

A Review on Wet Dust Collector

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ABSTRACT: Now a day's air pollution is going to increase at global level. The pollution by different industries, automobiles align with many other sources leads to the pollution of air and this is becoming a huge problem to our environment. There are so many causes behind this air pollution but the ways to control this problem are very less. Among all the causes of air pollution dust is one of the predominant factors. Removing these dust from air and making air is clean is very critical task. But sociologically removing dust from air and controlling the air pollution is mandatory. There are several methods to separate dust. For example, centrifugal force, difference in density absorption etc. Among those there is a device which is most widely used by industries to control pollution due to harmful dust particles and it is termed as "Dust collector". A dust collector is a system used to remove the dust and other harmful particles coming out from the industries and other sources and to improve the quality and purity of surrounding air. It can be used to remove any type of dust particles and huge volume of dust. The components of dust collection system include blower, filter, mechanism for dust separation like nozzle in wet dust collectors. It is completely different from air purifiers, which use disposable filters to remove dust. Wet dust collector is a device that removes pollutants from contaminated air. In wet dust collector the polluted air is brought into contact with water. The water is sprayed with the help of nozzles mounted on the top of chamber to remove the pollutants or dust particles.

I. INTRODUCTION

Dust collector is device which is used to recover valuable granular or powder from the process stream. They are also used to separate the poisonous gases coming out of the chemical companies before it is released into atmosphere. Dust collector is continuous system which collects any dust in the

handbook the company has mentioned wet dust control system fundamentals like particle size, basics of drop industry during operation. They are also used for air pollution control to maintain the purity of air. The construction of dust collector includes an empty cylindrical chamber. The chamber may be made of material like steel or plastic. Inside the chamber nozzles are mounted in the top that spray liquid in atomized form. Usually the contaminated air enters from one end of the duct and released from the other end into atmosphere. The liquid is sprayed downward with the help of nozzles. Many nozzles are placed across the tower to spray water on contaminated air as it moves along the length of tower. Multiple nozzles are fitted at different heights inside the chamber. Here the multiple nozzles are used in order to get the maximum number of atomized water droplets coming in contact with the dust particles and to increase the contact surface area of dust and water. Theoretically, as the water droplet size decreases the dust collection efficiency increases.

II. LITERATURE REVIEW

Akshey Bhargava, "WET SCRUBBERS – DESIGN OF SPRAY TOWER TO CONTROL AIR POLLUTANTS" in this research paper author has mentioned about experimentation on spray tower to improve efficiency. We have taken the basic idea about the performance parameters to improve efficiency from this paper. [1]

Dr. R. K. Jain, Faraz Ahamad, "AN EXPERIMENTAL STUDY OF PARAMETERS OF WET SCRUBBER FOR ENVIRONMENTAL BENEFIT" in this paper author has mentioned parameter of wet scrubber for environmental benefit. We have taken information about various component and their materials from this paper. [2]

"A GUIDE TO SPRAY TECHNOLOGY FOR DUST CONTROL" by Spraying Systems Co. In this

- Spray tower
- Cyclone scrubber

size etc. The company also has stated the guidelines for nozzle selection and determination of spray angle. [3]

John Dauber, John Davidson and Mike Walters, "Dry Vs Wet dust collector," has briefly compared the dry and wet dust collectors including merits and demerits of each of the dust collector. Some guidelines about selection between dry or wet dust collector have been also discussed. [4]

Zaman Bhuiyan, "Design analysis of Dust collection system," has briefly explained the main components of dust collection system including the importance of each and every component, factor considered while designing dust collection system. Some details about selection of dust collection of duct shape and selection of fan have been also discussed. [5]

III. CONCEPT OF WET DUST COLLECTOR

The concept of wet dust collector is very simple. The spray liquid mostly water is injected into the stream of water gas. The spray particles impact on the gas particles and separate them from the gas stream. These particles are collected in the sump for blow down. Then the gas leaving will be the clean gas with dust particles.

The design of wet dust collector depends on various factor such as:

- Nature of dust to be removed
- Properties of dust particles such as its size, whether it is flammable or not
- Required removal efficiency
- Temperature and flow rate of gas
- Dust collector location, indoor or outdoor

In all wet dust collectors, the droplets of spraying liquid are formed and generally it is formed much greater than the size of particles to be collected. In most of air cases water is used spraying liquid but sometimes in some devices different medium can be used as per requirement in order to have better collection efficiency. But the operating principle in all the cases remain same. The droplets after removing dust particles are collected in sump below. Various types of dust collector are used as follows:

In addition to this flow, in spray tower may be concurrent or cross current. In cross current flow spray towers the contaminated air and the water spray through nozzle flows in the same direction. Since the flows are not opposing each other the gets purified. In this project efforts are directed more towards improving efficiency

- Orifice spray
- Venture scrubber

IV. SPRAY TOWER

Spray towers are very simple and low energy wet dust collector. It consists of an empty vessels called as chamber and nozzles that spray liquid in chamber. In these type of dust collectors, the contaminated air is allowed to flow into a chamber. Inside the chamber the air comes in contact with the fine droplets of water.

The size of liquid droplets is controlled such that maximum liquid droplet particle contact will be achieved which will affect efficiency.

Spray towers consists of cylindrical or rectangular chamber and these can be installed vertically or longitudinally as per our requirement. In vertical spray tower waste gas stream usually enters from the bottom of chamber and moves upward. In these, the fan is fitted at top of tower to suck the gas upward and the liquid is sprayed downward through the spraying nozzles. This opposite flow of liquid droplet and gas is called counter current flow and the unit is called counter current flow spray tower.

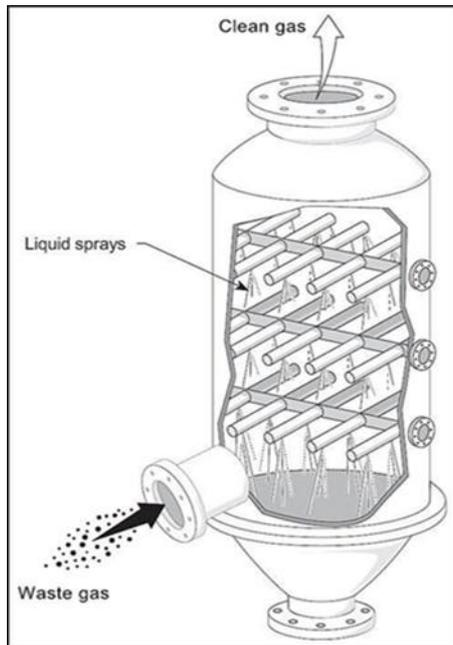


Fig.1 Counter current spray tower

spray tower dust collector. Spraying water on small dust particles have contributed to increase the weight of dust particles due to which they settled down and air gets of dust collection and reducing the cost of system.

Velocity of stream in cross current flow spray tower is higher than counter current. Therefore, the size of cross current flow spray tower of same capacity is less than counter current flow spray tower.

Cross current flows spray tower is also called as horizontal spray tower. In this type the movement of contaminated air and water particles is perpendicular to each other.

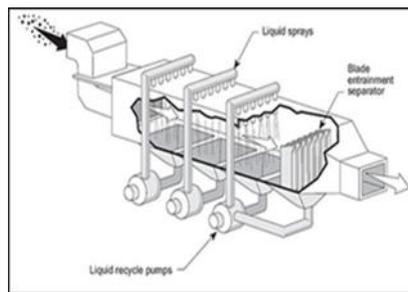


Fig.2 Cross current flow spray tower

V.COMPARISON BETWEEN WET AND DUST COLLECTOR

Wet and dry dust collectors are two very different methodologies used to remove dust particles from the air generated during different production processes. Both the processes have their own advantages and disadvantages. The advantage of wet dust collection system is that it can handle very small dust particles which are difficult to control by cyclone effect in dry system. On the other hand, dry systems are more safe and clean system.

VI. CONCLUSION

Hereby we studied the concept of wet dust collector. We designed the basic model of cross current flow purified. In this project efforts are directed more towards improving efficiency of dust collection and reducing the cost of system.



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