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Analysis of Air Pollution Parameters of Fertilizer Industries Specially Reference to G.S.F.C. Vadodara, Gujarat

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ABSTRACT: The air samples collected from around the factory G.S.F.C.(Gujarat state Fertilizer company, Vadodara) during 4 year of studies 2010-2013 With the help of high volume sampler equipment. Different parameters where measured and also analyzed the effect of seasonal variation on various parameter was also studied. The value of all the studies, and their result can be concluded the value of SPM was higher in summer then in winter and was least in rainy season. All other gaseous pollutants (SO_2, NOx) and trace element are present in higher side in winter.

Keywords: G.S.F.C., SPM, Fertilizer, Gaseous oxide, Trace metal, High volume sampler.

I. INTRODUCTION

Industrial development of any country is the foundation stone of its prosperity provided it is not destructive. With the advancement of various technologies and Industries mankind will show great interest towards natural sources by which they get an excessive amount of energy for their own use. Now a day's industries play an important role for mankind and it is one of the major sources of atmospheric pollution which produces a huge amount of waste, which is released in environment and this is a major issue.

A large number of industries like fertilizers, drugs, paper, cement, petroleum refineries, acid plants, plastic industries are responsible for about 22 percent of atmospheric pollution , such pollutants which are produced by these industry are various types of organic, inorganic compounds, gaseous oxides,(NOx,SO_2) SPM and trace metal etc.

All such pollutants are hazardous to human body. We find that most of the diseases and other health problems are caused by air pollution and bad environment. Industrialization is necessary for the growth of any country. The pulse of the nations is felt by it's their industrial development but with rapid industrialization and urbanization manifold environmental problems have been generated by them.

Fertilizer industries cause great threat to the environment. Present study is concerned with air pollution aspects. The main air pollutants from chemical industries are as follows.

(i) Suspended particulate matter (SPM)
(ii) Oxides of Nitrogen (NO_x)
(iii) Sulphur Dioxide (SO_2)
(iv) Trace Metals

For the present study in the chemical industries I have chosen the fertilizer industry A specially reference to G.S.F.C. (Gujrat state fertilizer company).

A. Pollution in Fertilizer Industry

The fertilizer industries are playing a crucial role in the production of food grain to meet the requirements of increasing population. The gap between the demand & supply of the fertilizer at the end of tenth five-year plans was in the order of 35 million tones. India's fertilizer industry started growing in size and complexity to achieve self-sufficiency. Today there are 32 major fertilizers complexes in India with production capacity of 53, 80,000 and 1, 45, 09,000 tones of Nitrogenous and Phosphate fertilizers respectively. Apart from these complexes, 29 units are also manufacturing Single Super Phosphate, Urea, Sulphuric acid and Phosphoric acid etc. Due to development of crop production in recent years and fast growth of development and industrialization in India, due to which a large amount of fertilizer has been produced by fertilizer industries. To feed our growing millions, food production has got to be increased which is just not possible without chemical fertilizers. Consumption has always been ahead of production. This rapid growth of fertilizer industries has caused serious concern to the environmental scientist. The situation is so alarming that it needs a serious as well as immediate attention of each and every persons. Pollution due to fertilizer industry is found in varying degrees in air, water and soil. Virtually every fertilizer industry produces some gaseous effluents.

These are ammonia from ammonia and urea plants, Urea dust from urea prilling towers, fumes and particulates from complex fertilizers plants, Oxide of sulphur and acid mist from sulphuric acid plants, oxides of nitrogen from nitric acid and fluorides from phosphoric acid plant. In the urea industry water is formed during urea formation, this water is usually contaminated with dissolved ammonia. This dissolved ammonia escapes to the atmosphere where the effluents are discharged. Besides this, ammonia can also be lost to the atmosphere through leakage from pumps and valves.

In urea plants, prilling towers use cold air for cooling down the hot urea solution sprayed from prilling tower top. The air escaping to the top of prilling tower contains urea dust. The urea dust emission level from the prilling tower of urea plant is higher. Nitrogen fertilizer industry emits the several phytotoxic chemical compounds in the atmosphere, such as oxides of nitrogen, sulphur dioxide, dust of ammonium nitrate, ammonia, dust of urea and others. The major source of emission of oxide of nitrogen is the acid plant of that fertilizer industry. In an NPK plant one of the major problems is the dust emanating when the fertilizers are granulated and dried.

From the above it is clear that many pollutants which are released by fertilizer industries and it also discuss a brief detail about their adverse effects towards environment.

II. MATERIAL AND METHOD'S

Air sampling equipment: High volume sampler is the equipment which is used to monitor the suspended particulate matter (SPM). It also has provision to collect samples of various gaseous pollutants such as H_2S, NOx, CO, SO_2, trace metals etc. From ambient air by absorbing them in appropriate absorbing reagents kept in impinger tubes followed by further analysis in the chemical lab with use of U.V. spectrophotometer and Atomic absorption spectrophotometry (AAS).

III. EXPERIMENTAL

The samples were collected from around the factory premises.

Different parameters were tested and the effect of seasonal variation on various parameters was also studied and compared. The high volume sampler is used to monitor ambient air. Samples were collected manually at regular intervals. The parameters were analyzed in the laboratory.

All the observed values of various parameters are recorded in the tables 1 to 4) year wise.

The effects of seasonal variation on various parameters are studied. The comparative study of same parameters for different season year wise.

Table 1.

G.S.F.C.			
Result of year 2010			
Standards	**Winter**	**Summer**	**Rainy**
Temp. ^{0}C	21	43	24
Suspended particulate matter (SPM) (µg/m^3)	418.70	527.62	130.67
Sulphur dioxide SO_2 (µg/m^3)	39.35	34.08	19.40
Nitro	49.77	37.20	21.48
Trace Metals (µg/m^3)			
Zn	1.27	1.03	0.94
Fe	1.18	1.08	0.70
Pb	0.38	0.34	0.22
Ni	0.044	0.040	0.23
Cd	0.019	0.016	0.013
Cr	0.016	0.013	0.009

Table 2.

G.S.F.C.			
Result of year 2011			
Standards	**Winter**	**Summer**	**Rainy**
Temp ^{0}C	23	43	23
Suspended particulate matter (SPM) (µg/m^3)	431.08	541.18	131.00
Sulphur dioxide SO_2 (µg/m^3)	46.00	33.18	20.21
Nitro	53.31	41.58	24.00
Trace Metals (µg/m^3)			
Zn	1.58	1.26	0.9
Fe	1.20	1.18	0.78
Pb	0.41	0.33	0.34
Ni	0.051	0.043	0.031
Cd	0.028	0.020	0.015
Cr	0.017	0.015	0.011

Table 3.

G.S.F.C.			
Result of year 2012			
Standards	**Winter**	**Summer**	**Rainy**
Temp ^{0}C	20	42	23
Suspended particulate matter (SPM) (µg/m^3)	458.84	580.62	144.00
Sulphur dioxide SO_2 (µg/m^3)	52.24	35.44	27.80
Nitro	59.00	43.68	27.00
Trace Metals (µg/m^3)			
Zn	1.80	1.61	1.12
Fe	1.29	1.20	0.88
Pb	0.66	0.56	0.32
Ni	0.074	0.069	0.038
Cd	0.032	0.029	0.021
Cr	0.027	0.020	0.009

Table 4.

G.S.F.C.			
Result of year 2013			
Standards	**Winter**	**Summer**	**Rainy**
Temp ^{0}C	22	42	25
Suspended particulate matter (SPM) (µg/m^3)	468.05	582.75	148.00
Sulphur dioxide SO_2 (µg/m^3)	56.12	37.51	28.00
Nitro	62.00	46.18	31.12
Trace Metals (µg/m^3)			
Zn	1.98	1.62	0.38
Fe	1.35	1.21	1.04
Pb	0.67	0.62	0.38
Ni	0.078	0.078	0.044
Cd	0.038	0.032	0.021
Cr	0.032	0.019	0.012

IV. RESULT AND DISCUSSION

Fertilizer industries have multiplied during last fifty years. Fertilizer industries are producing wide range of products. The growth of fertilizer is mainly due to increase of population and growth of various diseases. All Fertilizer industries are very important industries. But it is also true that they are industry is creating air, soil and water pollution. Generally these industries are situated in remote areas but even then they are causing great damage to environment. The purpose of this research work is to measure various air polluting Parameters such as SPM, SO_2, NO_x and trace metals in fertilizer industries. Constant monitoring was carried out for four years in G.S.F.C. fertilizer. All the observed values of various parameters are recorded in tables. The comparative study of same parameter for all season year wise. During all seasons and for all parameters studied, the temperature was also noted which also made a slight variation in the results and is depicted in tables.

Air pollution analysis was done for the years 2010 to 2013 at Gujarat state fertilizer company Ltd. near Vadodara. Air pollution is the major problem of fertilizer industry. SPM and trace Metals cause great damage to human beings and animals. Particles enter the body thorough the respiratory tract. Human beings and animals suffer respiratory diseases, like lung cancer, and asthma, throat infection ect. SO_2 and NO_x cause irritation in respiratory system, eyes and also affect the mucous membrane. Whereas NO_x can damage lung tissues and cause internal bleeding, Oxygen deficiency, nasal irritation.

SPM was calculated and was found maximum for the month of April and May 527.62 $\mu g/m^3$ and the minimum value was 130.67 $\mu g/m^3$ in rainy season. Because wind doesn't blow high. This was observed for the year 2010. For year 2011 and 2012 the maximum values were 541.18 $\mu g/m^3$ and 580.60 $\mu g/m^3$ and minimum values were 131.00 $\mu g/m^3$ and 144.00$\mu g/m^3$.

In year 2013, the maximum value obtained was 582.15 $\mu g/m^3$ in month of April and May and minimum value obtained was 148.00 $\mu g/m^3$ in the rainy season.

The value for SO_2 was found between 19.40 $\mu g/m^3$ to 56.12 $\mu g/m^3$ where as the value of NO_x was found between 21.48 $\mu g/m^3$ to 62.00 $\mu g/m^3$ for the four year of testing in G.S.F.C. Beside the above parameter I have also studied trace metals in ambient air of GSFC. SPM is an extensively used parameter for determining the air quality. The data become more significant when SPM samples are further analyzed (AAS instrument) for trace element variation in concentration of trace metals are also observed, the variation of trace metals are due to localized effect and industrial activity. The concentration of about trace metals (Zn, Pb, Ni, Cd, Cr) was only a little higher than the normal value. Metal concentration where present at a slightly higher during winter compare to summer and rainy. In our observation we find that the concentration of trace metals present in SPM are the iron (Fe) is in higher concentration after that zinc (Zn), lead (Pb), nickel (Ni), cadmium (Cd) and the lowest concentration is of chromium(Cr).

V. CONCLUSION

The quality of ambient air samples collected was analyzed and studied. All the analysis indicates that the value of SPM in all four year was highest in summer then in winter and was least in rainy season. Beside this gaseous pollutant and trace element are present in higher side in winter then summer and least in rainy season.

Atmospheric pollution is one of the major issue of whole world hence to overcome this problem considerable amount of research and development program must be required which may help to control this issue up to such extent.

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