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Manufacturing and Modification of 2000 CMH ESP cell Model for Process Improvement and Efficiency

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Abstract

In this fastest growing industrialization everyone is looking forward for simplification of the work and everyone has to deal and maintain the environment safe. The industrial laws and acts for industrial emission has been very much strict every industry has to maintain it as per the regulations. In various industrial processes, power generation and welding processes hazardous fumes and gases are generated and these fumes and gases are circulates around the workplace. It effects on the health of worker some time causes death also. Hence in conventional system filters are separately provided from through ducting. In modern industry space occupation is one of the most important consideration .So we are going to modify and design this system in compact size and improving efficiency.

***Keywords*:** Electrostatic precipitation; Collection Efficiency, transformer Testing, Machine Testing

1. Introduction

Pollutant ionizations to the atmosphere can be classified into two major categories Particulates (often referred to as particles, including both liquid and solid matter) and Gases. Although gaseous pollutant comprise approximately 85% of industrial pollutant emission, it is estimated that about 35 million tons of particulate matter are emitted to the atmosphere each year for manmade source such as fuel combustion, transportation, solid waste disposal, and various industrial processes. Particulate matter is also produced from natural source such as the sea, soil, volcanic eruption, and forest fires.in many cases the contribution from these sources is considerably greater than that associated with human activities. It does the particle separation with the use of an electric field which (i) gives a positive or negative charge to the particle, (ii) attracts the particle to an oppositely charged plate, (iii) Removes the particle from the collection surface to dust settling chamber by washing or vibrating the collection surface. Electrostatic precipitator is the most widely used device for particulate emission control. Electrostatic precipitators may be classified according

to the type of use for which they are designed-: High Voltage, Single stage ESPs, The Two types of High Voltage ESP configuration currently used are tubular and plate. Tubular

a)

Precipitator consists of cylindrical

b)

collection plates with ionization plates located on the axis of the cylinder. Low Voltage, Two stage ESPs, Low-Voltage, Two Stage ESP were originally designed for air purification in conjunction with air conditioning system.

c)

2. Problem definition

The problem of pollutant fumes and smoke has been conventionally tackled by using mesh-type filters, proper-based cartridge filters and exhausts. Out of these, exhaust just transfer polluted air from one place to another and hence are of no use Mesh-type filters and paper-based cartridge filters also fail to provide a permanent solution as they consume a lot of power and need to be replaced very often, adding to energy losses, as well as recurring costs.

Sub-Micron level particulates suspend in the environment, increasing the level of hazardous particulates manifold. This poor quality air causes irritation. Sudden puffs of fumes lower visibility momentarily. Working continuously in such environment lowers the weld shop productivity.

3. Objectives

To Increase Efficiency.

Objective Reduce the Space Require.

Modify Collection plate area and new design.

4. Working Principle

ESP is a method of cleaning of polluted air that uses the concept of electrostatic forces, and consists of ionization plates and collection plates. A high voltage is given to the ionization plates to form an electrical field between the plates and the collection plates, and also ionizes the fumes around the ionization plates to supply ions. When gas that contains a pollutant flows between the collection plates and the ionization plate, the pollutant particles in the gas are charged by the ions. The Coulomb force caused due to the electric field causes the charged particles to get collected on the collection plates, and the air or fumes is purified.

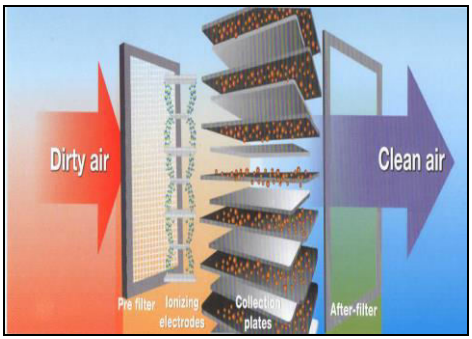

Fig. 1 Working Principle of Electrostatic Precipitator

Construction

A typical ESP, irrespective to particular design, has these three essential components: ionization plates, collection plates, high voltage electrical systems. An ionization plates is either metal plate that mounted vertically in the ESP, a number of plates are attached together. Ionization plates create a very strong electrical field that ionizes flue gas thus charging the particles are done for the gas. Collection plates collect the pollutants that are charged by the ionization plates. Collection plates are typically flat plates with a charge opposite that of the ionization plates.

Working

An ESP works with the help of electrostatic attraction (like charges repel; unlike charges attract). An ESP requires a high voltage electrostatic field to separate dust, fume or mist from a gas stream. The precipitator consists of vertical parallel plates (collection plates). Ionization plates are electrically isolated from the plates and suspended in rows between the gas passages. Every particle either has or can be given a charge - positive or negative. A high voltage system provides power to the ionization plates to generate an electrical field. The particulate, entrained in the gas, is charged while passing through the electrical field. The particulate is then attracted to the grounded collector plate, and forms a dust layer on the plate.

5. Experimentation and testing

1) Experimentation and Testing of Transformer

Fig 2 Experimentation and Testing of Transformer

Procedure for transformer charging

1. Assemble the stack.
2. Make the arrangement for the electric connection as follows.
3. Give the connection of ionization from transformer to ionization rod of stack.
4. Give the connection of collection from transformer to collector rod of stack.
5. Connect the main power to the transformer s shown in figure.

Procedure for transformer testing

1. Connect and cross check all connection as shown in figure.
2. Then take the reading at transformer ionization and collector before connecting the load/stack.
3. Then make the connection as give in above procedure.
4. Then take the reading at ionization and collector rods of the stack with tong tester and measure the testing.

2) Experimentation and Testing of Machine

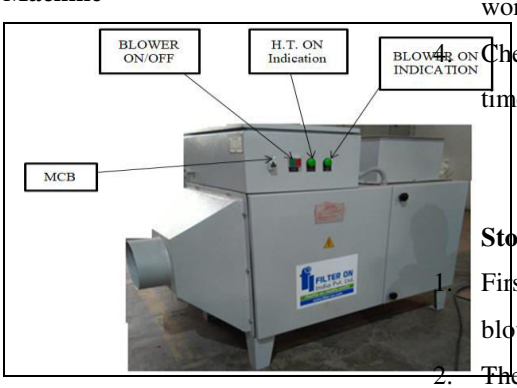

Fig.2 Experimentation and Testing of Machine

Starting of System

1. First of all switch on the main incoming supply given to the machine.
2. Initially the machine is in default off condition
3. Switch ON MCB provided on the machine to start ESP
4. The H.T ON Indication Lamp (Green) will glow.
5. Press Blower ON Green push button to start blower
6. Blower ON indication lamp will glow.

Running Operation

1. The H.T. ON indication should be checked at least two times per shift.
2. During running if the unit shows H.T. ON indication lamp glowing and again steady H.T. on indication; then it's in normal working.
3. Check if the H.T. ON indication does not glow or it glows but blinking continuously, then it's not in normal working.
4. Check blower ON Indication at least two times per shift

Stopping the System

1. First Switch OFF Blower through RED blower OFF push button on the panel.
2. The Blower on the lamp will gate OFF.

3. Then only Switch OFF MCB on the panel to stop ESP
4. Now the H.T. On lamp will get off.
5. Switch off the main incoming power supply.

Testing of Machine

1. Make all the connection and start the machine as explain above.
2. Make the generation of fumes and gas at the inlet of machine
3. Provide the ducting if fume generation source is away from the machine suction.
4. Start the machine.
5. Take the reading at the fume generation source with the help of PM measuring instrument/ devices.
6. Take the reading at the outlet of machine with the same PM meter.

6) Results

a) Result of transformer testing

Table No.1 result of transformer Testing

Sr. No.	Transformer model and number	12 KV reading		6 KV reading		Remark
1.	Harco P30 HVPS	Without load	12	Without load	6	Not OK
		With load	10.43	With load	5.59	
2.	Harco P30 HVPS	Without load	12.15	Without load	6.15	Not OK
		With load	11.55	With load	5.15	
3.	SMP jagtap HVPS (19031212)	Without load	12.30	Without load	6.15	OK
		With load	11.75	With load	5.80	
4.	Genvolt HVPS (B90234)	Without load	12.50	Without load	6.30	OK
		With load	12.28	With load	6.12	
5.	Genvolt HVPS (B90226)	Without load	12.54	Without load	6.29	OK
		With load	12.25	With load	6.00	
6.	Genvolt HVPS (B87693)	Without load	12.54	Without load	6.30	OK
		With load	12.48	With load	6.28	

b) Results of machine testing

Table No. 2 Result of machine Testing

Sr. No.	Application	PM2.5		HCHO		Efficiency
1.	MIG welding	Before extraction	999	Before extraction	2	95.27%
		After extraction	47	After extraction	0.161	
2.	TIG welding	Before extraction	999	Before extraction	3	96.79%
		After extraction	32	After extraction	0.168	
3.	Co2 welding	Before extraction	999	Before extraction	2.5	96.395
		After extraction	36	After extraction	0.150	
4.	Arc welding	Before extraction	999	Before extraction	3.2	95.99%
		After extraction	40	After extraction	0.169	

7) Conclusion

1. From the above testing and analysis of transformer also going through the specification of various transformers and comparing them we finally conclude that Genvolt HVPS transform is best for the practical use.
2. This project exposes various machining operations like welding, turning, grinding, drilling, boring, etc. We got the good knowledge about the fabrication and production of new product. We face and overcome them.
3. As the machine's efficiency has increase it can work with greater effectiveness with the same parameters. This machine has certain advantages and also disadvantages too which can be made obsolete by working on it further

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