

Assessment of Air Pollution Emission from Ultratech Cement Ltd Plant Jhajjar, Haryana

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ABSTRACT

In this research study, data on the ambient air quality in Jhajjar, Haryana, India's Ultratech Cement Ltd. is presented. The New National Ambient Air Quality Standard was used to evaluate the air quality. The criteria that were used were SPM, PM₁₀, SO₂, and NO_x. Near coal mills and power plants, the average PM₁₀ level was found to be higher than allowed. The Air Quality Index has been used to present the study's findings. For PM₁₀, the AQI was found to be moderate, while good levels of SO₂ and NO_x were recorded. People with asthma or other respiratory conditions are the group most at danger, according to PM₁₀ findings.

INTRODUCTION

Although water is not a commercial good, the construction industry has exploded in recent years. Numerous projects, including multi-story residential buildings, are being built. Due to the availability of the raw materials required for the production of cement, construct commercial buildings as well as a variety of other infrastructure projects (Garg et.al 2001; Kumar and Joseph 2006). The main environmental problems caused by cement manufacture are energy use and air emissions. About 2% of the world's energy consumption is thought to go toward the cement sector, which also accounts for 5% of all man-made carbon dioxide emissions (Chandrasekhran 1998).The dust produced during shipping, storage, milling, packing, etc. is one of cement manufacturing's most detrimental effects (Chaurasia et. al, 2022; Gupta et. al 2002). Particularly in dry climates, atmospheric dust is an important source of air pollution. According to reports, 0.07 kg of dust was produced for every kg of cement produced in Egypt. 2008; Barman et al.

In southern Jordan, Balaceanu and Stefan (2004) analysed the distribution of metals in soil and discovered that all of the metal concentrations were found nearby the cement factory (Sirajuddin and Ravichanran 2010; Agrawal and Khanan 1997). A typical cement manufacturing facility would produce dust, nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon oxides (CO and CO₂), and carbon monoxide (CO) (Chaurasia et. al 2022; Chaulya 2004). Humans, animals, and plants that depend on the soil for their biological communities and habitats are all susceptible to detrimental or bothersome effects from air pollution (World Business Council for Sustainable Development 2005).

Air-quality rating

There are six ranges of air quality index readings, and each range has a descriptor and a colour code. Each API range has standardized public health advisories attached to it. These are as follows.

1. The AQI ranges from 0 to 50. The quality of the air is regarded as excellent, and there is little to no risk from air pollution.
2. Moderate: AQI ranges from 51 to 100. Although the air quality is good, a very small percentage of people may have a moderate health concern from some contaminants. For instance, individuals with very high ozone sensitivity may have respiratory problems.
3. AQI is 101 to 150, Unhealthy for Sensitive Groups. While the general population is unlikely to be harmed by this AQI range, those with lung disease, older adults, and children are more at risk from ozone exposure than individuals with heart and lung disease, older adults, and children are from airborne particle exposure.
4. Unhealthy: AQI ranges from 151 to 200. Members of the sensitive groups may experience more severe consequences than the general population. Everyone may start to experience some negative health effects.
5. Very Unhealthy: AQI is 201 to 300. A health notice would be issued in response, warning that everyone might experience more severe health impacts.
6. Dangerous: AQI over 300. An emergency health alert would be issued as a result. It is more likely that the entire population will be impacted.

Study area:

One of the 22 districts that make up the northern Indian state of Haryana is Jhajjar. It was separated from the Rohtak district on July 15, 1997, and its administrative seat is in Jhajjar. It is located 29 kilometres (18 miles) from Delhi and has grown to be a significant industrial hub. Jhajjar is a town in the Haryana state of India's Jhajjar district. The city is located along the highways that connect Charkhi Dadri to Delhi, Gurgaon to Bhiwani, Loharu to Meerut, and Rewari to Rohtak (NH-352). Located 55 kilometres (34 miles) west of Delhi is Jhajjar. Jhajjar district spans 1,890 km². The district has 2408 plots spread across 2 industrial sectors. In Jhajjar, Haryana, UltraTech Cement has put into operation a cement grinding machine with a 1.6 million TPA capacity. The location of the plant is Village-Jharli, Tehsil-Matanhail, District-Jhajjar, Haryana for UltraTech Cement Ltd. (Jhajjar Cement Works). The current study aims to investigate the topic “Assessment of Air Pollution Emission from Ultratech Cement Ltd Plant Jhajjar, Haryana”.

METHOD AND MATERIALS

The investigation was carried out over a two-month period with intervals of 15 days. In each 15-day period, samples were taken in the afternoon from 2 PM to 6 PM at each site for 4 hours. For measuring ambient air, four sampling locations were chosen. These are close to the main entrance, the power plant, the coal mill, and CLP India Ltd. Suspended Particulate Matter (SPM), PM₁₀, and gaseous pollutants SO₂& NO_x were the monitored parameters. For air sampling and analysis, HVS (APM 460) was utilized in accordance with standard procedures. Air Quality index (AQI) was calculated by airnow.gov/index.cfm.

Air Quality Index(AQI) 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

Source- Chaurasia et. al, 2022.

RESULTS AND DISCUSSION

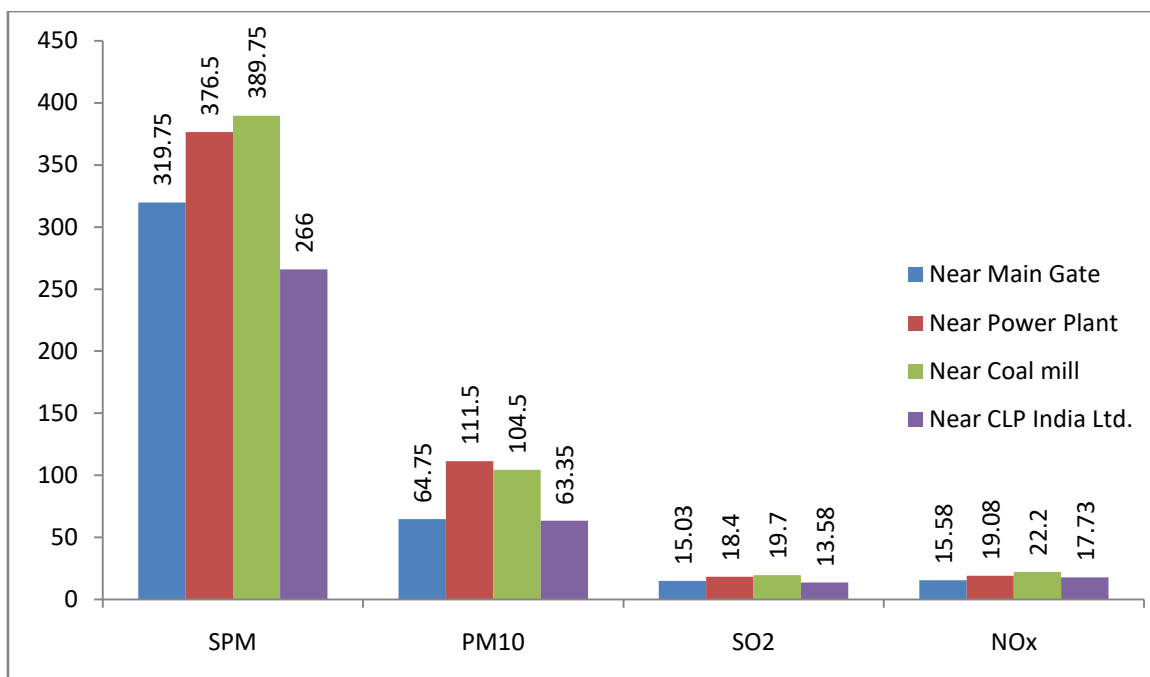
According to the plant production capacity, the environmental management system is functioning properly. Even though air pollution is unavoidably increased by huge production facilities, there is now a better mechanism in place to manage air quality. The maximum concentration of SPM, 526 g/m³, was identified on January 15, 2022, close to a power plant, exceeding the permitted limit of 500 g/m³, and the minimum value, 210 g/m³, was discovered on January 15, 2022, and January 30, 2022, respectively, close to CLP India Ltd. and close to the main gate. The maximum PM₁₀ concentration was 132 g/m³, which was over the permitted limit of 100 g/m³, and the lowest value was 20.4 g/m³ near CLP India Ltd. on January 30, 2022.

The highest SO₂ reading was recorded at 24.2 g/m³ near a coal mill on February 28, 2022, and the lowest reading was recorded at 10.6 g/m³ close to the main gate on January 15, 2022. Near CLP India Ltd. on January 15, 2022, 27.1 g/m³ of NO₂ was recorded as the highest amount. The highest concentration of NO_x was recorded at 27.1 g/m³ near the power plant on February 28, 2022, and the lowest concentration was recorded at 12.3 g/m³ near CLP India Ltd. and the main gate on January 30 and February 15, 2022, respectively. Thus, average SPM concentration was found to be between 266 and 389.75 g/m³, and average PM₁₀ concentration was determined to be between 63.35 and 111.5 g/m³, which was beyond the allowable limit. 100 g/m³, SO₂ concentration was found to be between 13.58 and 19.70 g/m³, and NO_x concentration was found to be between 15.58 and 22.20 g/m³.

Values for the AQI were also computed. PM₁₀ AQI was found to be moderate and SO₂ and NO_x levels were good. Table 3 displays the relationships between several parameters. Every parameter exhibits a strong positive association. The study's findings support the claim that SPM and PM₁₀ air pollution are not well managed and controlled generally. Finally, it can be concluded from the Indian AQI that Ultratech Cement Ltd. is in the yellow zone because it lacks an effective management strategy to prevent pollution and preserve the environment. People with asthma or other respiratory diseases are the group most at danger, according to SPM and PM₁₀ findings.

Table.1 SPM, PM₁₀, SO₂ and NO_x Concentration (µg/m³) at Various Stations

S. No.	Parameters(µg/m ³)	Standard Limit	Date of sampling	Stations			
				Near Main Gate	Near Power Plant	Near Coalmill	Near - CLP india Ltd.
1	SPM (µg/m ³)	500 (µg/m ³)	15/01/2022	406	526	325	210
			30/01/2022	210	230	245	303
			15/02/2022	263	425	503	315
			28/02/2022	400	325	486	236
			Average	319.75	376.50	389.75	266.00
			S.D.	±98.56	±117.68	±125.47	±51.00
2	PM ₁₀ (µg/m ³)	100 (µg/m ³)	15/01/2022	56	103	123	87
			30/01/2022	40	111	98	20.4
			15/02/2022	83	132	103	56
			28/02/2022	80	100	94	90
			Average	64.75	111.5	104.50	63.35
			S.D.	±21.23	±14.43	±12.47	±32.44
3	SO ₂ (µg/m ³)	80 (µg/m ³)	15/01/2022	11.3	13.6	12.2	10.6
			30/01/2022	18.3	21.7	20.1	16.4
			15/02/2022	16.2	18.6	22.3	14.8
			28/02/2022	14.3	19.7	24.2	12.5
			Average	15.03	18.40	19.70	13.58
			S.D.	±2.97	±5.83	±5.27	±2.54
4	NO _x (µg/m ³)	80 (µg/m ³)	15/01/2022	13.5	19.1	25.3	24.9
			30/01/2022	16.2	14.2	18.7	12.3
			15/02/2022	12.3	15.9	20.2	13.5
			28/02/2022	20.3	27.1	24.6	20.2
			Average	15.58	19.08	22.20	17.73
			S.D.	±3.54	±5.72	±3.15	±5.91



Graph Showing Average Values of SPM, PM₁₀, SO₂ and NO_x at four different Sampling Stations

Table.2 Air Quality Index of different parameter at selected stations.

Locations/Colourcode	Parameters($\mu\text{g}/\text{m}^3$)		
	PM ₁₀	SO ₂	NO _x
NearMainGate	55	21	14
Colour code	Yellow	Green	Green
Levelofhealthconcern	Moderate	Good	Good
NearPowerPlant	79	26	18
Colour code	Yellow	Green	Green
Levelofhealthconcern	Moderate	Good	Good
NearCoal mill	75	27	21
Colour code	Yellow	Green	Green
Levelofhealthconcern	Moderate	Good	Good
Near CLP India Ltd.	55	19	16
Colour code	Yellow	Green	Green
Levelof health concern	Moderate	Good	Good

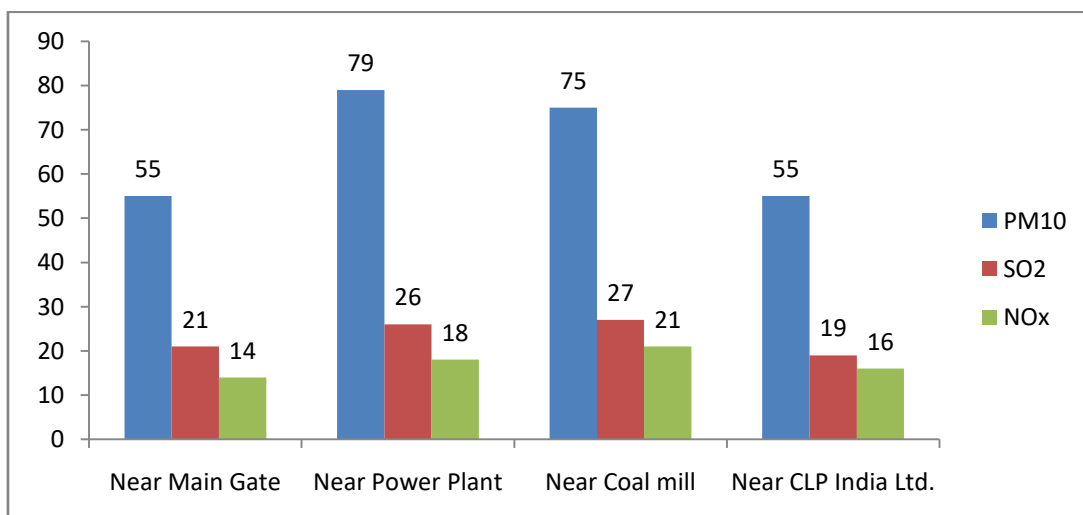


Table.3 Correlation between parameters

Parameters	SPM	PM ₁₀	SO ₂	NO _x
SPM	1			
PM ₁₀	0.994908	1		
SO ₂	0.997777	0.9994	1	
NO _x	0.999499	0.997334	0.99926	1

RECOMMENDATIONS

1. Strict enforcement of emission standards as announced under the EP Act of 1986 and the CPCB for cement plant fugitive emission control, etc.
2. All locations in the cement and power plants will begin conducting ongoing ambient and stack monitoring of certain pollutants. Data will be made available on the plant website and linked to the SPCB website.
3. Include interlocking mechanisms in all process units and pollution control equipment.
4. When engaging in transport activities, water should be sprinkled.

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