

A STUDY ON CEMENT PLANT AIR POLLUTION AND THEIR EFFECTS ON HUMAN HEALTH IN SATNA DISTRICT

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ABSTRACT: -

Climate change is considered as major environmental challenge for the world. Emissions from cement manufacturing are one of the major contributors in global warming and climate change. Cement manufacturing is a highly energy intensive process, which involves intensive fuel consumption for clinker making and resulting in emissions. Beside Fuel consumption, the calcining process is a major source of emissions such as NO_x, SO_x, CO₂, particulate matters etc. In this paper, the role of cement industry is reviewed in causing impact on environment and health. It describes the cement production process and its emission sources followed by overview of emissions and their environmental and health impacts. Present study has focused on emission generation from clinker production and excluded the emissions due to indirect energy (electricity, transportation, supply chain etc.) used for cement operations. This Study observed Satna district cement industry and associated emissions and health impacts

KEYWORDS: Cement manufacturing, emissions, SO₂, NO_x, PMs, CO₂, environmental impact, health impacts, sustainability

INTRODUCTION

during recent years, the increasing demands of cement for industrial and urban development have resulted in rapid expansion of cement manufacturing industries, which are increasing the problem of air pollution where particulate and different gases emissions around the source. various activities during operation of cement plants and cement manufacture process can change the environment attributes in many ways. cement kiln involve the processing of raw material by crushing, milling, grinding, drying, calcimining and heating which generate considerable amount of dust. the final grained dust from heating furnaces gets dispersed into atmosphere. large amount of particulate matter is also emitted during packing. loading and transportation of cement bags. generally the average particulate matter emission from the kilns of dry and wet process technology in India. amount to 0.2 and 0.1 %

respectively of cement production. (Agrawal and Khanamm 1997)

STUDY SITE:-

The study site satna district, is a border city of M.P. and is touched by the border of satna of U.P. Satna lies Intone among the line stone belts of India as a result of which Satna contribute surround 8-9% of India's total cement production. it is also known as plants as prism cement, Birla corporation ltd, Jaypee cement plant located at Satna district. the Asia's biggest cement Factory known as prism cement is in Satna.

Table No. 1
Large, medium and small industries working at satna dist.

s.no.	Category of industries	No. of industries	Category		
			red	orange	Green
1	Large	18	18	--	--
2	Medium	02	02	--	--
3	Small	238	14	151	73

Table No.2. mines status in satna

s. no.	Category of mines	No. of mines	Type of mines			
			Patiya patthar Raddi patthar	okars	Lime stone	murum
1	More then 5 he.	86	--	28	58	--
2	Less then 5 he.	160	84	32	43	01

METHODOLOGY:-

The present study was conducted at satna district of M.p. during the period from march 2015 to June 2015. there are many cement plant placed at satna district. in this study the secondary data is collected from pollution control board satna.

criteria of investigation- (Air) the selected sites around the cement plant will be regularly sampled for ambient air pollution. the air quality will be monitored by MPPCB regularly with following method:-SPM,RSPM and gaseous pollutants (SO₂, NO_x) will be sampled with the help of Respirable dust sampler (Envirotech model). the SPM and PM10 concentrations will be determined by collecting each on part. weighed glass fiber filter paper. after sampling the concentration of each in ambient air will be computed on the basis of net mass collected in proportion to volume of air sampled. the gaseous pollutants will be collected by drawing air at flow rate 0.5 liter /minute through respiration absorbing media. then quantitative estimation of SO₂ and NO_x will be done by West and Greake 1956, Jacob and Jacob 1958 method respectively.

To show the effect of air pollution from cement plants on human health. a survey is conducted two sites are selected for the survey, first is highly polluted site near cement plant and second one is less polluted site about 5-6 k.m. away from cement plant in the each site 250 objects were studied and find how many people are affected in each site and then a comparative study is carried out.

Air pollution control equipment:- stationary sources of air pollution emission, such as cement plants, steel mill and other industrial processes release contaminated into the atmosphere as particulates, aerosols, vapors of gases. these emissions are typically controlled to high efficiencies using a wide range of air pollution control devices. the most commonly used air pollution control devices are:-

- 1- Electrostatic precipitator
- 2- Bag house
- 3- Bag filter
- 4- Cyclone
- 5- Multi Cyclone
- 6- Reverse air baghouse

Air pollution from cement plant and their effect on human health:-

Cement industries are the major source of air pollution. cement manufacture process generates a variety of wastes, including air pollution which may be gaseous such as CO₂, CO, NO_x, SO_x or in the form of particulates such as SPM, RSPM etc. the main constituents of exhaust gases from cement kiln are N₂, CO₂, water and O₂. the exhaust gases also contain small quantity of dust,

chlorides, fluorides, SO₂, NO_x, CO and still smaller quantity of organic compounds and heavy metals.

NO_x:- Increased airway resistance (due to inflammation), damage to lung tissue, chronic obstructive pulmonary disease, of COCP, Emphysema, Pulmonary edema, Infant and cardiovascular death.

SO_x:- Irritation of eyes, nose, throat, damage to lung when inhaled, acute and chronic asthma, bronchitis, and emphysema, lung cancer.

Dust/particulates:- Stuffy noses, sinusitis, sore throat, wet cough, dry cough, phlegm, head colds, lung disease, stone problem, aggravated asthma, chronic bronchitis, Nonfatal heart attacks.

CO₂/CO:- Toxicity of the central nervous system and heart, headaches, dizziness, nausea, unconsciousness, loss of vision, severe effects on the body of a pregnant woman.

Volatile organic components (VOCs):- Tiredness, vertigo, confusion, unconsciousness, anemia, bone marrow damage, liver damage, cardiovascular diseases, cancer, abnormal changes in fetus development.

Acid gases:- Throat irritation, swelling and spasm of the throat and lung tissues, lead to suffocation.

RESULT & DISCUSSION:-

Air pollution resulting from CO, CO₂, SPM & RSPM may place an undue burden on the respiratory system and contribute to increased morbidity and mortality specially among susceptible individual in the general population. particulates greater than 3μ in diameter are likely to collect in the lung lobar bronchi. smaller particulates (less than 3μ) end up in the alveoli. the thoracic or lower regions of the respiratory tract, where more harm can be done the respirable particles are inhaled by the human continuously for long time producing permanent damage of the respiratory system leading to dust related lung diseases mainly silicosis. air pollution around the cement plants is higher than less polluted area away from the cement plants.

To show the effects of air pollution from the cement plants in human health a survey is conducted. for the survey two sites are selected first is around the cement plants and second one is 6-7k.m. away from the cement plant.

A comparative study shows that in the first site around the cement plant 33.6% objects are having health problem while in the second site away from the cement plant only 20.8% objects have health problem.

Table-3
 Concentration of SPM, RSPM, So₂, Nox, around the prism cement plant

Sites	Air pollutants (in ug/m ³)			
	SPM	RSPM	So ₂	Nox
Near treatment plant	174	32	16	21
Dormitory	174	42	16	21
Den	160	26	13	17
Colony area	148	22	12	16

Table-4: Concentration of SPM, RSPM, So₂, Nox, around the Maihar cement plant, Satna

Sites	Air pollutants (in ug/m ³)			
	SPM	RSPM	So ₂	Nox
Near unit-2 get	596.37	152.00	17.5	22.00
Near guest house	434.00	126	11	16
Near filtration plant	486	118	16	18

Table No. 5 Concentration of SPM, RSPM, So₂, Nox, around the Birla cor. Ltd. Satna

Sites	Air pollutants (in ug/m ³)			
	SPM	RSPM	So ₂	Nox
Near dormitory	203	56	10.2	24
Near birla school	162	44	11	10
Near ghurdang school	184	28	21	21
Near ram singh residence	178	64	08	05

Table-6_ survey information of site-1st around the cement plant

Survey area	Around the cement plant (birla colony, satna)
Pollution source	Birla cement plant
Total object	250
Total effected object	84
Skin effect	15
Respiratory effect	17
Stone	07
Blood pressure	13
Sugar	13
Other diseases	19

Table-7- Percentage of effected persons persons from different disease in site-1st around the cement plant

Effects or disease	No. of effected persons	% of effected person in total objects	% of effected person in total effected objects
Skin effect	15	6%	17.8%
Respiratory effect	17	6.8%	20.25
Stone	07	2.8%	8.3%
Blood pressure	13	5.2%	15.4%
Sugar	13	5.2%	15.4%
Other disease	19	7.6%	22.6%
Total	84	33.6%	100%

Table-8 -Survey information of site-2nd 6-7km. away from cement plant

Survey area	Village Nimi, Babupur
Pollution source	BJP cement plant placed at 6-7km. away
Total object	250
Total effected object	52
Skin effect	07
Respiratory effect	09
Stone	06
Blood pressure	05
Sugar	10
Other disease	15

Table-9- Percentage of effected persons from different disease in site-2nd away from 6-7km. cement plant

Effects or disease	No. of effected persons	% of effected person in total objects	% of effected person in total effected objects
Skin effect	07	2.8%	13.4%
Respiratory effect	06	3.6%	17.30%
Stone	06	2.4%	11.53%
Blood pressure	05	2%	9.61%
Sugar	10	4%	19.23%
Other disease	15	6%	28.84%
Total	52	20.6%	100%

CONCLUSION:-

The study shows that the cement industries are an important source of air pollution. emission from cement plant such as different gases and particulate matter effect to human health in many ways and causes dangerous effects(diseases). other earlier studies also shows the dust or particulate matter inhaled through the breathing and cause respiratory problem lime sore throat, asthma, damage to lung tissue etc. different gases such as So₂, Nox, Co₂, Co and other air emission may be carcinogenic and cause cancer of throat and lungs and also cause harmful effects in skin, respiratory system,

nervous system and immune system of human.

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