

Certain Characteristics of Air Pollution through Cement Plant at Sonadih Limestone Mine, District Baloda Bazar [CG]

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Abstract: District Baloda-Bazar is the cluster of six cement plants in CG, functioning under different private Sector. Cement dust and related Emission by cement plant are one of the vulnerable sources of air pollution in the area. The cement plant at Sonadih Limestone Mine in district Baloda-Bazar has been working by Nuvacs Vistas Corporation in private sector and selected as case study. It was originally in operation by Tata Steel-ACC, Lafarge since the past thirty years. It has capacity of Clinker production of 5.1 MTPA and Cement production of 3.0 MTPA respectively, after environmental clearance and Impact Assessment conducted by MOEF & Climate Change in February 2019. The air pollutant parameters namely: Ambient Air Quality with respect to particulate matter, Chemical properties of cement dust and the impact of Emission on prevailing local flora and fauna have been studied during winter season of 2016-17 for the area. The guidelines cum suggestions have been made for sustainable ecosystem towards maintaining the latest National ambient Air Quality standard for the studied area.

1. Introduction

The cement had discovered by Joseph Aspdin [1824] in England. He had patent for cement-produced through high temperature firing of ground clay and limestone, until limestone was calcinated. The first cement plant in India was established in 1913 at Porbander [Gujarat] [2].

The cement is fine grey to white colored powder, manufactured in cement plant through clinkering and grinding process. There are 200 cement plants [under operation] in India by 2019, with production of 200 MTPA of cement through dry process [93 %]. Mostly, Indian cement plants are working through private sector namely: ACC, Grasim, Century, Ambuja, Lafarge, Shree cement and L&T with only Cement Corporation of India [CCI] in public sector. The cement is integral part of concrete and backbone of Indian construction industry, as prime building material, presently. The cement acts as binder material in between

different aggregates and water with appropriate ratio to form concrete. India is at third position globally in concrete production, after USA & China. The cement production and CARBON DIOXISE EMISSION from the cement plant have almost same ratio.

The use of fly-ash as alternative building material, with replacing cement for producing concrete is Geo-Polymer Concrete, and is going to be prominent in next generation among Indian construction industry, because of its abundant availability [4].

2. Area of Study

Cement plants in CG have been working since the past thirty years. There are 14 cement plants in C G, with maximum number of 6 in District Baloda-Bazar. The distribution of cement plants in C G is summarized as Table 1.

Table 1: Distribution of Cement Plants in CG

S N	Organization	Name of sector	Name of locality	Name of District	Remarks
1	CCI	Public	Akatlatara	JajgiriChampa	Six are in Baloda-Bazar
2	Lafarge	Private	Arasmeta	JajgiriChampa	
3	Nuvacs Vistas Corporation	Private	Sonadih	Baloda-Bazar	Four are in Durg
4	Imami	Private	Resade-kukurdi	Baloda-Bazar	
5	Shree Cement	Private	Semardeha-Bhaurwad	Baloda-Bazar	Two are in Raipur
6	Grasim	Private	Rawan	Baloda-Bazar	
7	Ultra-Tech	Private	Rawan	Baloda-Bazar	Two are in Jajgiri-Champa
8	Ambuja	Private	Rawan	Baloda-Bazar	
9	CCI	Public	Mandhar	Raipur	
10	Century	Private	Baikunth	Raipur	
11	ACC	Private	Jamul	Durg	
12	J&K Laxmi	Private	Bhilai	Durg	Two are in Public sector
13	Jay Pee	Private	Bhilai	Durg	
14	Rungta	Private	Proposed	Durg	Twelve are in Private sector

3. Methodology & Objectives

The evolved methodology is based upon conventional approach namely- relevant literature collection with data analysis for the following objectives:-

- Ambient Air Quality with particulate matter of cement dust from cement plant.
- Major chemical properties of cement dust with its influence on human health
- Impact of emission from cement plant on local flora and fauna.

4. Result & Discussion

The word pollution is derived from Latin word POLLUTIONEM, which means to defile or make dirty. Cement plant is one of the most popular Industrial Unit producing air pollution-globally to locally. It is a kind of point source, producing sufficient amount of carbon dioxide into atmosphere through emission, besides contamination of cement dust. Globally, 2200 million tons of carbon dioxide has been released into atmosphere in 2016, leading to global warming [4].

1) Ambient Air Quality with particulate matter of cement dust from cement plant:

The cement production from cement plant is energy intensive. The clinkering process releases lot of heat, dust, particulate matter and emission. It has undesired effect to the breathable air on the ground surface or ambient air quality [8].

The particulate matter is of small size air pollutant present in ambient air. These are inhalable during normal breathing process by human being and beyond the range of human eyes detection. It has two categories namely: PM_{2.5} & PM₁₀. The P_{2.5} is less than 2.5 micrometer in diameter. The P₁₀ is in between 2.5 to 10.0 micrometer in diameter and sometimes irritate to human eyes.

The Particulate Matter [PM] has been collected during December 2016 to February 2017 at Sonadih cement plant. The analysis of collected samples through eight different locations around cement plant has revealed the following range:

PM_{2.5} = 41.8 to 56.6 Microgram per Cubic meter, PM₁₀ = 18.0 to 26.3 Microgram per Cubic meter.

2) Major chemical properties of cement dust with its influence on human health:

The Sulfur Dioxide [SO₂] and Nitrogen Oxide [NO_x] are major chemical components of cement dust and ambient air quality, which have adverse effect on human health. These have been sampled during winter period of December 2016 to February 2017 and observed following range:

Sulfur Dioxide = 8 to 13.9 Microgram per Cubic meter,
Nitrogen Oxide = 9.1 to 14.8 Microgram per cubic meter.

Several epidemiological studies have proved a relationship in between inhalable particulate matter of increased concentration and mortality, morbidity of cement dust for

prolonged period is responsible for risk of various types of cancer to living people [6].

It has been revealed that workers of cement plant are badly affected by lung disease and gastro-intestinal problems, when exposed for longer time, due to adverse working environment [5].

3) Impact of emission from cement plant on local flora and fauna:

The leaf portion of local flora around cement plant has been proved as most sensitive part from air pollution point of view. When cement dust of sufficient quantity for longer period in association with emission is deposited over leaf of flora, it starts decaying tissue due to adverse impact on chlorophyll [3]. Later on, it disturbs cell metabolism of flora through disturbance in absorption sun light and reducing growth of proper seed with increasing toxicity level.

It leads to various respiratory and hematological disease to local cattle [fauna], who graze such leaf unknowingly and get suffered by eye defect and genetic problem [7]. It is a sort of crisis for the nomenclature of district Baloda-Bazar, as the name district has been derived from BALUDA BAZAR, taken from word, BODA [Buffalo] selling place, once upon a time.

5. Conclusion & Suggestion

The localities around cement plants in District Baloda-Bazar have serious exposure to air pollution on account of ongoing Industrial activity of cement industry. The cement industry consumes huge amounts of energy and emits carbon dioxide-the main greenhouse gas, which leads to Global Warming. The conducted study has been for one cement plant only and similar cases may be there for remaining five more cement plants in clustered area. The proper breathing in sustainable environment is most essential activity of anybody's life for flora, fauna and human beings as well as to conserve the "Bowl of Rice in CG". The following suggestions have been summarized for conservation of air and related atmosphere [1]:

- 1) Provision of medical facility for the people of effected villages of cement plant and related issues from air pollution point of view.
- 2) Installation, functioning and maintenance of air pollution control equipment as per earmarked fund of approved budget.
- 3) Maintenance of Green belt, extensive plantation program through local flora species.
- 4) Implementation of new Nitrogen Dioxide emission standard through adequate technology.
- 5) Installation cum operation of 24 x 7 continuous emission monitoring system at clinker processing stake as per guideline and standard prescribed by MOEF & Climate Change.

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