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RESEARCH ARTICLE

STUDY ON AIR QUALITY OF SKS ISPAT AND POWER Ltd. RAIPUR (CG)

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ABSTRACT

In the present globalization era, climatic change (CC) plays a crucial role in regards to human health and environmental aspects from the pollution control point of view. It is a mandatory criterion to monitor Ambient Air Quality (AAQ) in every industry. In the present study, Respirable Dust Sampler Technique (RDST) was used for AAQ in the SKS Ispat and Power Ltd, Raipur (CG) India. The data collected from various sampling points of SKS Ispat and Power Ltd. The concentration of Suspended Particulate Matter (SPM) and Particulate Matter (PM_{10}), and concentration of Sulfur Dioxide (SO_2) and concentration of Oxides of Nitrogen (NO_x) are measured fortnightly and results obtained were discussed in this paper. An attempt has been made to calculate the air pollution index of SKS Ispat and Power Ltd.

Key words: Ambient Air Quality (AAQ), Suspended Particulate Matter (SPM), PM_{10}, SO_2 and NO_x, Air pollution index (API).

INTRODUCTION

SKS Ispat and Power Limited, is an ISO – 9001/2000 certified Steel conglomerate, having 0.5mtpa Integrated Steel Plant situated in longitude $81^0$35' to $81^0$40' east and latitude $21^0$20' to $21^0$25' north at Raipur in the State of Chhattisgarh. Rich experience of 40 years in the Steel Industry enables SKS to understand and serve valuable customers in a highly professional and cost effective manner. SKS is advancing ahead with innovative ventures in the wide array of business, in synergy with market dynamics, to reach new heights at each step. Presently the company is engaged in trading in structural's, long products and other related products of SAIL, RINL, Llyod, JSPL, Essar Steel, Ispat Industries Ltd etc. There are mainly five manufactures units namely Sponge iron division, Steel melting shop, Ferro alloy plant, Pellatization plant, Continuous casting machine. Air pollution has become a major threat to the survival (Nandusekar *et al*., 2009). Rapid industrialization and addition of toxic substances to the environment are responsible for air pollution (Garg *et al*., 2001, Chaulya 2002 and Gupta *et al*., 2002). The main atmospheric pollutants SPM, PM_{10}, SO_2 and NO_x were studied at various sampling points and discussed in this paper.

Air Pollution Index

Air quality index values are divided into ranges, and each range is assigned a descriptor and a colour code. Standardized public health advisories are associated with each API range. There are six levels of health concern and what they mean are:

- "Good" API is 0 - 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- "Moderate" API is 51 - 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- "Unhealthy for Sensitive Groups" API is 101 - 150. Although general public is not likely to be affected at this API range, people with lung disease, older adults and children are at a greater risk from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air.
- "Unhealthy" API is 151 - 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
- "Very Unhealthy" API is 201 - 300. This would trigger a health alert signifying that everyone may experience more serious health effects.
- "Hazardous" API greater than 300. This would trigger a health warning of emergency conditions. The entire population is more likely to be affected.

Air Pollution Index (API) Values	Levels of Health Concern	Colors
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Objectives of the study

- To know the Status of Air Pollution and Air Quality at SKS Ispat Ltd.

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- To know the air pollution index at different monitoring sites.

MATERIAL AND METHOD

The study was conducted for a period of two months in the interval of 15 days. In each site 4hrs samples were collected in each 15 days in the afternoon 2PM to 6PM. Four sampling sites for ambient air monitoring are near main gate, near canteen, near quality control lab and near reservoir. Monitored parameters were Suspended Particulate Matter (SPM), PM_{10}, Gaseous SO_2 and NO_x. HVS (APM 460) was used for air sampling. Air quality index values are divided into six ranges. Air pollution index (API) was calculated by airnow.gov/ index.cfm?action=resources.cocm_aqi_cacl website.

RESULT AND DISCUSSION

The temperature of study area was recorded in the range 5-48^{0}C, RH 62% and annual rainfall 1288mm Table 1. Wind direction was found mostly SE direction (Fig. 1). The monitored parameter in SKS steel and power plants were SPM, PM_{10}, SO_2 and NO_x. The data observed for all the parameters at various stations are given in Table 2 and the standards for all these parameters are given in Table 4. SPM values were found in the range of 140-270 µg/m^3 (Table 2) and average value of SPM at various stations are shown in Fig. 1. The range of PM_{10} was found 45-110µg/m^3. The concentration of PM_{10} was high from the permissible limit (100 µg/m^3) i.e. 102 µg/m^{3}on 15/6/11, 108 µg/m^3 on 30/6/11 both values were found at near quality control lab and 108 µg/m^3 at near Main gate on 15/7/11 (Table 2).

Table 1. Showing micro-meteorological data

S.NO	Parameters	Value
1	Maximum temperature (^{0}C)	48
2	Minimum temperature (^{0}C)	05
3	Relative Humidity %	62
4	Predominant wind direction	West
5	Average Wind Speed (m/s)	1.63
6	Calm winds frequency (%)	25.59

Average values of PM_{10} at different site are shown in Fig. 2. SOx values were observed in the range of 11-25.6 µg/m^3 which were within the standard limit. The average values of SOx at different stations are given in Fig. 3. NOx values were also found within the permissible limit with range of 9-29.3 µg/m^3. The average values of different stations are shown in Fig. 4. Air Pollution Index was calculated and given in Table 3. This index also shows that PM_{10} was found in moderate range while SOx and NOx were found in permissible range at all the selected stations.

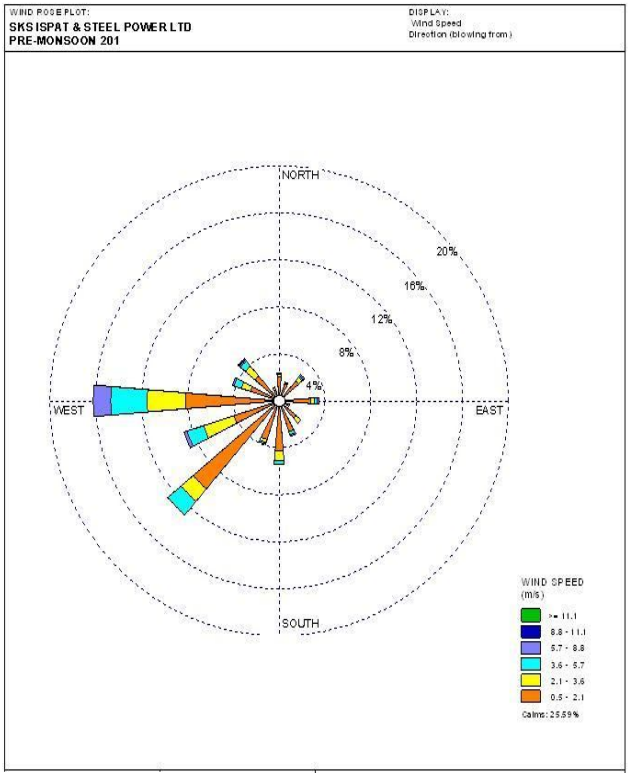


Fig. 1.Wind Rose of air monitoring Site.

Table 2. Showing SPM, PM_{10}, SO_2 and NO_x concentration at various stations

S. No.	Parameters (µg/m^3)	Standard Limit	Date of sampling	Stations			
				Near Main Gate	Near Canteen	Near Quality Control Lab	Near Reservoir
		500 (µg/m^3)	15/6/11	150	225	256	170
			30/6/11	160	200	270	210
1.	SPM		15/7/11	180	210	195	140
	(µg/m^3)		30/7/11	160	230	180	200
			Mean	162.5	216.25	225.25	180
			±S.D.	12.58	13.77	44.39	31.62
		100	15/6/11	60	90	102	68
		(µg/m^3)	30/6/11	64	84	108	84.2
2.	PM_{10}		15/7/11	110	80	100	90
	(µg/m^3)		30/7/11	45	90	68	75
			Mean	69.75	86	94.5	79.3
			±S.D.	28.05	4.89	17.99	9.74
		80	15/6/11	13.2	15	22.2	11
		(µg/m^3)	30/6/11	15.2	18.5	20.5	17.6
3.	SO_2		15/7/11	15.9	17.2	13.1	17
	(µg/m^3)		30/7/11	11.7	21.2	20.2	25.6
			Mean	14	17.97	19	17.8
			±S.D.	1.91	2.59	4.03	5.99
		80	15/6/11	18.2	25.2	26	29.3
		(µg/m^3)	30/6/11	19.2	22.2	29	21.3
4.	NO_x		15/7/11	17.2	26.2	9	25.3
	(µg/m^3)		30/7/11	16.2	20.2	15	23.3
			Mean	17.7	23.45	19.75	24.8
			±S.D.	1.29	2.75	9.35	3.41

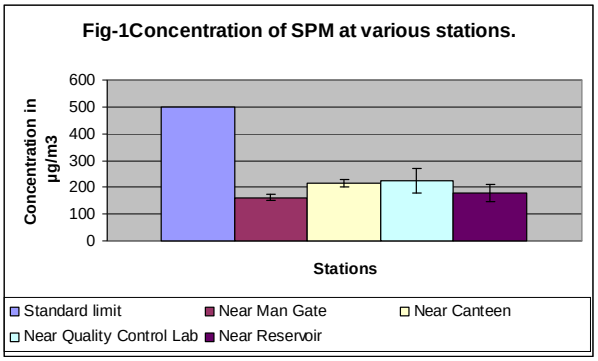
Table 3. Air Pollution Index of different parameter

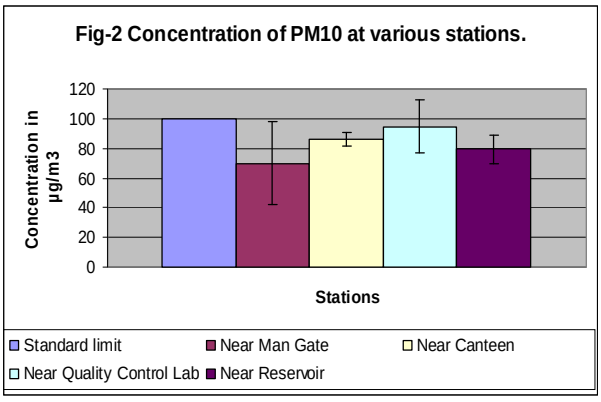
Locations/Colour code	Parameters		
	PM_{10}	SO_2	NO_x
Near Main Gate	58	20	16
Colour code	Yellow	Green	Green
Level of health concern	Moderate	Good	Good
Near Canteen	66	24	22
Colour code	Yellow	Green	Green
Level of health concern	Moderate	Good	Good
Near Quality Control Lab	70	27	18
Colour code	Yellow	Green	Green
Level of health concern	Moderate	Good	Good
Near Reservoir	63	24	23
Colour code	Yellow	Green	Green
Level of health concern	Moderate	Good	Good
Average	64.25	23.75	19.75
Colour code	Yellow	Green	Green
Level of health concern	Moderate	Good	Good

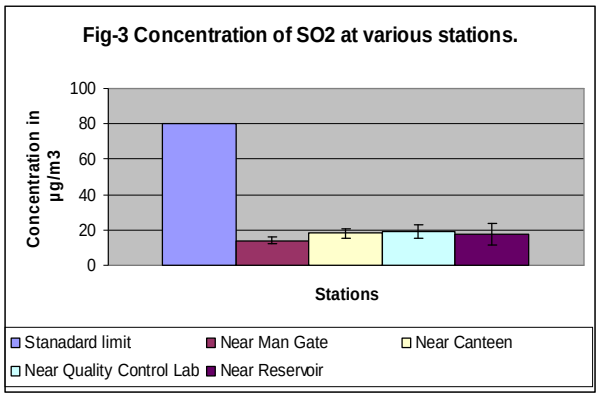
Table 4. Ambient Air Quality Standard (2009)

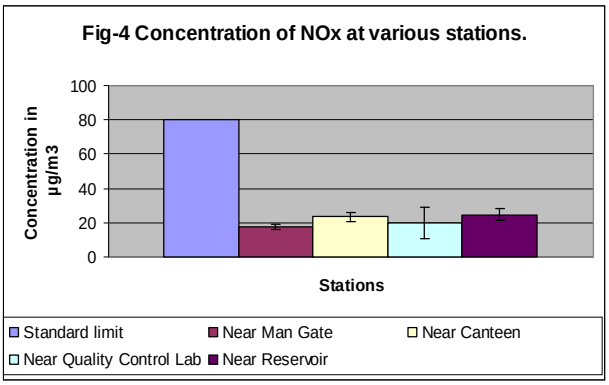
Pollutants	Time- Weighted Average	Concentration in ambient air Industrial Area ($\mu g/m^3$)
SO_x	8 hours	80
NO_x	8 hours	80
PM_{10}	8 hours	100
SPM	8 hours	500 (as per 1995 standard)

Source- Ministry of Environment and Forest, New Delhi, Notification, Dated 16th Nov, 2009.









Conclusion

From the present study it can be concluded that over all management and control of air pollution and management is satisfactory. According to Air Pollution Index for PM_{10}, it can be said that SKS Ispat and Power Ltd falls in yellow zone (moderate) as it has not efficient management plan to control particulate pollution while SO_2 and NO_x were in green zone, indicating good health of ambient air quality.

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