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Treends of Flue Gas Composition during ETP Sludge Mixed With Coal Burning

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ABSTRACT

Due to the rapid industrialization, the waste generated from industries is growing more. The waste generated from an industry is may be hazardous or non-hazardous category. The minimization of waste is a main Hazardous Waste Management (HWM) is a very important issue and is assuming significance globally. Hazardous and non hazardous waste mixing with coal burning, when carried out in a safe and environmentally sound manner, is recognized for far-reaching environmental benefits. ETP sludge is a very common waste, which will generate from most of the industries. ETP Sludge which is having GCV > 2500 kcal/kg can burn along with coal in energy recovery process. In this study ETP Sludge is collected from pharmaceutical industry, different compositions of this ETP sludge is mixed with coal burning process. The trends of flue gas composition (SO_2, NO_x, CO, O_2 CO_2 & HC) of these emissions have studied in different composition mixed with coal burning. The summary of trends of flue gas composition is discussed in results and discussion.

Keywords: Hazardous Waste, ETP Sludge, Flue gas composition

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INTRODUCTION

During the last few decades the waste generated from the industries day by day increasing more and more. The waste minimization or hazardous waste management is the major concern to regulatory authorities. There is a growing concern all over the world for the safe disposal of HWs generated from anthropogenic sources. HWs can be classified into- (i) Solid wastes (ii) Liquid wastes (iii) Gaseous wastes (iv) Sludge wastes. HW as any substance, whether in solid, liquid or gaseous form, which has no foreseeable use and which by reasons of any physical, chemical, reactive, toxic, flammable, explosive, corrosive, radioactive or infectious characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or environment, and should be considered as such when generated, handled, stored, transported, treated and disposed off. This definition includes any product that releases hazardous substance at the end of its life, if indiscriminately disposed off. The HW needs to be disposed off in a secured manner in view of their characteristic properties.

There are three main techniques employed in the safe minimization of hazardous waste.

1. Re-cycling
2. Land disposal
3. Incineration

These are the main techniques to safe disposal of waste or safe minimization of waste. Incineration or burning of waste is one of the safe minimization processes. The substances having high calorific value viz.; tyres and plastic wastes, which are otherwise treated as “waste” but do not fall under the purview of “hazardous waste” as stipulated in the Hazardous wastes (Management and Handling & Transboundary movement) Rules, 2008, can also be co-processed in the Cement industry [1].

Incineration is a proven sustainable development concept that reduces demands on natural resources, reduces pollution and landfill space, thus contributing to reducing the environmental footprint. Co-processing is also based on the principles of industrial ecology, which considers the best features of the flow of information, materials, and energy of biological ecosystems, with the aim of improving the exchange of these essential resources in the industrial world.

In this study we are collected ETP sludge from Pharmaceutical industry and studied the characteristics of this sludge. The calorific value of this sludge is observed >2500 kcal/kg and the rest of the chemical analysis is observed beyond the limits of the Hazardous wastes (Management and Handling & Transboundary movement) Rules, 2008.

Different composition levels of this sludge is mixed with coal and burned. The emissions released in this burning process are collected, documented and summarized in the results.

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Instruments Used:

1) Flue gas Analyzer (Make: Testo)

Present Study:

In throughout world is looking to resolve two issues. One is safe minimization of Waste and the second one is to minimize the fossil fuel consumption. In this regard we made an attempt to Study the flue gas compositions during the coal burning and coal mixed with Solid waste (ETP sludge). A maximum of 5% of ETP Sludge as alternative was targeted as a alt is targate dETP sludge is mixed with coal with four different compositions.

1. Coal
2. Coal + 1.0% ETP Sludge
3. Coal + 2.5% ETP Sludge
4. Coal + 5.0% ETP Sludge

Flue gas (SO_2, NO_x, CO, O_2 CO_2 & HC) is very important issue for environment. If the flue gas levels has grown more the there may be a chances to formation of acid rains. Due to the emissions of flue gas composition during the above composite sludge and coal has studied. The trends of Flue gas composition is shown in

RESULTS AND DISCUSSION

In this study we were taken four measurements of flue gas composition of each of the coal and sludge mix. Total 20 flue gas measurements are taken for this study. The results of flue gas are shown in below table.

Flue Gas Emission Study Only with Coal

S.No.	Parameter.	Unit	Sample-1	Sample-2	Sample-3	Sample-4
1	Sulper Dioxide	ppm	8.2	7.9	8.1	8.3
2	Oxides of Nitrogen	ppm	108.6	98.2	103.2	104.1
3	Carbon Monoxide	ppm	24.8	26.2	28.9	27.6
4	Carbon Dioxide	%	8.9	9.6	8.8	9.3
5	Hydrocarbons	ppm	1.26	1.18	1.09	1.13
6	Oxygen	%	10.6	9.8	11.1	10.8

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Flue Gas Emission Study Coal with 1.0 % ETP Sludge mixing

S.No.	Parameter.	Unit	Sample-1	Sample-2	Sample-3	Sample-4
1	Sulper Dioxide	ppm	8.0	8.1	7.9	7.7
2	Oxides of Nitrogen	ppm	96.4	99.2	94.1	92.8
3	Carbon Monoxide	Ppm	24.9	26.2	27.3	26.9
4	Carbon Dioxide	%	8.6	8.2	8.8	8.3
5	Hydrocarbons	Ppm	1.19	1.09	1.12	1.08
6	Oxygen	%	10.8	11.2	11.4	10.8

Flue Gas Emission Study Coal with 2.5 % ETP Sludge mixing

S.No.	Parameter.	Unit	Sample-1	Sample-2	Sample-3	Sample-4
1	Sulper Dioxide	Ppm	8.1	7.9	7.9	7.8
2	Oxides of Nitrogen	Ppm	89.6	92.6	86.4	88.1
3	Carbon Monoxide	ppm	25.8	24.9	23.8	26.2
4	Carbon Dioxide	%	8.3	8	8.3	8.5
5	Hydrocarbons	ppm	11	11.2	11	11.3
6	Oxygen	%	11	11.2	11	11.3

Flue Gas Emission Study Coal with 5.0 % ETP Sludge mixing

S.No.	Parameter.	Unit	Sample-1	Sample-2	Sample-3	Sample-4
1	Sulper Dioxide	ppm	7.8	7.6	8.0	7.7
2	Oxides of Nitrogen	ppm	80.6	84.8	80.9	82.8
3	Carbon Monoxide	ppm	24.8	25.2	22.1	24.8
4	Carbon Dioxide	%	8	7.7	8.1	8.2
5	Hydrocarbons	ppm	1.12	1.06	0.99	1.11
6	Oxygen	%	11.3	11.5	11.2	11.4

Trends of Flue gas Composition:-

Sulphur Dioxide:

During the study period the maximum sulphur dioxide emissions are observed in coal burning process and minimum sulphur dioxide emission are observed in during coal with 5% ETP sludge burning process. The trends of sulphur dioxide emissions during burning of coal and coal with different compositions of ETP sludge is shown in figure-1.1.

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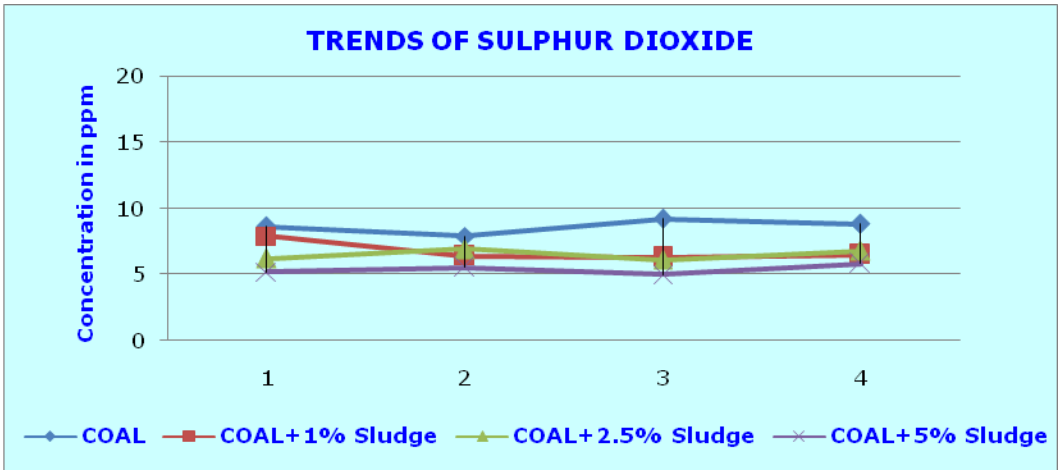

Figure-1.1 Trends of Sulphur Dioxide Emissions

Oxides of Nitrogen:

During the study period the maximum NO_X emissions are observed in coal burning process and minimum NO_X emission are observed in during coal with 5% ETP sludge burning process. The trends of Oxides of Nitrogen emissions during burning of coal and coal with different compositions of ETP sludge is shown in figure-1.2.

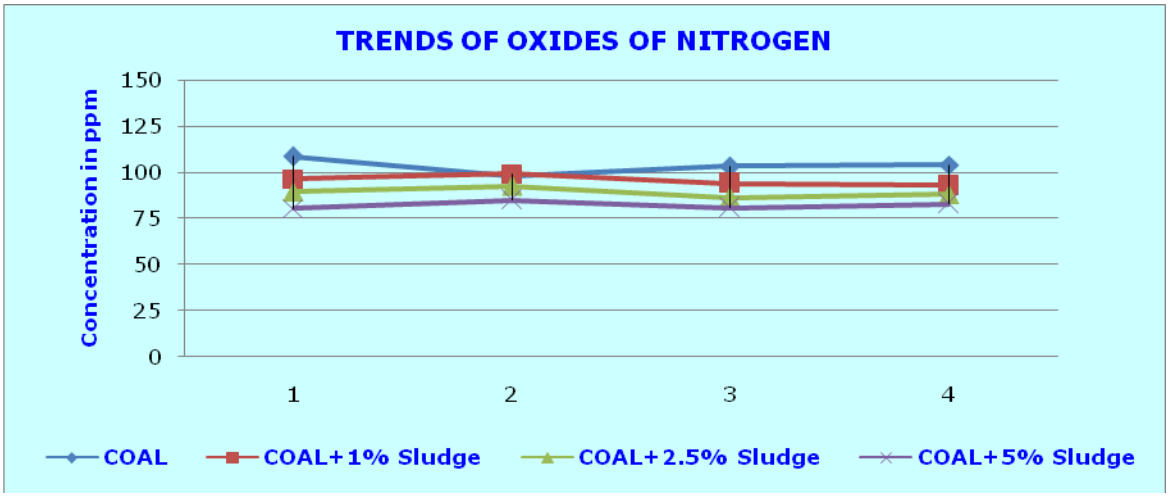

Figure-1.2 Trends of Oxides of Nitrogen Emissions

Carbon Monoxide:

During the study period the maximum Carbon monixide emissions are observed in coal burning process and minimum Carbon monoxide emission are observed in during coal with 5% ETP sludge burning process. The trends of Carbon monoxide emissions during burning of coal and coal with different compositions of ETP sludge is shown in figure-1.3.

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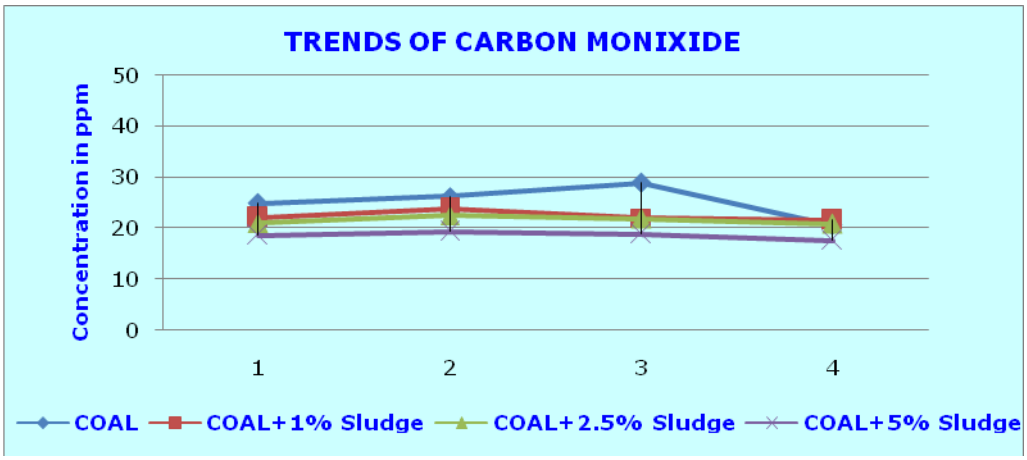

Figure-1.3 Trends of Carbon Monoxide Emissions

Hydrocarbons:

During the study period the maximum Hydrocarbons emissions are observed in coal burning process and minimum Hydrocarbons emission are observed in during coal with 5% ETP sludge burning process. The trends of Hydrocarbons emissions during burning of coal and coal with different compositions of ETP sludge is shown in figure-1.4.

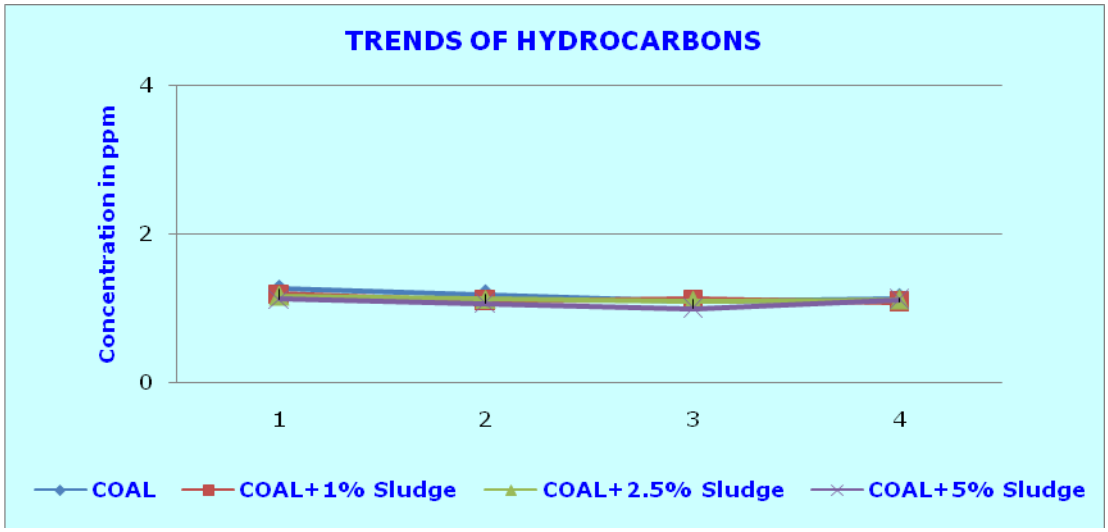

Figure-1.4 Trends of Carbon Monoxide Emissions

CONCLUSION

In this study we were studies emission trends during coal burning and coal with fixed quantities of EPT sludge. Coal may consist of higher levels of Organic Carbon and also consists of small quantities of nitrogen, sulphur, hydrogen contents. The emission values of SO_2, NO_X,CO, HC,O_2 & CO_2 during the burning of only coal is takes as base value. While we are

adding the ETP sludge along with coal up 5% levels, we were observed the slight descending trends of SO_2, NO_X,CO, HC & CO_2 and slightly ascending trends in oxygen levels.

Hazardous waste management is one of the major problems. In this study indicated that the mixing of EPT sludge upto 5% levels along with coal burning process is one of the safe disposal method to minimize the hazardous waste.

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