

Monitoring Report for

**“Grasim Cement: Energy efficiency by up-gradation
of clinker cooler in cement manufacturing”**

UNFCCC Reference No: 0858

Version 01

28-05-2007

Monitoring period: 01/10/2004 to 31/03/2007

Prepared By

**Grasim Cement
P.O. Grasim Vihar, Village Rawan,
Dist. Raipur, Chhattisgarh,
India**

SECTION- I: INTRODUCTION

I.1: Purpose

This monitoring report has been prepared for “Grasim cement: Energy efficiency by up-gradation of clinker cooler in cement manufacturing” project. The project has been registered with UNFCCC as a CDM project activity under article 12 of the Kyoto protocol. The UNFCCC reference number for the project activity is **0858**. Submission of monitoring report and subsequent verification has been required mandatory by UNFCCC for issuance of Certified Emission Reductions (CERs) credits. The monitoring period covered under the report extending from 01/10/2004 – 31/03/2007.

I.2: Project Description

The project activity is to upgrade the clinker cooler for energy efficiency in the cement manufacturing process. GCR Plant was commissioned in 1995 with the best available technology by the FLS, Denmark. In the commissioning, reciprocating grate Folex CG-928S-EL cooler for clinker cooling was used.

The project is the redesigning of the grate system with Control Impact System & Mechanical Flow Regulator (CIS-MFR) plate type system, which will increase the cooler recuperation efficiency by reduction of heat consumption by 20 KCal/kg of clinker. The project activity is the retrofitting of the clinker cooler for effective trapping of the heat in the clinker cooler. In this project activity new clinker inlet distribution system is used to distribute the clinker on the grate. Due to the benefits of the inlet grate system the proper cooling of inlet is taking place with additional benefit of high temperature tertiary air ducts.

I.3: Project Location

Grasim Cement Raipur (GCR) is located at P.O. Grasim Vihar, Village Rawan, Dist. Raipur; Chhatisgarh. The location of proposed project activity is at Grasim Cement Raipur. The plant is well connected by railway and road transport.

Section- II: Monitoring

II.1: Monitoring Period

The monitoring of parameters has been done for project emissions calculations. Monitoring period chosen for the project activity is from 01/10/2004 -31/03/2007. Parameters monitored during the period and their recording frequency is given in the table below. Data has been archived for verification purpose.

II.3: Monitoring Parameters

II.3.1 For project emissions Calculations

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	Comment
Clinker production (Clk)	Plant	Tons/day	Measured and calculated	Recorded continuously	Electronic	The clinker production will be calculated from the raw meal consumption and the raw meal to clinker conversion factor. Raw meal consumption: Raw meal supplied at Kiln inlet is measured by Solid Flow Meter. Conversion factor: The conversion factor is given by the government agency national council for concrete and building materials.(NCCBM). Calibration: Annual calibration from equipment supplier. Loss in weight of kiln feed system is checked through

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/paper)	Comment
						"intecont plus" controller and the procedure is inbuilt and the programmed in the chip. Frequency : Annual Tag No: 411SF1 411SF2 Data retention period: Crediting period + 2 years
Quantity of fuel consumed (Q_{Fuel})	Plant	Tons/month	Measured and calculated	Recorded continuously and reported monthly	Electronic	Instrument used: Transweigh make loss in weight equipment Tag no. 53CO1FT1, 53CO2FT1 Calibration: Internal calibration with standard calibrated weights. Frequency: Annual Data retention period: Crediting period + 2 years
Emission factor of fuel (EF_{Fuel})	IPCC	tCO ₂ /TJ	Fixed	Fixed	Electronic	IPCC default values, Fixed
Gross Calorific value of fuel consumed (CV_{Fuel})	Plant	Kcal/kg	Measured	Recorded continuously and reported monthly	Electronic	By Bomb Calorimeter with standard procedure as given by the OEM is done by outside lab. The graph is prepared for the different ash percentage and calorific value. The calorific value is measured based on the graph.

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	Comment
						Calibration: By Benzoic acid powder/ tablet test for the bomb calorimeter. The graph is plotted annually and value is used for calorific value. Data retention period: Crediting period + 2 years
Average emission factor (EF _{average})	Plant	TCO ₂ /TJ	Calculated	Monthly	Electronic	Calculated. Data retention period: Crediting period + 2 years
Inlet temperature of clinker in cooler (T _{Clk In})	Plant	°C	Estimated	Fixed	Electronic	The inlet temperature of clinker in cooler is estimated constant in pre and post project scenario, based on the data given by technology supplier. Data retention period: Crediting period + 2 years
Specific heat of clinker (S _{Clk In})	Formulae provided by technology supplier	Kcal/kg°C	Calculated	Weekly	Electronic	Calculated as per eq 2 of calculation. Data retention period: Crediting period + 2 years
Inlet temperature of cooling air in cooler (T _{Cooling Air})	Plant	°C	Measured	Daily	Electronic	Average temperature of minimum and maximum ambient temperature. The mercury thermometer (Dry and wet bulb thermometer) is used

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	Comment
						for the same. Data retention period: Crediting period + 2 years
Density of air (ρ_a)	Formula depends on the inlet temperature.	Kg/m ³	Calculated	Weekly	Electronic	Calculated as per eq 3 in the project calculation section. Data retention period: Crediting period + 2 years
Volume flow rate of cooling air in cooler ($\dot{V}_{Cooling\ Air}$)	Plant	M ³ /min	Measured & Calculated	Weekly	Electronic	Measured as per the piezometer reading in the control room and cross checked with the anemometer readings from individual cooler fans. Data retention period: Crediting period + 2 years
Specific heat of cooling air ($S_{Cooling\ Air}$)	Formulae provided by technology supplier	Kcal/ kg/°C	Calculated	Fixed	Electronic	Calculated as per eq 2 in the project calculation section. Data retention period: Crediting period + 2 years
Power consumed by cooler fans (P_{Fan})	Plant	KWh /day	Measured	Monitored continuously and reported weekly	Electronic	Instrument used: Energy meter including auxiliaries Class: 0.5 S Make: ION Data retention period: Crediting period + 2 years
Exhaust air temperature from cooler ($T_{Exhaust\ Air\ Cooler}$)	Plant	°C	Measured	Weekly	Electronic	Instrument used: K type Thermocouple. Calibration: Internal Frequency: Annual Data retention

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	Comment
						period: Crediting period + 2 years
Static Pressure from ESP exhaust ($StPr_{ESP\ Exhaust}$)	Plant	mm water gauge	Measured	Weekly	Electronic	Instrument used: Pitot Tube with digital /mercury manometer. Calibration: External Frequency: Annual Data retention period: Crediting period + 2 years
Dynamic Pressure from ESP exhaust ($DyPr_{ESP\ Exhaust}$)	Plant	mm water gauge	Measured	Weekly	Electronic	Instrument used: Pitot Tube with digital /mercury manometer. Calibration: External Frequency: Annual Data retention period: Crediting period + 2 years
Mass flow rate of cooler exhaust gas ($M_{Exhaust\ gas}$)	Plant	kg/hr	Measured & Calculated	Weekly	Electronic	Calculated as per equation 8 in the calculation.
Specific heat of cooler Exhaust gas ($S_{Exhaust\ gas}$)	Formulae provided by technology supplier	Kcal/ kg / °C	Calculated	Fixed	Electronic	Calculated as per eq 2 in the project calculation section. Data retention period: Crediting period + 2 years
Temperature of clinker dust from cooler ($T_{Dust\ cooler}$)	Plant	°C	Estimated	Weekly	Electronic	Temperature of dust will be same as exhaust air temperature from cooler.
Clinker dust from cooler ($M_{Dust\ Cooler}$)	Plant	mg /m ³ of exhaust air	Estimated	Every six month	Electronic	Equipment used is the environmental test equipment. The test is considered monthly. The

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	Comment
						average value of 55 mg/m ³ is used in the calculation.
Specific heat of clinker Dust from cooler ($S_{\text{Dust cooler}}$)	Formulae provided by technology supplier	Kcal/kg°C	Calculated	Fixed	Electronic	Calculated based on the equation no 2. in project calculation section. Data retention period: Crediting period + 2 years
Temperature of clinker from cooler ($T_{\text{Clk Out}}$)	Plant	°C	Calculated	Weekly	Electronic	The data is online monitored in control room. Instrument used: K type Thermocouple. Calibration: Internal Frequency: 6 months Data retention period: Crediting period + 2 years
Clinker from cooler ($M_{\text{Clk Out}}$)	Plant	TPD	Measured and Calculated	Daily	Electronic	Difference of clinker inlet and clinker dust
Specific heat of clinker from cooler ($S_{\text{Clk Out}}$)	Formulae provided by technology supplier	Kcal/kg°C	Calculated	Fixed	Electronic	Calculated based on the equation no 2. in project calculation section. Data retention period: Crediting period + 2 years
Radiation losses from cooler (R_{Loss})	Technology supplier.	Kcal/hr	Calculated	Weekly	Electronic	6 Kcal/kg of Clinker. Fixed value is used as per the data given by technology supplier.
Kiln running hours (K hrs)	Plant	Hrs	Monitored	Daily	Electronic	Monitored daily from control room. Data retention period: Crediting period + 2 years

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	How will the data be archived? (electronic/ paper)	Comment
Cooler Efficiency (Eff ^{Cooler})	Plant	%	Calculated	Weekly	Electronic	Calculated as per eq 14 of the calculation. Data retention period: Crediting period + 2 years

II.3.2: Data Monitored for Baseline Emission Calculations

All the data used is monitored ex ante.

II.3.3: Data Monitored for Leakage Calculations

There is no leakage emission from the project activity.

II.3.4: Quality Assurance (QA)/ Quality Control (QC) Plan

Quality assurance/quality control plan was made as per quality system (ISO 9001) guidelines. Monitoring was done with necessary equipments on intervals mentioned in the methodology adopted for the project activity. All the equipments are calibrated as per the described procedure and frequency of calibration. The procedure for the calibration for CDM monitoring related equipments is defined in the plant.

II. 3.5: Environmental Management Plan

In general, the environmental monitoring activities (like stack emissions, ambient air quality for Suspended Particulate Matter etc.,) is carried out in the plant as per the guidelines provided by Pollution Control Board (PCB). The compliance report of environmental condition of the plant is submitted monthly to PCB and environmental statement of the plant is submitted to PCB on annual basis.

II. 3.6 Roles and Responsibilities

A CDM team (Under Technical cell) has been working in Grasim cement for monitoring and verification of all the monitoring parameters as per the guidelines formulated by the management. Qualified and trained people monitor the parameters and emission reduction calculations. In the complete implementation and monitoring Plan, Grasim cement is the sole agency responsible for implementation and monitoring.

Section-III: GHG Emission Reduction

III. 1 Emission reduction

Emission Reductions at Grasim cement, Raipur	
Year	Annual estimation of emission reductions in (tonnes of CO2 e)
2004-05 (Oct 04-March 05)	8199
2005-06	15822
2006-07	12049
Total estimated reductions (tones of CO2 e)	36070

For all the data and calculations detailed excel sheet is attached with the monitoring report.