CHAPTER 8
ENVIRONMENT MANAGEMENT PLAN

The impact assessment of the proposed project has highlighted certain areas, which needs special attention. The Environmental Management Plan (EMP) is required to ensure sustainable development in the study area (10-km) of the project site. The project will carryout the control measures for air pollution by installing APCS and has also drawn up advance plans for rainwater harvesting, installation of STP and plantation program. These are covered in the following paragraphs.

8.1 CONSTRUCTION PHASE

The construction activities of the proposed plant will have some adverse impact on the environment. The activities during the construction phase of the plant include site preparation, transportation of construction materials and equipment and construction of the infrastructural facilities. During this phase workers/ laborers would be staying on site till completion of the construction work. The impact will last only for a short period of 18 months. As soon as construction is over, the excavated earth has to be utilized to fill up low-lying areas, the muck is to be cleared and all inbuilt surfaces reinstated. No tree felling is involved. The proponent will undertake plantation over an area of 10 hectares. It is proposed to undertake plantation wherever possible during construction phase also.

8.1.1 Air pollution

There may be need of ground leveling and some excavation is anticipated for the laying of machinery foundations. Dust, the major source of air pollution is likely to be generated from construction activities and transportation. Hence water sprinkling will be done on regular basis. The construction vehicles will be properly maintained to minimize exhaust emissions. The muck resulting from the debris and left over building materials shall be used in filling of voids and spaces.

8.1.2 Noise

Noise generation during construction phase will be due to the operation of heavy equipments and increased frequency of vehicular .The nearest habitation is at a distance of 1-km. Hence the noise generated will be diffused by the natural obstructions and shall decrease with distance. On-site workers will be provided earmuffs. As far as possible

noise prone activities will be restricted during day time (6 am to 10 pm).The construction activities shall be screened off by raising enclosure of galvanized iron sheets around the construction site.

8.1.3 Water quality

There will be temporary houses along with canteen and toilet facilities. Water for washing & sanitary requirement will be met from tankers. There will be negligible impact on the surface water quality. Soak pits shall be made to contain and decompose sewage generated. The soak pits shall be covered by stone slabs/ cement slabs to enhance anaerobic decomposition.

The ground water table is 8-9 m deep where as the soak pit shall be about 1.5 to 2 m deep. A buffer zone of 4 m is sufficient to safe guard ground water contamination by sewage.

8.2 OPERATIONAL PHASE

8.2.1 Air pollution

The air pollution sources have been discussed in Chapter-4. Dust extraction system will be installed at the following sections with identified air pollution control equipment.

TABLE 8.1: Recommended Air Pollution Control Equipment for Various Sections

S.No	Section	Air Pollution Control Equipment Proposed
1	Raw Material Storage	Bag Filter
2	Raw material blending / homogenization /grinding section	Bag Filter/Bag House
3	Blending Silo	Bag Filter
4	Coal handling/crushing/grinding	Bag Filter
5	Raw mill/Preheater/Kiln	Bag House
6	Clinker Cooler	ESP
7	Clinker Silo	Bag Filter
8	Cement Grinding	Bag Filter
9	Packing Plant	Bag Filter
10	Coal Grinding	Bag Filter

11	Limestone Crusher Complex	Bag Filter
12	All Transfer Points to be covered with hood	Bag Filter
13	Belt conveyors	Bag House
14	Open storage/receiving yard	Water Sprinkler/ Dry Fogging
15	Haulage roads within plant premises	Bitumin covered/concrete
16	Limestone crusher hopper(enclosed with wind breaker screens)	Water Sprinkler
17	Limestone stacker / reclaimer (with wind breaker screens 5m high)	Dry fogging
18	Dust on roads/plant floor	Using mechanised sweeping with vaccum cleaners

The efficiency of ESP will be 98.5 % to maintain the emission level at respective stack @50mg/Nm^3. Safe interlocking system will be provided for kiln operation with respective ESP operation i.e. whenever 'ESP trips', the entire kiln operation stops. Also the CO levels in the kiln shall be pegged at 0.08% and any upward deviation shall stop the kiln operation till corrective action is taken up to prevent explosive situations.

8.2.2 Action Plan to Control and Monitor Secondary Fugitive Emissions from Secondary and Fugitive Sources

It is proposed to use the Dry Fog and water sprinkler type dust suppression system for all the secondary sources and fugitive dust emissions.The choice between the two shall be decided by the situational advantage and or easy availability of resources. In view of this, all transfer points, conveyor to conveyor transfer, conveyor to equipment transfer, screens and crushing shall be covered under this system. For the smooth operation of this system separate pump houses comprising of water pumps, compressors, storage tank, air receivers, pipe network with atomizing nozzles and accessories shall be provided.

Where ever possible, the fugitive sources such as crusher hopper, screens, coal hopper, raw material hoppers shall be sprayed with fine mist/dry fogging agents.

In addition the following management measures shall be adopted.

8.2.2.1 Operation and Maintenance Requirement for all Dust Extraction cum Bag filter Systems

- A "U"-tube manometer (of minimum 400 mm length) shall be fixed at all bag filters. It shall be connected with inlet and outlet side of the bag filter through flexible rubber tubes. Coloured water should be filled to zero level mark for proper visibility of the pressure drop across bag filter.
- The minimum dust extraction volume should be based on the guidelines for ventilating various sources as per industrial ventilation hand book guidelines
- Un-interrupted supply of dry compressed air at desired pressure should be always ensured for pulsejet cleaning type bag filter.
- The flow rate and static pressure at the bag filter inlet should be monitored at least quarterly and recorded to ensure appropriate functioning of the bag filter installed.
- A sampling platform and access ladder shall be provided at the final stack to carry out stack monitoring (in main stacks). Final emission should not exceed the prescribed standard.
- In systems where water is also spread, it should be ensured that water does not get carried over/sucked to the bag filter. The details such as bag house specifications, layout drawing, operation and maintenance guidelines are to be maintained.
- Basic details/specifications of the dust suppression systems installed at various locations should be maintained. The information should contain the quantity of water sprayed in LPH, number of nozzles, type of nozzles, desired water pressure, details of suppliers of spares, pipeline diagram, system layout etc.
- A pressure gauge and water flow meter shall be installed at major source for online measurements and a record be maintained for quantity of water sprayed.
- A fine mesh micro filter should be installed for filtering suspended solids from water prior to pumping to the nozzles to prevent choking of nozzles thereby ensuring proper sprays.

8.2.2.2 SPM Concentration Standard for Assessing Effectiveness of Control Measures to be Adopted

- The effectiveness of prevention cum control measures provided for controlling fugitive emissions from any source shall be said to be satisfactory, provided the

SPM concentration, measured at 10 metre distance (from the enclosure wall housing the emission source or from the edge of the stockpiles/pavement area) in downwind direction shall not exceed 200 microgram per cubic metre and 500 microgram per cubic metre for coal yard /coal stock pile and rest other area respectively. These standards are for one year period and will be reviewed after one year. In cases where SPM concentrations exceed the prescribed limit, necessary corrective measures in terms of improving the controls shall be taken and action taken records of improvements carried out be maintained.

- The measurement shall be carried out by Respirable Dust Samplers as per standard method prescribed by CPCB/BIS, covering at least 4 hours duration (240 minutes) during normal working hours with normal production rate of the operation / source being monitored on quarterly basis.

8.2.2.3 General Guidelines (For areas not otherwise specified)

Apart from the specific guidelines provided above for some specific sections/areas, for all other fugitive dust emitting areas, following general guidelines would apply.

- The industry should prevent fugitive emission from all active operation and storage piles, such that the emissions are not visible in the atmosphere beyond the boundary line of the emission source.
- The Industry shall conduct active operations by utilizing the applicable best available control measures to minimize the fugitive dust emission from each fugitive dust source type within active operation.
- Except for Gypsum and Clinker, all storage piles should be kept in moist condition by spraying water at regular intervals for controlling fugitive emission, wherever possible.
- All storage silos shall be vented to bag filters, which should have proper bag cleaning arrangement so as to avoid choking of filter bags, thereby to avoid pressurization of silos.
- Regular inspection at a pre-determined frequency be carried out of all fugitive dust control system and records be maintained of such inspection and corrective action taken if any.
- The operation of the pay loaders shall slow down whenever the average wind speed is high exceeding 50 km/h, which may cause fugitive emission.

- Wind screens shall be erected around all open yards and spaces from where fugitive dust emission is anticipated. The height of wind screens shall be at least 5 m so that air borne dust is minimized. Also water sprays shall be used especially at limestone hopper and other places.

8.2.2.4 Protection from Fugitive Dust

The following measures are recommended by CPCB to control fugitve dust from various sources. The measures shall help to reduce generation of fugitive dust to maximum level.

Also for the workers who have to work near the source of generation, it is recommended to use personal protective equipment such as dust mask, goggles and helmets.

The details of section wise control measures and its relevant guidelines are given below:

1. Unloading Section (Limestone, Coal & other relevant material)

Sr. No.	Control Measures to be Provided	Guidelines
1.	Enclosure should be provided for all unloading operations, except wet materials like gypsum	The enclosures for the unloading sides could be flexible curtain type material covering up to height of dumpers discharge from the roof.
2.	Water shall be sprayed on the material prior and during unloading	A dust suppression system should be provided to spray water. The amount of water sprayed should preferably be optimized by employing proper design of spray system. Suitable systems may be adopted to reduce the problems like choking, jamming of the moving parts.

2. Material Handling Section (Including Transfer Points)

Sr. No.	Control Measures to be Provided	Guidelines
1.	All transfer point locations should be fully enclosed.	The enclosures from all sides with the provision for access doors, which shall be kept, closed during operation. Spillages should be periodically removed.
2.	Airborne dust at all transfer operations / points should be controlled either by spraying water or by extracting to bag filter.	Either water spray system should be provided for suppressing the air borne dust or dry extraction cum bag filter with adequate extraction volume.

3. Coal Storage Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	Coal yard / storage area should be clearly earmarked.	A board should be erected to display the area earmarked.
2.	The pathways in coal yard for vehicle movement should be paved.	Proper pathways with entry and exit point should be provided.
3.	Accumulated dust shall be removed / swept regularly and water the area after sweeping.	Any deposits of dust on the concrete roads should be cleaned regularly by sweeping machines.
4.	Coal other than coal stock pile should preferably be stored under covered shed.	Where ever blending activity is carried out by chaining in open ground, covered shed should be provided to reduce the fine coal dust getting airborne. The enclosure walls shall cover minimum three sides up to roof level.
5.	The coal stock pile should preferably be under covered shed for new plants.	The enclosure should be from three sides and roof so as to contain the airborne emissions.
6.	Instead of dust extraction cum bag filter system, If dust suppression measure is used, following additional control measures should be provided.	
a	Wetting before unloading.	Coal should be sufficiently moistened to suppress fines by spraying minimum quantity of water, if possible.
b	Spray water at crusher discharge and transfer points.	Water spray should also be applied at crusher discharge and transfer points.

4. Clinker Cooler Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	Air borne fines extracted from clinker cooler shall be separated and sent to last possible destination directly, if possible.	The possibilities especially in new cement plant may be explored for the following: The unit may need to add on / install necessary provisions for separating fine particulates from the clinker cooler ESP collection. Fines separation may be achieved by passing collected dust through cyclone, the fines escaping cyclone to be separated, cyclone collection (coarse particles) could be

5. Clinker Stock Piles Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	In new cement plant, clinker should be stored preferably in silo.	Bag filter may be provided before venting out the gases.
2.	Clinker should be stored in closed enclosure covered from all sides and should have a venting arrangement along with a bag filter.	The enclosures should have a venting arrangement located at transfer point where clinker is dropped to the stockpile. The extraction / venting should be sufficient enough. Clinker stockpile access door should be covered by mechanical gate or by flexible rubber curtain. The access doors shall be kept closed at all possible times.
3.	The dust extracted and captured in bag filter should be avoided to feed back / recycled to the clinker stockpile, if possible.	Extracted dust should be captured in bag filter and the collected dust should be avoided to feed back to the clinker stockpile, if layout permits. It may be recycled at last possible destination i.e., cement mill section through suitable arrangement, if possible.
4	Generally open storage of clinker should be avoided. Only in case of emergency clinker should be stored in open with following control measures.	
5.	Area for open storage of clinker should be clearly earmarked.	After earmarking the open storage area of clinker, a board should be erected to display the area earmarked.
6.	Provide cover on openly stored clinker.	During the period when the openly stored clinker is inactive, it should be covered fully by HDPE or tarpaulin type sheets to prevent wind blowing of fugitive dust.
7.	Provide windbreak walls or greenbelt on three sides of open stock piles	Install three sided enclosures, which extend to average height of the stockpile, where ever feasible.
8.	Provide partial enclosure for retrieving area.	Flexible type wind breaking enclosure should be provided covering the clinker retrieval area as wind barrier to prevent dust carry over by wind. The enclosure could be of lightweight material like moulded plastic material or similar, which could be dismantled / assembled and shifted from one place to other.
9.	The travel path of pay loaders should be paved and frequently	Travel areas path used by the front – end pay loader shall be paved with concrete. It should

	swept.	be regularly swept by high efficiency vacuum sweeper to minimize the material build – up.
10.	Provide loading of clinker by pay loaders into trucks / trailers be carried out in an enclosure vented to a bag filter.	The possibilities especially in new cement plant may be explored for the following: An enclosure fitted with bag filter could be located at the most central place adjacent to the clinker storage area. The pay loader moves to the fixed loading area from one end of the enclosure and the truck/trailer enters the enclosure from other end.

6. Storage of Limestone, Gypsum, Flyash and other additives:

Sr. No.	Control Measures to be Provided	Guidelines
1.	The storage should be done under covered shed.	The enclosure walls shall cover minimum two sides up to roof level.
2.	Dry fly ash shall be transported by closed tankers. In case of wet fly ash trucks may be used for transportation.	Flyash shall be pumped directly from the tankers to silos pneumatically in closed loop or mechanically such that fugitive emissions do not occur.
3.	Dry Fly ash shall be stored in silos only.	The silo vent be provided with a bag filter type system to vent out the air borne fines.
4.	Flyash in the dry form should be encouraged and in wet form should be discouraged. In case wet flyash is to be used, it may be stored in open temporarily for the purpose of drying with necessary wind break arrangement to avoid wind carryover of fly ash. The fly ash should be removed immediately after drying.	If possible, the dry flyash should be sent to closed silos. Otherwise, flyash should be transported through closed belt conveyors to avoid wind carryover of flyash.

7. Cement Packing Section:

Sr. No.	Control Measures to be Provided	Guidelines
1.	Provide dust extraction arrangement for packing machines.	The packing machines should be equipped with dust extraction arrangement such that the packing operation is performed under negative pressure. The dust may be captured in bag filters.
2.	Provide adequate ventilation	Adequate ventilation for the packing hall

	for the packing hall.	should be provided for venting out suspended particulate thereby ensuring dust free work environment.
3.	Spillage of cement on floor shall be minimized and cleared daily to prevent fugitive emissions.	The spilled cement from the packing machine should be collected properly and sent for recycling. The spilled cement on the shop floor should be swept by vacuum sweeping machines periodically. Proper engineering controls to prevent the fugitive emissions may include arrangements like providing guiding plate, scrapper brush for removing adhered dust on cement bag etc.
4.	Prevent emissions from the recycling screen by installing appropriate dust extraction system.	The vibratory screen provided for screening/ recycling spilled cement should be provided with a dust extraction arrangement to prevent fugitive emission from that section.

8. Silo Section :

Sr. No.	Control Measures to be Provided	Guidelines
1.	The silo vent be provided with a bag filter type system to vent out the air borne fines.	The bag filter should be operated and maintained properly, especially the cleaning of bags to avoid pressurization of silos thereby causing fugitive emissions from leakages etc.

9. Roads:

Sr. No.	Control Measures to be Provided	Guidelines
1.	All roads on which vehicle movement of raw materials or products take place should be paved.	The paved roads should be maintained as paved at all times and necessary repairs to be done immediately after damages to the road if any.
2.	Limit the speed of vehicles.	Limit the speed of vehicle to 10 Km/h for heavy vehicles with in the plant premises to prevent the road dust emissions.
3.	Employ preventive measures to minimize dust build up on roads.	Preventive measures include covering of trucks and paving of access areas to unpaved areas.
4.	Carry out regular sweeping of roads to minimize emissions.	Mitigative controls include vacuum sweeping, water flushing.

8.2.3 Action Plan to follow National Ambient Air Quality Emission Standards issued under GSR No 826(E)

The details mentioned under paragraph 8.1.3 above shall be repeated to achieve the emission standards as mentioned in national ambient quality standards. In addition the following shall be included to control the emission of various polluting gases.

For NO_x control following measures shall be adopted:

- Maintaining stable operating conditions i.e. constant fuel, air, feed flow rates and composition by installing an automatic kiln control system.
- Using low NO_x burners to avoid localized emission hot spots
- Developing a staged combustion process as applicable in preheater-precalciner (PHP) and preheater (PH) kilns ; Zero NO_x precaciners
- Use of selective non catalytic NO reduction (SNCR) And Selective Catalytic Reduction (SCR) measures.

For SO_2 control following shall be adopted:

- Use of vertical mill and gases passing through the mill to recover energy and to reduce sulphur content in the gas. In the mill, the gas containing sulphur di oxide mixes with calcium carbonate of the raw meal and produces calcium sulphate.
  The coal shall have minimum suphur content.
- Injection of absorbents such as hydrated lime $CaOH_2$, calcium oxide or fly ash into the exhaust gas before filters.

8.2.4 Noise Pollution Control Measures

The main sources of noise shall be various operating equipment, machinery from various sections of the cement plant. Practically every section where an equipment or machinery is being operated shall emit noise. Especially- limestone crusher, unloading of limestone in crusher hopper, raw material grinding/coal/cement grinding mills, compressors, etc emit noise at high levels. Also raw material handling/crushing/haulage shall emit noise. Workshop operations also emit noise discontinuously.

In view of the noise levels which shall be in the range of 90 dB(A) the following mitigation measures/controls shall be applied. This shall be applicable to all locations where similar situations may arise.

- The source of noise in particularly in the clinker cooling section equipment like blowers / fans has high intensity.
- The inlet pipe and venting piping of blowers in the clinker cooling section will be covered with silencers. The Blowers/fans will be insulated with sound insulating hoods. The equipments such as pumps will be connected with the piping by the means of flexible couplers, the foundations for the equipments such as motors will be integrated with vibration insulating measures. Low noise equipments will be installed and where required acoustic enclosures will be provided.

8.2.4.1 Technological Measures

- Plugging leakages in high pressure gas/air pipelines
- Reducing vibration of high speed rotating machines by regular monitoring of vibration and taking necessary steps. Design of absorber system for the shift office and pulpit operator's cabin Noise absorber system in pump houses. Noise level at 1 m from equipment will be limited to 85 dB(A) The fans and duct work will be designed for minimum vibration.
- The noise level at the boundary of the plant will be controlled by adopting above mentioned source specific control measures and also by raising a dense green belt of 7.5 m width all along plant periphery. It is anticipated that the noise levels shall be not more than 65 dB(A) at day time and 55dB(A) at night as per the NAAQ standard. The green belt shall be so designed as to have shorter trees and bushes/shrubs in the inner side towards the plant and progressively increasing in height towards the boundary. The floral species selection shall be as recommended by CPCB guidelines.
- The areas where noise levels are high will be partitioned off, noise levels will be minimized at the source, and noise reflection and transmission should be minimized.
- The operator's cabin will be properly insulated with special doors and observation windows.
- The workers working in the high noise areas like compressor houses, blowers, generators, feed pumps, compressor plant will be provided with ear muffs/ear plugs

- Acoustic laggings and silencers will be provided to equipment wherever necessary. The compressed air station will be provided with suction side silencers. Ventilation fans will generally be installed in enclosed premises
- Supply ducts and grills on the ventilation and air conditioning system will be suitably sized for minimum noise level
- The silencers and mufflers of the individual machines will be regularly checked
- The noise level shall not exceed the limit 75 dB (A) during the day time 70 dB (A) night time within the plant premises.
- Green belt around the plant area will reduce the noise level further. Training of personnel is recommended to generate awareness about damaging effects of noise.

8.2.4.2 Management Measures

It may not be practicable to apply technological measures at all noise generating locations despite best efforts to do so. In such cases the following administrative measures shall also be carried out.

- Unmanned high noise zone will be marked as “High Noise Zone”
- In locations where measures are not feasible, attempts shall be made to provide operators with sound –proof enclosure to operate the system.
- Workers exposed to noise levels shall be provided with rotational duties
- All workers will be regularly checked medically for any noise related health problems and if detected they shall be provided with alternative duty.

8.2.5 Water Environment

Water is primarily used for cooling the equipment and kiln bearings, and application in green belt and for sanitation.

In cooling of equipment except evaporation loss, the recirculation system will be adopted to ensure minimum water wastage. Further air cooled compressors will be installed to minimize the water loss.. Similarly installation of bag house will further reduce water requirement.

8.2.5.1 Action Plan for Rain Water Harvesting

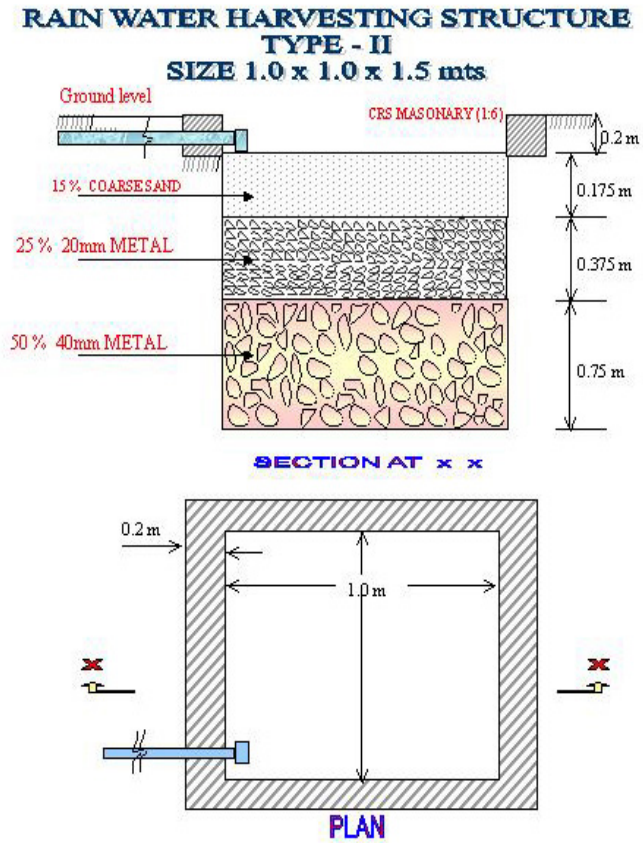
It is proposed to harvest rain water in an underground tank beneath the raw material storage yard. The proposed dimension shall be approximately 50m x 50 m and the depth of the tank shall be tentatively 5m. About 12500 m^3 of water shall be collected and used for various requirements.

It is also proposed to build a ground water recharge pit of following dimensions to ensure augmentation of ground water supply. The local gram panchayats shall also be taken into confidence for carrying out similar structures at suitable places. Rainwater Harvesting System (RWHS) designs and construction details are given in the following table

Rain Water Harvesting Structure (RWHS) for Ground water Recharge:
Size: 1.0m x 1.0m x 1.5m

CONSTRUCTION DETAILS OF RAIN WATER HARVESTING SYSTEM

S.No	Volume (in Cum)	Description
1	1.5	Excavation in Hard Gravelly and all available soils
2	0.75	65 mm metal
3	0.375	20 mm metal
4	0.225	Coarse sand
5	0.16	CRS masonry in 1:6 prop.
6	1.5	Carting of excavated earth for a lead of 8 km.

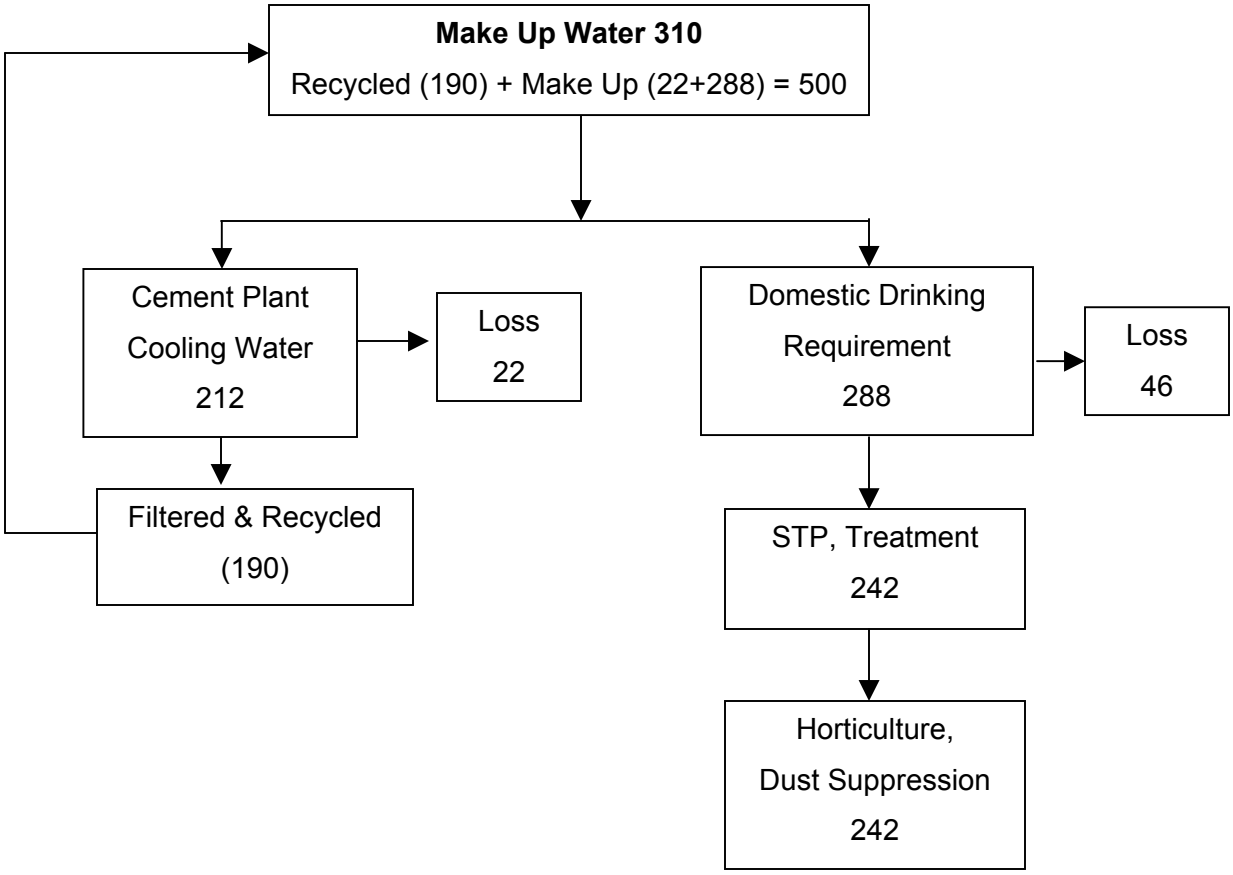


It is proposed to construct 5 recharge pits of this dimension.

8.2.5.2 Waste Water Treatment & Management:

Principle of **"Zero Discharge"** will be adopted. There is no waste water generated from the cement plant except domestic effluent from the colony. Sewage/Waste water from the cement plant shall be treated in the neutralization pit and then transferred to the sewage treatment plant. A water balance diagram is shown in Figure 8.1.

Figure 8.1: WATER BALANCE FLOWSHEET (Volume in m^3 per day)



242 m^3 of domestic waste water will be generated from the colony and the plant. A STP is proposed to treat the same and use the treated water in green belt, dust suppression, work shop floor washing etc.

8.2.5.3 Sewage Treatment Plant

i) Sewage Collection System

Sewage from plant & residential colony will be collected into a collection tank. The location of sewage treatment plant will be beneficial both in terms of easy maintenance and economical. The location advantage of the site is considered like (a) all the waste waters shall flow by gravity and (b) total equipment like aerators, pumps etc, will be located at one place only, hence operation shall be easy.

ii) Design data

Sewage Treatment plant has been designed based on the following characteristics of wastewater**.**

Anticipated Waste Water Characteristics

Parameter	Unit
pH	6.0–8.5
Total Suspended Solids	300 mg/L
Biochemical Oxygen Demand	80 mg/L
COD	100 mg/L
Oil & Grease	20 mg/L

iii) Process description

All the sewage from colony and plant is collected into a collection tank after passing through bar screen and oil & grease trap. In oil & grease trap most of the oil & grease is separated. In aeration tank diffusers will be provided with powered twin lobe blowers to supply necessary oxygen for the survival of micro organisms. In the aerobic biological treatment, biological growths will be created which absorb organic matter from the wastes and convert it into simple end products like CO2, H2O, NO3 etc. by means of oxidation enzyme systems in presence of oxygen. External aeration activates sludge particles and encourages growth of an active culture of aerobic organisms. Main features of aerobic treatment are to clarify effluent by absorbing majority of colloidal and suspended solids on the surface of sludge particles and oxidize organic matter.

Over flow from aeration tank shall flow by gravity to secondary clarifier (Tube settler). A part of the sludge from secondary clarifier is re-circulated to aeration tank to maintain desired quantity of mixed liquor suspended solids (MLSS) and excess sludge is sent to sludge drying beds. The dried sludge is composted and used as manure for green belt. The clarified and treated wastewater from secondary clarifier is collected into a storage tank and passed through pressure sand filter and used for horticulture & dust suppression measures.

The treated sewage shall have the following characteristics.

Designed Treated Water

Parameter	Unit
pH	6.0–8.5
Total Suspended Solids	<50 mg/L
Biochemical Oxygen Demand	<30 mg/L
COD	<100 mg/L
Oil & Grease	<10 mg/L

8.2.5.4 Pathways for Pollution Via Seepages and Prevention

The open storage spaces for raw materials, gypsum, fly ash, and clinker are potential sources for initiation of contaminants through release of leachates during rains. Fly ash and clinker contain certain heavy metals which may be leached away during monsoon. Also, run offs from work shop vicinity may contain chemicals and waste oils and grease which may ultimately be carried away in suspension or in solution and ultimately reach ground water regime.

The region receives heavy rains during monsoon and is susceptible for developing leachates from the described sources. In view of this potential danger, it is proposed to store all of the materials under covered spaces so that they are not amenable to surface run off. Further, al of the materials described above shall be stored on concrete surface which shall have sufficient brickwork below and also shall have a basal layer of thick PVC sheet extending under the entire extent of raw materials and other materials which may be added to make cement. The concrete surface shall have a curbing all along the edge and shall be directed to the drains to ultimately reach the waste water treatment system.

This shall prevent the origination of leachates from the storages in the first place and then secondly if it occurs then it shall be prevented to mix up with ground water regime.

8.2.6 Solid Waste Management

8.2.6.1 Action Plan for Solid/Hazardous Waste Generation /Storage /Disposal / Treatment

A) Process Waste

There is no generation of hazardous waste during cement manufacturing process. The only generation of solid wastes from cement manufacturing process is the cement kiln dust **(CKD)** which is collected in kiln ESP.

The chemical composition of CKD is similar to the raw meal and does not vary much. Because of this peculiarity, it is completely recycled in the raw meal stream. This CKD shall be collected from the ESP hoppers and stored in an enclosed bin. The CKD shall be chemically characterized to determine its suitability to blend with raw meal stream. The chemical composition shall enable to quantify its recycling with the raw meal. It shall be completely recycled with predetermined dosage over a period.

B) Non Process Waste

Different types of solid wastes are generated from the non-process activities in the unit such as waste packaging materials, steel scrap, empty oil / grease drums, used tyres, used batteries etc.

The hazardous waste comprising above items shall be disposed off to registered recyclers as per Hazardous Waste (Management and Handling) Rules 2003.

C) Floor cleaning

Industrial vacuum cleaners will be used to sweep the floor and roads in the plant. Entire dust that shall be collected shall be disposed of in pit and sprinkled with water and compacted.

D) Dispatch section

All roads will be bitumen covered or made of concrete to ensure minimal fugitive emission due to plying of trucks. Regular water sprinkling will be done on the roads. The loaded trucks shall be covered with tarpaulins to ensure no emission of dust while in motion.

8.2.7 Flora

8.2.7.1 Action Plan for Green Belt Development

As discussed in Chapter-4 the impact on flora and fauna will be minimal as the proposed project area is devoid of any vegetation. Out of 30 hectares of project area, 10 hectares land will be covered with plantation during first 3 years from the date of construction, at the rate of 2500 saplings per hectare. The selected species will be indigenous and as per the recommended list of CPCB. The species should have dust & noise tolerant and enhance aesthetics. A plantation program is given in Table 8.2 and shown in Figure 8.2.

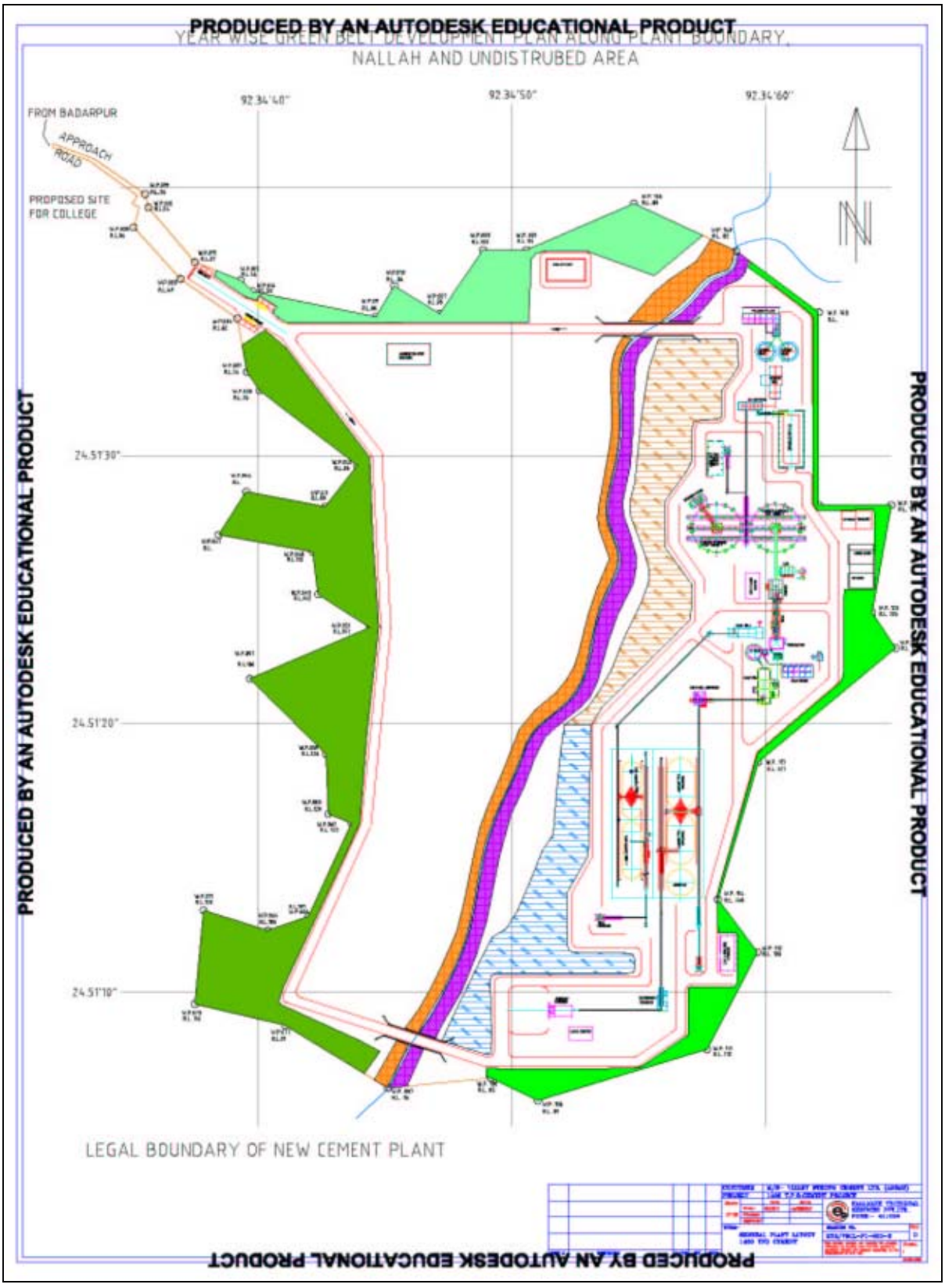
TABLE 8.2: PLANTATION PROGRAM (AREA IN HECTARES)

Year	Along Periphery		Along Water body		Along the storage Area		Undisturbed Area		Total	
	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.
1st	1.0	2500	1.5	3750			1.0	2500	3.5	8750
2nd	1.0	2500	1.5	3750			1.0	2500	3.5	8750
3rd	1.0	2500			1.0	2500	1.0	2500	3.0	7500
Total	3.0	7500	3.0	7500	1.0	2500	3.0	7500	10.0	25000

RECOMMENDED SPECIES FOR PLANTATION

Common Name	Botanical Name
Mango	*Mangifera indica*
Sisham	*Dalbergia sisso*
Shok	*Casuarina equisetifolia*
Margosa	*Azardirachta indica*
Golden Shower Tree	*Casia fistuta*
Karanj	*Pongamia pinnata*
Bougainvillea	*Bougainvillea glabra*
Kachnar	*Bauhinia variegate*
Siris	*Albizza lebbek*
Safed Babool	*Leucaena leucocephala*
Bamboo	*Phyllostachys aurea*
Jamun	*Eugenia jambolana*
China Rose	*Hibiscus rosasinensis*

Figure 8.2: Map showing plantation program



8.2.8 Occupational Health & Safety

The company will maintain Occupational safety & health of the employees with well defined procedures, as per ISO- 14001 and OSHA-18001. A well defined On Site Emergency Plan, monitoring and mock drills will be conducted regularly. Ambulance will be kept ready for the plant.

8.2.8.1 Process Specific Safety and Health

The manufacture of Cement involves processing of limestone & additives for clinker manufacture and handling of finished product cement while grinding with gypsum and fly ash and packing of cement. All raw materials shall be stored in covered spaces. The storage area is also covered on all sides.

The following occupational safety and health measures will be adopted to ensure that the employees are not exposed to pollutants; Necessary systems to be provided for the operator comfort inside the cabin.

i) Medical Surveillance

The cement plant will have a dispensary within the premises and all the employees will be tested for medical fitness at the time of recruitment. All employees will be medically examined by Factory Medical officer once in two years to ascertain the health status of all workers in respect of Occupational Heath hazard to which they are exposed. Medical officer will prepare a list of hazardous area both area wise and trade wise Specific tests are performed for identification of such occupational hazard. No person is employed to operate a crane, locomotive or work-lift or give signals unless his eye sight and color vision have been examined by qualified ophthalmologist.

ii) Employee Information and Training

The cement plant will provide training program for the employees to inform them of the following aspects; hazards of operations, proper usage of nose mask and earplugs, the importance of engineering controls and work practices associated with job assignment.

List of Tests to be conducted and recorded every two years:

1. Eyes	8. Ears
2. Respirator system	9. Circulatory system (Blood Pressure)
3. Abdomen	10. Nervous System
4. Locomotor System	11. Skin
5. Hernia	12. Hydrocele
6. Urine	13. Blood for ESR Report
7. Audiogram	14. Chest X Ray

iii) Medical examinations:

The following medical check up/examinations will be done:

1. Comprehensive Pre-employment medical check up for all employees.
2. X-ray of chest to exclude pulmonary TB, Silicosis etc.
3. Lung function test.
4. Sputum Test to detect Asbestos bodies.
5. Audiometer test to find deafness.

iv) Schedule for Medical Examination

The following schedule for medical checkup will be followed:

1. Comprehensive Pre-employment medical check up for all employees.
2. Chest X- Ray once a year for workers working near mills, rotary kiln and packing section.
3. Chest X- Ray for all other employees once every 3 years.
4. Lung function test for all employees once every 6 months.
5. Clinical examination of all employees once every 6 months.
6. Sputum examination of employees in Fibremill, Hard ground waste plant and Carbo – cutting machine once every year.
7. Comprehensive medical examination of all the employees after retirement and all those employees with more than 5 years of service leaving the company.

The periodicity of this examination will be once in 3 years for employees working near various mills, rotary kiln and & packing plant. For other employees it will be once in 5 years. This will be for a period of 15 years after retirement or for a period of 40 years.

8.2.9 Socio Economic Environment

A total budget of Rs. 500 lakhs has been earmarked for taking up CSR initiatives comprising of 5 broad themes. It is further proposed to tap various available central and state government sponsored schemes concerning road development, fodder farming, creation of Self Help Groups and providing vocational training to the unemployed and BPL family youths. In such schemes it is required to pay 10% of the capital while balance is borne by either central or state government under relevant schemes.

Also the people shall be educated to eradicate the social evils such as gambling, drinking, spread up of AIDS, etc. Leading Social NGO's and government agencies shall be involved from time to time to get guidance and corrective measures.

The project proponent would aid in the overall social and economic development of the region. The plant will give direct and indirect employment to about 800 people. This will enhance the economic status.

In order to mitigate the adverse impacts likely to arise in the proposed project activities and also to minimize the apprehensions to the local people, it is necessary to formulate an affective EMP for smooth initiation and functioning of the project. The suggestions are given below:

- Communication with the local community should be institutionalized and done on a regular basis by project authority to provide an opportunity for discussion
- Project authorities should undertake regular environmental awareness program on environmental management measures being undertaken for improving their quality of life
- To mitigate the strain on existing infrastructure adequate provision of basic amenities viz. education, health, transport etc. should be made considering the immigrating population and the work force in the area
- Job opportunities are the most demanding factor, the local people having suitable skill should be considered for employment
- For social welfare activities to be undertaken by the project authorities, collaboration should be sought with the local administration, gram panchayat, block development office etc for better coordination

8.3 CREP GUIDELINES

Compliance to the CREP guidelines prescribed by CPCB for the new cement plants is given in Table 8.3 below.

TABLE 8.3: CREP GUIDELINES FOR CEMENT INDUSTRY

Sl. No.	Corporate Responsibility for Environmental Protection (CREP)	Compliance to CREP
1	Cement Plants, which are not complying with notified standards, will do the following to meet the standards: • Augmentation of existing Air Pollution Control Devices-by July 2003 • Replacement of existing Air Pollution Control Devices-by July 2004	All of the Air Pollution Control Devices have been planned to meet the emission standard of <50mg/Nm^3
2	Cement Plants located in critically polluted or urban areas (including 5km distance outside urban boundary) will meet 100 mg/Nm^3 limit of particulate matter by December 2004 and continue working to reduce the emission of particulate matter to 50 mg/Nm^3	The particulate emissions from all of point sources have been designed to meet standard of <50mg/Nm^3
3	The new cement kilns to be accorded NOC/Environmental Clearance w.e.f 01.04.2003 will meet the limit of 50 mg/Nm^3 for particulate matter emissions	The particulate emissions from all of point sources have been designed to meet standard of <50mg/Nm^3
4	CPCB will evolve load based standards by December 2003.	The gaseous and particulate emissions are proposed to be controlled as per measures given

		in EIA/EMP Report Chapter 8
5	CPCB and NCBM will evolve SO_2 and NOx emission standards by June 2004	The emissions of NOx and SO2 shall be controlled by measures as given in EIA/EMP Report Chapter 8
6	The Cement industries will control fugitive emissions from all the raw material and products storage and transfer points by December 2003. However, the feasibility for the control of fugitive emissions from limestone and coal storage areas will be decided by the National Task Force (NTF). The NTF will submit its recommendations within three months.	The fugitive emissions shall be suppressed by a series of measures as prescribed in EIA/EMP Report Chapter 8.
7	CPCB, NCBM, BIS and Oil refineries will jointly prepare the policy on use of petroleum coke as fuel in cement kiln by July 2003.	Petcoke as may be available from nearest refinery shall be tested for physico-mechanical properties and tried for use as secondary fuel.
8	After performance evaluation of various types of continuous monitoring equipment and feedback from the industries and equipment manufacturers, NTF will decide feasible unit operations/sections for installation of continuous monitoring equipment. The industry will install the continuous monitoring systems (CMS) by December 2003	The Continuous Stack Emission monitoring has been prescribed for online monitoring of various pollutants such as PM, CO,SO2 for raw meal/Kiln stack
9	Tripping in Kiln ESP to be minimized by July 2003 as per the recommendations of NTF	Tripping shall be minimized by introducing interlocking with CO level in kiln and dust concentration at ESP inlet.

10	Industries will submit the target date to enhance the utilization of waste material by April 2003.	It is proposed to use Blast Furnace slag from Orissa Steel Plant to manufacture Port land Slag Cement.
11	NCBM will carry out a study on hazardous waste utilization in cement kiln by December 2003	The available hazardous materials in the plant vicinity shall be evaluated for their physico-mechanical parameters and scheme shall be made to use the same in phased manner.
12	Cement industries will carry out feasibility study and submit target dates to CPCB for co-generation of power by July 2003.	The co-generation potential for the proposed plant shall be taken up for studies after it is commissioned and process parameters have been stabilized.

The guidelines enlisted in the CREP charter have been taken into consideration in planning the design aspects of all pollution control devices and equipments. Also the guidelines for control of fugitive dust are taken into consideration and shall be implemented.

8.4 A Note on Identification and Implementation of CDM Project

8.4.1 Cogeneration in Cement Industry

Cogeneration of power utilizing waste heat is an attractive proposition for cement plants for energy conservation and minimizing dependence on the grid. Further, cogeneration of power will also help reduce environmental pollution as well as strain on the economy because of reduction in consumption of diesel oil. The present scenario therefore, warrants adoption of cogeneration systems in the India cement industry to make them more economical and to ensure cleaner environment.

In Indian cement industry, cogeneration system has not been implemented so far owing to the following reasons:

- Non-availability of proven technology indigenously
- Non-availability of installation or their operating experience in India resulting in lack of confidence.
- Design of waste heat boiler suiting to high dust load.
- Large capital requirement and financial constraints owing to fluctuating Cement marketing scenario.

NCB studies indicate that in the dry process cement plants, nearly 40% of the total heat input is rejected as waste heat from exit gases of pre-heater and grate cooler. The quantity of heat lost from PH exit gases ranges from 180-250 kcal/kg clinker at temperature range of 300-400^{0}C. In addition, 80-130 kcal/kg clinker heat is lost at a temperature range of 200-300^{0}C from grate cooler. This waste heat can be utilized for electric power generation. In existing plants, cogeneration technologies based on bottoming cycles have potential to generate upto 25-30 percent of the power requirement of a plant.

The analysis of the data of 20 cement plants by NCB has indicated cogeneration potential ranging from 3.0 to 5.5 MW in different plants depending upon the temperature and quantity of waste gases from PH and cooler exhaust, number of PH stages, use of gases for drying of raw materials and coal etc.

8.4.2 Use of Fly Ash

The use of Fly Ash as a blendable component to cement has been scientifically proved to enhance the quality of cement especially its corrosion resistance strength. The addition of fly ash not only yields corrosion resistance but also increases its compressive strength to certain extent. Further in addition fly ash results into conservation of raw materials and results into use of industrial waste for gainful use.

The most significant advantage due to addition of fly ash to cement, results in the low heat of hydration of cement. Due to this there is no expansion in the cement after it is casted and for this reason and advantage it is preferred to use in applications where cement is needed in bulk to fill in.

Budget for Environmental Protection Measures

Rs. 760 lakhs as capital and Rs. 65 lakhs as recurring budget is allocated for Environmental Protection Measures. The detail of Environmental budget is given below:

Table 8.4 Budget for Environmental Protection Measures

A. Capital Cost

Sl. No.	Particulars	Amount (Rs. In Lakhs)
1	Pollution Control Equipment with civil structures	650.00
2	Sewage Treatment Plant	20.00
3	Environmental Monitoring and Laboratory Equipment	20.00
4	Occupational Health & Safety Equipment & Fire Fighting equipment	30.00
5	Green Belt Development	20.00
6	Rainwater Harvesting / Recharge Structures	20.00
	Total	**760.00**

B. Annual Recurring Cost

Sl. No.	Particulars	Amount (Rs. In Lakhs)
1	Replacement of Bag filters	10.00
2	Maintenance of ESP	20.00
3	Monitoring and Testing	5.00
4	STP Operation and maintenance	5.00
5	Salaries and wages	20.00
6	Greenbelt Development and maintenance	5.00
	Total	**65.00**