NOTE ON
ENVIRONMENTAL IMPACTS
DUE TO USE OF PET COKE, LIGNITE IN ADDITION TO COAL
IN
CEMENT PLANT AND CAPTIVE POWER PLANT

FOR

AMENDMENT IN ENVIRONMENTAL CLEARANCE

(EC Granted :MoEF letter no. J-11011/ 250/2003 - IA. II (I) dated 5th, January 2005)

Submitted under Clause 7 (II)

AT

ACC Limited

LAKHERI CEMENTWORKS

Lakheri, Dist-Bundi, Rajasthan

Prepared By

B.S. ENVI-TECH (P) LTD.

SECUNDERABAD-500017

NABET Accreditation No: NABET/EIA/1316/RA002

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1.0 INTRODUCTION

ACC Ltd is operating Lakheri Cement Works (LCW) at Lakheri, Bundi District, Rajasthan.

Lakheri Cement Works is operational since 1917 with dry process plant then when through up-gradation 1997 with dry process plant on 5th January 2005 LCW have received Environmental Clearancefrom MOEF & CC vide letter MoEF letter no. J-11011/ 250/2003 - IA. II (I) dated5th, January 2005for Expansion of cement plant from 0.4MTPA to 1.5MTPA & Setting up Captive Power Plant of 25 MW capacity & Cement Plant. 25 MW Captive Power Plant was commissioned in 2007.

ACC-LCW obtained all statutory approvals from the Rajasthan State Pollution Control Board and the plant is in operation with the following capacity.

a. Cement Plant – 1.5 MTPA
b. Captive Power Plant– 25.0 MW

2.0 PRESENT PROPOSAL

ACC proposes to use Petcoke, lignite in addition to coal depending upon the availability in the Kiln of cement plant and boilers of Captive Power plant due to inadequate coal supply. Present proposal is for obtaining Amendment in Environmental Clearance from MoEF&CC for use of Petcoke, lignite in addition to Coal to the extent possible in cement plant and captive power plant.

A comparison of the statement showing the key parameters for EC granted and EC amendments sought is given below

S. No.	Particulars	Existing Environmental Clearance (EC)	Proposed EC Amendment	Remarks
	CEMENT PLANT			
1	Capacity of Cement Plant	1.50 MTPA	1.50 MTPA	No Change
2	Fuel	Coal	Petcoke in addition to	Use of pet coke, in

S. No.	Particulars	Existing Environmental Clearance (EC)	Proposed EC Amendment	Remarks
			coal	addition to coal
3	Heat Input	100 % by coal	100 % by Petcoke Or 100 % by coal Or 100% combination of petcoke & coal	Use of Petcoke
4	Quantity of Fuel, TPD*	Coal –500	Pet coke – 218.75 TPD (max) Or Coal – 500 TPD (max)	Use of pet coke, in addition to coal to the extent possible
5	Net Calorific value of fuel (Kcal/ Kg of fuel)	3500 (coal)	3500 (coal) or 8000 (Pet Coke)	-
6	Sulphur content in fuel (%)	0.40 max. (Coal)	0.40 max. (Coal) or 5.0 – 6.0% max. (Pet Coke)	-
7	Max. PM in stack flue gases			
a)	Kg/Hr	Coal – 26.28	Pet coke - 15.77 or Coal - 15.77	Reduction in emissions
b)	Mg/Nm^3	50	30	Complying with new emission standard while usage of Petcoke, Coal.
8.	Max. SO_2 in stack flue gases			
a)	Kg/Hr	Coal – 52.67	Pet coke –52.67 or Coal - 52.67	No Change
b)	Mg/Nm^3	100	100	Complying with new emission standard while usage of Petcoke, Coal.

S. No.	Particulars	Existing Environmental Clearance (EC)	Proposed EC Amendment	Remarks
9.	Max. NOx in stack flue gases			
a)	Kg/Hr	Coal – 739.48	Pet coke - 421.49 or Coal - 421.49	Reduction in emissions
b)	Mg/Nm^3	1650 – Kiln 1200 – Calciner	1000	Complying with new emission standard while usage of Petcoke, Coal.
	CAPTIVE POWER PLANT			
1	Capacity of Captive Power plant	1 X 25 MW	1 X 25 MW	No Change
2	Number of Boilers	2 x 60 TPH	2 x 60 TPH	No Change
3	Type of boiler	Atmospheric Fluidised Bed Combustion (AFBC)	AFBC	No Change
4	Number of Steam Turbines	1	1	No Change
5	Heat Input	100 % by coal	Fuel Mix (58% by Coal + 42 % by petcoke) Or 100 % by coal Or 100% combination of petcoke, lignite, coal, biomass	Use of Petcoke, lignite, biomass
6	Fuel requirement (tones per day)*	Coal –551 (max)	Fuel Mix (320 - Coal + 101 Petcoke) Or 551 - Coal Or Petcoke + Coal + Lignite	Use of Petcoke, lignite, biomass
7	Net Calorific value of fuel	3500 (coal)	3500 (coal) or	-

S. No.	Particulars	Existing Environmental Clearance (EC)	Proposed EC Amendment	Remarks
	(Kcal/ Kg of fuel)		8000 (Pet Coke) or 2800 (Lignite)	
8	Sulphur content in fuel (%)	0.40 % max. (Coal)	0.40 % max. (Coal) or 5.0 – 6.0% max. (Pet Coke) or 2.0 – 3.0 % max. (Lignite)	-
9.	Max. PM in stack flue gases			
a)	Kg/Hr	Coal – 9	Fuel Mix – 9 or Coal -9	No Change
b)	Mg/Nm^3	50	50	No Change
10.	Max. SO_2 in stack flue gases			
a)	Kg/Hr	Coal – 183.6	Fuel Mix – 110.9 after 80 % SO_2 capture by limestone injection or 110.9 - Coal after 41% SO_2 capture by limestone injection	-
b)	Mg/Nm^3	1020	<600	Complying with new emission standard while usage of Petcoke, lignite, biomass, Coal. Reduction in SO_2 emission load
c)	Limestone Injection, TPD	-	@ fuel mix firing –40.08 or @ Coal firing – 6.97	Limestone injection for control of SO_2 emissions complying with new emission

S. No.	Particulars	Existing Environmental Clearance (EC)	Proposed EC Amendment	Remarks
				norms
11.	Max. NOx in stack flue gases			
	Kg/Hr	Coal – 90.18	Fuel Mix - 54.11 or Coal -54.11	
	Mg/Nm^3	500	300	Complying with new standard. Reduction in Nox emission load.
12.	Ash Generation			
	Total Ash (tpd)	220.0	42.11 Or 226.2	Includes ash from limestone injection
	Fly Ash generation (tpd)	176.32	4.30 – with fuel mix(31 % ash in fuel mix) Or 176.32 – with coal	100% fly ash will be used in cement manufacturing process
	Bottom Ash generation (tpd)	43.68	37.81(1.07from fuel mix firing and 35.67 bottom ash due to limestone injection) Or 49.88(43.68from coal firing and 6.20 bottom ash due to limestone injection)	100% bottom ash will be reused as raw mix ingredient in cement manufacturing process
13.	Boiler stack height (M)	98 m (single)	98 m (single)	No Change. Stack height requirement is 57.4m as per CPCB norm. However the same stack height of 98 m will be maintained

S. No.	Particulars	Existing Environmental Clearance (EC)	Proposed EC Amendment	Remarks
14.	Particulate Matter emission (mg/Nm^3)	<50	<50	No Change High efficiency ESP (2 nos) provided

*Fuel quantity may vary depending upon the calorific value of the fuel mix

Overall Emissions Due To Use Of Pet coke /coal In Kiln Of Cement Plant And Boilers Of Captive Power Plant									
S.No	**Parameter**		**Existing Environmental Clearance (EC)**			**Proposed EC Amendment**			**Remark**
			100 % Coal			100% Petcoke	Fuel Mix (58 % Coal + 42 % Petcoke) /100% coal/100% combination of petcoke, lignite, biomass, coal		
			Kiln	CPP	**Total**	Kiln	CPP	**Total**	
1	Air Emissions, Kg/hr	Particulate Matter	26.28	9.00	35.28	15.77	9.00	24.77	↓ decrease In overall emissions
		Sulphur Dioxide	52.67	185.76	238.43	52.67	108.22	160.89	
		Oxides of Nitrogen	739.48	90.18	829.66	617.58	54.11	671.69	
			Kiln	CPP	**Total**	Kiln	CPP	**Total**	
2	Ground Level Concentrations ($\mu g/m^3$)	Particulate Matter	1.18	0.70	1.77	0.711	0.70	1.35	↓ decrease in ground level concentrations
		Sulphur Dioxide	2.37	14.7	16.8	2.37	8.56	10.7	
		Oxides of Nitrogen	33.7	7.14	39.4	28.28	4.28	31.7	

Note :↓ decrease ↑ increase

*Sulphur Dioxide Control By limestone stone injection in boiler

3.0 NEED FOR USE OF PET COKE

Due to uncertainty in the availability of coal linkage and rising prices of imported coal, it is proposed to use of petcoke, lignite as much as possible in addition to coal depending upon its availability for which approval from MoEF& CC is being sought. The proposed fuel, i.e. Pet Coke is readily available in Indian market. For the above Kiln/CPP, the conversion to pet coke as an alternative fuel is envisaged due to the following reasons:

1) Petroleum coke (Pet coke) is a carbonaceous solid derived from oil refinery coker units or other cracking processes. The chemical composition of petroleum coke is mostly elementary Carbon (usually over the 85% C dry with sulphur content of about 8.5 % (max)) with high heating value and very little ash content (usually less than 1-2 %).
2) Compared to other low ash coals, pet coke has advantage in terms of bed material inventory. In spite of having low ash content, the bed material requirement is minimum, since limestone and its reacted products (gypsum) act as the bed material.
3) Use of Pet Coke in cement Kiln will facilitate use of sub-grade limestone to the optimum extent resulting in production of high quality clinker .

4.0 ENVIRONMENTAL BENEFITS OF USAGE OF PETCOKE

CEMENT PLANT

Use of Petcoke in the cement industry results in various environmental benefits listed below

- Petcoke is a refinery waste which is having a high calorific value. Usage of Petcoke at LCW provides waste disposal solution to the refinery thereby helps conserving virgin natural resources.

- In case of 100 % availability & usage of Petcoke there will be reduction of approx. 0.5 % of gypsum usage which will results in resources conservation.

- Low particulate matter and fugitive emission as the ash content in Petcoke is negligible.

- Lowering CO2 emissions

- There will not be any change in Sulphur-di-oxide (SO_2) emissions from kiln as limestone is the main component of the kiln feed and sulphur in the fuel (Petcoke) gets absorbed in the process.

CAPTIVE POWER PLANT

The pet coke based captive power plant will ensure supply of power at a competitive cost, providing greater flexibility and viability to the ACC Manufacturing operations in an environmentally responsive manner.

The project will result in following environmental and economic benefits:

1) Generation of power at a competitive cost compared to power generated by using imported coal.
2) Utilization of industrial waste thus resulting in fossil fuel conservation.
3) Limestone injection in Boiler will greatly minimize SO_2 emission from the stack (about 80 % reduction and to meet new environmental norms of <600 mg/Nm^3).
4) Solid wastes viz. Fly Ash and Bottom Ash generated from the CPP will be reused/ recycled in the cement plant located within the premises.
5) Lowering CO2 emissions

5.0 PROJECT COST

No additional project cost is involved.

6.0 PROJECT DESCRIPTION:

Cement Manufacturing unit of Lakheri Cement Works is a fully integrated cement plant supported with captive power plant and captive limestone mine.

Fuel is used in the following areas of cement plant complex

a. Kiln of Cement Plant
b. Boiler of Captive Power plant

Presently fuel used is coal for which all clearances were obtained. Due to non availability of coal, it is now proposed to use pet coke, lignite as a fuel for Kiln and CPP. The pet coke is proposed to be brought to site by rail/ road. In case of road transport, pet coke will be brought in high capacity covered trucks to avoid spillage.

Pet coke requirement for the project (Kiln and CPP) will be about 0.116 Million TPA. It is proposed to inject limestone into the boiler to

control SO_2 emission. The limestone requirement is about 0.014 million TPA.

6.1 CEMENT PLANT

LCW proposes to use pet coke due to uncertainty in the availability as well as rising prices of coal.

The process of clinker production in kiln systems creates favourable conditions for use of pet coke due to high temperatures, long residence times, an oxidising atmosphere, alkaline environment, ash retention in clinker, and high thermal inertia which ensure that the fuel's organic part is destroyed and the inorganic part, including heavy metals is trapped and combined in the product.

No additional machinery is required for firing of Petcoke in kiln. No additional pollution control equipment will be required for control of Particulate matter, SO_2 and NOx.

The kiln at Lakheri is equipped with 7 stage preheater along with SLC calciner. Already calciner modification is in place. The following primary measures are under implementation and expected Noxemissions will be within the limit applicable for SLC kiln i.e 1000 mg/Nm^3 as per the new MoEF&CC notification

Expected reduction potential of various measures is given below:

S.no	**Primary Measures**	**% Reduction of Nox Emissions**
1	Calciner Modification	10-30
2	Process Optimization*	10-30
3	Low Nitrogen Alternative Fuels	10-20

*Process optimization includes primary measures like addition of mineralizers, raw meal split, raw meal curtain, fuel split, air split which helps in NOx reduction.

6.2 CAPTIVE POWER PLANT

To increase the thermal efficiency, a pre-heater for the fluidizing air and combustion air, and a boiler feed water heater, are installed SO_2

emission is reduced by injection of limestone in the combustion chamber.

Limestone Feed and Control Mechanism

Sulphur capture in boiler happens by injecting Limestone along with fuel. The fuel and Lime mixture enters into combustion chamber through multiple feed points located in furnace front close to the bottom primary zone. Limestone undergoes decomposition by taking heat from the hot bed material (endothermic) and converts into Calcium Oxide (CaO).This process is called Calcination. The calcined Limestone being porous in nature gets entrained in flue gas and enters the top section of furnace where the mixture of Oxygen and Sulphur Dioxide reacts with Calcium Oxide and converts into Calcium Sulfate (CaSO4). This Process is called Sulfation. This process is an exothermic reaction. Thus, the Limestone converts gaseous SO_2 emission to solid Calcium Sulfate and gets removed from the system. Attributing higher particle residence time and recirculation, the Sulphur capture efficiency in boilers can be achieved to almost 80 %. The amount of limestone that is required for a given amount of fuel depends on the sulphur content of coal. An increase in sulphur dioxide emissions will necessitate an increase in the amount of limestone that is required for a given fuel flow to the furnace. The limestone demand is a function of the main fuel flow. An increase in fuel flow demand will result in a corresponding increase in the limestone demand to provide the demand signal to the Limestone Variable Rotary Feeder.

7.0 FUEL-REQUIREMENT, QUALITY AVAILABILITY & TRANSPORTATION:

It is envisaged that pet coke, lignite required for the project will be transported through rail/ road. During road transport pet coke will be brought in closed trucks. Limestone available inside the plant will be used.

PET COKE QUANTITY:

Considering pet coke with gross calorific value (GCV) of 8000 kCal/kg and plant load factor of 100%, the annual pet coke requirement for

CPP works out to be about 0.063 Million Tonnes and 0.036Million Tonnes for Cement Plant.

FUEL QUALITY (PET COKE):

Pet coke for the project will be available either from Indian refineries/imported. During road transport, pet coke will be brought in high capacity covered trucks. The proximate and ultimate analysis of pet coke to be used for the captive power plant& Kiln, are as follows:

Heating Values	
Calorific Value	8000 kcal/kg
Ultimate Analysis (weight %)	
Moisture	4.50
Ash	0.84
Carbon	79.00
Hydrogen	3.21
Nitrogen	1.37
Sulphur	5.00
Oxygen	1.69
Proximate Analysis (weight %)	
Moisture	4.5
Ash	0.84
Volatile Matter	10.60
Fixed Carbon	80.30

Source :ACC Ltd

Because of the extremely low ash (<1%) and high sulphur content of pet coke (5.0%), limestone is used in the majority of bed materials of the FBC boilers using pet coke. Limestone sizing is critical not only for efficient sulphurcapture but also for effective fluidization and fuel mixing thereby uniform temperatures and heat transfer is attained. Limestone will be sourced from the captive mine situated adjacent to the cement plant. Limestone of approx. 45% CaO content will be used for CPP for desulphurization.

PET COKE HANDLING PLANT:

The pet coke handling will be done in the same system designed for coal.

8.0 ENVIRONMENTAL IMPACTS

Environmental impacts due to use of pet coke in the Cement plant and Captive power plant has been worked out and presented below under each environmental component.

There will be no change in water and wastewater components of the plant due to use of Pet coke, lignite, biomass in addition to coal.

8.1AIR ENVIRONMENT

The emission details along with emission parameters for Coal and Petcokeare given below.

EMISSION DETAILS (EC OBTAINED)

Location	Height	Temp-erature	Dia-meter	Velocity of flue gas	Flow rate m^3/hr	emissions from stacks (gm/sec)		
	M	^oC	M	M/sec		PM	SO_2	NOx
CEMENT PLANT								
*Raw Mill/Kiln	126	140	3.0	13	330000	3.30	6.61	109.13
*Raw Mill/Calciner	129	150	3.5	12	410000	4.00	8.02	96.28
CAPTIVE POWER PLANT								
+CPP Boiler stack	98	140	1.9	24	250000	2.50	51.6	25.05

*emissions are based on operating values PM = 50 mg/Nm^3, SO_2 = 100 mg/Nm^3 and NOx - 1142 mg/Nm^3 (Kiln) and 1265 (kiln-Caliner) mg/Nm^3 in case of kiln

+ emissions are based on PM=50 mg/Nm^3 , SO_2 = 762 mg/Nm^3 and NOx 500 mg/Nm^3 in case of power plant

EMISSION DETAILS (EC REQUESTED)

Location	Height	Temp-erature	Dia-meter	Velocity of flue gas	Flow rate m^3/hr	emissions from stacks (gm/sec)		
	M	^oC	M	M/sec		PM	SO_2	NOx
CEMENT PLANT								
*Raw Mill/Kiln	126	140	3.0	13	330000	1.98	6.61	95.44
*Raw Mill/Calciner	129	150	3.5	12	410000	2.40	8.02	76.11
CAPTIVE POWER PLANT								
+CPP Boiler stack	98	140	1.9	24	250000	2.50	30.06	15.03

#petcoke or coal will be fired at any given time. Control of SO2 will be by lime injection in boiler for both the fuels

*emissions are based on PM = 30 mg/Nm3, SO_2 = 100 mg/Nm^3 and NOx 1000 mg/Nm^3 in case of kiln

+ emissions are based on PM=50 mg/Nm3 , SO2 = 600 mg/Nm3 and NOx 300 mg/Nm3 in case of CPP

The emission load in terms of Kg/hr (both from cement plant kiln and captive power plant is given below :

Kg/Hr	**EC granted**	**EC requested**		
	Coal	Coal		Petcoke
Particulate Matter	35.28	24.77	Or	24.77
Sulphur Dioxide	238.43	160.88		160.88
Oxides of Nitrogen	829.66	671.00		671.00

GROUNDLEVEL CONCENTRATION

The ground level concentration due use of petcoke in kiln of cement plant and CPP computed using AERMOD model (EPA recommended model) is given below :

		EC granted	**EC requested**
Ground Level Concentrations (ug/m^3)	Particulate Matter	1.77	1.35
	Sulphur Dioxide	16.8	10.7
	Oxides of Nitrogen	39.4	31.7

Predicted ground level concentration of PM_{10}, SO_2 and NO_x due to use of petcoke in kiln of cement plant and boiler of power plant are shown in **Fig - 1**to **Fig – 3.** 50 High 24-hourly average ground level concentrations of PM_{10}, SO_2 and NO_x are given in **Table – 1**to **Table – 3.**

AIR POLLUTION CONTROL MEASURES

The change in pollution control equipment due to use of pet coke in kiln and power plant are given below :

POLLUTION CONTROL EQUIPMENT

		EC Granted	**EC Requested**	**Remarks**
Sl. No.	**Location / Unit**	**Type of Equipment**	**Type of Equipment**	
Control of Particulate Emissions				
1	Raw Mill/ Kiln Raw Mill/Calciner	Bag house – 2 no	Bag house – 2 no	No change
2	Boiler – CPP	ESP – 2nos	ESP – 2nos	No change
Control of SO_2				
1	Raw Mill/ Kiln Raw Mill/Calciner	Absorption in Kiln and calciner	Absorption in kiln and calciner	Optimization of raw mix and process parameters will be done for efficient absorption of SO_2 in kiln atmosphere.
2	Boiler – CPP	-	Limestone injection at FBC boilers	
Control of NOx emissions				
1	Raw Mill/ Kiln Raw Mill/Calciner	Low NOx burner	Low NOx burner	Cacliner modification, process optimization, usage of low nitrogen alternative fuels
2	Boiler – CPP		Process optimization along with usage of biomass	Low Nox emissions. Usage of biomass

Note: Results of Pet Coke Trial Run conducted by NCCBM at 33 Kilns showed that there is no increase in SO_2, NOx and PM in kiln while the Pet Coke was used.

➲ CONTROL OF PARTICULATE MATTER

Cement plant:Pollution control equipment for control of particulate emission specified above are designed for meeting outlet emissions below 30 mg/Nm^3.

Captive Power plant:Due to the very low ash content in Petcoke, there will be low particulate matter emission in power plant and the outlet emissions will be well below 50 mg/Nm^3

➲ CONTROL OF SULPHUR DIOXIDE

Cement Plant

The combustion zone of the kiln with the presence of high lime dust acts as a scrubber combining to form calcium sulfate preventing much of the potential SO_2 from the emission gas stream.

The combustion of Sulfur: $S + O_2 \rightarrow SO_2$
The formation of Calcium Sulfate: $CaO + SO_2 + ½\ O_2 \rightarrow CaSO_4$

Captive Power Plant

FBC technology captures a large amount of Pet Coke's sulphur during the combustion process. The combustion temperature is well below the melting point of the fuel's ash, which allows to minimize the corrosion and fouling issues experienced in conventional boilers.

➲ CONTROL OF OXIDES OF NITROGEN

Cement Plant: The kiln is equipped with separate Calciner.The fuel is injected into the kiln riser below where the tertiary air enters at the base of the calciner. This so-called reduction zone, designed for a particular gas retention time, has an oxygen deficient atmosphere that promotes NOx reduction.

Captive Power Plant: Nox emissions will reduceto an extent of 20 %, process optimization and use of Biomass will be done

8.2SOLID WASTE GENERATION

The solid waste generation is mainly ash from the captive power plant. The ash generation from the plant with use of coal and petcoke is given below.

The maximum Ash generated from coal firing is 220tpd (from fuel ash and limestone injection). With fuel mix ash generation will increase to 226.2 tpd (from fuel ash and limestone injection). Only dry ash handling system is adopted and the ash is stored in silos. Transportation of Ash in dry form from the hoppers to storage silos is done through pneumatic conveying. 100% ash will be utilized for manufacturing of Portland Pozzolana Cement (PPC). The bottom ash of boilers will have minimum unburnt carbon and thus will be used in cement raw mix.

SOLID WASTE GENERATION (T/DAY)

	EC Granted	**EC Requested**	**utilization**
FROM BOILER			
Fuel	Coal	Fuel mix Or Coal	
Total Ash (tpd)	220.0	42.11 Or 226.2	Total ash will be utilized in cement manufacturing process
Fly Ash generation (tpd)	176.32	4.30 – with fuel mix (31 % ash in fuel mix) Or 176.32 – with coal	
Bottom Ash generation (tpd)	43.68	37.81 (1.07 from fuel mix firing and 35.67 bottom ash due to limestone injection) Or 49.88 (43.68from coal firing and 6.20 bottom ash due to limestone injection)	

9.0 CONCLUSION

ACC – LCW proposes to obtain Amendment in EC for use of petcoke, lignite, biomass in addition to coal as alternative fuel in Kiln of cement plant and Boiler of captive power plant.

Use of Pet coke will not result in increase of SO_2 and due to complete absorption by the limestone in Kiln.

1) Generation of power at a competitive cost compared to power generated by using imported coal.
2) Utilization of industrial waste thus resulting in fossil fuel conservation.
3) Limestone injection in Boiler will greatly minimize SO_2 emission from the stack (>85 % reduction and to meet new environmental norms of <600 mg/Nm^3).
4) Solid wastes viz. Fly Ash and Bottom Ash generated from the CPP will be reused/ recycled in the cement plant located within the premises.
5) Lowering CO2 emissions

FBC technology adopted enables use of pet coke in the boiler and injection of limestone which controls the sulphur dioxide emission by 85% meeting outlet concentration of 600 mg/Nm^3.

Low NOx burners provided in the boilers use less excess air (3 to 5%) and use staged combustion (fuel and air are combusted in multiple stages) thus low NOx in each stage of combustion.

There will be decrease in pollution load with pet coke usage as lime injection in boiler is proposed for capturing the sulphur dioxide. The comparison statement of pollution load and corresponding Groundlevel concentrations are shown below:

Overall Emissions Due To Use Of Pet coke /coal In Kiln Of Cement Plant And Boilers Of Captive Power Plant

Parameter		**Existing Environmental Clearance (EC)**			**Proposed EC Amendment**			**Remark**
		100 % Coal			100% Petcoke	Fuel Mix (58 % Coal + 42 % Petcoke) /100% coal/100% combination of petcoke, lignite, biomass, coal		
		Kiln	CPP	**Total**	Kiln	CPP	**Total**	
Air Emissions, Kg/hr	Particulate Matter	26.28	9.00	35.28	15.77	9.00	24.77	↓ decrease In overall emissions
	Sulphur Dioxide	52.67	185.76	238.43	52.67	108.22	160.89	
	Oxides of Nitrogen	739.48	90.18	829.66	617.58	54.11	671.69	

Ground Level Concentrations (µg/m³)

	Kiln	CPP	**Total**	Kiln	CPP	**Total**	
Particulate Matter	1.18	0.70	1.77	0.711	0.70	1.35	↓ decrease in ground level concentrations
Sulphur Dioxide	2.37	14.7	16.8	2.37	8.56	10.7	
Oxides of Nitrogen	33.7	7.14	39.4	28.28	4.28	31.7	

Note :↓ decrease ↑ increase

*Sulphur Dioxide Control By limestone stone injection in boiler

There will be no change in water and wastewater components of the plant due to use of Pet coke, lignite, biomass in addition to coal

Solid waste generated from limestone injection will be totally used in the cement plant

Amendment in EC proposal facilitates use of pet coke, lignite, biomass in Kiln and Boiler. Use of Pet Coke in cement Kiln facilitates use of sub-grade limestone to the optimum extent resulting in production of high quality clinker

In view of the above, ACC-LCW requests MOEF&CC to consider the above aspects and issue the amendment in Environmental clearance for use of Pet coke, lignite, biomass in addition to coal in kiln of cement plant and boiler of captive power plant

* * *

Table – 1

Predicted 50 high 24-hourly Average Ground Level Concentration

Of Particulate Matter Due To Use Of Pet CokeIn Cement Plant And Captive Power Plant

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR) OF (UTM COORDINATES)	TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR) OF (UTM COORDINATES)	TYPE
1	1.34859	15052824	AT	(16486.50, 2847871.42)	GP	26	0.93629c	15050124	AT	(17562.30, 2847355.38)	GP
2	1.30708	15051624	AT	(17685.55, 2847478.63)	GP	27	0.92961	15050324	AT	(16669.51, 2847688.41)	GP
3	1.28088c	15050724	AT	(16276.72, 2847355.38)	GP	28	0.92597c	15050724	AT	(15955.33, 2846972.35)	GP
4	1.27483	15050324	AT	(16276.72, 2847355.38)	GP	29	0.9171	15050324	AT	(16169.51, 2846822.38)	GP
5	1.2478	15052824	AT	(16449.66, 2847950.41)	GP	30	0.91697b	15052124	AT	(16419.51, 2847255.39)	GP
6	1.2171	15050424	AT	(16276.72, 2847355.38)	GP	31	0.91604	15051624	AT	(17883.69, 2846972.35)	GP
7	1.20783	15052824	AT	(16536.49, 2847800.03)	GP	32	0.91576	15051724	AT	(17352.52, 2847871.42)	GP
8	1.1963	15051624	AT	(17562.30, 2847355.38)	GP	33	0.90343c	15050724	AT	(16419.51, 2847255.39)	GP
9	1.19461c	15050724	AT	(16153.47, 2847478.63)	GP	34	0.90217c	15050724	AT	(16053.48, 2847621.42)	GP
10	1.18731	15052824	AT	(16053.48, 2847621.42)	GP	35	0.90166	15052824	AT	(16598.12, 2847738.40)	GP
11	1.18355	15050324	AT	(16419.51, 2847255.39)	GP	36	0.89714c	15050124	AT	(17302.53, 2847800.03)	GP
12	1.16029	15052824	AT	(16153.47, 2847478.63)	GP	37	0.89573c	15050724	AT	(16669.51, 2847688.41)	GP
13	1.13877	15050424	AT	(16153.47, 2847478.63)	GP	38	0.88932c	15051924	AT	(17685.55, 2847478.63)	GP
14	1.10797c	15050724	AT	(16598.12, 2847738.40)	GP	39	0.88772	15052724	AT	(16536.49, 2847800.03)	GP
15	1.10638	15051624	AT	(17785.54, 2847621.42)	GP	40	0.88539	15050324	AT	(16536.49, 2847800.03)	GP
16	1.06471c	15050724	AT	(16536.49, 2847800.03)	GP	41	0.8849	15050424	AT	(16598.12, 2847738.40)	GP
17	1.05158	15050324	AT	(16598.12, 2847738.40)	GP	42	0.88121c	15051924	AT	(17562.30, 2847355.38)	GP
18	1.02379	15052824	AT	(15979.82, 2847779.40)	GP	43	0.88009	15052824	AT	(16276.72, 2847355.38)	GP
19	1.02063	15052724	AT	(16053.48, 2847621.42)	GP	44	0.87978c	15050124	AT	(17419.51, 2847255.39)	GP
20	0.99725	15050324	AT	(16153.47, 2847478.63)	GP	45	0.87885	15052724	AT	(16153.47, 2847478.63)	GP
21	0.99312c	15050124	AT	(17685.55, 2847478.63)	GP	46	0.87533	15050424	AT	(15955.33, 2846972.35)	GP
22	0.96913	15050324	AT	(15955.33, 2846972.35)	GP	47	0.85376	15050424	AT	(16536.49, 2847800.03)	GP
23	0.95753b	15050824	AT	(16053.48, 2847621.42)	GP	48	0.85082	15051724	AT	(17389.36, 2847950.41)	GP
24	0.95468	15051624	AT	(18068.58, 2847157.24)	GP	49	0.85055c	15050124	AT	(17785.54, 2847621.42)	GP
25	0.94154	15052824	AT	(16427.11, 2848034.60)	GP	50	0.84980c	15050724	AT	(16486.50, 2847871.42)	GP

Table – 2

Predicted 50 high 24-hourly Average Ground Level Concentration

Of Sulphur Dioxide Due To Use Of Pet CokeIn Cement Plant And Captive Power Plant

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR) OF (UTM COORDINATES)	TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR) OF (UTM COORDINATES)	TYPE
1	10.68868	15052824	AT	(16486.50, 2847871.42)	GP	26	7.01799	15050424	AT	(16536.49, 2847800.03)	GP
2	10.00403	15052824	AT	(16536.49, 2847800.03)	GP	27	7.00628c	15050724	AT	(16419.51, 2847255.39)	GP
3	9.73299	15051624	AT	(17685.55, 2847478.63)	GP	28	6.99514	15050324	AT	(16536.49, 2847800.03)	GP
4	9.60728	15052824	AT	(16449.66, 2847950.41)	GP	29	6.99231	15052824	AT	(15979.82, 2847779.40)	GP
5	9.50172c	15050724	AT	(16276.72, 2847355.38)	GP	30	6.99186b	15052124	AT	(16419.51, 2847255.39)	GP
6	9.36702c	15050724	AT	(16598.12, 2847738.40)	GP	31	6.91279	15051624	AT	(18068.58, 2847157.24)	GP
7	9.15694	15050324	AT	(16276.72, 2847355.38)	GP	32	6.88451	15051724	AT	(17352.52, 2847871.42)	GP
8	9.02314	15050424	AT	(16276.72, 2847355.38)	GP	33	6.86687	15050324	AT	(16153.47, 2847478.63)	GP
9	8.99547	15050324	AT	(16419.51, 2847255.39)	GP	34	6.83031	15052824	AT	(16276.72, 2847355.38)	GP
10	8.79007	15050324	AT	(16598.12, 2847738.40)	GP	35	6.82881b	15050824	AT	(16053.48, 2847621.42)	GP
11	8.73343	15051624	AT	(17562.30, 2847355.38)	GP	36	6.82732	15052724	AT	(16486.50, 2847871.42)	GP
12	8.54215c	15050724	AT	(16536.49, 2847800.03)	GP	37	6.74449c	15050124	AT	(17562.30, 2847355.38)	GP
13	8.46182	15052824	AT	(16153.47, 2847478.63)	GP	38	6.69935	15050224	AT	(16598.12, 2847738.40)	GP
14	8.39110c	15050724	AT	(16153.47, 2847478.63)	GP	39	6.68803c	15050124	AT	(17302.53, 2847800.03)	GP
15	8.32837	15050324	AT	(16669.51, 2847688.41)	GP	40	6.65318	15050324	AT	(15955.33, 2846972.35)	GP
16	8.30206	15052824	AT	(16053.48, 2847621.42)	GP	41	6.64662	15053124	AT	(16536.49, 2847800.03)	GP
17	8.2908	15051624	AT	(17785.54, 2847621.42)	GP	42	6.63932c	15050724	AT	(16486.50, 2847871.42)	GP
18	8.02418c	15050724	AT	(16669.51, 2847688.41)	GP	43	6.61451	15050224	AT	(16536.49, 2847800.03)	GP
19	7.94012	15050424	AT	(16153.47, 2847478.63)	GP	44	6.59585b	15050824	AT	(16486.50, 2847871.42)	GP
20	7.86551	15050424	AT	(16598.12, 2847738.40)	GP	45	6.59162c	15050724	AT	(15955.33, 2846972.35)	GP
21	7.85261	15052824	AT	(16598.12, 2847738.40)	GP	46	6.59029	15050324	AT	(16169.51, 2846822.38)	GP
22	7.30271	15052724	AT	(16053.48, 2847621.42)	GP	47	6.54399c	15051924	AT	(17685.55, 2847478.63)	GP
23	7.24155c	15050124	AT	(17685.55, 2847478.63)	GP	48	6.53135c	15050124	AT	(17419.51, 2847255.39)	GP
24	7.19747	15052724	AT	(16536.49, 2847800.03)	GP	49	6.51391	15053124	AT	(16598.12, 2847738.40)	GP
25	7.17157	15052824	AT	(16427.11, 2848034.60)	GP	50	6.49171	15051624	AT	(17883.69, 2846972.35)	GP

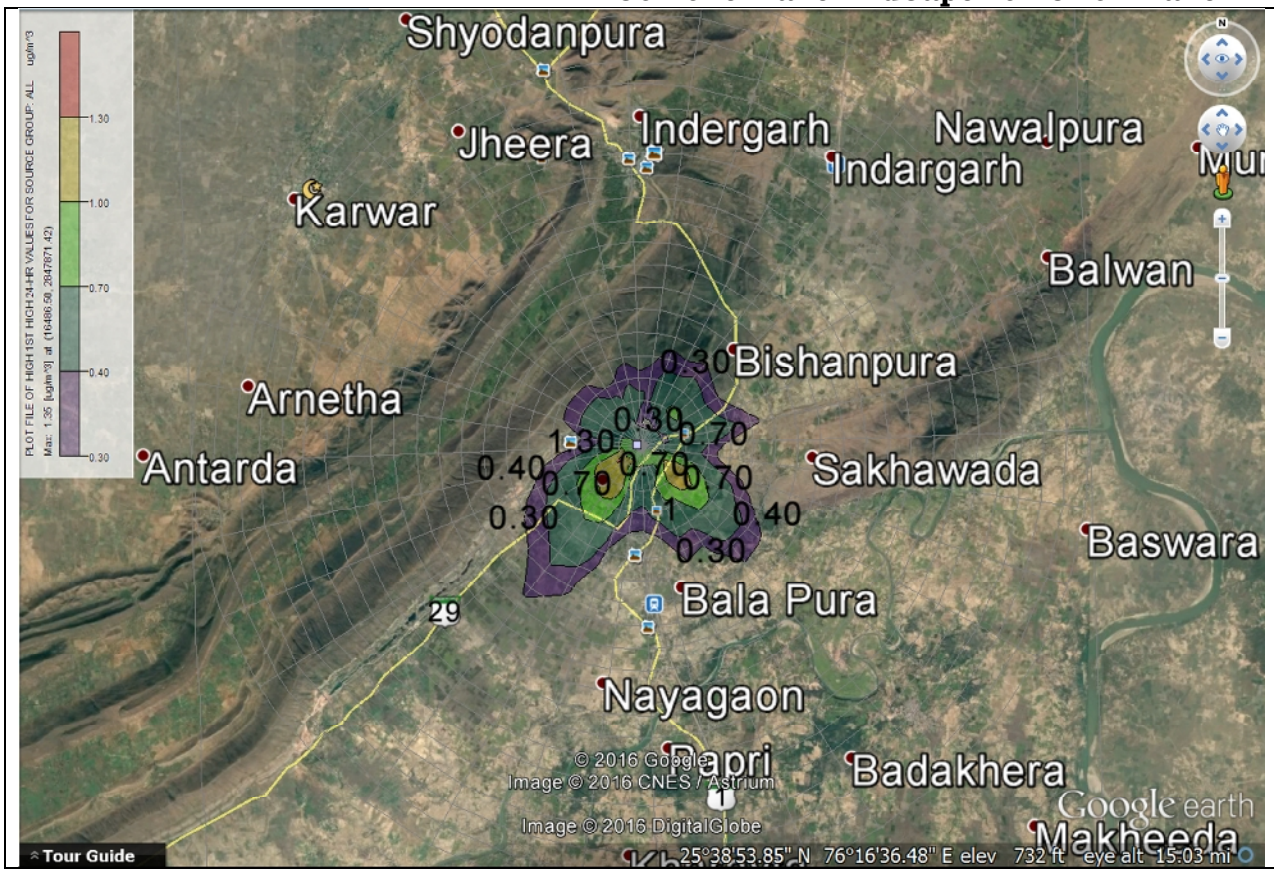
Table – 3

Predicted 50 high 24-hourly Average Ground Level Concentration

Of Oxides of Nitrogen Due To Use Of Pet CokeIn Cement Plant And Captive Power Plant

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR) OF (UTM COORDINATES)	TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR) OF (UTM COORDINATES)	TYPE
1	31.67261	15050324	AT	(16276.72, 2847355.38)	GP	26	23.01662	15051624	AT	(17883.69, 2846972.35)	GP
2	31.07776	15051624	AT	(17685.55, 2847478.63)	GP	27	22.70878	15050324	AT	(16169.51, 2846822.38)	GP
3	30.64460c	15050724	AT	(16276.72, 2847355.38)	GP	28	22.30562	15050424	AT	(15955.33, 2846972.35)	GP
4	30.36492c	15050724	AT	(16153.47, 2847478.63)	GP	29	22.26511c	15050724	AT	(15770.44, 2847157.24)	GP
5	30.31756	15052824	AT	(16053.48, 2847621.42)	GP	30	22.14621c	15050724	AT	(16598.12, 2847738.40)	GP
6	29.73063	15052824	AT	(16486.50, 2847871.42)	GP	31	21.84724	15052824	AT	(16427.11, 2848034.60)	GP
7	29.1561	15051624	AT	(17562.30, 2847355.38)	GP	32	21.62376	15051724	AT	(17352.52, 2847871.42)	GP
8	29.15406	15050424	AT	(16153.47, 2847478.63)	GP	33	21.61774	15052724	AT	(16153.47, 2847478.63)	GP
9	29.13507	15050424	AT	(16276.72, 2847355.38)	GP	34	21.44235	15050324	AT	(16598.12, 2847738.40)	GP
10	28.58798	15052824	AT	(16449.66, 2847950.41)	GP	35	21.42008c	15051924	AT	(17685.55, 2847478.63)	GP
11	28.32324	15052824	AT	(16153.47, 2847478.63)	GP	36	21.39247	15052824	AT	(15770.44, 2847157.24)	GP
12	27.49884	15050324	AT	(16419.51, 2847255.39)	GP	37	21.37053c	15050124	AT	(17302.53, 2847800.03)	GP
13	26.75247	15052824	AT	(15979.82, 2847779.40)	GP	38	21.23831c	15051924	AT	(17562.30, 2847355.38)	GP
14	26.07308	15051624	AT	(17785.54, 2847621.42)	GP	39	21.21006b	15052124	AT	(16419.51, 2847255.39)	GP
15	25.89551	15050324	AT	(16153.47, 2847478.63)	GP	40	21.19600b	15050824	AT	(15979.82, 2847779.40)	GP
16	25.4018	15052724	AT	(16053.48, 2847621.42)	GP	41	21.14991	15050424	AT	(15770.44, 2847157.24)	GP
17	25.18216	15050324	AT	(15955.33, 2846972.35)	GP	42	20.99417c	15050124	AT	(17419.51, 2847255.39)	GP
18	24.95453	15052824	AT	(16536.49, 2847800.03)	GP	43	20.98293b	15052124	AT	(16276.72, 2847355.38)	GP
19	24.18190c	15050124	AT	(17685.55, 2847478.63)	GP	44	20.81663	15052824	AT	(15620.47, 2847371.42)	GP
20	23.93185b	15050824	AT	(16053.48, 2847621.42)	GP	45	20.43171c	15050724	AT	(16419.51, 2847255.39)	GP
21	23.42574c	15050724	AT	(16053.48, 2847621.42)	GP	46	20.26286c	15050124	AT	(17785.54, 2847621.42)	GP
22	23.40234	15051624	AT	(18068.58, 2847157.24)	GP	47	20.24515	15052724	AT	(15979.82, 2847779.40)	GP
23	23.16254c	15050724	AT	(15955.33, 2846972.35)	GP	48	20.22952c	15051924	AT	(17785.54, 2847621.42)	GP
24	23.12519c	15050124	AT	(17562.30, 2847355.38)	GP	49	20.01299	15051624	AT	(17302.53, 2847800.03)	GP
25	23.04806c	15050724	AT	(16536.49, 2847800.03)	GP	50	19.93783	15050424	AT	(16053.48, 2847621.42)	GP

Fig – 1
Predicted Ground Level Concentration
Of Particulate Matter Due To Use Of Pet Coke
In Cement Plant AndCaptive Power Plant



WINDROSE

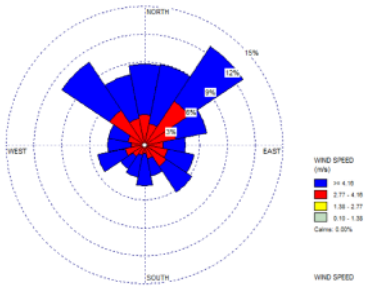
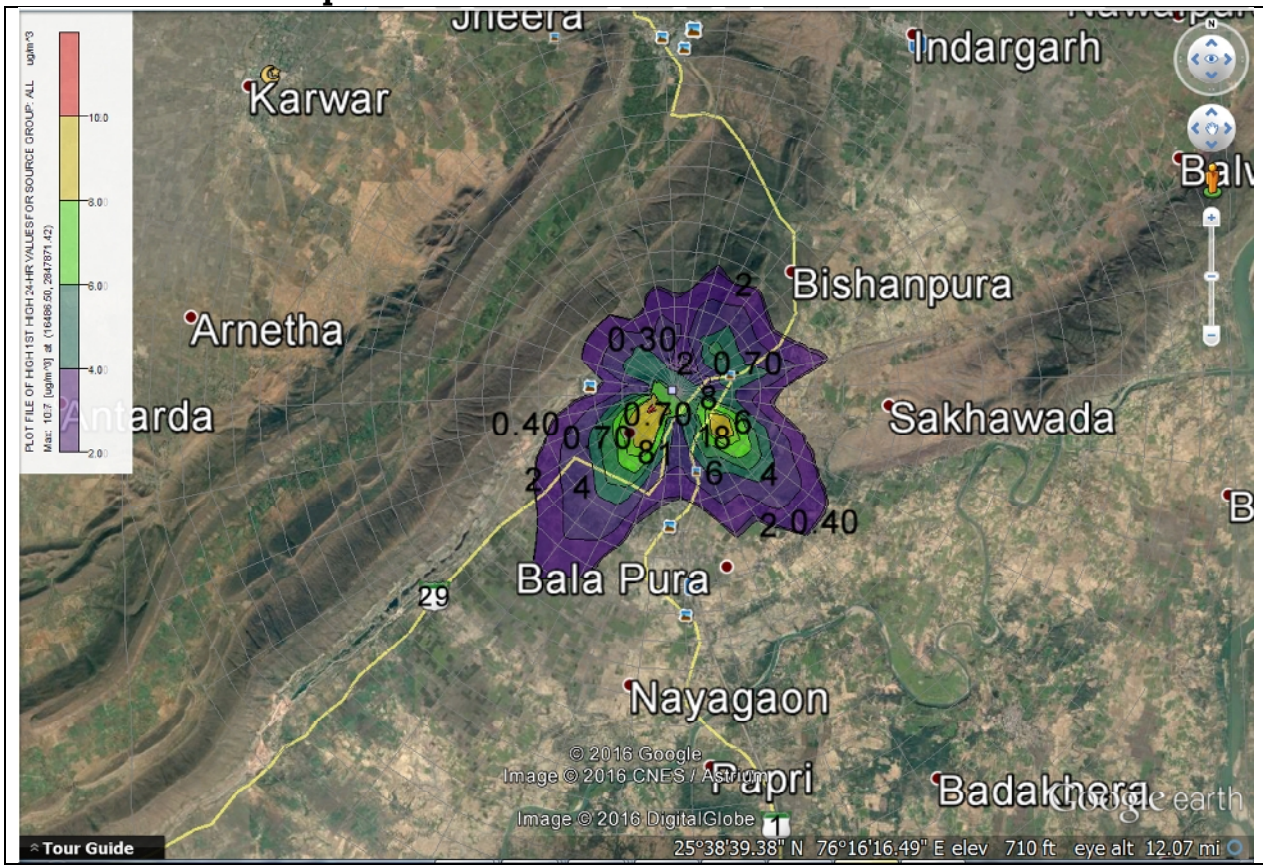


Fig – 2

Predicted Ground Level Concentration

Of Sulphur Dioxide Due To Use Of Pet CokeIn Cement Plant And Captive Power Plant



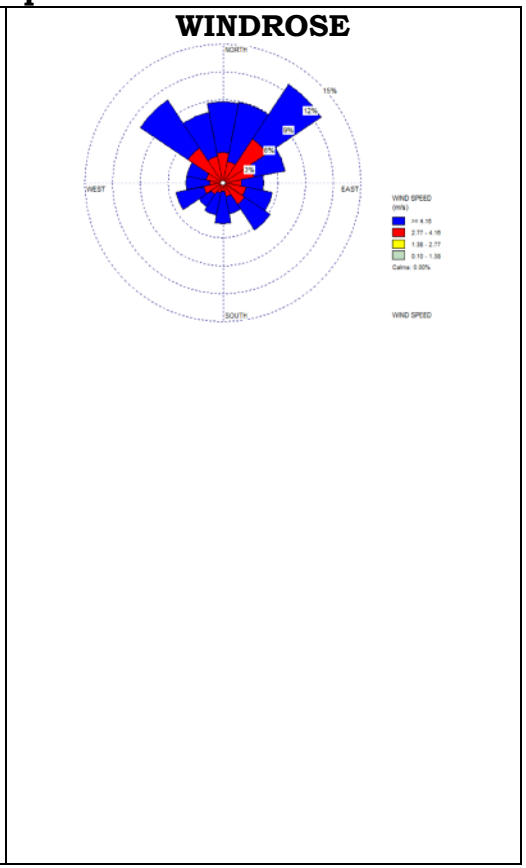


Fig – 3
Predicted Ground Level Concentration
Of Oxides of Nitrogen Due To Use Of Pet CokeIn Cement Plant And Captive Power Plant