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Study of Dust Suppression Mechanism in Kalisindh Super Thermal Power Plant Jhalawar, India.

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ABSTRACT
Coal emission from thermal power plants has become a major cause of environmental pollution which has many adverse effects on living beings and non living things. Now a days there is a great lead in the requirement of the electricity, to full fill the requirement of electricity we need to establish thermal power plant which emit coal and dust. To handle the coal in thermal power plant, they are equipped with coal handling plant.
To handle the emitted coal particles we use several techniques. In its simplest form, dust control may involve nothing more than attention to the enclosure of the transfer point chutework or the Use Of Water Sprays To Suppress The Emitted Coal Particles. In This Paper We Study The Dust Supression Mechanism Used In The Kalisindh Super Thermal Power Plant Jhalawar, India.
Keywords- Coal handling, Dust suppression.

I. INTRODUCTION

Jhalawar is the educational and historical district of Rajasthan state and it is situated at the elevation of 312 meter above mean sea level, in the Mukundra range of Hills. The development of Kalisindh Super Thermal Power Plant (2x600MW) calls many people for the employment every year. Day-to-day increase in the population leads to increase in the requirement of the power in the various fields which ultimately causing pollution directly or indirectly by means of smoke, coal particles, noise etc. Kalisindh Super Thermal Power Plant has jurisdictions over an area of 1430 Bigha/350 sq. Km.

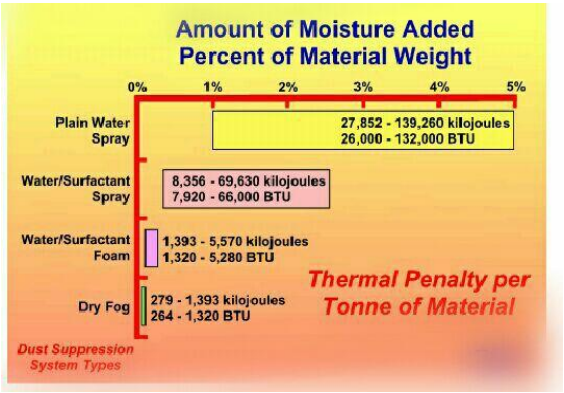
Dust Suppression is the application of water, chemical or other liquid to the body of material to prevent dust, ash or coal particles being carried off into the surrounding which can be very harmful for us and our environment. So we use dust suppression technique to minimize the mixing of these fines into the environment.

A significant advantage of dust suppression is that the material does not have to be handled

again. The suppressed dust returns to the main body of conveyed material and the

process without requiring additional material handling equipment.

There are a large number of processes are used for this purpose like water and surfactant sprays, foam and fog generation systems. These different processes used various amount of the moisture to the material.



This study is motivated by the stance that the suppression of the coal dust which is generated during the transformation of the coal to junction towers, discharge points and boilers through the conveyors. There are several existing methods of controlling dust but many are ineffective, costly, and unordinary and have detrimental effects on plant and its machinery. In Kalisindh Super Thermal Power Plant we use the Water Spraying Dust Supression System. In this plant water spraying dust suppression system is very effective system for the control of coal dust and it has the following objectives.

1. It is efficient to meet Health and Safety requirements.
2. It is totally practical and simple in operation.
3. It has low operating cost.
4. No adverse effect on plant and its machinery.

This system consists of three main parts:-

1. Proportioner units.
2. Spray header with pipe lines and pumping system.
3. Flow control units with electrical systems.

Proportioner Units include feed water pump, feed water tank, metering pump, water recirculation lines so that we can recirculate the water. The water required for the system is supply by feed water pump.

Spray Headers With Pipe Lines And Pumping System includes spray nozzles, solution pump which is used to supply pressurized water to spray nozzles. The required quantities of nozzles are used to spray water, wetting agent or chemical, which is in liquid condition, is dosed by metering pump according to requirement.

Flow Control Unit With Electrical System consists of underbelt switch which sense the flow of the coal, beam sensors, solenoid valves.

II. MATHADOLOGY OR OPERATING PRINCIPLE

In this system first of all we have to ensure that main tank is filled with water. The water is pumped by feed water pump from main tank to feed water tank and at the same time metering pump doses the proper quantity of the wetting agent or chemical into feed water tank. The operation of feed water pump to filling of the feed water tank, which can be controlled by float switch technology which maintains the proper level of water by means of the floating valve.

The metering pump starts the chemical dosing when there is requirement of the dosing of the wetting agent or chemical. The metering pump stops the operation when the required amount of the dosing is done into the feed water tank.

This wetting agent mixed water is then transferred to the main water supply pipe lines. The pressure of the water flowing in the main header is 8 kg/cm sq. to 10 kg/cm sq. There are underbelt switch are provided under the conveyor. Underbelt switch is one of the types of sensing device. When the coal is put down on the running conveyor from the coal hopper the underbelt switch senses the coal load and indicate to solenoid valve which is situated in flow control unit. It will allow spraying of the water from the spray nozzles in very small droplets of the water. Solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current though a solenoid. Solenoid valve control the flow of the fluid, i.e. Water, according to requirement.

If the conveyor is empty means there is no any coal on the conveyor the underbelt switch will not indicate solenoid valve to open and spraying the water. The main function of the underbelt switch is to sense the load of the coal on the running conveyor and indicate the solenoid valve to open so that spray nozzles can spray the pressurized small droplets of the water since coal dust can be settle on the conveyor.

III. ADVANTAGES

1. Reduced the adverse effects of coals.
2. Decrease in atmospheric pollution.
3. Improved working condition.
4. Economic operation with minimum use of water.

IV. EXISTING SYSTEM DRAWBACKS

This system does not effective on respirable dust. Typical water droplets size are 200 to 600 microns, which are much greater than the respirable dust. And it is does not operate on the emission quantity. The spray of the system should be operated on emission quantity. Thus, water sprays can be improved by increasing pressure or by designing nozzle which produce smaller droplets. And also larger droplets causes decrease in efficiency of the coal so that overall efficiency of the plant decreases.

V. CONCLUSION AND FUTURE MODIFICATION

Although, the dust suppression system used in Kalisindh Super Thermal Power is capable of handling the coal dust in the plant but due to spraying the water on the running conveyor it causes decrease in the efficiency of the coal. In last two years, ultrasonic atomizing nozzle is developed. The ultrasonic atomizing nozzle takes the form of the whistle using compressed air which accelerates through a converge section and expand to a diverge section into a resonator chamber. This produces powerful sonic waves. Water delivered to this area is shattered into micron droplets so less water is sprayed, thus lesser effective on efficiency of the coal.

REFERENCES

[1]. Research paper "Control of Respirable dust" by Schowengerdt, F.D. & Brown, J.T. in the issue of "Coal Age Magazine".
[2]. Literature by T & T systems, Inc. Eastern Regional Office P.O. Box 1484 Bluffton, SC. 29910.
[3]. Environmental Protection Agency; 40 CFR Part 50, [OAR-2001-0017; FRL-8015-8] RIN 2060-AI44 National Ambient Air Quality Standards for Particulate Matter. www.cpcb.nic.in
[4]. Impact Analysis of Dust Pollution within Katraj by G.N. Supe and S.M. Gawande.
[5]. Air pollution control at thermal power plant, case study-2005, Overseas Environmental Corporation, Japan. www.envirohandling.com
[6]. Bolander, Peter, U.S. Forest Service, A guide to liquid Spray Applications for Erosion Control, Dust Abatement and Tackifiers.