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FLY ASH PARTICLE REMOVAL EVALUATION OF WET SCRUBBER SYSTEM FOR ENVIRONMENTAL BENEFIT

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Abstract - *Environment is first priority of human beings. When the environment gets damaged we are the first human being to get more destructed. Such as industries are the most toxic to the environment by the side the hot unpurified gases passing through chimney. The study provides an experimental analysis on the wet scrubber system of the boiler section in the industry, for collecting more fly ash and releasing more purified hot gases from the chimney.*

***Key Words*: wet scrubber, filters, maximum efficiency, fly ash collection, mesh filter.**

1. INTRODUCTION

Increases public awareness due to global warming has led to has greater concern over the impact of anthropogenic emissions from industrial production. The effects of industrial pollution are vast, causing water contamination, a release of toxins into soil and the air, and it is the cause of some of the most significant environmental disasters of all time. Now our main topic is the crop getting affected due to the toxic fly ash. As shown in (fig.1) the crops of wheat are

Damaged due to the unhealthy environment that is the unpurified gas coming out of the chimney so our most essential ambition is that to provide the most eco friendly environment. Where the 0.1 micron to 10 micron ash is coming out of the factory which is harming the crops field is to be restricted by implementing filters in the wet scrubber as there is only spray nozzles in it so it is not capable of collecting 100% fly ash so these two filters wire filter and fiber filter will be able to collect as much as of ash which is toxic to the farmers field.

Fig1: crops damaged due to fly ash of factory

1.1 MATERIALS AND METHODS

We have just simply added the two components which are the collectors of micro particles ash which are not seen by naked eyes. So implementation process is simple we have to first attach a supporting plate and upon it there will be wire and fiber filters which we have to keep up on it. There are two types of ash as follows bottom ash and fly ash the bottom ash is collected at the bottom of the furnace by the workers working in the boiler section of factory and the fly ash which is generated in the boiler which is suctioned by the induced draft fan and brought to the wet scrubber in which all the fly ash is not collected and here where the most harming action starts for the environment.

the problem starts of the farmer near there gets in problem due to the ash collection in the crop field as shown above in (fig.1) image where the crops leaves are destroyed. As mentioned above the filters eventually the filtering process differs through different filtering bags such as mechanical ash handling system. Hydraulic ash handling system, there are two types of hydraulic ash handling system low-velocity system, high-velocity system, pneumatic ash handling system, steam jet ash handling system, cyclone separator, wet type mechanical dust collector, and last the least electrostatic precipitator this all system are money consuming structures. The wet scrubber system is referred more now days due to easy maintenance low maintenance in the industries. It has high fly ash capturing efficiency so we have just modified the wet scrubber system and boost its ash capturing efficiency. The filters will play very important role in capturing the ash and it can be replaced after year. Ash Are Different In Sizes of The Range As Starts From The 1000 Micron To The 0.1 Micron And Our Main Target Is To Collect Smaller Than The 10 Micron While On The

Beside it bigger than the 10 microns are collected due to the spray nozzles which supply tones of water in it. And the last ash uncollected of 10 microns or less than 10 microns will be trapped by the filters.

Fig2: ash small than 10 microns captured

Through filters

As shown in (fig 2) the NANO particles ash which cannot be seen through human normal eyes is harming to our precious nature as well as our health so this small tiny ash will be blocked in our innovative idea that is in the filter mesh type demister and fiber type demister. And washed away due to the spray nozzles on the demister and it will cleaned up the demister and again it will collect and washed again. This process will be repeated till the scrubber operates. It is efficient process with less mess and low maintenance.

1.2 CALCULATION

Collection of ash (fly ash) in the company

80t /d = 80,000 kg /day.

Efficiency of Scrubber

η = 90%

η = 1 - Pt

=1 - 0.1 = 0.9

=0.9×100 = 90%

Pt = the uncollected fly ash

Water droplets diameter in scrubber

$DD = 50/VGT + 91.8 (L/G)^{1.5}$

VGT =velocity of gas of throat

(L/G) = liquid to gas ratio

$= 50 \div 1000 \pm 91.8 (0.00028)^{1.5}$

=0.05004 cm/s

=500 microns

Calculate the particle aerodynamic geometric mean diameter, D pg

C_c =1+ ((6.21×10^-4) (273+320) ÷ (8))

=1.046.

T = temp of gas
D_{ps} =mass median particle size

D_{pg} = 8.0 (1.046×1.7) ^ 0.5
=10.57×10^-4 cm A

The inertial parameter for the mass-Median diameter, K pg

K_{pg} = ((D pg ^2 Vg) ÷ (9 µg DD))

= 1174

REYNOLD NO

N reo = ((VGT+DD) ÷ (Vg))

=250

Drag coefficient for the liquid at the throat entrance

C_d = 0.22+ ((24) ÷ NREO)) (1+0.15 Nreo^0.6))

=9.9

Parameter characterizing the liquid-to-gas B

B = ((0.00071) × ((1000) ÷ (1.0×9.9)

= 0.07

Overall penetration

From above step K_{pg} =1174

From above step B=0.07

From Overall penetration graph, Pt

P_t=0.1

2. FILTERS

WIRE MESH FILTER

The wire mesh filters are fabricated from knitted metal wires. This pad with the high free volumes and large impingement area can be installed in any new process vessel to provide separation efficiencies up to 99% for particles to five microns to ten microns with high pressure drop. Function of droplets size, wire size, pad thickness and physical properties of system. For a standard specification mesh demister (wire ø 0.28 mm, density 145 kg/m^3, surface area 300m^2/m^3) removal efficiency is typically 100 percent for a droplets 5 mm and greater in diameter. Higher surface area mesh demister 500 m^2/m^3 using a reduce wire diameter 0.15mm can be used to improve the removal efficiency.

FIG 3: WIRE DEMISTER

FIBER FILTER

The fiber filter are fabricated from glass fiber, polyster, fabric. It can be also installed in any process vessel to provide separation efficiencies up to 100 % for particles down to 5 microns with low pressure drop. It is corrosion resistance, extreme temperature resistance, easy to replace worn parts, ability to eliminate the chimney mist. For a standard specification mesh demister material: glass fiber.

Surface area: 190mm, mesh pads are typically 150mm thickness, 500 mesh grids with size hole of 2 microns beside these it is very costly so there should be proper attention to it.

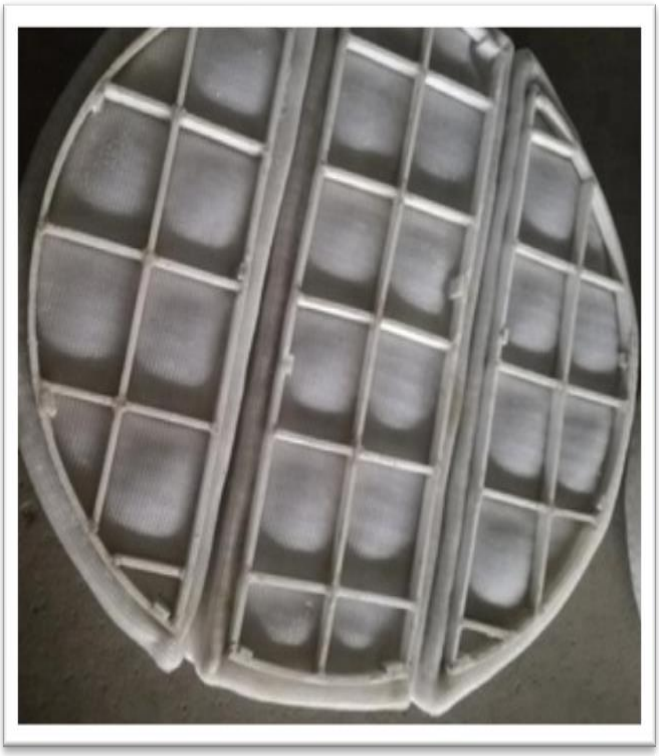

FIG 4: FIBER FILTER

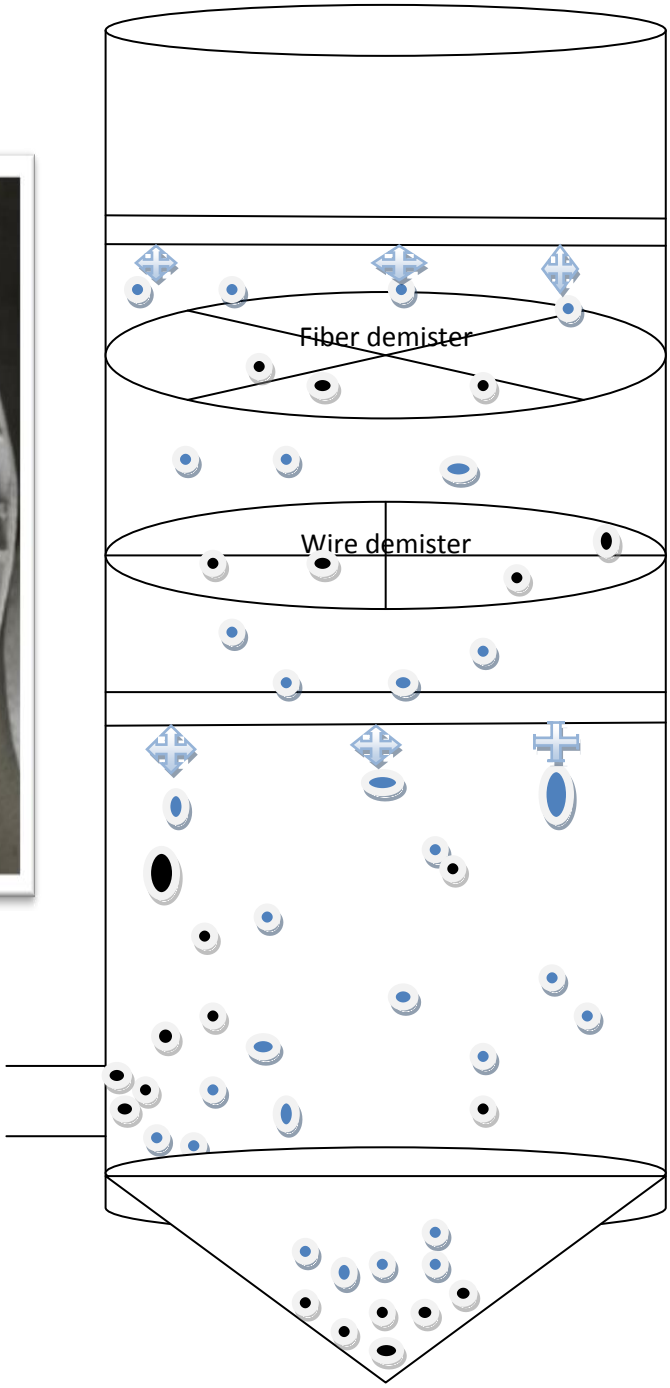

FIG 5: WET SCRUBBER WITH FILTERS AND SPRAY NOZZLES COLLECTING FLY ASH

WATER DROPLETS COMING OUT FROM SPRAYNOZZLES

FLY ASH COLLECTED BY FILTERS AND SPRAY NOZZLES AND PASSING TO SLURRY

3. CONCLUSIONS

In this study, an analytical method for design and prediction of spray tower scrubber performance based on ash particle removal efficiency has been described. The conclusions drawn from the study is that, the proposed system can be used in controlling particle sizes of 5μm and 10μm that are emitted from industrial productions. It is expected that the information provided in this paper will be useful for engineers and researchers for many air pollution control applications especially in the areas of particulate matter (PM10) emissions.

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BIOGRAPHIES

I am KHURSHID Student of final year mechanical department. I have working very hard on this topic by analyzing information as much as possible.

I am JAY.A. Student of final year mechanical department. I have researched GOOGLE patent papers for better knowledge of the topic.

I am JAY.N. Student of final year mechanical department. I have researched GOOGLE patent papers for better knowledge of the topic.

I am GAURANG Student of final year mechanical department. I was very willing to get proper solution to the problem by analyzing the different methods.