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A COMPARATIVE STUDY OF AIR POLLUTION IN DHANPURI OPEN CAST MINE AND BANGWAR UNDERGROUND MINE, IN TERMS OF RESPIRABLE PARTICULATE MATTER PM_{10}

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Abstract- Today pollution is the main problematic part in relation with human health and its one of the basic source is industrial pollution. The comparative study of air pollution in near working quarry, Dhanpuri open cast mine falls in to be sheet no. 64E/12 it is located south and south- west of Alai colliery of sohagpur area, Distt- Anuppur, state- M.P, INDIA and near working coal stock yard, Bangwar underground mine, P.O: Bemhauri, via-Burhar, pin: 484110, Sohagpur area, Distt- Shahdol, M.P, India, by taking the parameter respirable particulate matter PM_{10} formulation were carried out. Sampling of respirable particulate matter in the ambient air, determination of its concentration and comparison could be done.[1] There is a lot of pollution created by huge coal mines and its effects are well observed in the people living there. The sample collected and analysed by different methods, and the data comes out is foremost for the identification and comparison of the basic problem. All the parameters show that both mines are polluted in terms of air. The results and graphs represent the comparative variation in three months, on the basis of the observation carried out. The observed values shows that the air sample carried a lot of pollution and on the basis of which it conclude that Dhanpuri open cast mine is more polluted than Bangwar underground mine with respect to respirable particulate matter or PM_{10}. Although various safety measures are taken by the coal mines for the cleanliness of environment from air pollution as suggested by state pollution control board which is appreciable, but here some useful suggestions are given at the end of the research paper for the safety of environment and human health

Keywords-Respirable particulate matter PM_{10}, formulation, ambient air.

I. INTRODUCTION-

The first public sector coal company under central control was "NATIONAL COAL DEVELOPEMENT LIMITED" set up in October 1956.[2] Mining is one of the core industries whose adverse fallouts on environment and ecology has become a cause for deep concern worldwide, however, with rapid scientific and technological developments in the field, the problem to a great extent can be mitigated through applications of appropriate physical, chemical and biotechnological interventions. Destruction of the environment is often an unfortunate consequence of mining industry. In mineral processing, however, recovering a fraction of the mined material above the cutoff grade and discarding the rest as waste cannot help but have an adverse impact on the environment.[3] The environmental challenges from coal mining include coal mine accidents, land subsidence, damage to the water environment, mining waste disposal and air pollution. These are either environmental pollution or landscape change. A conceptual framework for solving mine environmental issue is proposed.[4] Open cast mine and underground mining dominates coal production in India. A survey was conducted to evaluate its local atmospheric impact. Emission data were utilised to compute dust generation due to different mining activities work zone air quality, ambient air quality seasonal variation are described revealing high pollution potential and consequent impact on human health.[5] Air pollution from coal mines is mainly due to emission of particulate matter (SPM & RSPM) and gases like NOx and SOx. Mining operation like drilling, blasting, hauling, collection and transportation are type major source of emission and air pollution.[6] High level of suspended PM increase respiratory diseases such as chronic bronchitis and asthma while gaseousemission

contributes to respiratory, cardiovascular and cerebral problems.[7] PM10 is a measurement unit for dust particles present in the air, particulate matter with diameter less than or equal to 10 micrometer. Its measurement unit is micro per cubic meter. Inhalable particles, particularly fine particles, have the greatest demonstrated impact on human health. Their small size allows them to get deep into the lungs and from where they can reach or trigger inflammation in the lung, blood vessels or the heart and perhaps other organs. Studies have linked RSPM exposure to health problems such as, irritation of airways, coughing, and difficulty in breathing. Reduced lung function, aggravated asthma, chronic bronchitis, irregular heartbeats, non-fatal heart attacks and some cancer Effects of RSPM on the environment include, increased acidity of lakes and streams, nutrients balance changes in coastal water and rivers basin, reduced level of nutrients in soil, damage to forest and crops, damage to stone and other material and reduced diversity in ecosystem.[8]

II. MATERIAL AND METHODS–

The sampling and analysis based on the principle that air is drawn through a size-selective inlet and through a 20.3 cm × 25.4 cm filter at a flow rate of about 1 000 1/min. Particles with aerodynamic diameter less than the cut-point of the inlet are collected by the filter. The mass of these particles is determined by the difference in filter weights prior to and after sampling. The concentration of PM10 in the designated size range is calculated by dividing the weight gain of the filter by the volume of air sampled.

The light surface cleaned and filter paper handled with clean hand so that it can prevent from contamination. The weight of filter paper was recorded and placed in the light table. The cap sealed tightly and sampler was switched on for 8 hours. After the sampler was on the flow rate was recorded. The inlet determines which particles are excluded and which pass through the collection system, the inlet is actually defining the particle cut-off size and thus the species captured. The correct use of the inlet, the flow rate and the general operation of the system is vital to the accuracy of PM10 determination.[9] For total respirable suspended particulate matter, the respirable dust sampler, envirotech, APM 460BL is used to set up in the sampling stations points, on a plan surface and at a correct position. The sampling points does not changed according to the seasons.[10] After sampling was completed the sampler switched off, the final flow rate and time was recorded. Then the cap was removed and the filter paper takes out folded half lengthwise by handling it along its edge with exposed side inward. At the end the filter paper with deposited particles weighed again and recorded.

Calculation: calculation of volume of air sample:
$V = Qt$

Where, V = volume of air sample in m3
Q = average flow rate in m3/min. ;&
T = total sampling time in min.

Calculation of PM10 in ambient air:
PM10 (as µg/m3) = (W2 – W1) X 106 / V

Where, PM10 = mass concentration of particulate matter less than 10 microns diameter in µg/m3.
W1 = initial weight of filter in gm.
W2 = final weight of filter in gm.
V = volume of air sample in m3.
106 = conversion of gram to µg. [11]

III. RESULT AND DISSCUSSION-

From table no.1 the analysed data of respirable suspended particulate matter found indhanpuri open cast mine are 164 µg/m3,169 µg/m3 and 95.20 µg/m3 and the respirable suspended particulate matter of bangwaar underground mine are 168 µg/m3, 170 µg/m3 and 92.50 µg/m3, for the months of 11 January, 08 February and 24 April 2014. All the above data shows that both mines are polluted and both affects the human life as well as environment. The data found to be in variation seasonally, that is different month show different observation. RSPM showed more dhanpuri open cast mine, comparatively in January and February month but found to be less in the month of April.

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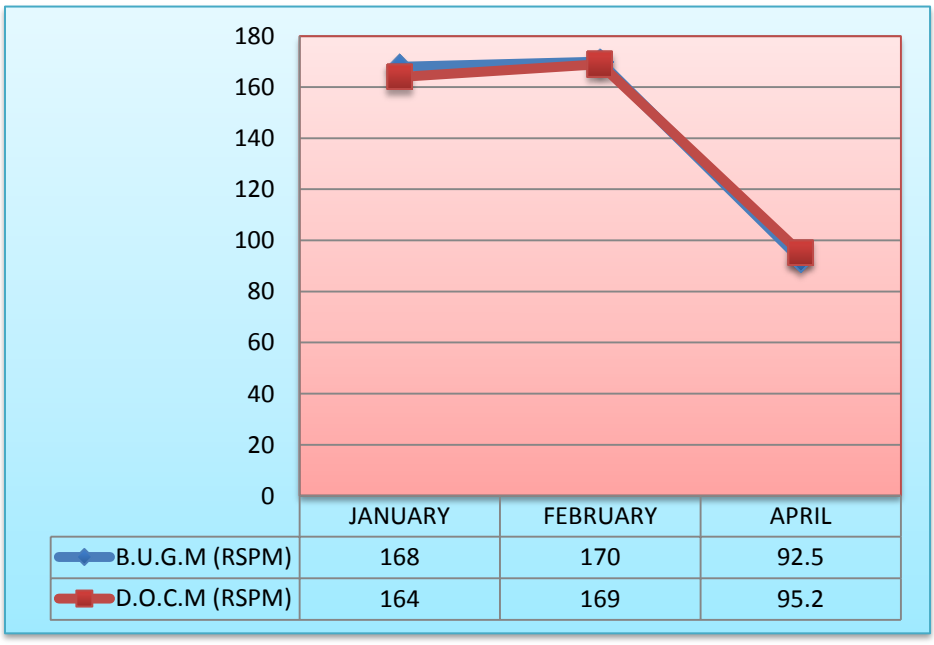
Analysed Data and Reports:

Table no:1

S.No.	Data analysed in selected month	Coal mines, S.E.C.L sohagpur area.	Respirable suspended particulate matter (RSPM in µg/m^3) upper limit is 100 µg/m^3
1. [A]	11 January 2014 Analysed on 12 january 2014	Dhanpuri open cast mine(Near working quarry)	164 µg/m^3
[B]	11 January 2014 Analysed on 12 january 2014	Bangwar under ground mine(Near coal stock yard)	168 µg/m^3
2. [A]	08 February 2014 Analysed on 09 february 2014	Dhanpuri open cast mine(Near working quarry)	169 µg/m^3
[B]	08 February 2014 Analysed on 09 february 2014	Bangwar under ground mine(Near coal stock yard)	170 µg/m^3
3. [A]	24 April 2014 Analysed on 25 april 2014	Dhanpuri open cast mine(Near working quarry)	95.20 µg/m^3
[B]	24 April 2014 Analysed on 25 april 2014	Bangwar under ground mine(Near coal stock yard)	92.50 µg/m^3

Graphical representation:

Graph 1: DhanpuriO.C.Mine&BangwarU.G.Mine (Comparative study of RSPM yr. 2014.



IV. CONCLUSION-

After elaborate study it was found that Dhanpuri open cast mine is more polluted than bangwar underground mine in respect with

respirablesuspended particulate matter. Although there are several safety measures are followed by these coal mines for the safety of our environment as stated by state pollution control board. Like, mobile water sprinkler for dust suppression and process of more plantation is there but ground water is use for the sprinkling process. So, these processes makes discharging of ground water level.

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