Century Cement : Baikunth

A Brief Write up on Century Cement

Introduction

It was around 1969, that the Management of M/s Century Textiles & Industries Ltd. thought of diversifying their activities towards other areas and decided to establish a Cement plant 8 Km from Tilda. Subsequently, the place where the present Plant and the colony came into existence was christened as "Baikunth". The name "Baikunth" was evolved out of the two/three letters of the three adjacent village in sequence i.e. "Ba" of Bahesar, Kun" of Kundru and "Th" of Tandwa . Baikunth is about 34 KM east of Raipur on Mumbai – Nagpur – Howrah SEC.Railway main line.

The 1st Kiln of the Plant was lighted up in December'1974 and the 2nd Kiln in May'1975. The first bag of Ordinary Portland Cement rolled out of the Plant and dispatched on 3rd March 1975. The present plant capacity is 18.00 Lakh MT per annum.

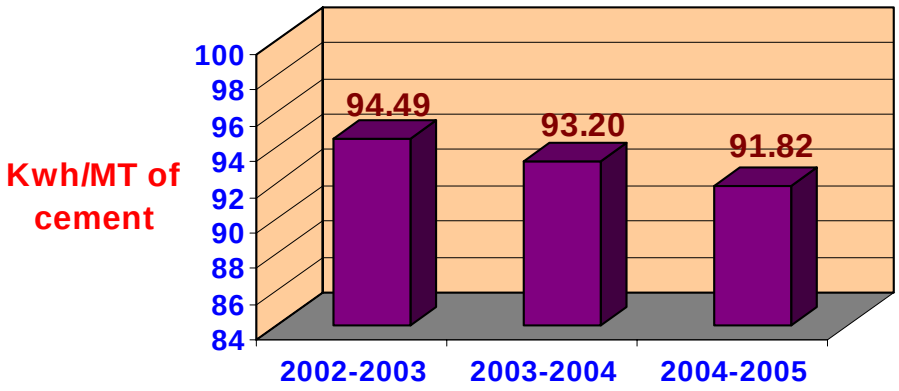
A view of the Plant

Energy Consumption

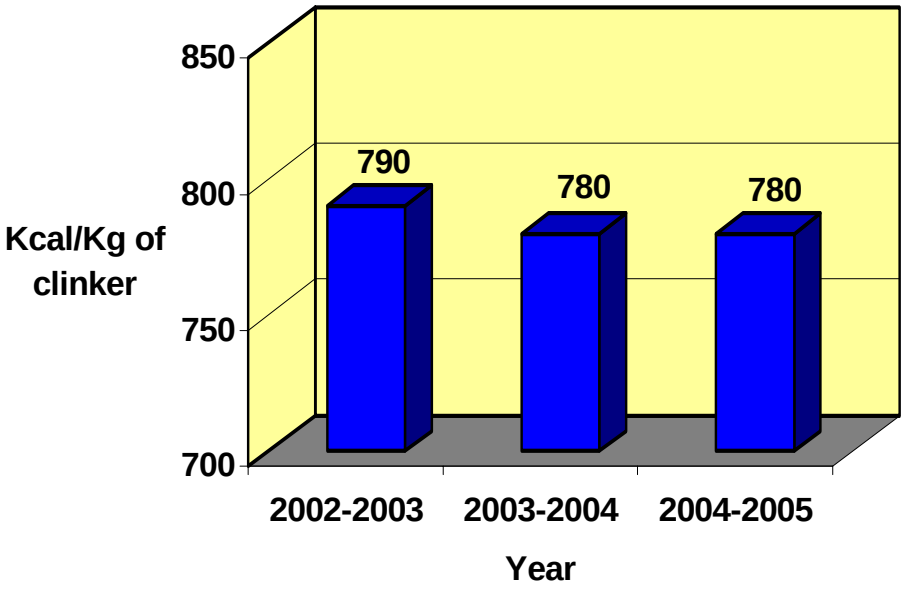
Cement manufacturing is an energy intensive industry. About 50% of the total production cost is that of energy (electrical & fuel). Therefore we are always trying to reduce the specific energy consumption. Total electrical energy, thermal energy consumed and specific electrical & thermal energy consumption figures are as under :-

Year	Electrical Energy Consumption (Lakh Kwh)	Thermal Energy Consumption MKCal	Specific Electrical Energy Consumption Kwh/MT of Cement	Specific Thermal Energy Consumption Kcal/kg of clinker
2002-2003	1463.72	961136	94.49	790
2003-2004	1509.83	972533	93.20	780
2004.2005	1576.95	1000437	91.82	780

Specific Power Consumption



Specific Thermal Energy Consumption



Energy Conservation Commitment, Policy and setup

Energy conservation receives top priority at Century Cement. In view of increasing green house gas emission, fast depleting natural resources of energy and galloping price of energy, the commitment of the management towards energy saving programme is pretty high. Consistent efforts are made to identify the potential of energy conservation and implementation of remedial measures for reducing energy consumption in the plant.

Energy Conservation Cell is headed by Executive President (Plant). Head of Production, Mechanical & Electrical departments are executive members of the cell. Monitoring of electrical energy consumption is done by electrical department and monitoring of thermal energy consumption is done by process department. Monitoring of energy consumption trend is being monitored daily. Specific electrical energy consumption report is prepared daily and specific thermal energy consumption report is prepared monthly. A daily meeting of EC cell with concerned sectional heads is being held and energy consumption trend is discussed. Also progress of various projects is discussed in the meeting.

Energy Conservation Achievements

Major energy conservation projects implemented during the year 2004-2005 are as under :-

1. **Dynamic separator was installed in place of conventional grit separator in coal mill.**

Pulverized coal is fired into the kiln as source of heat. Fineness of the pulverized coal is very important and fuel efficiency of the kiln is dependent on proper combustion of the fine coal. The coal is ground in coal mills.

Dynamic Separator Installed in Coal Mills

Originally coal mills were supplied with Static Grit Separator. The efficiency of the grit separator was not up to the mark and desired fineness of coal could not be maintained. Higher residue in fine coal is responsible for lower combustion efficiency and higher CO generation in the kiln inlet. This resulted in to higher coal consumption.

To overcome this problem, the grit separator was replaced by high efficiency Dynamic Separator supplied by M/s LNV Technologies in two coal mills. Cost of the installation was Rs 80.00 lacs.

After installation of the Dynamic separator in coal mills, we are able to maintain desired fineness of coal. This resulted into reduction in formation of CO at kiln inlet

and thus reduction in coal consumption. A saving of 1000 tonnes of coal per annum is achieved.

2. Inverted leaf (Philips make) seal ring was installed in the Kiln No. 1 outlet.

At kiln outlet, wind box type of sealing arrangement was there to avoid false air ingress in the kiln. But the same was not very efficient. Still about 10% of false air was sucked through this seal. To reduce the false air ingress in the kiln it was proposed to install Inverted leaf outlet seal ring.

The seal ring is used in rotary kilns with grate coolers as a seal between the kiln & kiln hood. It consists of non rotating cylindrical ring of steel plates fitted around the kiln on the kiln hood. The cylindrical ring supports a number of special steel
lamellae which slide on the circular cooling mantle surrounding the kiln outlet section.
Benefits of Inverted Leaf outlet seal

- Improves economy due to less ingress of false air in to the kiln.
- Reduce maintenance cost due to few moving parts.
- Obviates the need for lubrication.
- Ensures long service life due to rugged design.

Inverted leaf (Philips make) seal ring installed in the Kiln

The Inverted Leaf seal ring was installed at kiln out let of kiln no. 1 . Cost of the seal ring was Rs. 12.5 lacs. After the same was installed the false air ingress to kiln was reduced to 5% from previous 10%. This resulted in to increase of secondary air from cooler in to kiln which ultimately results in to fuel saving.
Calculation of saving :-

1. Reduction in false air qty to kiln = 780 Nm^3/hr.
2. Increase in secondary air qty to kiln = 780 Nm^3/hr.
3. Total heat saving = 780 x 1.293 x 0.245 (1050-40) = 249563 K.Cal.
4. Specific heat saving = 249563 / 83000 = 3.0 K.Cal/kg of clinker

Thus a heat saving of 3 K.Cal/kg of clinker was obtained after installation of Enviro outlet seal ring. This is equivalent to 336 Mt of coal per year.

3. Installation of VVVF panels at various process fan drive.

Variable Voltage – Variable Frequency drive (also called VVVF inverter) is a power electronic controller used to control the speed of 3 phase AC motors (synchronous or induction) by varying the frequency and voltage applied to the motor terminals. Voltage and frequency relationship is decided based on the motor name plate data and the load characteristics.

Advantages :

a) Step less speed can be achieved which is required in process control.
b) Energy saving
c) Improvement in productivity
d) Process improvement and better quality of product

VVVF panels installed at various process fan drive

Fan Application :

Fans are variable torque loads, following are the relationship with fan speed:

a) Torque is proportional to square of fan speed
b) Fan power is proportional to cube of fan speed.

We have installed 8 nos. of VVVF panels in the year 2004-2005 at various drives as under:
2 nos. VVVF panels for the FK pumps of RABH dust of C-line of both the kilns.
2 nos. VVVF panels for Sepax separators of Cement Mill no. 4 & 5.
2 nos. VVVF panels for dynamic separators for Coal Mill no. 2 & 4.
1 no. VVVF panel for exhaust fan of C-line of kiln no. 2.
1 no. VVVF panel for cooler fan no. 4 of kiln no. 2.
Approximate cost of the 8 nos. VVVF panels is Rs. 40.00 lac.
After installation of the panels total power saving achieved is 60 Kw.

4. Modification of coal mill no.3 by installation of outlet diaphragm (ALSTOM).

There are 4 nos. of coal mills to produce pulverized coal for firing into the kilns. All the mills are two chamber, closed circuit and air swept type. As the mills are air swept, there was no diaphragm at the mill outlet. It w as observed that the small size grinding media of second chamber of the mill got swept away with fine coal. This resulted in to high consumption rate of grinding media and lower output of the coal mills.
To overcome the problem, it was decided to convert one of the coal mills (Coal Mill no.3) into mono chamber and install a diaphragm at the mill outlet. Partition diaphragm of the coal mill no.3 was removed and M/s ALSTOM make diaphragm was installed at the mill outlet. Also the grinding media load pattern was revised as per recommendation of M/s ALSTOM. After above modification production rate of the coal mill was increased by 10%. **This ultimately resulted into power saving of 0.10 Kwh/ MT of cement.**

5. Optimization of Cement Mill no. 4 & 5 by installation of Pregrinder and Sepax separator along with dry fly ash handling system.

It was decided to increase the production capacity of the plant and therefore the cement grinding capacity is required to be increased. For this purpose a project was taken up to increase the production capacity of Cement Mill no. 4 & 5. In this project it was decided to install Sepax separators in both the cement mill and also a pregrinder is to be installed. For further promote the PPC production, dry fly ash storage and handling system is to be installed.

Sepax Separator: The Sepax separator is used in a closed- circuit grinding plant for separation of the fines from the coarse material, which is received from the mill. Subsequently, the fine fraction is separated in 4 cyclones, arranged in a planetary system, and at this stage the fines are referred to as finished product. The coarse fraction is recycled to the mill for further grinding.
Both the cement mills no. 4 & 5 were operated in open circuit previously. We installed M/s L & T supplied Sepax Separator in both the mills and operated in closed circuit.

Sepax Separator

Pregrinder : The Vertical Roller Pregrinder Mill is used mainly for the pregrinding of clinker. Clinker fed to the center of the mill table via a chute at a constant rate is spread over the table by centrifugal force to form a uniform layer. The clinker is caught between the rollers and table liner segments, crushed and conveyed outward towards the periphery of the table. Ground clinker falls to the base of the mill, where it is scraped by a paddle installed under the table towards the outlet and out of the equipment. This crushed clinker is conveyed to a Screen (Mogenson's Sizer) and finer portion from the screen is fed to cement mills and coarser portion of the clinker is send back to pregrinder.

We installed a Vertical Roller Pregrinder Mill model no. VRPM 230-3 supplied by M/s ACC Machinery Company Limited. Production rate of Cement Mill no. 4 & 5 have been increased by feeding Semi ground clinker.

Pregrinder

Dry Fly Ash Handling System : We are producing PPC using Fly ash as pozzolanic material. The fly ash used, containing 5 to 6% moisture and this adversely affected the production rate of cement mills. Also handling of this loose fly ash poses problem and created dusty environment. To overcome this problem a steel bunker of 500 MT capacity was constructed along with dust collector at the top and extraction arrangement at the bottom of the bunker. The fly ash is being received in closed tankers at our site. Fly ash is unloaded from the tankers to the bunker pneumatically and fed to cement mills through the totally closed arrangement. In this way totally moisture free fly ash is being fed to cement mills which result in to increase in the production rate of cement mill and clean environment surrounding the area.

Dry Fly Ash Handling System

Calculation:

		Before Modification	**After Modification**
1.	Mill drive power (Kw)	2210	1910
2.	Mill auxilliery power (Kw)	125	125
3.	Mech. Transport system power (Kw)	80	80
4.	Close circuiting power (Kw)	-	313.5
5.	Power of VRPM and auxillieries , per cement mill (Kw)	-	362
6.	Total power (Kw)	2415	2790.5
7.	Mill production rate (TPH)	80	107
8.	**Specific power consumption (kwh/MT of cement)**	**30.19**	**26.08**

Therefore, a saving of 30.19 – 26.08 = 4.11 Kwh/MT of cement was achieved.

Energy Conservation Plans & Targets

Energy Conservation Measures (Planned)	Anticipated savings in		Approx. investment (Rs. lakhs)	Project commencement & completion year
	Energy Value (Lakhs Kwh)	Rs. in lakhs		
Dynamic Separator for coal mill	500 MT coal	10.5	40.00	2005 -2006
Modification of coal mill by installation of outlet diaphragm (ALSTOM)	1.79	6.09	20.00	2005-2006
Modification of cyclone and riser ducts of preheater of kilns	Power saving	-	500.00	2007
Modification of raw mills separator	Production increased	-	600.00	2007
Third line of MTS for cement transportation from cement mills to silo.	Power saving	-	170.00	2005-2006
RCC silo for Fly ash storage and its handling system.	Power saving in PPC grinding	-	150.00	2006
Kiln feed MTS to be upgraded	Better process control	-	40.00	2007
Captive Thermal Power plant of 10 MW	To improve availability of power	-	4400.00	2007
Close circuiting of Cement mill no. 1, 2 & 3.	Power saving & capacity enhancement	-	900.00	2007

Environment & Safety

STEPS TAKEN FOR ENVIRONMENTAL PROTECTION AND ABATEMENT OF POLLUTION IN CEMENT PLANT

The well recognized environmental impacts associated with any cement industry are as follows :

1. **Air pollution**
2. **Depletion of natural Resources**
3. **Generation of Green House Gases**

Century Cement have made serious efforts to minimize the pollution and its effect on the environment due to above mentioned points as under :-

1. AIR POLLUTION

1. High efficiency pulse jet dust collectors have been installed in place of old shaking type bag dust collector in different sections of the plant i.e. Crusher, raw Mills, Cement Mills, Packing Plant etc. More than 45 nos. of Pulse Jet Dust Collectors costing more than Rs. 127.81 lac have been installed at various sections of the plant. All the dust collectors are working at almost 100% efficiency.

Smokeless chimneys of cement mills

2. Four nos. of Reverse Air Bag House have been installed for both the Kilns and their Precalcinator. Total cost of the RABH is around Rs. 368.65 lacs. Emission from the stacks of Bag Houses are practically nil.

   Century Cement had long back opted for Reverse Air Bag House over Electrostatic Precipitator for dedusting of kiln gases, because of the practically 100% efficiency of the Bag House.

Reverse Air Bag House

3. Two nos. of ESP have been installed for dedusting the clinker cooler vent gases of kiln no.1 & 2 in place of multiclone dust collectors originally installed. Cost of the two ESPs is around Rs. 192.85 lacs.

Electro Static Precipitator installed at clinker cooler

4. Insertible type dust collectors have been provided at the transfer points of limestone belt conveyor and coal belt conveyors to arrest dust emission by transfer of material from one belt to another.
5. Water spray arrangements have been provided over the hoppers of primary crusher and secondary crusher, limestone belt no. 1, 2 & 3 and clinker belt to control fugitive emission generated locally.

6. Sprinklers have been provided on the roads inside the plant to minimize the fugitive emission generated due to movement of vehicles.

7. To maintain cleanliness of the sections, vacuum cleaners have been provided for cleaning elevator pits and surrounding area of packing Plant and Cement Mills.

8. High capacity exhaust fans have been provided in different sections like Crusher, raw Mills, Cement Mills, Packing Plant etc. for good ventilation.

9. A road sweeper costing Rs. 18 lac has been procured for maintaining cleanliness inside the plant.

Road sweeper

2. DEPLETION OF NATURAL RESOURCES

Natural resources available for manufacturing cement are limited. Main raw material for making cement is limestone. For conservation of natural resources, Century Cement had started using waste material from other industries as raw material for manufacturing cement. Since inception of the plant we are using Chemical Gypsum, a waste product of fertilizer plant, for manufacturing cement in place of mineral gypsum. We are producing Portland Pozzolana Cement using fly ash from nearby thermal power plant since long back. Fly ash is a waste material generated in thermal power plant. Also Portland Slag Cement is produced by us using blast furnace slag, a waste product from steel plant.

Priority is given to production of blended cement over Ordinary or High Grade Portland Cement using maximum quantities of Fly ash and Slag, thus resulting in to power saving, mineral conservation, coal saving and thus help other industries (viz. Fertilizer plants, Thermal Power plants & Steel Plants) to reduce the environmental pollution. The consumption figures of waste material & the percentage of blended cement produced are given below :-

Year	Fly ash Purchased (MT)	Chemical Gypsum Purchased (MT)	Slag Purchased (MT)	Cement Production		
				%OPC	%PPC	%PSC
1975	-	15418	-	100	-	-
1976	-	34353	-	100	-	-
1977	-	38167	-	100	-	-
1978	-	33265	-	100	-	-
1979	Not Available	34200	-	86	14	-
1980	Not Available	35947	-	23	77	-
1981	Not available	37950	-	11	89	-
1982	23783	43306	-	-	100	-
1983	41171	48028	-	-	100	-
1984	38064	47085	-	16	84	-
1985	15847	39599	-	22	78	-
1986	8613	43176	-	78	22	-
1987	14187	34533	-	63	37	-
1988	3739	36150	-	82	18	-
1989-90	35864	41860	-	45	55	-
1990-91	53476	38498	-	20	80	-
1991-92	80880	52263	7466	10	90	-
1992-93	52549	47487	95007	02	71	27
1993-94	103675	45525	22310	14	79	07
1994-95	137553	63279	114946	13	67	20
1995-96	90639	55933	30220	15	66	-
1996-97	113668	27331	-	16	84	-
1997-98	138288	51245	-	24	76	-
1998-99	153114	61259	102727	20	68	10
1999-2000	214479	61459	52941	22	68	10
2000-01	203384	54331	54201	30	63	07
2001-02	203009	57755	198108	19	51	30
2002-03	198162	69346	305618	21	43	36
2003-04	207660	80809	187977	18	57	25
2004-05	350093	86392	167391	**02**	**79**	**19**

Use of 100 tonne of fly ash / slag for manufacture of cement means saving of approx. 150 tonnes of limestone and 17 tonnes of coal.

Whole quantity of fly ash generated in our captive thermal power plant is conveyed through dense phase conveying system to the plant and used for manufacturing of Portland Pozzolana Cement.

To further promote the fly ash consumption, we have installed a dry fly ash handling system to unload fly ash from closed tankers directly to steel hopper without generating any dust in the environment. This ensures totally dust free handling of fly ash in the plant.

3. GREEN HOUSE GAS

Cement making is highly energy intensive and is closely coupled with global warming mainly due to its process characteristics that involves burning of fossil fuel besides high electrical energy consumption. Cement manufacturing process creates CO_2 in two ways, one during dissociation of carbonates of limestone and second from burning of large quantities of fossile fuel inside the kiln to generate heat, necessary for calcinations of raw material and clinker formation.

Sources of CO2 generation in cement industry are as under:

a) Calcination of carbonates in raw material
b) Combustion of fossil fuel
c) Power consumption
d) Mining activities

Strategies for CO2 reduction:

a) **Increased production of blended cement:-** We are using large quantities of fly ash and blast furnace slag for manufacture of blended cement viz. PPC and PSC respectively. More than 80% of the total cement produced is blended cement only. Since Aug'2005, we have totally stopped the production of OPC. **Use of 1 tonne of fly ash / slag in manufacturing of cement directly reduces 1 tonne of CO2 emission in to the atmosphere.**

b) **Energy optimization:-** With lots of modernization and upgradation in our plant, thermal energy as well as power consumption have been reduced considerably. Energy consumption trend of our plant for last 5 years is as under :

Year	**Specific electrical energy consumption KWh/MT of cement**	**Specific thermal energy consumption Kcal/MT of clinker**
1999-2000	101.56	840
2000-2001	99.45	835
2001-2002	94.88	830
2002-2003	94.49	790
2003-2004	93.19	780
2004-2005	91.82	780

Due to production of high volumes of blended cement and reduction in specific energy consumption, CO2 generation per MT of cement has reduced considerably. CO2 generation per MT of cement production of cement is as under :

Year	**CO2 generation per MT of cement production**
2000-2001	0.702
2001-2002	0.659
2002-2003	0.650
2003-2004	0.650
2004-2005 Up to Feb'05	0.643

Average figure of CO2 generation in the country is 0.90 MT/MT of cement

4. OTHER MEASURES

a. Proper containments have been provided in the departments for storage of lubricating oil drums to avoid spillage of oil during transfer. Also individual hand pumps are provided for each drum to avoid any spillage due to transfer of pump from one drum to another.

b. Proper sealing has been provided in the various gear boxes and girth gears to avoid the leakage of oil.

c. An oil separator has been provided at the outlet drain of the plant to reduce the oil & grease content in the discharged water.

5. PLANTATION

Road side plantation

Originally the natural land when leased to us was almost a barren land with hardly any vegetation. The soil, climatic and arid conditions appeared to be unfriendly to aforestation efforts. After soil correction, a massive plantation has been done in almost all sections of the plant, colony and mines and also in the surrounding area. Every year plantation programme is taken up in the monsoon. Total plantation done up to 31.03.2005 is 404959 nos. The plantation work has not only enriched the environment in terms of fresh oxygen but also has helped in reducing the atmospheric temperature by 2 - 3 Deg. C in peak summer. It has also assisted us in combating pollution to great extent.

Road side plantation

REHABILITATION

As early as in 1974 an old mined out pit measuring 6.2 hectare had been converted into a reservoir of 10 meters depth having water storage capacity of 74 million gallons. Now its capacity has been further enhanced to about 200 million gallons by deepening and increasing the height of bunds. Green belt has been developed all around. Also the surrounding area has been developed as a picnic spot by beautiful garden and swimming pool attracting picnickers from as far as Raipur, Bilaspur and other distant places.

Abondand mines pit converted in to a beautiful lake.

1. Mine water from present two quarries is pumped into this reservoir from where it is pumped to water filtration plant and then used for domestic and industrial requirement.
2. Initially this area was totally devoid of any dependable source of water and even the requirement for domestic consumption could not be met, leave aside the large requirement for major plant. It is this reservoir now which has proved to be the life line for plant and colony people through out the year.
3. Also, due to massive plantation and creation of huge reservoir a lot of migratory fauna are seen in this area providing additional attraction to the resident and visitors.

ENVIRONMENTAL MANAGEMENT SYSTEM – ISO : 14001

For better pollution control & continual improvement in our environmental performance, Environmental Management System ISO 14001 has been implemented in the plant & mines. The certification was granted in Nov'1999 for a period of 3 years and is further renewed up to Nov'2005

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