Dust Pollution: A Review And Its Health Hazards In Coalfield Area Of Jharia And Dhanbad. (Jharkhand)

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Abstract:

This Paper deals with the concept of Dust Pollution, its sources and a simple survey showing in rapid and alarming increase. It also deals with its impact on Human health. Thus, this paper may find its importance for increasing public awareness about its hazards which might prove an effective pioneer step in controlling it.

Keywords: Dust pollution, SPM, RSPM, Aerosol, Gas- emissions, Hypoxia.

Introduction:

The enormous Greed of Mankind for wealth, knowledge and power resulted in ruthless exploitation of Nature. This has given birth to a new Demon called 'Pollution'. Now, everybody is very much aware from this word, which simply means excess of any particular matter or energy, adversely hampering the natural flow or run of ecosystems. It is termed accordingly as it effects the different parts of Biosphere as Air, Soil, water etc. As, we all know that Dust Pollution is just a minor area under Air Pollution, which stands for a discrete mass of any material of microscopic and sub microscopic dimensions existing in the atmosphere.

Dust, which here stands for all types of air borne matters resulting not only from direct emission of particles, but also from emission of some gases that condenses as particles directly or undergoes transformations to form particles. Thus, dust particles present in air may be primary or secondary. Primary dust particles include dust from soil or rock debris, volcanic emissions, Sea -Spray, Forest fires and reactions between natural gas emissions. The secondary dust particles stand for liquid or solid produced due to condensation or due to some other natural phenomena in the atmosphere as asbestos particles produced during Cement or asbestos related industry., Nickel, Arsenic, and other metallic particles released during metal processing and related industries.

Thus, according to the range of size, dust particles present in the atmosphere can be categorised into following types –

1) Respiratory Suspended Particulate Matter (RSPM) or Aerosol -Size ranging from 0.001 µm to 0.10 µm. It can be inhaled with breathing and directly enters the Bronchi and Bronchioles of Lungs.

2) Suspended Particulate Matter (SPM) - size ranging from 0.11µm to 5000 µm. It easily reaches upper tract of Respiratory System and get stuck there.

3) Particulate Matter (PM) or Fly ash - 5000 µm to sub microscopic sizes.

Sources of Dust Pollution - The various Sources of dust Pollution are –

1) Mining - This is the main Sources of dust Pollution in the areas rich in minerals. The various Human activities emitting dust are-

a) Coal and Rock dust in course of stripping, mining, loading - unloading and transporting

b) Dust generated due to operation of vehicles including HEMM, Trucks and Dumpers.

c) Dust generated during blasting, hole drilling and other mining operations.

d) Dust from exposed surfaces of dumps, coal benches, flanks of open coal mines.

e) Generation of dust during operation of coal handling plants and loading of coal into wagons.

f) Katchha Haul roads in open coal mines areas causes large dust blooms.

2) Vehicular Emission and Transportation -In the Census by a Popular Daily, India had over 32. 63 million vehicles by 2020 of which more than 65% were two wheelers operating on petrol. In all the major cities of the country almost 800 to 1000 tons of pollutants are being emitted in the air from automobile exhausts. In all major cities vehicular hydrocarbons, 30% to 40 % of all oxides and 30% of all SPM. During peak traffic hours, automobiles of all classes emit as much as 700 kg of CO, 250 kg of Hydrocarbons and 60 kg of Nitrogen Oxides, 3 kg of SPM including Aerosol and Fly ash. It is estimated that a car (without cleaning device) emits 350 kg of CO, 0.6 kg of SO_2, 0.1 kg lead, 1.5 kg SPM. In a Dust pollution data, SPM level at two test points, Regional MADA office Dhanbad and MADA office Jharia were found to have 8 to 9 times more than normal prescribed limit in 2016, which was 3 times and 4 times more than in 2007 respectively. (Table 1) This data is provided by environmental department of ISM Dhanbad.

Table 1 – Air quality of Dhanbad Jharia Township (2007-2016) : Annual Average of SPM in µg/m3

Sampling Station	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reginal MADA Office Dhanbad	422.7	485.1	573.4	632.7	673.6	690.1	707.5	751.2	793.9	853.3
MADA Office Jharia	440.5	190.1	590.4	641.9	645.9	747.7	778.6	813.6	863.7	904.1

Citing the local conditions of Dhanbad and Jharia alone, number of registered vehicles is 64562 and 46414 respectively in 2016 which includes trucks, Dumpers, Buses, Cars, Two and Three Wheelers. At the same time, chain like transport of trucks and other vehicles on nearby GT road fills the atmosphere with so much dust that it appears like fog for whole year right from early evening. Not only this, Lead added in the fuel in these vehicles make the conditions worst and more lethal. In an analysis done by Environmental Dept. of ISM, Dhanbad, the air surrounding the Gaya Bridge, has SPM in the range of 320 to 2600 µg/m3. with an average of 1400 µg/m3. in May 2016. This is almost three times the permissible limit of 500 µg/m3. for Industrial Area and 14 times of 100 µg/m3. limit for residential area. And this report is only due to heavy vehicular exhausts in this designated area.

3) Stone Crushers, Small Scale Industries like hard Coke manufacturing, soft coke manufacturing, Domestic Consumption of fossil fuels. -These sources constitute another important source of dust in the atmosphere. It has been estimated that each Stone Crusher emits 3 tons of SPM daily and the dust concentration around them varied from 3000 to 8000 µg/m3 of air. This is 15 to 40 times more than the prescribed limit for Industrial area. Each Coke processing Unit releases about 1000 tonnes of ash out of which about 200 tons get settled down at the bottom and 800 tonnes goes into the Chimneys. Out of this if ESP (Electrostatic Precipitator) is not present, about 400 tonnes of SPM are released into the atmosphere.

4) Metals and Metals related Industries - These are another important source of metallic dust in the air., Which are most lethal of all SPM. Arsenic is produced as a by-product of metal refining Process. In Industrial area, its concentration reaches nearly 20 to 90 µg/m3 which is found to be carcinogenic. Asbestos used in asbestos cement pipes, flooring products, paper roofing products, asbestos cement sheets, insulation textiles etc. have also been found to be carcinogenic. Nickel used in Chemical, Petroleum and metal Industries; Electrical Goods Industries have also been reported to activate oncogenes. In addition to this, they also undergo Bio magnification in the food chain and web, thus posing danger even on the existence of future generations.

5) The Biotic World is also a source of Particulate matter that remain suspended in the atmosphere. These are bacterial Cells, Spores, pollen Grains, etc. They also cause many distresses in Human beings.

Health Hazards -

The pungent polluted turbid air in the area of dense vehicular traffic, burning watering Eyes after a two-wheeler ride from Dhanbad to Jharia, reminds us the threat posed by dust pollution on our health in the area. But this is just a superficial effect, consequences become more severe, when these dust reaches inside our body. A Simple exposure of dust pollution causes difficulty in breathing, Headache and irritation in mucus membranes in the respiratory tract. This further leads to constriction of air passages causing Hypoxia and Broncho constriction. (Finkelman, 2004).

The aerosol readily passes through alveolar membrane of the lung and reaches the blood stream. The aerosols block the minute pores present in the walls of bronchi, which are the main site of exchange of gases. The further effect led to Anoxia and Broncho - ocular diseases. The most common of them are Tuberculosis and Asthma. Therefore, these diseases are most common in the people of heavy dust polluted area. (Ghose, et. al. 2000a,b)

Inhalation of metallic dust like lead from the fuel exhaust causes reduced Haemoglobin formation leading to Anaemia. These results infection in liver and kidneys. Cadmium dust even at very low concentration is reported to accumulate in liver and kidney of human beings. This causes Hypertension, Emphysema and kidney Damage. (Jha M, et. al). It has also been found to cause Cancer. Same is reported with Arsenic and Nickel dust. Asbestos, a non-degradable fibre is dangerous as it undergoes Biomagnification and have been found to activate oncogenes very rapidly. (Jha M, et. al. 2010) after kidney damage. Thus, people living in

heavily dust and gas polluted areas are very much prone to the respiratory diseases, mainly of lungs, Asthma, Tuberculosis, Bronchitis and Cancer. They also cause Byssinosis. The Biological particulate matter is also responsible for causing bronchial disorders, allergy and many other similar diseases. In these areas, the air has also been reported with high concentration of polycyclic. aromatic hydrocarbons (PAHS) produced during coal production. Although, it does not show any immediate harm, but when get metabolised with enzymes of the body they attack the nitrogenous bases of DNA present in the chromosomes. Thus, they are able to induce point mutation as well as Cancer at that level.

Conclusion:

But, only discussing these will not benefit the common people suffering. Focus should be on how to combat it and reduce their harmful effect to its minimum.

In this regard, Cyclone collectors in which particulate matters are removed by using Centrifugation force is only 70% efficient. Electrostatic Precipitators (ESPs) which removes the SPM by applying the electric force is 99% efficient. It ionizes the suspended particles which get attracted to oppositely charged electrodes. But, unfortunately very few Industrial Units have these ESPs. Beside this, it cannot separate high resistivity and Corrosive Particulate Matters. Therefore, creating public awareness and generating more effective pollution controlling Technologies along with Sustainable ecofriendly Progress of the Mankind is only option for sustainable Development in the present century.

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