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DUST POLLUTION IN STONE CRUSHER UNITS IN AND AROUND BALASORE, ORISSA, INDIA

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ABSTRACT

The study area is in and around Balasore town where several stone crusher units are running without following CPCB (Central Pollution Control Board, India) norms to feed crushed stone for various health problems. To monitor the dust pollution level 5 monitoring stations were chosen and dust sample inside the unit and 100m away of the unit were monitored. In all the crusher units the concentration of SPM were much more than the permissible standard i.e., 500 μg/m^3, where as 100m away the concentration level fall down and were within the norm. However, a residential zone is 100 m away and this cause health problem to the residents.

INTRODUCTION

Stone crushing industry is an important industrial sector in the country engaged in producing crushed stone which acts as raw material for various roads, bridges, buildings, canals etc. The stone crusher is one such industry that exists in the vicinity of almost all major cities, towns throughout the country in all the states because the construction activates go on throughout the country but at the same time it has brought a host of dust pollution problems in the vicinity by way of fugitive emissions which adversely affect the ambient air quality and human health.

Various sources of emissions

- ***Emissions during unloading of mined stones at crusher site***

At the time of unloading of mined stones into the storage hopper, large amount of fine dust is emitted, which appears like a dust cloud. Generally there could be two to six unloading per hour. This emission occurs at an elevated level and the dust is carried by wind currents to a long distance.

- ***Emission during crushing operations***

During crushing operations, size reduction takes place. Bigger stones and broken pieces get excessively crushed which, results into formation of stone dust. The finer dust gets airborne and escapes as fugitive emissions.

- ***Emission during material movement and transfer***

The crushed stone is moved from one place to the other such as crusher to vibratory screen and

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screen to storage piles by conveyor belts. During the movement and free fall during transfer of crushed stones, fine dust particles get airborne as fugitive dust emissions.

- ***Emission during vibratory screen operation***

During vibratory screening of crushed stones, vigorous movement of the stones taking place and particles get loose and airborne as fugitive emission.

- ***Emission during transportation***

During transportation of the crushed stone products and vehicular movement on non-metal led roads fine dust settled on the ground gets airborne.

STUDY AREA

The study area is located in Balgopalpur and Mitrapur at a distance of 12 Km to the north west of Balasore city. The area covered 12 crushers with a daily crushing capacity of about 30 tones. The Balgopalpur Industrial Estate has two major industries namely ISPAT ALLOYS and EMAMI PAPER MILL also contributing a lot to the atmospheric pollution to the vicinity. The university campus and other major residential areas are located at a distance of 500m and 1000m respectively. These localities received the maximum dust impact due to stone crushing activities.

The primary objective of this study was to assess the dust concentration and its fallout in and around the workplace. For this purpose an extensive air pollution survey was carried out in the study area.

MATERIAL METHODOLOGY

To determine the concentration of dust in the study area, the dust samples have been collected from different sites in selected units location of Balasore district. The dust was collected on Whatman GF/A (Size 8''/10'') glass fiber filter paper with a pore size of 1micron using a High Volume Samplers (Envirotec APM460), operating at a flow rate of 0.8-1.0 m^3/min.Ambient air quality monitoring was carried out for two seasons; during summer (march-may) and pre-monsoon (Nov-Feb) for 30 days continuously on an 8 hour basis and the concentration were averaged for 24 hour to facilitate comparison with the Indian standards. The dust concentration was calculated from the difference in the weight of the filter paper before and after the sample collection.

RESULT AND DISCUSSION

SPM Concentration Around Stone Crusher Unit

Ambient suspended particulate matter was measured out in each of 5 crusher units at two locations i.e., inside the factory area and out side the factory area (100m away). The results are presented in Table 1.

At Ganesh stone crusher the SPM concentration recorded inside factory and out side factory was found to be much higher in comparison to others the value inside the factory which is 1182.72 µg/m^3 against the CPCB norm i.e., 500 µg/m^3. Similarly at Uma, Sai, Laxmi, Jagannath stone crushers inside the factory SPM collected were 1072.62 µg/m^3, 1001.23 µg/m^3, 955.4 µg/m^3, 1055.4 µg/m^3 respectively. It was observed that all the results were higher than the CPCB norm in the factory premises. Similarly the SPM were monitored out side the factory premises (100m away) in those entire crusher units and the result were 217.52 µg/m^3, 195.43 µg/m^3, 175.16 µg/mv, 197.155 µg/m^3 respectively. It was noted that after 100meters the suspended particulate concentration

Table 1. Concentration of Suspended particulate matters in different crusher units

Sl No.	Name of the stone crusher	SPM inside factory area in µg/m^3			SPM Outside factory 100m away µg/m^3		
		Nov.-Feb.	March-May	Mean	Nov.-Feb.	March-May	Mean
1.	Ganesh	1182.79	1052.57	1117.68	233.87	205.34	219.60
2.	Uma	1072.62	957.52	1015.07	217.52	190.23	203.87
3.	Sai	1001.23	823.43	912.33	195.43	167.52	181.47
4.	Laxmi	955.45	815.58	885.51	175.67	151.45	163.56
5.	Jagannath	1055.37	943.23	999.3	197.55	174.43	185.94
	Mean	1053.49	918.46	985.98	204.0	177.79	190.89
	SD	85.77	99.67	114.25	22.25	15.72	21.52
	CPCB norm	500			200		

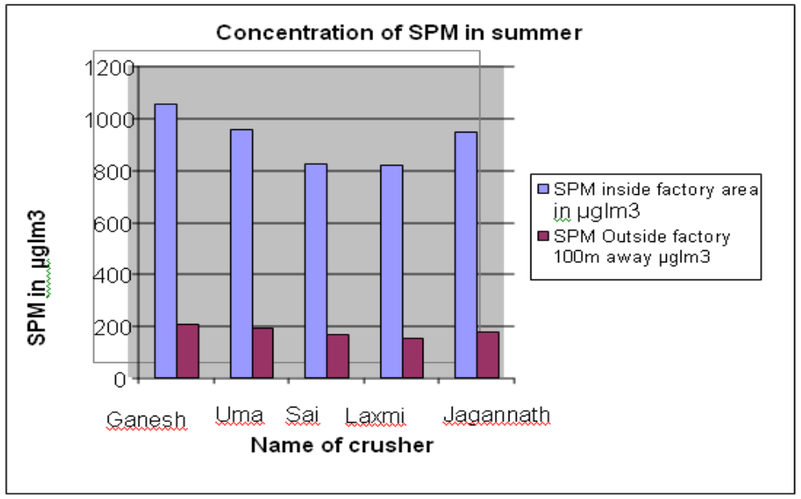

Fig. 1 Concentration of SPM in summer in different crusher units

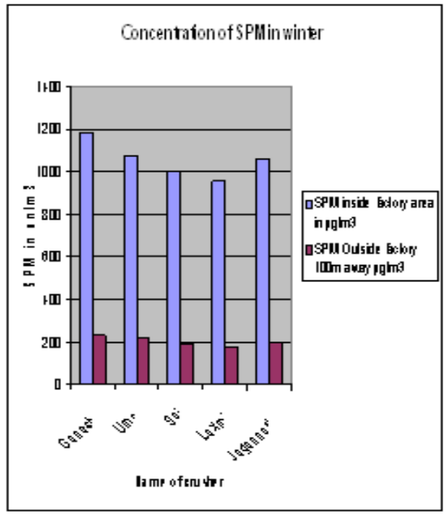

Fig. 2 Concentration of SPM in winter in different crusher units

reduces drastically but still very near to prescribed standard of residential zone i.e., 200µg/m^3. This reduction of dust fall away from factory premises indicates that the dust concentration is settling quickly within the factory premises. To have a better comparison, mean value and standard deviation of SPM monitored from the five crusher units have also been computed and the result are tabulated in Table 1. It was found that the average mean value of SPM inside crusher unit were 1053.49 µg/m^3 , 918 µg/m^3 and the cumulative average in the monitoring area was 985.98 µg/m^3 respectively. Simillarly it was also

found that the average mean value of SPM out side of the crusher unit at 100 m away were 204.0 and 177.79, $\mu g/m^3$ and the cumulative average in monitoring area was 190.89 $\mu g/m^3$. So it was observed that in all the cases all the computed value were more than prescribed standard i.e., 500 $\mu g/m^3$. Similarly the standard deviation (SD) was calculated as 85.77 $\mu g/m^3$, 99.67 $\mu g/m^3$ and 114.25 $\mu g/m^3$ respectfully in side the crusher unit. Similarly the SPM were measured during the summer season inside crusher unit and 100m away from crusher unit and value of mean and standard deviation (SD) were computed. It was found that all the mean value were well within the standard norms of CPCB which may be due to settling of dust fall after moving away from the crusher unit.

CONCLUSION

The dust generated from crushers during operations contain significant amount of fine inhalable particulate matter. The contribution of individual crushers to the SPM concentration is not constant as evidenced from the finding. The result varies from crusher to crusher due to dissimilar mechanical operation as well as duration and capacity of crushing of stones. But as a whole it is marked that the amount of SPM in the factory premises in all the crusher Units are far above than prescribe CPCB standards. It is also marked that the concentration drastically falls down beyond 100m away from the crusher units. But still the concentration of dust is beyond the permissible limit as people are living around 100m away from the crusher units and hence the area is considered as residential zone. Thus it is highly essential to take immediate remedial measures to reduce the dust pollution problem in the study area.

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