

# **ECOAUDITING AS A STRATEGIC TOOL IN MANAGING THE RESOURCE AND ENERGY IN CEMENT INDUSTRIES**

**Kailash C. Sharma, Prem S. Dubey and Krishna Haryani**

**Vice Chancellor**, Maharshi Dayanand Saraswati University,  
AJMER 305009 Rajasthan, India  
Email [drsharma@datainfosys.net](mailto:drsharma@datainfosys.net)

**Chairman**, M.P. Pollution Control Board,  
Paryavaran Parisar, E-5, Arera Colony,  
Bhopal, 462 016 Madhya Pradesh, India  
Email [preshdubey@satyam.net.in](mailto:preshdubey@satyam.net.in)

**Project Scientist**, Institute of Environment Management and Plant Sciences,  
Vikram University, Ujjain, 456010 Madhya Pradesh, India  
Email [krishnaharyani@yahoo.com](mailto:krishnaharyani@yahoo.com)

## **ABSTRACT**

A continuous environmental auditing executed for several years in three cement plants conclusively prove that ecoauditing if done in details on monthly basis for various components one can diagnose the point of strength and weakness of entire production process, resources and energy utilization trend. A careful review of the recommendation of the audit report can provide remedial measures for correction of the processes, for checking of the spoilage and waste of the raw material and resources at various points starting from mining to packing and transportation. From the same report one can visualise the area where recycling and reutilization is possible.

The case history of Vikram Cement, Aditya Cement and JK White Cement prove that the environmental that the environmental audit can yield improvement in environmental quality as well as conservation and minimise economic losses. With the implementation of the recommendation and observation of the audit team the achievements in the conservation of water, in the production process is quite impressive. On the energy front there is a remarkable achievement in heat and thermal energy per ton of cement produced.

The achievements are more spectacular in Vikram Cement where auditing has been done for eight years continuously. In other two industries in four years itself auditing has proved its utility in conservation of energy and resources and in turn economic benefit.

## **INTRODUCTION**

Ecoauditing is a significant tool in the problems of environment. The word acquired such a proportion of awareness that it has almost become synonymous to the word environment. The entire scenario of environmental concerns at village to global level is changing fast and attitude is growing towards the totality of protection. Obviously industries are no longer and will no longer be treated as culprits much because of the

commitment generated, technological expertise implemented and the self consciousness emerged at every level. Because, the environment requires respect, dedication, devotion and designs for natural benefits:- means we need a management proposal which ultimately provides a regular guidance. The picture is getting clear and clear, the industrial environments are getting cleaner and cleaner, environmental management is gaining priorities over the profit oriented economical management.

It is this reason that in India, even in the industrial sector, the fusion of technosphere-biosphere has started yielding better Environmental Management Plans and Systems. True, that the environmental preservation is a task, no regulation, acts, laws, rules can make a sea change in our environmental scenario until people's participation and the industries, planners and authorities adopt voluntary exercises.

The objective of this paper is not to meet the standards and complete the consent conditions laid by Government agencies or Pollution Control Boards but the real objective is to obtain consent from our ecosystems and their components. No certificate is more valid than this. The environment management of Cement industry is not just a routine one but it is a fact sheet of a cohesive effort of people, executives, labours and other employees. The general concept that cement production is energy intensive and pollution generative process has been proved into misconceptions at these sites at least. The continuous auditing procedure on annual basis since last ten years at these sites and of much significance environmentally is, the improvement made as a consequence of the recommendations in these annual statements.

The over all scenario of comprehensive efforts of company in turn will have a long term impact on conservation of these resources - a policy quite compatible with the national policies.

### Sites

The environmental auditing was done annually at different cement industries since last ten to fifteen years. The details about industries are mentioned in table:1

Details	Name of Industry		
	Vikram Cement	Aditya Cement	J.K. White Cement
Location	A unit of Grasim Industries P.O. KHOR, Distt. Neemuch (MP) 458470	A unit of Grasim Industries P.O. Sawa- Shambhupura Dist. Chittorgarh (Raj.) - 312613	A unit of J.K. Industries Ltd. P.O. Gotan, Distt. Nagaur (Raj.) 342902
Longitude	75°58' E	74°37' E	73°45' E
Latitude	24°07' N	24°46' N	26°49' N
Annual Production (TPD)	Upto 1998 – 4000 From 1999- 7300	Upto 2001 - 3300 from 2001 - 4800	Upto 2000 - 530 From 2000 – 760
Year of establishment	1985	1994	1984

Soil Type	Black cotton soil with large patches of red laterite	Black/yellowish brown soil with red loam	Yellow sandy soil
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**Table :1 General information about the industry**

## **RESULTS & DISCUSSION**

The energy and resource management is a key to the success for environmental quality. The very fact that cement production is highly energy intensive and resource exploitative, it is too critical for cement industries to manage these two aspects, which are rather key issues of environment management in general.

In nutshell, the strategy of resource saving, yielded results with no compromise on the quality of the cement produced. This orientation in functional and management aspect of lime stone, other raw materials and water consumption is a significant achievement in it self. Since it corroborates with the national policy of natural resource conservation.

The situation of raw material utilisation too is optimistic with a continuous reduction in water use pattern, mineral materials to be used and coal consumption for the per ton of cement or clinker production. Infact, there has been an over all attempt to cut the energy in all sectors whether it is grinding or packing or clinker formation.

The table 2,3 & 4 gives the detailed information of the water use pattern and raw material consumption in manufacturing of the cement. The water conservation efforts shows, a serious attempt has been made for water economy so as to bring it to the level of previous years. The good practices adopted in the domestic consumption of water has given positive results at Vikram Cement then other industries. The data exhibit that the company has taken water conservation as a high priority area: since the region is already a water scarce area. The industry has prepared a programme for rainwater harvest and this season will be the one, which will offer the result of it.

Raw material consumption pattern has been optimised, since the raw material use per ton of cement produced is decreased in last few years showing that processes are in good shape and are well stabilized. The mineral resource picture is more impressive with a reduction of per ton of cement, which is once again an achievement at these industries. The data of the few years and the current year exhibit a trend towards resource waste minimisation through careful production and management.

In the raw material (limestone) sector the per ton clinker/cement is decreased by 3.55 %, 15.64% and 1.45% at Vikram Cement, Aditya Cement and J.K.White Cement over 1995-96 respectively. Actually the conservation of limestone will be actually 0.049, 0.206 and 0.018 ton per ton of cement production. The maximum saving of limestone was carried out by Aditya Cement then other two industries. As far as raw material is concerned the situation is quite optimistic which can lead to the further saving of resources in next few

years. It should be noted that this has been achieved through updating of technical know how and care to stop spillage.

No country, industry or a modern civilisation can afford to be without energy. The industries require enough of it and cement industry in it self is in energy intensive process. In such a case it becomes more important rather obligatory for the industry to reduce the energy use per ton of clinker/cement, since ultimately it terminates to the saving of energy may be electrical may be thermal and may be even human one. Now cement is a key player product of market specially in developing countries as result whether it is thermal or electrical, it should be saved, which will mean a strategy based on field experience, keen observations and regular implementations.

The energy is the key of all functions of life, industries and systems of any kind and cement production requires large quantum of energy per unit of production which may be derived from coal, oil and electricity. The competition of cutting the price of cement and the energy for conservation of resources made, the cement industry in general to evolve strategies for energy conservation. A comparative data of use of the coal, diesel and power has been calculated in terms of thermal or electrical energy per ton. The picture of conservation of energy resources have been continually positive since last four to five years have been continued to this year also with success.

There is a significant reduction in the thermal energy per ton of cement/clinker i. e. a saving over 1995-96 is 8.07 % at Vikram Cement, 21.19% at Aditya Cement and 17.13 % at J.K. White Cement. A perusal of the data sheet indicates a continuous trend of energy saving from 1995-96 to 2002-2003. The similar trend figures for electric energy Kwh requirement per ton of cement produced was decreased at Vikram Cement and Aditya Cement i.e. 22.10% and 51.09% respectively over 1995-96 while there is a slight increased in electric energy consumption at J.K. White Cement i.e. 1.05% was observed. These data for achievement of the energy in the one decade in terms of resource and money as well as environment would amount to large saving of resources. The most significant attainment of the Aditya Cement is thus energy management.

The situation of raw material utilisation too is optimistic with a continuous reduction in water use pattern, mineral materials to be used and coal consumption for the per ton of cement or clinker production. Infact, there has been an over all attempt to cut the energy in all sectors whether it is grinding or packing or clinker formation.

Finally the objective of ecoauditing is simple, if the pollution control can not yield results in natural resource conservation than these efforts and financial inputs are of less importance and poor significance because it will serve only one objective i. e. environmental quality improvement only but no resource economy. The following points will present a summary of these units on resource minimization and energy conservation.

1. Through the cement sector is in turmoil of recessive economy, these cement units managed financial allocation for the environmental management and pollution control efforts. The dust control and recycling of the trapped dust material, amounts to a definite saving of the mineral resources and an achievement in itself.

2. Water is becoming a precious commodity and is more so in a case of these cement areas, where water is in scarce. In such a situation cutting down of water consumption in domestic as well as cement production should be well appreciated since the quantity of water saved is enormous.
3. The water resource economy is further emphasised by the use of the entire quantity of treated sewage for the horticultural purpose that mean a straight reduction in the use of fresh water equivalent to 120m<sup>3</sup>/day.
4. The utilisation of low-grade limestone for production of cement is another effort, which have a direct bearing on the saving of limestone from natural sources.
5. A critical assessment made after a continuous appraisal of the plant and machine operations indicate that energy saving efforts is efficiently put in all sectors of the plant. Also the spillage of oils, grease and other material is almost negligible and perhaps induction of TPM concepts has made it possible. Ultimately the resources are utilised and production cost is reduced.
6. One of the major achievement is in the energy use pattern per ton of clinker/cement, whether it is the electrical or thermal any type of energy. The net savings in last six/seven years in energy sectors has been significant. This achievement has not come suddenly; indeed it is because of recurrent efforts and modern technical inputs, which gave these results. On an economic scale the savings would be in terms of crores of rupees while in terms of resources saving i. e. coal, HSD, etc. which are priceless adventure.

At last one can justifiably conclude that the management of any industry if acts and behaves environmentally, it can become a symbol of industrial environmentalism.

## ACKNOWLEDGEMENTS

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**Table 2. Water and Raw Material Consumption at Vikram Cement**

### I. Water Consumption (Kl/day)

	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Industrial + Cooling	1145	933	1071	956	1509	1505	1670	1681
Domestic	1293	1269	1468	1338	634	649	506	463

Name of the product	Water consumption / unit of product (Kl/Ton)							
	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Cement	0.17	0.174	0.173	0.163	0.2116	0.2230	0.2352	0.2350

## II. Total Raw Material Consumption

Years	Consumption of raw material/ unit of clinker (per Ton)					
	Limestone	Laterite	Red Ochre	Flyash	Total	*Gypsum
1995-1996	1.4288	0.0295	--	--	1.4583	0.0518
1996-1997	1.4241	0.0454	0.0093	--	1.4817	0.0529
1997-1998	1.4264	0.0439	0.0500	--	1.4807	0.0500
1998-1999	1.4200	0.0512	0.0115	--	1.4827	0.0500
1999-2000	1.4170	0.050	0.0115	--	1.4995	0.0518
2000-2001	1.4037	0.0650	0.0143	-	1.4830	0.0488
2001-2002	1.3980	0.0339	0.0459	0.0387	1.5165	0.0455
2002-2003	1.3781	0.0383	0.0592	0.0719	1.5475	0.0495

**Table 3. Water and Raw Material Consumption at Aditya Cement**

### I. Water Consumption (Kl/day)

	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Industrial + Cooling	512.78	451.55	653.53	678.01	1000	1065	1427	
Domestic	232.14	288.73	361.46	380.13	401.00	406.00	499.00	

Name of the product	Water consumption / unit of product (Kl/Ton)							
	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Cement	0.39	0.18	0.37	0.23	0.26	0.28	0.32	

## II. Total Raw Material Consumption

Years	Consumption of raw material/ unit of clinker (per Ton)					
	Limestone	Laterite	Red Ochre	Flyash	Total	*Gypsum
1995-1996	1.5660	0.037	0.033	0.002	1.607	0.051
1996-1997	1.4345	0.0418	0.0096	--	1.5172	0.0492
1997-1998	1.4345	0.0481	0.0439	--	1.5366	0.052
1998-1999	1.4220	0.057	0.0439	--	1.4375	0.051
1999-2000	1.4190	0.0410	--	--	1.4356	0.0530
2000-2001	1.3366	0.0564	0.0177	--	1.4580	0.0473
2001-2002	1.3429	0.0246	0.0632	0.0003	1.4800	0.0505
2002-2003						

**Table 4. Water and Raw Material Consumption at JK White Cement**

**I. Water Consumption (Kl/day)**

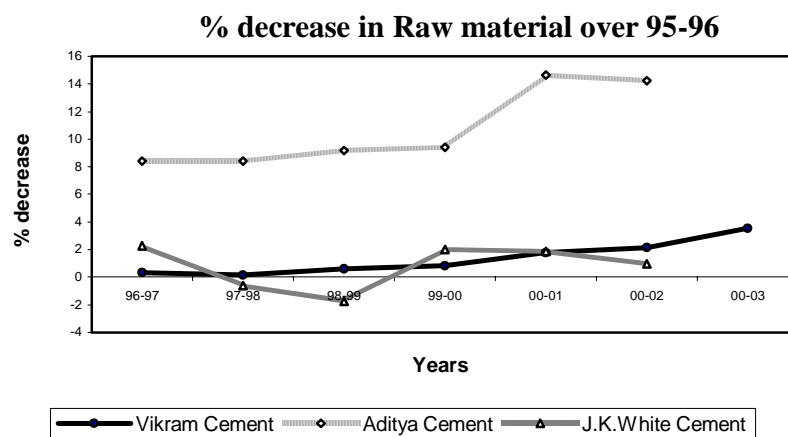
	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Industrial + Cooling	455.4	487.58	460.00	494	591	497	422	
Domestic	671.0	444.08	502	571	568	517	605	

Name of the product	Water consumption / unit of product (Kl/Ton)							
	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Cement	1.877	1.762	1.649	1.776	1.790	1.480	1.821	

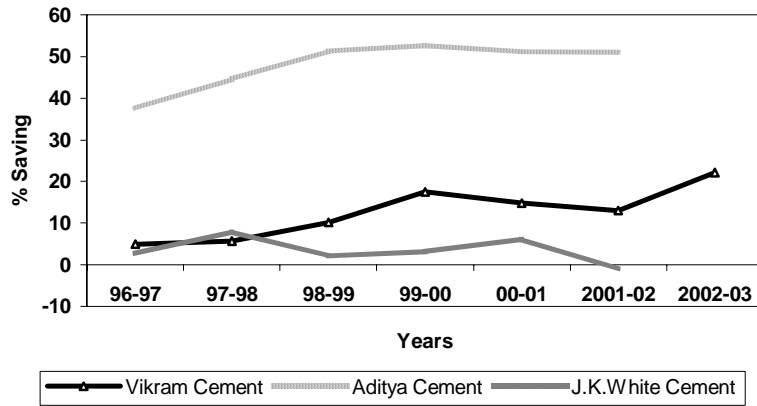
**II. Total Raw Material Consumption**

Years	Consumption of raw material/ unit of clinker (per Ton)				
	Limestone	China Clay	Flourspar	Total	*Gypsum
1995-1996	1.2492	0.2843	0.0025	1.5760	0.0400
1996-1997	1.2210	0.3062	0.0040	1.5742	0.4300
1997-1998	1.2569	0.2637	0.0030	1.5713	0.4770
1998-1999	1.2709	0.2568	0.0029	1.5740	0.0434
1999-2000	1.2241	0.3251	0.0026	1.5380	0.4250
2000-2001	1.2261	0.3267	0.0037	1.5370	0.0400
2001-2002	1.2371	0.2651	0.0036	1.5393	0.0369
2002-2003					

\*Gypsum consumption taken per unit (Ton) of cement



**% Saving in Elelctric Energy Kwh/Ton Cement  
over 1995-1996**



**% Saving in Specific Heat Consumption  
Kcal/kg Clinker over 1995-1996**

