

APPLICATIONS OF ELECTRONIC DEVICES IN ENVIRONMENTAL MONITORING

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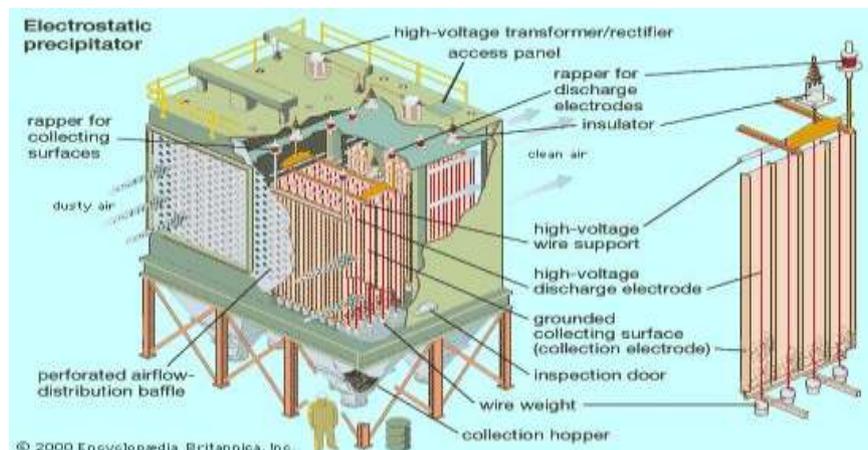
ABSTRACT

Electronic devices applications in environmental monitoring are now a days, of great interest because of the instruments proven capability of recognizing and discrimination between a variety of different gases and odors using just a small number of the electronic devices .Such applications in the environmental field include analysis of parameters relating to environmental quality ,process control and verification of efficiency of odor control system. Considering as one of the example of electronic devices in environmental monitoring here we are discussing about an electronic device called “ELECTROSTATIC PRECIPITATOR”

KEYWORDS: *Environmental Monitoring, Electrostatic Precipitator, Applications of Electrostatic Precipitator.*

I INTRODUCTION

Electrostatic precipitator, also called electrostatic air cleaner, a device to remove certain impurities either solid particles or liquid droplets—from air or other gases in smokestacks and other flues. The precipitator functions by applying energy only to the particulate matter being collected. Without significantly impeding the flow of gases. Originally designed for recovery of valuable industrial process materials. Electrostatic precipitators are used for “air pollution control”. Particularly for removing particles from waste gases at industrial facilities and power-generating stations.



ELECTROSTATIC PRECIPITATOR ,A COMMON PARTICLE-COLLECTION DEVICE AT FOSSIL-FUEL POWER GENERATING SYSTEM

II.HISTORY

In 1824 M. Hohlfeld , a mathematician teacher in Leipzig , first described the precipitation of smoke particles by electricity. The first commercially successful process was patented in 1908 following experiments by American chemist Fredrick gardener Cottrell at the university of California, Berkeley. Early units were used to remove sulfuric acid mist and lead oxide fumes emitted from acid-making and smelting activities . The devices helped to protect vineyards in northern California from lead emissions.

III.PRINCIPLE

An electrostatic precipitator is an device that removes dust particles from a flowing gas(such as air)using the force of an induced electrostatic attraction (i.e, like charges repel ; unlike charges attract)electrostatic precipitators are highly efficient filtration device that allow the flow of gases through the device, and can easily remove fine particulate matter such as dust and smoke from the air stream.

IV.DESIGN OF THE ELECTROSTATIC PRECIPITATOR:

Precipitators function by electrostatic ally charging particles in the gas stream. The charged particles are attracted to and deposited on plates or other collection devices. The treated air then passes out of the precipitator and through a stack to the atmosphere. When enough particles have accumulated the collection devices, they are shaken off the collectors by mechanical rappers. The particulates, which can be either wet or dry, fall into a hopper at the bottom of the unit, and a conveyer system transports them away for disposal or recycling. Precipitators are often deployed with de nitrification units that remove nitrogen oxides and scrubbers or other devices that remove sulfur dioxide.

The most basic precipitator design consists of a row of thin vertical wires and a stack of large flat vertical metal plates. The plates are spaced from less than 0.5 inch(1.3cm) to about 7 inches(about 17.8cm)apart, depending on the application . The gas stream flows horizontally between the wires and through the stack of plates. A negative charge of several thousand volts is applied between the wires and plates to remove impurities from the gas stream.

Plate precipitators re often marketed to the public as air purifiers or as a permanent replacement for furnaces filters. Unlike some other air purification technologies, they typically do not become breeding grounds for harmful forms of bacteria. Yet , the plates can be difficult to clean and can also produce ozone and nitrogen oxides. Some consumer precipitation filters are sold with special soak-off cleaners that allow the entire plate array to be removed and soaked for several hours, which loosens the particulates.

V.PROCESS

In many industrial plants, particulate matter created in the manufacturing process is released as dust in the hot exhaust gases. If released into the atmosphere .The particulates reduce visibility can contribute to climate

change and lead to health problem in humans ,including lung damage and bronchitis .fine particles that are smaller than 2.5 microns (0.0001 inch) in each diameter can be especially dangerous because they are drawn deep into the lungs and can trigger inflammatory reactions .

Electrostatic precipitators are important tools in the process of cleaning up flue gases .They are highly effective at particle pollution, including those particles whose sizes approximate 1 micron (0.00004inch) in diameter. And some precipitators can remove particles of 0.01 micron in diameter. In they can handle large volumes of gas at various temperatures and flow rates, removing either solid particles or liquid droplets.

Electrostatic precipitators are available in many different sizes and types, designed for various dust and water droplet characteristics and gas volume flows. Some types are designed to work with a gas streams with particular temperature and moisture characteristics. Dry electrostatic precipitator operate above the dew point of the gas stream to remove impurities from smoke and dust. Wet electrostatic precipitators, in contrast, operate with saturated airstreams that have 100 percent relative humidity. Wet precipitators are commonly used to remove liquid droplets, including oil, resin, tar, and sulfuric acid mist, from gas streams in industrial settings. They are applied where gases are laden with humidity, contain combustible particulates, or have particles that can be sticky.

Very large power plants may have multiple precipitator for each unit, whereas residences may have a single precipitator, which is often only slightly larger than a household vacuum cleaner. Some precipitators can collect 99.9 percent or more of the dust(which can contain arsenic, acids, and other chemicals)from the gas exhaust, depending on the temperature and flow rate of the gas, the size and chemical composition of the particles, and the precipitator design and voltage it applies to the gas. They have been used in the following industrial and household applications:

VI.APPLICATIONS OF ELECTROSTATIC PRECIPITATOR:

- *Removing dirt from flue gases in steam plants
- *Removing oil mists in machine shops
- *Removing acid mists in chemical process plant
- *Cleaning blast furnace gases
- *Removing bacteria and fungi in medical settings and pharmaceutical production facilities
- *Purifying air in ventilation and air conditioning systems
- *Material recovery from gas flow(including oxides of copper, lead and tin)
- *Separating rutile from zirconium sand in dry mills and rutile recovery plants

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