerisation area. The investment made Rs 5.5 Lacs yielding a benefit of Rs 9.3 Lacs per annum.

8. Optimisation of Kiln burning:

One of the factors govern thermal energy consumption is the flame behaviour of the kiln burner. To measure and monitor the flame characteristics can be done by monitoring NOx at kiln inlet. The measurement of NOx indicates the burning zone temperature and also reduced condition inside the kiln. The consistent quality clinker formation requires a stable burning zone temperature and hence the NOx measurement helps in controlling the burning zone conditions.

The on line NOx analyzer is installed with an investment of Rs 22 Lacs. The benefits are in terms consistent quality of clinker, control of pollutant (NOx) emission from kiln system, reduction of CO formation inside kiln and reduction of ESP tripping. This will become a major monitoring tool when we employ expert system for kiln operation.

Other Projects

- ✓ Use energy saver for street lighting
- ✓ Installation of Asian make 28 watt tube lights in colony & office area
- ✓ Use of 9 watt CFL in guest house, shopping complex and hospital
- ✓ Replacement of metallic impellers by FRP impellers (kiln shell cooling fans, raw mill drive GRR cooling blower, centalised AC blowers)
- ✓ Use of transparent sheet in work shop and wagon tippler shed
- ✓ Raw mill & coal feeding circuits equipment start –stop sequences timing are reviewed and reduced
- ✓ Use of soft starter for truck loader shuttle drive
- ✓ Coal and rawmix quality fine tuned to have lower heat consumption
- ✓ Use of microprocessor based power factor correction relays to maintain power factor at 0.99.