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Receptors for Lower Air Pollution (Tree Leaves)

Shashikant [1]

[1]*MTech Student, Civil Engineering Department, P.D.A College of Engineering, Kalaburagi, Karnataka, India*
Email- shashikant247@gmail.com

ABSTRACT

One of the most significant problems facing the planet is air pollution. Cancer, cardiovascular disease, and high mortality rates are just some of the ill consequences it may have on a person's health. The high population density of cities and other developed regions is a major cause of air pollution there. Particles in the air that float about and eventually settle, as well as polyaromatic hydrocarbons, are the major causes for alarm. When compared to other causes of air pollution, the prevalence of heavy industry stands out as a significant contributor. Are getting there, keeping warm locally, and maybe picking up pollutants from an industrial area nearby. This thesis focuses mostly on long-term time series, including climatic variables and air pollutants (PM10, SO2, and NOx). The inclusion of data on the startup and shutdown of factories is an important consideration when evaluating the worth of this effort. The goal of this data thesis is to evaluate the impact of tree planting on air quality in industrial zones by contrasting the pre- and post-planting dust particle concentrations. So far, no one has used these data sets for in-depth studies by including physical and chemical features of the dusts deposited on the leaves, hydrometer analysis, and planimeter instrumentation.

Keywords– Cement Plant, Dust particles, Leaves, Planimeter, Hydrometer analysis.

I. INTRODUCTION

Recent decades have seen an unprecedented wave of industrialization in India, leading to the country's economic and social development as a whole, as well as a rapid increase in the population of its major cities. The increasing need for concrete in construction projects has made concrete production the most important industry in India, surpassing even steel production and electricity generation. Methane, fumes, dust, nitric oxide, sulfur oxide, carbon dioxide, and carbon dioxide are the most harmful byproducts of cement production, polluting the air and posing risks to human and plant health through inhalation. Flying debris from the cement manufacturing process is transported through air and stored at a facility close to the assembly facilities or maybe in a far-off, easy-to-remove location. This consists of urban areas, suburban areas, green areas, sports facilities, normal vegetation, and rural terrain. The assertions interfere with the natural metabolic organization of horticulture production, which in turn affects food quality and quantity. The growing demand for cement has led to the expansion of an existing plant and the establishment of a new facility to meet this demand on an annual basis. Therefore, strict Air Contamination Control became an absolute need. Focusing on climate change as a means of combating corruption and improving human health. In order to reduce air pollution in the construction industry, this paper will propose a new method that won't hurt the environment, such as increasing tree planting.

II. OBJECTIVES OF THE STUDY

- Determine how much dust and dirt has settled on the leaf.
- Determine the chemical and physical properties of the dust.
- To determine particle sizes

III. MATERIAL AND METHODOLOGY

Location: close to taluk sedam, dist. kalaburagi; coordinates: 17°06′15″–17°08′50″ (N) and 77°09′15″–77°12′55″ (E); capacity: about 120 MTPA. Both the municipality and the factory are on 800 acres of land.

The climate of the region is semi-arid, meaning that it is mostly dry with the exception of the Southwest monsoon season. Beginning about the middle of February and ending around the first week of June is summer. The southwest monsoon continues into the latter week of September. The monsoon season ends in October and November, while winter lasts from December to February. Late summer and the monsoon bring stronger winds, although they are still relatively mild.

At the sampling stations, look at the differences in air quality metrics between the weekdays and the weekends. The primary objective of this study is to quantify the level of concentration or the quantity of accumulated particulate matter on the leaves. Since the rajashree Cement facility is an industrial center, it produces large quantities of important particle pollutants, which may have serious consequences for the local ecosystem and human health. Our first and foremost concern is for the natural habitat of the Rajshri Cement Works in Malakhed. As a result, we settled on selecting sample places in the packing factory and mining regions as a means of experimenting with suitable precautions.

Limestone (87–92%), bauxite (5.6%), laterite (4.5%), clay (2.3%), and hematite (4.5%) make up the raw materials. Fly ash (0.4)% in OPC, 30-35% in PPC, 20-25% in PPCS, and gypsum (5% by weight) during cement milling (between Laterite and Hematite, depending on stock of the material available).

Dust collection:

- The process involves: Collecting tree leaves from the packaging factory and cement plant mines, handling them with care
- In a flask, wash the leaves thoroughly with distilled water. In a pot, boil the gathered dust for one to two hours before letting it cool.

1) Calculation of surface area of leaf using planimeter:
Procedure:
Depending on the size of the figure, you'll want to secure the anchor point either outside or within the outline. Then, at that point, shift the subsequent point exactly counterclockwise around the plot figure. Verify that all restricted areas are conveniently accessible.

Figure 1: sokkia-digital-planimeter

2) Characterizing the physical and chemical properties of the dust that has settled on the leaves

Table1: Different methods of parameters

Sl.NO	Parameters	Units	Methods
01	pH	-	Potentiometric method
02	Chloride	mg/L	Titrimetric method
03	Alkalinity	mg/L	Titrimetric method
03	Hardness	mg/L	Titrimetric method
04	phosphates	mg/L	Titrimetric method
05	Zinc	mg/L	DTPA extraction
06	Iron	mg/L	DTPA extraction
07	Copper	mg/L	DTPA extraction
08	manganese	mg/L	DTPA extraction

3) Determination of size of the dust particles using hydrometer analysis:
Procedure: To use a hydrometer, just fill the jar with your sample liquid. Put the hydrometer in the jar and quickly spin it around to release any trapped air. Once the hydrometer has stabilized, you may take a reading at the 8, 15, 30, 1, 2, 4, and 24 hour marks. Hydrometer apparatus seen in fig 2.

Figure 2: Hydrometer instrument

IV. RESULTS AND DISCUSSION

Table 2 and Table 3 below demonstrate the physical and chemical properties of dust samples taken from areas around packing plants and mines.

Table 2 the physical-chemical characteristics of dust collected near packing plant

Sl.NO	Parameters	Units	Characteristics
01	pH	-	7.400
02	Chloride	mg/L	39.98
03	Alkalinity	mg/L	168.0
03	Hardness	mg/L	264.0
04	phosphates	mg/L	2.112
05	Zinc	mg/L	0.774
06	Iron	mg/L	1.886
07	Copper	mg/L	1.658
08	manganese	mg/L	10.442

A 7.4 pH reading in a sample of dust from a packaging facility shows that the dust is neutral. Chloride levels are 39.98 mg/L, alkaline levels are 168 mg/L, hardness is 264 mg/L, phosphate levels are 0.774 mg/L, zinc levels are 2.112 mg/L, iron levels are 1.886 mg/L, copper levels are 1.658 mg/L, and manganese levels are 10.442 mg/L..

Table -3: The physical-chemical characteristics of dust collected at mines

Sl.NO	Parameters	Units	Characteristics
01	pH	-	11.00
02	Chloride	mg/L	70.00
03	Alkalinity	mg/L	440.0
03	Hardness	mg/L	628.0
04	phosphates	mg/L	0.690
05	Zinc	mg/L	1.398
06	Iron	mg/L	0.368
07	Copper	mg/L	0.228
08	manganese	mg/L	2.110

The sample of mine dust we tested had a pH of 11.1, making it alkaline. Chloride concentrations are 70 mg/L, alkalinity is 440 mg/L, hardness is 628 mg/L, phosphate levels are 0.690 mg/L, and trace amounts of zinc, iron, copper, and manganese range from 0.228 to 2.112 mg/L.

Table 4: The average values of physico chemical characteristics of the dust sample of both packing plant and mines

Sl.NO	Parameters	Units	Characteristics
01	pH	-	9.2000
02	Chloride	mg/L	54.990
03	Alkalinity	mg/L	304.00
03	Hardness	mg/L	446.00
04	phosphates	mg/L	1.4010
05	Zinc	mg/L	1.0860
06	Iron	mg/L	1.1420
07	Copper	mg/L	0.9430
08	manganese	mg/L	6.2760

Both the packing facility and the mines have alkaline pH values, averaging 9.2. Raw materials used in the cement industry contribute to elevated levels of heavy metals such as chloride (54.99 mg/L), alkaline (304 mg/L), hardness (446 mg/L), phosphate (1.086 mg/L), zinc (1.401 mg/L), iron (1.142 mg/L), copper (0.943 mg/L), and manganese (6.276 mg/L).

Table 5 and Table 6 show the particle size distribution at the packing facility and the mines, respectively.

Table-5: The particle size distribution for packing plant.

Time	Hydrometer density readings	Percentage finer	Size of the particles
8min	1.015	23.85	10.05 µ
15min	1.013	20.67	9.75 µ
30min	1.010	15.90	9.00 µ
1hour	1.007	11.13	6.00 µ
2hour	1.006	9.54	5.20 µ
4hour	1.005	7.95	4.50 µ
24hour	1.005	7.95	4.50 µ
Avg size of the dust			7.00 µ

Particles may range in size from a maximum of 10.05µ to a minimum of 4.50µ. The average particle size thus measured 7.00µ in the packing factory.

Table 6 The particle size distribution for mines.

Time	Hydrometer density readings	Percentage finer	Size of the particles
8min	1.014	22.26	9.89 µ
15min	1.012	19.08	9.48 µ
30min	1.011	17.49	9.15 µ
1hour	1.009	14.31	7.50 µ
2hour	1.008	12.72	6.75 µ
4hour	1.007	11.13	6.00 µ
24hour	1.006	9.54	5.20 µ
Avg size of the dust			7.71 µ

Particles may range in size from a high of 9.89µ to a low of 5.20µ. Particles in mines have an average size of 7.71µ.

Table 7 and Table 8 below illustrate the surface area of the packed and mined leaves, respectively.

Table 7: The surface area of the leaves collected and weight of the dust near packing plant

Leaves	**Weight of leaves with dust**	**Empty weight of leaves**	**Weight of dust**	**Surface area**
1	4.18g	4.10g	0.08 g	54.10cm²
2	1.02g	0.90g	0.12 g	19.07cm²
3	4.00g	3.90g	0.10 g	28.20cm²
4	4.39g	4.30g	0.09 g	54.90cm²
5	1.30g	1.30g	0.00 g	23.20cm²
Total	14.89	14.5g	0.39 g	179.47 cm²

Five leaves have a combined surface area of 179.47cm^2, and their dust content weighs .039g. That works out to 22.23 grams of dust per square meter.

Table 8: The surface area of the leaves collected and weight of the dust near mines

Leaves	**Weight of leaves with dust**	**Empty weight of leaves**	**Weight of dust**	**Surface area**
1	4.300g	4.20g	0.11 g	55.04cm²
2	3.000g	2.90g	0.10 g	24.00cm²
3	3.750g	3.60g	0.15 g	27.34cm²
4	4.190g	4.00g	0.19 g	52.10cm²
5	2.080g	1.90g	0.18 g	22.80cm²
Total	17.33g	16.6g	0.73 g	181.28 cm²

Five leaves have a combined surface area of 181.28cm^2, and their dust content weighs 0.73g. This amounts to 40.26g of dust per square meter.

V. CONCLUSION

- Particles in the air in a packing factory or mine tend to have a pH of 9.2, making them somewhat alkaline.
- The dust contains minute amounts of heavy metals such as phosphate, iron, manganese, zinc, and copper.
- Mines had the highest dust concentration while packing plants had the lowest.
- At the mines, the particle size distribution peaked at 9.89 µ nm and bottomed out at 5.2 nm, whereas at the packing facility, it peaked at 10.05 µ nm and bottomed out at 4.5 nm.
- The amount of dust decreased in a 1m2 area near mines and packing plants is 40.26g and 22.23g, respectively.

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