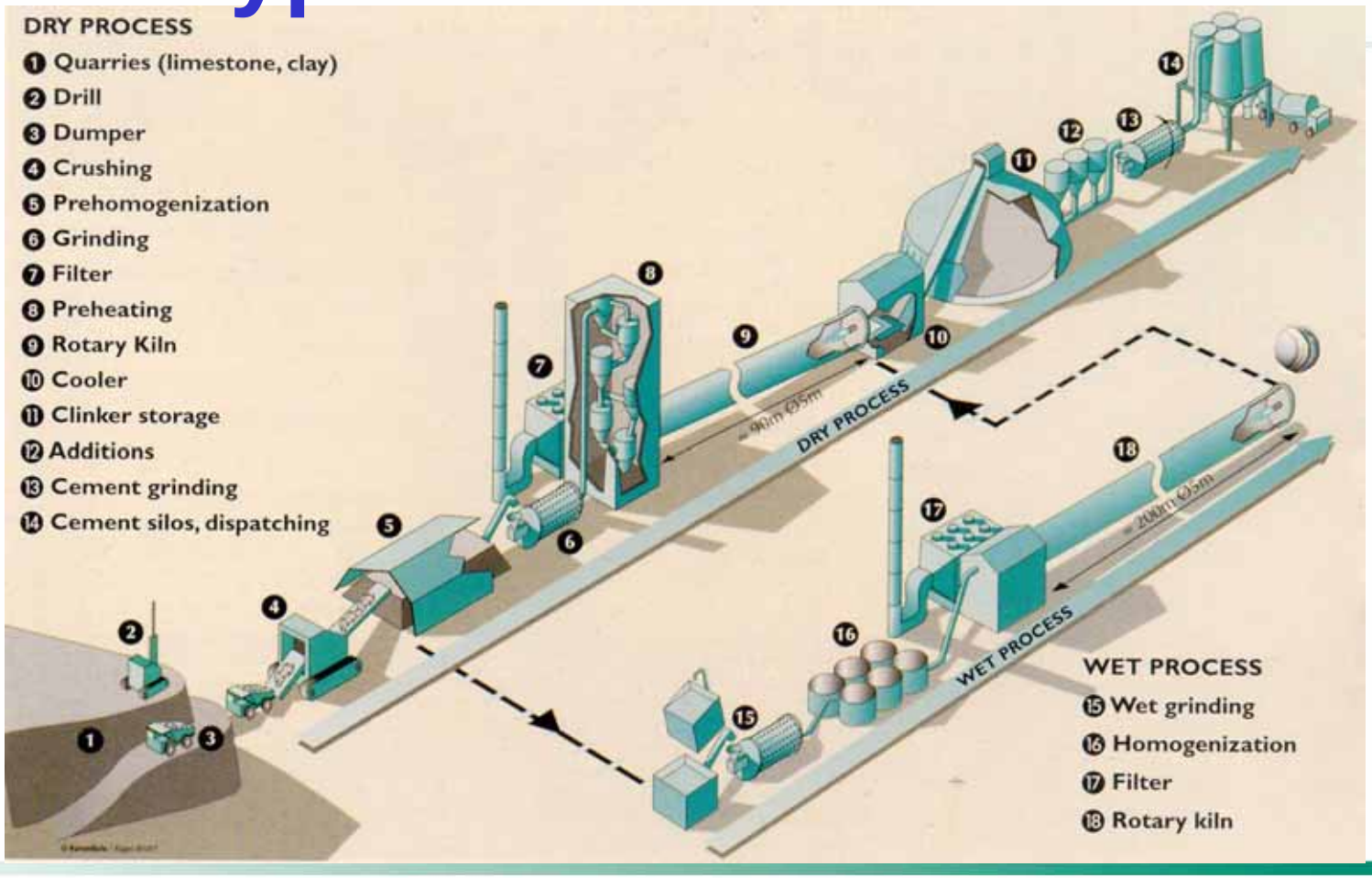
Managing Emissions from industrial and Mining Sources

Dust Emissions from Cement Manufacturing Plant

Overview

- A typical cement manufacturing operation
- Sources of air emissions from a cement plant
- Dust emissions control
- Lafarge in East Africa
- Way forward for Cement industry in East Africa

Typical Cement Plant



Mass Balance for 1kg Cement

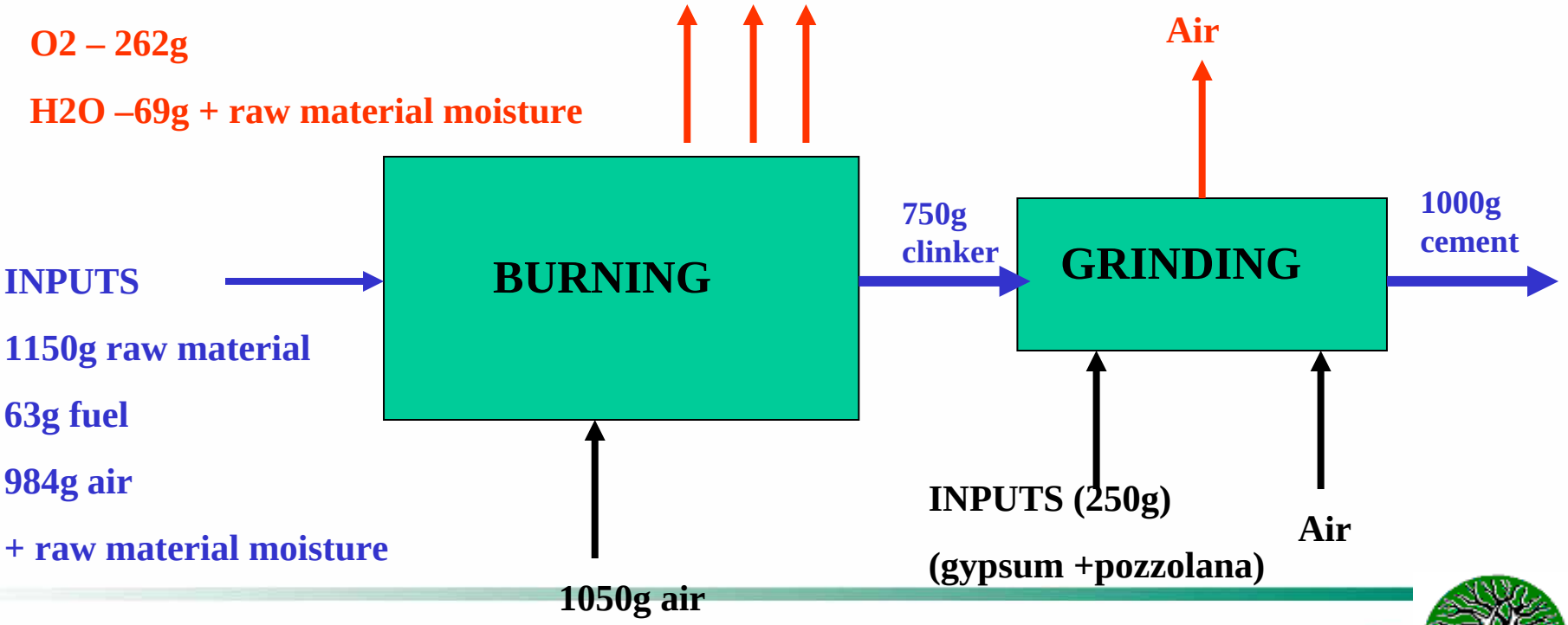
AIR EMISSIONS

CO2 – 650g

N2 – 1566g

O2 – 262g

H2O –69g + raw material moisture



SOURCES OF GASEOUS AIR EMISSIONS

- **CO_2 – Calcination of Limestone ($CaCo_3$) and fuel combustion [900-1000 kg/tonne clinker]**

- **NOx – Fuel combustion by oxidation of chemically bound Nitrogen in the fuel and by thermal fixation of Nitrogen in the combustion air.**

- **SOx – Combustion of sulphur compounds (pyrites) in the raw materials and fuel.**

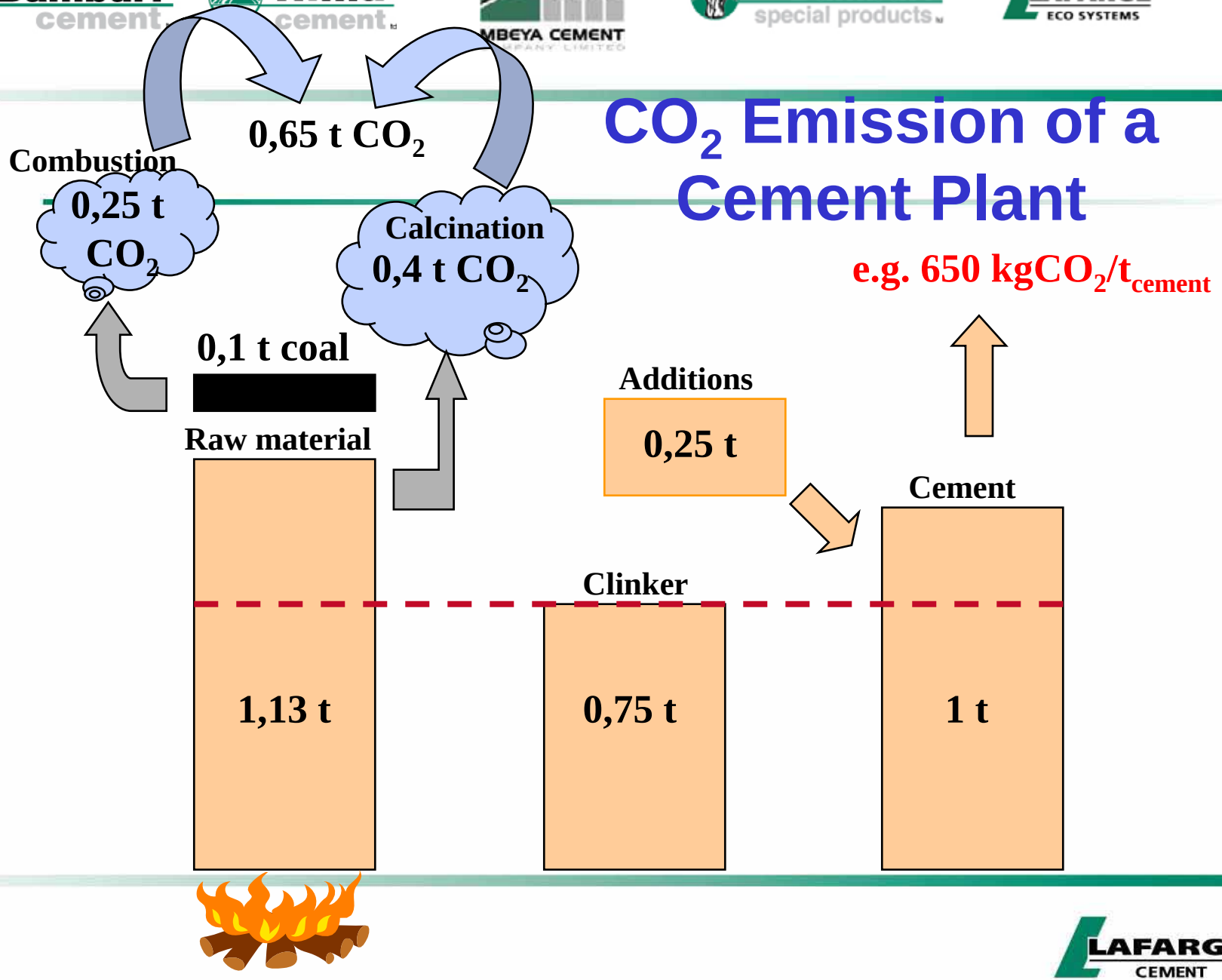
Sulphur Dioxide - SO_2

- **Source**
  - SO_2 from fuels are trapped in the pre-heater. Almost all SO_2 emissions are linked to pyrite in our raw materials evaporated at the top of the preheater
- **Abatement technology**
- Process optimisation
- Selective mining
- Wet scrubber
- **Best available technology (BAT)**
  - 200 – 400 mg/Nm³

Oxides of Nitrogen - NOx

- **Source**
  - In the kiln NOx is formed at high temp.(thermal NOx) and at lower temp. from the nitrogen in the fuel (fuel NOx)
- **Abatement Technologies**
- Process optimization, Flame cooling, Alternative fuels
- Staged combustion
- Selective/ Non Catalytic Reduction (SCR/SNCR)
- **Best available technology (BAT)**
- SNCR 200 – 500 mg/Nm³
- SCR 100 – 200 mg/Nm³

CO_2 Emission of a Cement Plant



e.g. 650 kgCO_2/t_{cement}

Composition/Source of Dust

- **Chemical Composition**

Cement plant dust is primarily mineral. It contains traces of the raw material used to manufacture it, notably $CaCO_3$ (limestone), as well as SiO_2 (shale) (silica) , Al_2O_3 (Bauxite)(alumina) and Fe_2O_3 (Iron ore).

- **Sources**

Fugitive sources

Blasting

Material storages and handling (wind and spillages)

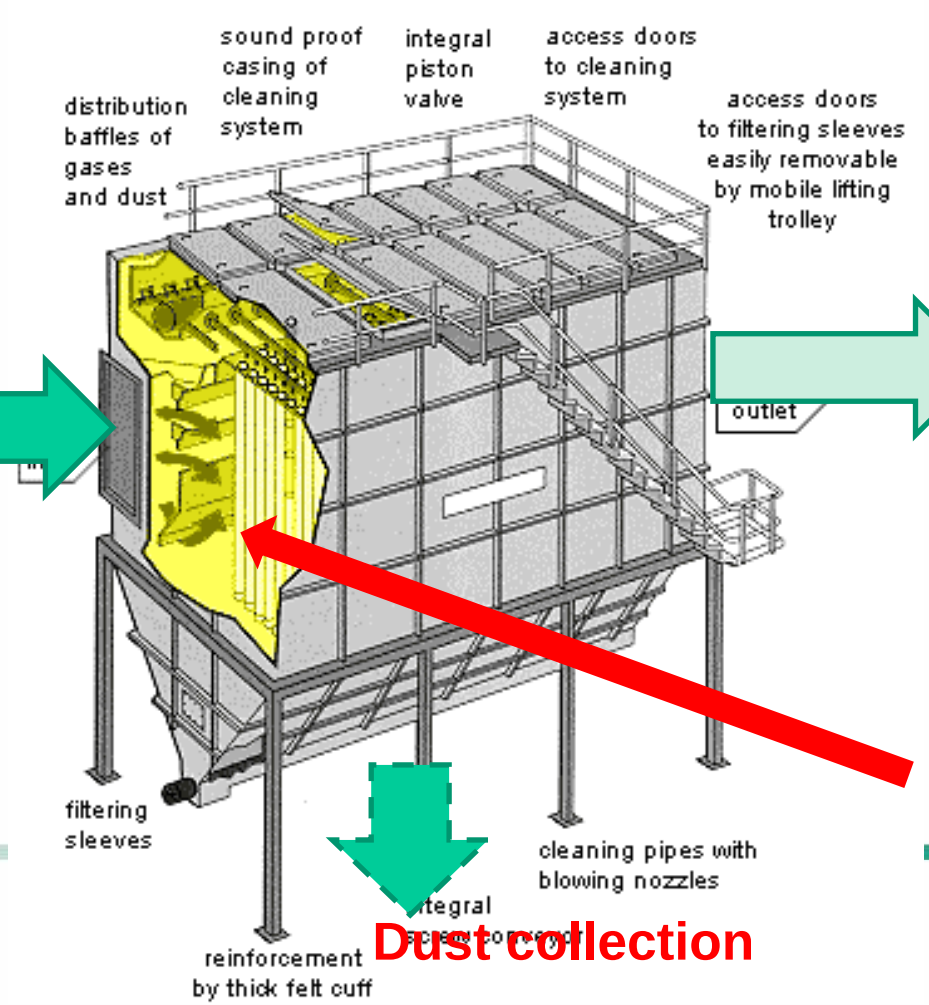
Point sources

(stack, cooler, filters etc.)

Dust Emission Abatement Technologies

- **Fugitive sources**
  - Housekeeping
  - Effective maintenance
  - Closed storages
  - Paved roads & green areas
- **Point sources**
  - Fabric (Bag) filters and Electrostatic Precipitators (ESPs)
- **Best available technology (BAT)**
  - 20 – 30 mg/Nm³

HOW DOES AN BAG FILTER WORK?



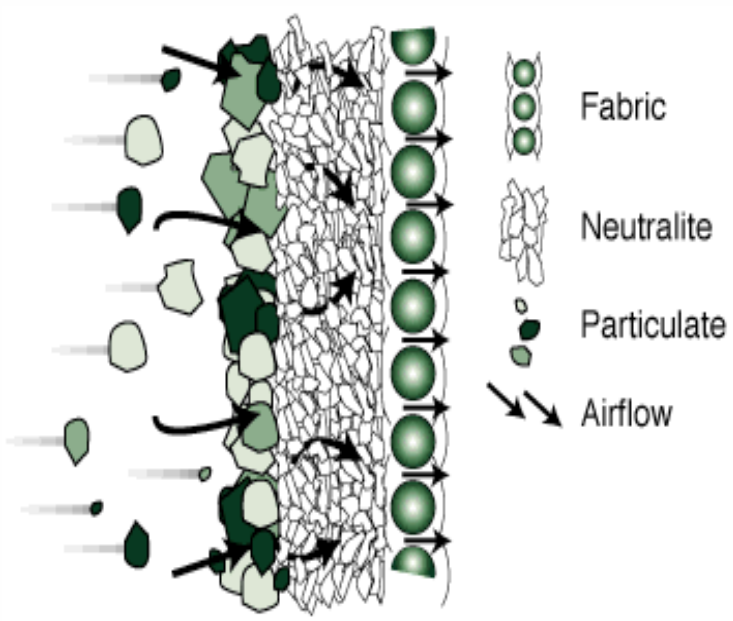
Dust filled Air

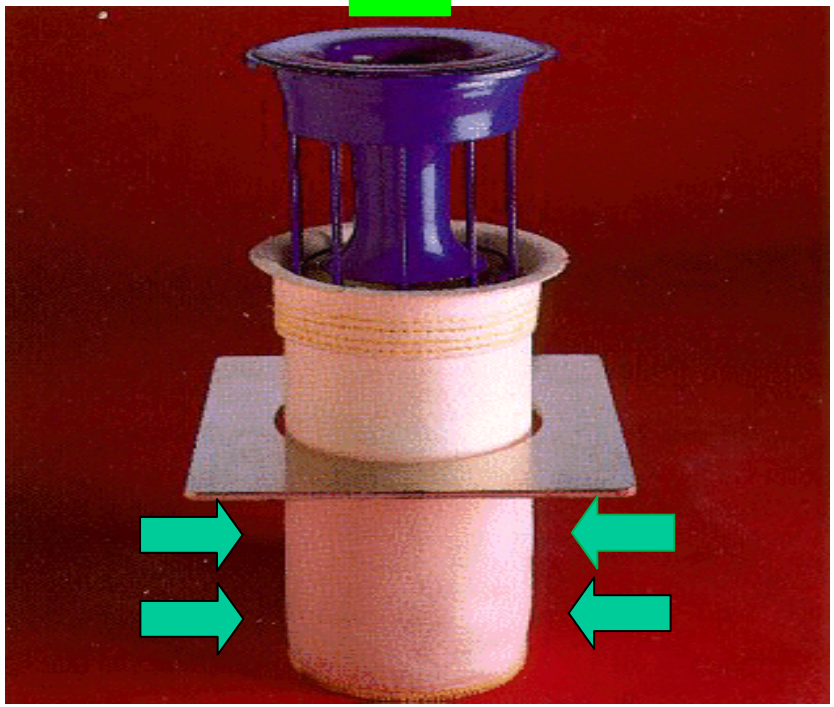
Clean Air

Filter Bags

Dust collection

HOW DOES AN BAG FILTER WORK?





LAFARGE IN EAST AFRICA

KENYA

- Bamburi Cement Limited
  - Mombasa Plant
  - Nairobi Grinding Plant
- Bamburi Special Products
- Lafarge Eco-Systems

UGANDA

- Hima Cement Limited

TANZANIA

- Mbeya Cement Limited

LAFARGE Environmental Policy

- To achieve a maximum level of stack dust emissions of 50 mg/Nm3 at all our cement plants (2010)

- Reduce emissions for the period 2005-2012
  - Dust by 30%, NOx by 20%, SOx by 20%

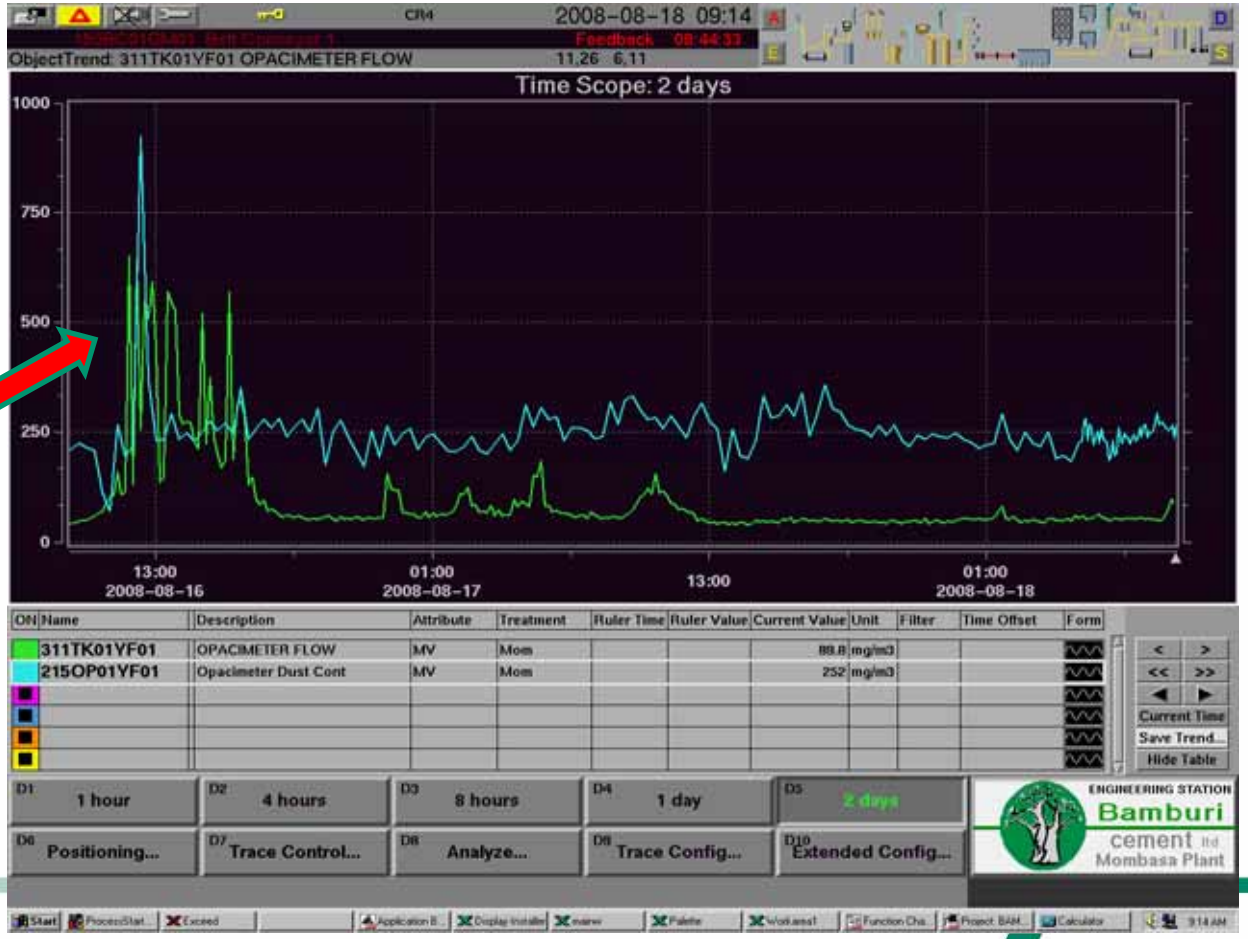
STACK EMISSION PROJECTS IN E.AFRICA

Kiln Cooler Bag Filter Installation –Mombasa Plant

- Installation in 2001 at a cost of over Kshs.200 million (< 50 mg/Nm3)

STACK EMISSION PROJECTS IN EAST AFRICA

Installation of Opacimeters



Key Air Emission Projects By Lafarge

- The Mombasa Plant Cooler Bag filters installed in 2001.
- The Gas Conditioning Tower (GCT) project for HIMA Cement was initiated in 2007 and expected to be commissioned by May 2008.
- The Electrostatic Precipitators (ESP) Refurbishment project by Mbeya Cement commenced in 2007 to be completed in Oct. 2008
- Opacimeters (dust monitors) installed in all the stacks by Oct.2008
- Mombasa Plant kiln stack ESP upgrading project in progress
- Alternative fuels projects
- Biofuels project

A COMPARISON OF EAST AFRICAN AIR EMISSION STANDARDS

		STACK EMISSIONS		
	Enactment Status	Dust (mg/Nm3) (PM10)	(SO2) (mg/Nm3)	(NOx) (mg/Nm3)
TANZANIA	FINAL Enacted 2005	50	500	1500
UGANDA	DRAFT Drafted 2005	50	400	300
KENYA	DRAFT	50	400	1500
LAFARGE	Cement Plant Standard	30	400	800
World Bank	IFC guidelines for cement/lime industry	100 (Kiln-existing) 30 (kiln-New) 50 (other stacks)	400	600

Way Forward to Achieve Better Air Quality in the Cities in East Africa

- NEMA and the cement companies in Kenya (ARM, EAPC, Mombasa Cement, Bamburi Cement) have partnered to form the Cement Industry Environmental Committee
  - To formulate environmental management guidelines for the industry (EIA, Audits)
  - Share Best practices
  - Benchmarking of the cement companies

Way Forward to Achieve Better Air Quality in the Cities in East Africa

- All cement companies to install at a minimum the Best Available Technology (BAT) for air emission abatement
- All cement companies to comply with the National environmental legislations and regulations
- The environmental regulators to conduct air quality modelling for the urban towns to able to simulate urban planning scenarios….

From Wasteland to Paradise…HALLER PARK

Former quarries in Mombasa that have been rehabilitated into a now world famous park