Available online at **www.joac.info**

ISSN: 2278-1862

Journal of Applicable Chemistry

2016, 5 (6): 1315-1320

(International Peer Reviewed Journal)

A Comparative Study of Dust-Fall at Silent Zone and Public Transport Station (Central Bus Stand), Aurangabad

A.S. Ingle*and N.N. Bandela

*Department of Environmental Science, Dr.Babasaheb Ambedkar Marathwada University, (M.S.), **INDIA**

Email: anuingle23@gmail.com, drbandella@rediffmail.com

Accepted on 19th November 2016, Published online on 27th November 2016

ABSTRACT: D*ust is one of the important air pollutants in ambient air. Dust contains Respirable Particulate Matter (PM10 & PM2.5) which are critical air pollutants which may cause health problems and damage property. The Study of Dust fall is thus crucial to community health, hygiene and framing government policies. The study was conducted to determine the dust fall rate in two different sampling locations in the city of Aurangabad in Maharashtra state, India. One site is a notified 'Silent Zone' and second is a 'Public Transport Station' (central Bus stand). In each site, five sampling stations were selected for the study. The sampling was carried out by gravimetric method. The average dust fall in the silent zone was 0.188 g* cm^{2-1} h^{-1} *while that found at the Public Transport Station (central bus stand) was 0.408 g* cm^{2-1} h^{-1}*. From the statistical analysis it was inferred that the p value 0.05 was significant hence, it was proved that there was a significant difference in dust fall at silent zone and public transportation (central bus stand) and also it is prove that the p value of the one tailed & two tailed test is high.*

Keywords: Dust fall rate; Silent zone; RSPM; Pollutants; Maharashtra.

INTRODUCTION

Dust is known to be generated naturally as a result of weathering of rocks, minerals and wood also by erosion of soil [1]. The generation & dispersion of dust also accelerated by human activities like Construction, Mining, and Transportation and Wood cutting [2, 3]. Dust particles float in the air by coming in contact with the wind or movement of vehicles or various other reasons [4]. These particles get settled down and deposit wherever it acquires space. The dust fall is bound to vary from place to place with respect to the conditions that are prevalent at the respective place [5, 6]. It is crucial to measure dust fall as dust contains RSPM (PM10 and PM2.5), these may easily enter the human respiratory system and cause health problems [7-9]. The clogging by dust is also known to cause issues with machinery like vehicles and computers. The World Health Organization (WHO) also treats the airborne dust as a potential hazard [10]. The current investigation was carried out for comparing the dust fall at two selected areas in the historical & industrial city of Aurangabad in the state of Maharashtra in India. One of the sampling point was a notified silent zone and other was a busy public place with a heavy traffic load. The survey was to check whether the dust fall at the public place was more than that at the silent zone. Dust fall can be calculated using various methods which include the use of instruments like 'Gravimetric Dust Sampler'

and 'Personal Dust Monitor' [11]. Dust fall can also be measured by using Dust Fall Collectors and Dust fall Jars.

MATERIALS AND METHODS

The experiment was conducted by selecting two sites one of which was a notified 'Silent Zone' (site 1) and other was a 'Public Transport Station' (central Bus stand) (site 2). Five sampling stations were selected at each site in an area of 250 sq. meters. The dust fall was measured using the gravimetric technique. The sampling was conducted for 10 h per day. Samples were taken in five intervals after every couple of hours. This was done by placing a white ceramic tile (15 cm x 15cm) at each sampling station. Totally 10 tiles were placed and samples were taken after every 2h. The samples were taken by using distilled water and the dust deposited on the tile was collected in sampling bottle by washing it with distilled water. All the samples were analyzed in the laboratory. The weight of the dust in the sampling bottles was measured by evaporating the water and measuring the difference in the initial & final weight. The dust fall was measured in the laboratory using standard procedure. The Data was statistically analyzed using T-test for comparison.

RESULTS AND DISCUSSION

The Readings of dust fall measurement were noted down in the laboratory & tabulated. All the readings obtained from each sample according to the sampling interval are presented in the table1.

Table 1: Dust Fall at Silent zone and Public Transport station

Time In .h	Sampling Site	Silent Zone	Public Transport Station
9.00-11.00	1	0.236	0.456
	2	0.219	0.275
	3	0.240	0.472
	4	0.202	0.317
	5	0.240	0.436
11.00-13.00	1	0.205	0.411
	2	0.160	0.319
	3	0.158	0.315
	4	0.163	0.326
	5	0.147	0.294
13.00-15.00	1	0.202	0.294
	2	0.237	0.326
	3	0.219	0.315
	4	0.218	0.436
	5	0.131	0.261
15.00-17.00	1	0.126	0.856
	2	0.131	0.789
	3	0.161	0.322
	4	0.147	0.294
	5	0.131	0.793
17.00-	1	0.234	0.265

19.00	2	0.243	0.252
	3	0.213	0.262
	4	0.218	0.271
	5	0.129	0.845

The average dust-fall at the Public Transport Station (central Bus stand) during the first interval that is 09.00 h to 11.00 h was 0.391 g cm^{2-1} h^{-1} and the dust-fall at the silent zone in the first session was recorded to be 0.227 g cm^{2-1} h^{-1}. The dust-fall at the Public Transport Station (central Bus stand) was 0.164 g cm^{2-1} h^{-1}more than that found at the Silent Zone.

During the Second interval that is 11.00 h to 13.00 h, the average dust-fall at the Public Transport Station (central Bus stand) was 0.332 g cm^{2-1} h^{-1} and the dust-fall at the silent zone in the second interval was recorded to be 0.166 g cm^{2-1} h^{-1}. The dust-fall at the Public Transport Station (central Bus stand) was 0.166 g cm^{2-1} h^{-1}more than that found at the Silent Zone.

During the Third interval that is 13.00 h to 15.00 h, the average dust-fall at the Public Transport Station was 0.326 g cm^{2-1} h^{-1} the dust-fall at the silent zone in the third interval was recorded to be 0.201 g cm^{2-1} h^{-1}. The dust-fall at the Public Transport Station (central Bus stand) was 0.125 g cm^{2-1} h^{-1}more than that found at the Silent Zone. The difference was found to be least in this interval and the dust fall at the silent zone was highest. Silent zone is an educational institution. There was lunch break during 13.00 h to 15.00 h and due to this reason more number of people are seen on the roads either walking or on vehicles . This creates arise in dust dispersal which accounts for subsequent rise in dust deposition and at the same time the dust fall at the Bus Station was lowest.

The low dust fall in this interval can be attributed to the less vehicular traffic at the Bus Station. The Station sees a total 233 vehicles moving in and out of the Station during 24 h of a day, this means around 10 vehicles move every hour. During the second interval this frequency drops down to 6 vehicles per hour. During the fourth interval that is between 15.00 h to 17.00 h the average dust-fall at the Public Transport Station (central Bus stand) was recorded to be the highest at 0.610 g cm^{2-1} $h^{-1}$and the dust-fall at the silent zone in the fourth interval was recorded to be the lowest 0.139 g cm^{2-1} h^{-1}. Thus the difference in the dust-fall at the Public Transport Station (central Bus stand) & the Silent Zone was highest at 0.471 g cm^{2-1} h^{-1}. The High rate of dust fall was because the number of vehicles coming in and going out of the Bust Station which was highest that is 41 buses in2 h.

In the final and fifth interval, the average dust fall at the Public Transport Station was 0.378 g cm^{2-1} h^{-1} and that at the Silent Zone was 0.207 g cm^{2-1} h^{-1}, the dust fall at the Public Transport Station (central Bus stand) was more than the silent zone by 0.171 g cm^{2-1} h^{-1}. The results are represented graphically in fig1.

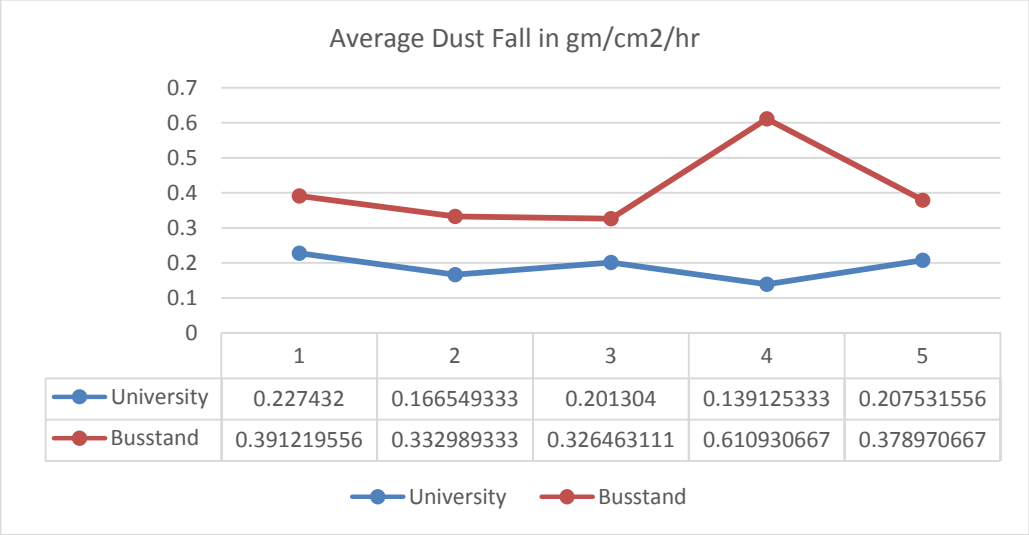

Fig 1. An Independent T-test was applied to the above readings,

The Independent T-test is shown in table 2.

Table 2: T-test for the two sampling points

	Silent Zone	*Public Transport Station*
Mean	0.188388444	0.408114667
Variance	0.001834051	0.037949333
Observations	25	25
Hypothesized Mean Difference	0	
Df	26	
t Stat	-5.508090055	
P(T<=t) one-tail	4.41897E-06	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	8.83794E-06	
t Critical two-tail	2.055529439	

From the statistical analysis it can be inferred that the p value at 0.05 LOS was significant hence, it was proved that there was a significant difference in dust fall at silent zone and public transportation (central bus stand). The permissible limit assigned by NEERI is 10 g m^{2-1} $month^{-1}$. The average dust fall at the Public Transport Station is 29.8110 g m^{2-1} $month^{-1}$which is significantly high. The average dust fall at the Silent zone was 13.76 10 g m^{2-1} $month^{-1}$, this was too exceeding the limit but not as high as the other sampling site.

The study gains importance as the presence of PM10 and PM2.5 in the dust particles makes a great impact not only on the human life but also on flora and fauna. Shubhankar Basant and Ambade Balram in their investigations have studied the dispersal of pollutants in different seasons by collecting SO_2 and NO_2 gases [12]. From their investigations we can say that if the dust particles are coated with toxic gases like SO_X and NO_x or with carbon particles as a result of anthropogenic activities there is a possibility that it's no longer when the historical city would be in the clutches of pollution. Consequently it affects not only the more than 100 Thousand Foreign Tourists and a Million Domestic Tourists visiting the city annually according to a report by the ministry of Tourism of the Government of India but also the ancient

monuments which attract these Tourists [13] and this may have a negative impact on the city Tourism Industry and the Economy.

This study proved that the dust fall rate increased at public transportation (central bus stand) zone may cause various health problems [9]. The vehicular emission consists of carbon emission and many people like workers, parking attendants, tea stall centres and fruit vendor work in the area they also may be prone to respiratory and skin diseases. Students and children may also face many problems. Muhammad Kalim Khan has studied the hazards and health effects of NOx, SOx, CO and Particulate Matter on human health [14]. Dust fall may also have effect on the vegetation by hindering their growth [15].

APPLICATIONS

The current investigation gains importance because of the easy technique. It is easily applicable at places where modern means of sampling are not easily available. The primary investigations can be applied to initiate steps to control dust fall and its dispersion.

CONCLUSIONS

The statistical analysis shows that there was a significant difference in the dust fall at the two sampling stations. The Dust fall at the Public Transport Station (central Bus stand) was higher than the standards set by NEERI. This can be attributed to several reasons; the most important amongst these reasons was the deteriorating condition of the roads in the area under investigation. In comparison the roads at the silent zone were cemented and quite well maintained which reduced the dust dispersal. The vehicular movement in this area was mostly Light Motor Vehicles & Two wheelers in addition most of the commuters were walking. The Tree cover here was dense & there was no Construction activity in and around the silent zone. Improving the quality of the road can be a remedy to reduce the dust generation at the transport station. Developing a green belt besides the roads can be one of the solutions to reduce the Dust fall as it is directly related to Public health and community hygiene.

REFERENCES

[1] Paul Ginoux, Joseph M. Prospero, Thomas E. Gill, Ming Zhao.Global-scale attribution of anthropogenic and natural dust sources and their emission rates based on MODIS Deep Blue aerosol products, *Reviews of Geophysics,* **2012**, 51.
[2] Gawande, Gajanan N. Supe, M. Sagar, Effects of Dustfall on Vegetation, *International Journal of Science and Research (IJSR),* **2013**, 5.
[3] I. Tegen, M. Werner, S. P. Harrison, K. E. Kohfeld., Relative importance of climate and land use in determining present and future global soil dust emission, *Geophysical Research Letters,* **2014.**
[4] Balram Ambade, Sampad Ghosh, Basant Shubhankar**,** Ambient air quality of Jamshedpur City: A study with reference to SO2, NO2, *J Applicable Chem.,* **2013,** 2 (3), 539-544.
[5] Windom, L.Herbert, Atmospheric Dust Records in Permanent Snowfields: Implications to Marine Sedimentation. *Bulletin; The Geological Society of America, Inc,* **1968,** 80(5), 21.
[6] D. S. Gorsline, A review of fine-grained sediment origins, characteristics, transport and deposition., *Lyell collection*, **1984,** 15, 17.
[7] Cheng MF, Ho SC, Chiu HF, Wu TN, Chen PS, Yang CY.,Consequences of exposure to Asian dust storm events on daily pneumonia hospital admissions in Taipei. *J Toxicol Environ Health,* **2008,** 71.
[8] Schwartz, Joel, Fine Particles Are More Strongly Associated than Coarse Particles with Acute Respiratory Health Effects. *Epidemiology*,**2000,** 11(1), 4.
[9] C.Nagavardhini, K. Sunder Kumar, K.Anitha, R. Ramesh Raju, Assessment of Air Pollution Monitoring Sites in Rural and Urban Areas., *J Applicable Chem.,* **2013,** 2(5).

[10] Hazard Prevention and Control in the Work Environment : Airborne Dust. s.l. : World Health Organisation (WHO). Publication.
[11] Laboratory Manual for Air Quality. Delhi: Department of Civil Engineering.
[12] Balram, Shubhankar Basant and Ambade.Identification and Analysis of PM2.5 WSIS and Trace Gases during Winter Season at Industrial Zone of Tatanagar, *J Applicable Chem* , **2016,** 5 (3), 637-645.
[13] ACNielsen ORG-MARG. Tourism Survey for State of Maharashtra. s.l. : Ministry of Tourism Govenrment of India, **2010.**
[14] Muhammad Kalim Khan*, Syeda Rubina Gilani, Abdul Rauf, Kabir Shahid and Yaqoob Ali.Estimation of NOx,SOx,CO and Particulate Matter from stack emission and its hazardous effect on human health , *J Applicable Chem* , **2015,** 4 (1), 204-211.
[15] T. Panigrahi, K.K. Das, B.S. Dey, M.Mishra, R.B. Panda. *Air Pollution Tolerance Index of various plants species found in, Journal of Applicable Chemistry*, **2012,**1(4), 519-523.
[16] Hazard Prevention and control in the work Environment: Airborne Dust. s.l. :World Health Organisation (WHO) publication.

AUTHOR ADDRESS

1. **A.S. Ingle**
Department of Environmental Science,
Dr. Babasaheb Ambedkar Marathwada University, (M.S.) India
E-mail: anuingle23@gmail.com