

SMOKE ABSORBER AND ADVANCED POLLUTION CATCHERS

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ABSTRACT – Pollution has become as dangerous as a disease so in order to control the it, pollution catchers and smoke absorbers are developed. The advanced pollution control equipment's are also being invented. So that we can control the pollution and keep it safe. In future it gets mandatory to have a smoke absorber in every house. A pollution catcher not only keeps your surroundings pollution free but also it can prevent one from the diseases. Advanced pollution catcher equipment makes it easy to get rid of pollution without any loss of human energy.

Key words: Pollution catcher, smoke absorber, advanced pollution control equipment.

1.INTRODUCTION

What is a Smoke Absorber? This is a tool that's want to filter the inside air to stay the environment clean by removing bacterial fumes, combustion products, bad steam and odor, heat, and grease. A mechanical fan that is used pulls out harmful fumes and gases with a carbon filter.[1]



Fig-1: Smoke Absorber

1.1 Why Smoke Absorber Is Useful?

1. Harmful Chemical Gases will be removed from the Air

The environment is kept safe and clean through smoke absorber it removes harmful chemical gases.

2. Various Filtration types

There are different filtration devices available in the market, we have the best filtration device that is the most efficient active carbon filter that absorbs fumes, harmful smoke, and an odd smell.

3. Protect the Respiratory System

Smoke Absorber may be a very efficient and useful device that helps in preventing respiratory problems. It extracts the harmful fumes far away from the environment and keeps the air clean and breathable.

4. Smoke Absorber as a Ventilation

There are many areas/spaces where ventilation isn't proper thanks to the shortage of windows or doors. So, for these small workplaces, smoke absorber works as ventilation unit and provides a safe environment for work.

5. Rules and Regulations

A Smoke Absorber may be a Fume Extractor that follows NIOSH, COSHH, and the other rules and regulations to stop harmful chemical fumes to try to any reaction round the workspace.

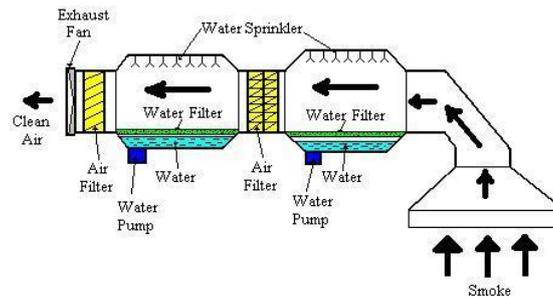


Fig-2: soldering smoke absorber

1.2 Advantages Of Soldering Smoke Absorber [2]

- Harmful chemical particles within the air are removed.
- Bad odor, smell left after soldering are removed.
- Harmful chemical fumes and gases are removed.
- It reduces the probabilities of causing respiratory problems.

1.3 5 Important Reasons to Use a Smoke Absorber! [3]

- 1.Helps Remove Harmful Fumes
- 2.Follows Rules and Regulations Set by Local and Federal Laws
- 3.Removes Harmful Contagions in the Air
- 4.Various Filtration Options Available
- 5.Provides Proper Ventilation.

2. Advanced pollution Control Equipment

In this decade, pollution control systems are a requirement. Air pollutants are generated by both natural e.g., volcanic eruptions and wildfires and human-made sources along with mobile and stationary ones. Mobile represents moving sources, such as airplanes, trains, and automobiles, while stationary refers fixed industrial sources, such as power plants, factories, and other facilities. Stationary sources are also broken into major and area sources: for major sources either 10 or more plenty of one air pollutant or 25 or more plenty of a combination of air pollutants, while as for area sources emit less than 10 tons of a single pollutant or less than 25 tons of a combination of pollutants. In the case of high enough concentrations, the pollutants developed by either mobile or stationary sources can cause adverse effects to the atmosphere, the surrounding environment, and human life, like increasing the average of global temperature, decreasing the atmospheric visibility, diminishing the air quality, and affecting human health. The Environmental Protection Agency (EPA) has implemented the Clean Air Act (CAA) which will impose regulations on both sources of air pollutants to help

mitigate their effect on the atmosphere, the environment, and human life. Pollutants that regulated by the EPA are divided into mainly three groups, which includes criteria air pollutants, air toxics, and also greenhouse gases.

- Criteria air pollutants are a group of six common air pollutants i.e., particulate matter (PM), photochemical oxidants (e.g., ozone), carbon monoxide, Sulphur oxide, nitrogen oxide, and lead which can dangerously affect public health and also welfare, the atmosphere, environment, and surrounding structures.

- The term “toxics in air” refers to list of over 180 air pollutants such as organic chemicals, volatile organic compounds (VOCs), metals, and metal compounds, along with the fuels, solvents, mercury, arsenic, asbestos, and benzene which will yield hazardous health and environmental effects even when present in trace amounts and produced by fewer sources compared to criteria pollutants.

- Greenhouse gases (GHGs) are meant to gases, which contains carbon dioxide, chlorofluorocarbons (CFCs), methane, and ozone, that effects both human health and contribute to the escalation of the greenhouse effect on Earth and the subsequent effect on the global climate.

It concludes that, the regulations surrounding different types of air pollutants emit some of the considerations that industries must keep in their mind to remain compliant with the EPA standards like implementing the necessary and proper air pollution control equipment and systems and avoid government repercussions. We can also explore the various types of air pollution control equipment available to address stationary sources of air pollutants and explains their respective functions and mechanisms.

2.1 Types of Air Pollution Control Systems and Equipment [4]

Air pollutants are generated by nearly every facet of the industrial process, including raw material sourcing, product manufacturing, maintenance and repair services, and distribution. Consequently, there are several different types of air pollution control equipment available for air pollutants produced by both mobile and stationary sources across a wide range of industries. However, this article focuses mainly on control equipment for stationary-sourced air pollutants, such as those produced during combustion processes.

In an industrial setup, air pollution control equipment acts as an umbrella term refers to equipment and systems used to regulate and eliminate the emission of potentially hazardous substances including particular matter and gases developed by manufacturing, process system, and research applications into the air, atmosphere, and surrounding environment. Control equipment has applications in a wide range of industries, preventing the release of chemicals, vapours, and dust and filtering and purifying the air within the work environment. Mainly, fans or blowers directs industrial exhaust and emits into the air pollution control equipment and system which will remove or reduce air pollutants by the use of one or more of the following processes:

1. Combustion (destroying the pollutant)
2. Conversion (chemically changing the pollutant to a less harmful compound)
3. Collection (removing the pollutant from waste air before it gets released into the environment and atmosphere)

Some of the air pollution control equipment applied to industrial applications that utilize one or more of the methods of air pollutant removal or reduction are mentioned above:

- Scrubbers
- Cyclones
- Electrostatic precipitators
- Catalytic reactors

Scrubbers

Some of the foremost commonly used pollution control devices in manufacturing and processing facilities, industrial air scrubbers employ a physical process i.e., scrubbing which removes particulates and gases from industrial emissions, like smokestack exhaust (in the case of exhaust air scrubbers), before they're released into the atmosphere. There are two main categories of scrubber's dry scrubbers and wet scrubbers.[5][6]

Wet Scrubbers

Wet scrubbers, also referred to as wet adsorption scrubbers or wet collectors, employ liquid solutions typically water to collect and remove water-soluble gas and particulate pollutants from industrial emissions.[7] The wet scrubbing process either passes a gas stream through a liquid solution or injects a liquid solution into a gas stream. As the gas stream comes into contact with the liquid, the solution absorbs the pollutant removing it from the stream. The types of wet scrubbing equipment available include venturi, packed bed (or packed tower), and bubbling scrubbers.[8]

Dry Scrubbers

Dry scrubbers, also mentioned as dry adsorption scrubbers, inject dry, neutralizing chemical agents, like bicarbonate of soda, into the emission stream, causing the gaseous pollutants contained within to undergo a reaction which either neutralizes the pollutants or converts them into innocuous substances. Once the reaction concludes, filters within the scrubber chamber collect and take away the spent agents from the cleaned emission gas. In some cases, the collected agents are often washed and reused for future dry scrubbing processes, but, if impossible, the scrubbing waste must be disposed of by specialists. Typically, dry scrubbers are wont to remove or counteract acid gas within industrial emissions. The chemical reactions resulting from the addition of neutralizing agents during the dry scrubbing process helps to both reduce the acidity of the emissions and take away air pollutants.[9]

Cyclones

Cyclones also mentioned as cyclone dust collectors are pollution control devices which, similarly to air filters, separate dry particulate from gaseous emissions. However, instead of employing filtration media, cyclones utilize force to gather and take away particulates. As gas streams go into a cyclone, they flow along a spiral path within the cylindrical chamber. This swirling motion forces large particulates against the chamber wall, which slows their inertia, causing them to drop into the gathering hopper below for additional processing and disposal. The cleaned gas streams carry on upward and out of the cyclone.[10]

While cyclones are mainly employed for filtration applications of particulates $\geq 50 \mu\text{m}$ in diameter, some models are capable of greater than 90% efficiency for particulates $\geq 10\text{--}20 \mu\text{m}$ in diameter. Efficiency increases or decreases counting on larger or smaller particulate diameters, respectively.[11] Typically, additional filtration devices want to control pollution, like baghouses, are employed following cyclones in a pollution system to get rid of the smaller particulates not previously separated and picked up from the gas stream by the cyclones

Electrostatic Precipitators [12]

Electrostatic precipitators (ESPs), like air filters and cyclones, are pollution control devices want to collect and deduct particulate, like dust, from industrial emissions and exhaust. ESPs employ transformers to make high static electrical potential between charging electrodes and collecting plates. As gas streams pass between the 2 components, an electrical charge is introduced to the particulates, which attracts the particulate to the collecting plates. Similarly, to air filters, PM accumulation is periodically far away from the collecting plates and deposited during a group hopper below, either through mechanically dislodging the particulates or by introducing water to wash off the particulates. ESPs which employ the latter method are mentioned as wet ESPs. As ESPs mainly have multiple collection plates, their efficiencies often exceed 99%. [13]

Catalytic Reactors

Catalytic reactors, also mentioned as selective catalytic reduction (SCR) systems, are pollution control devices widely used to mitigate oxide (NO_x) emissions produced by the burning of fossil fuels in industrial applications. These devices first inject ammonia into the economic exhaust and emissions, which reacts with the NO_x compounds to provide nitrogen and oxygen. Similarly, to incinerators, these devices also employ other catalysts which enable variety of the remaining gaseous pollutants to undergo combustion for further processing and reduction. One common application of catalytic reactors is in modern automobiles; the three-way converter during a car's exhaust is used to reduce the amounts of NO_x, CO, and other VOCs within the engine emissions.

3. CONCLUSION and FUTURE RECOMMENDATION

Automatic smoke absorber machine is type of machine that have own function where to save the environment by reducing the air contamination that come from open burning process. while to mention for open burning process, it means the smoke that come from open burning process does not have heavy particles in the smoke compared to industry smoke; for example, smoke from factory. So that, for future recommendation, if this machine want to apply to the factory, the contain

of water that want to be mist out to filter the smoke must have some chemical particles to react with the chemicals smoke, so that, neutralization process will happen and the smoke will be neutralized and the air contamination will reduce by that process.

other than that, filter within the Automatic smoke absorber machine are often replaced with some filter more compact. for instance , if we would like to filter the smoke that contain with the fully with oil, which suggests the particles within the smoke have oily and it can't be filter easily by using sponge or water because the density of oil and water are different. here, we've to filter the smoke using compact dust and shaping it in filter type. so, the oil particles are often filtered with the sort of filter.

The conclusion is, it had achieved the objectives where this machine can reduce the air contamination and Automatic Smoke Absorber Machine have been done and can be apply to personal home especially. And all the pollution control equipment's mentioned above can be very useful in reducing the pollution and preventing it.

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