

AIR POLLUTION FROM SOLID PARTICLES, FILTRATION AND FILTERS

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INTRODUCTION

Outdoor air pollution is one of the world's largest health and environmental problems. Any change in the structure of the air is in relation to natural conditions due to the presence of other gases, vapors, particles in concentrations that affect human health or affect the biosphere is considered air pollution. Through human action, various substances reach in the air. Air pollution from anthropogenic sources imposes a significant burden on public health in most developed countries. Particulate matter (PM), which are microscale airborne pollutants, has specifically been recognized as a serious risk factor for premature mortality [4].

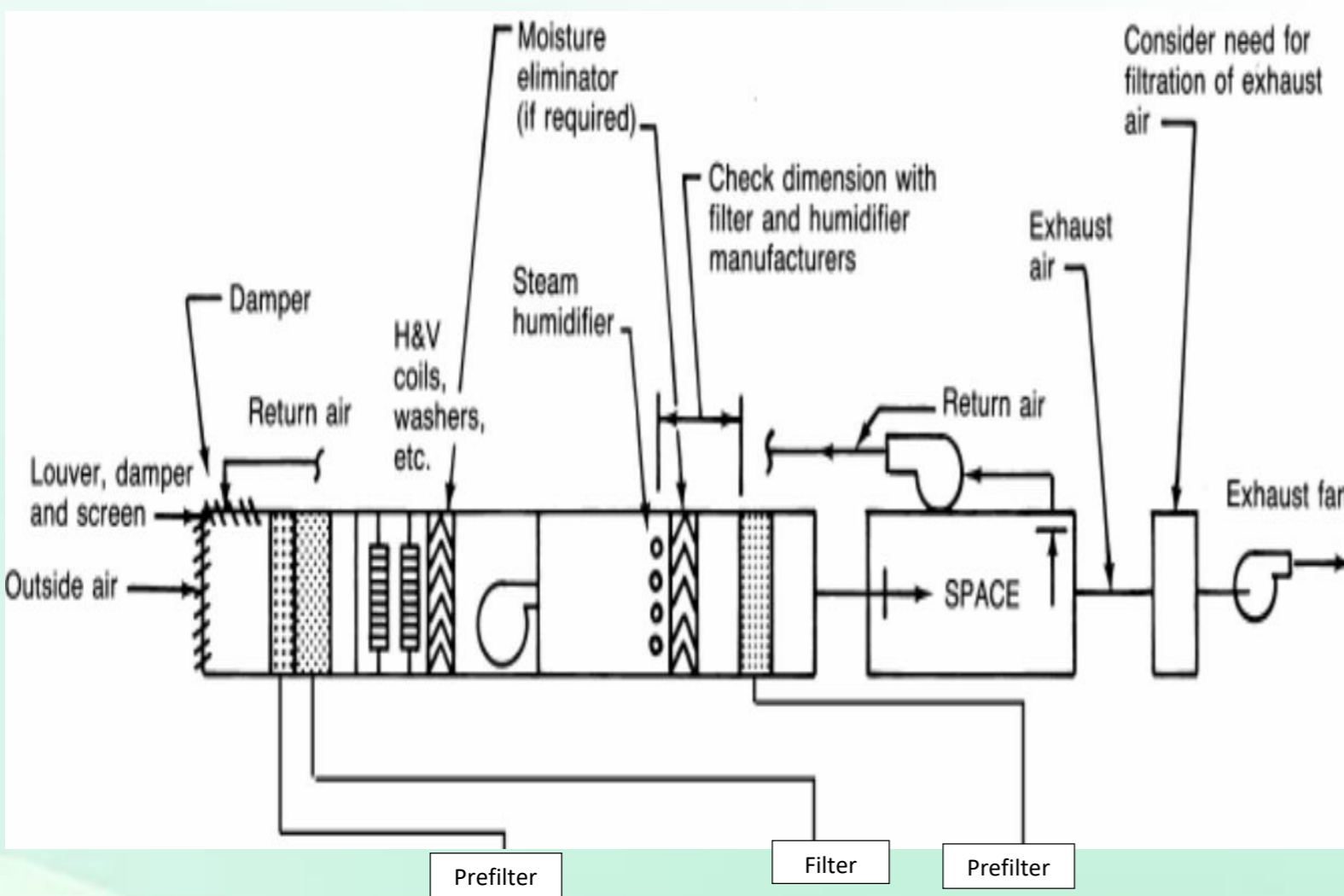
The air quality in the industrial process is mostly affected by powdery substances, regardless of their granulate (PM₁₀, PM_{2.5}, TSP). When it comes to the choice of filters for the purification of polluted air, an important parameter is the emission of PM_{2.5} particles, or their concentration.

Air filtration

Filtration is the process of removing suspended solids from the air. Removal of suspended particles from the air takes place with filters. Air filtration filters are used to remove coarse and fine particles from the air, separating dirt, oil residues, oil vapors and smells from the air. The type of filter for air purification depends on the need and purpose for which the purified air used, as well as on the air production capacity.

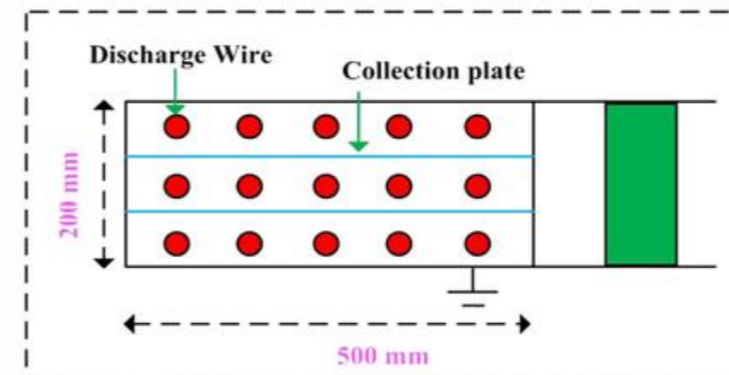
When it comes to the industrial process, can be spotted that in most industrial processes, during production, particles accumulate due to abrasive wear during operation, where they become harder than the motherboard. If these particles are not removed by proper filtration, they will return to the production process and cause additional wear. For that reason, it is necessary to determine an adequate way of filtration in order to avoid breakdowns and production downtime.

In Figure 1, a schematic representation of air filtration is given:

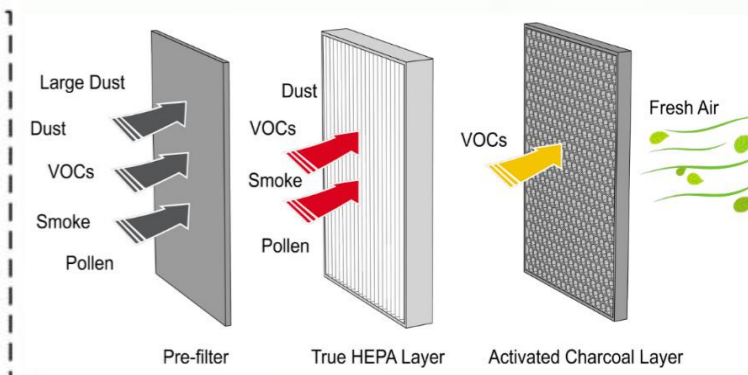


Types of filters

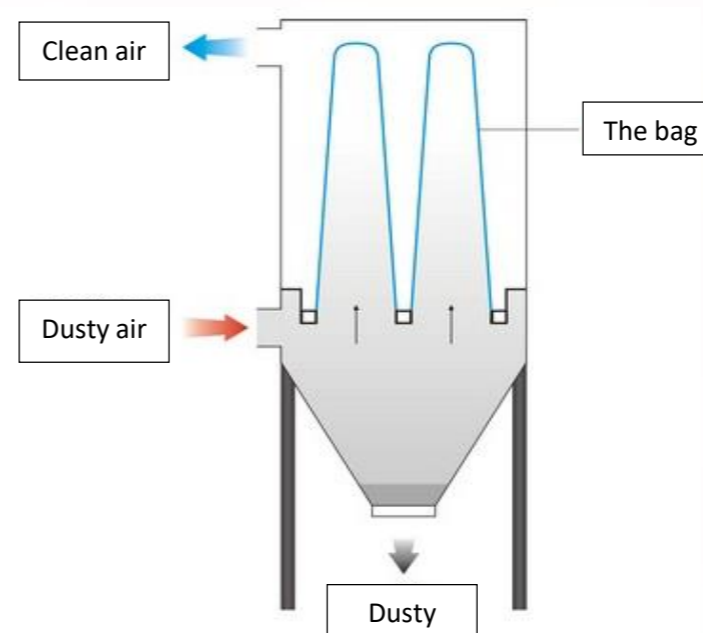
• Electrostatic filters



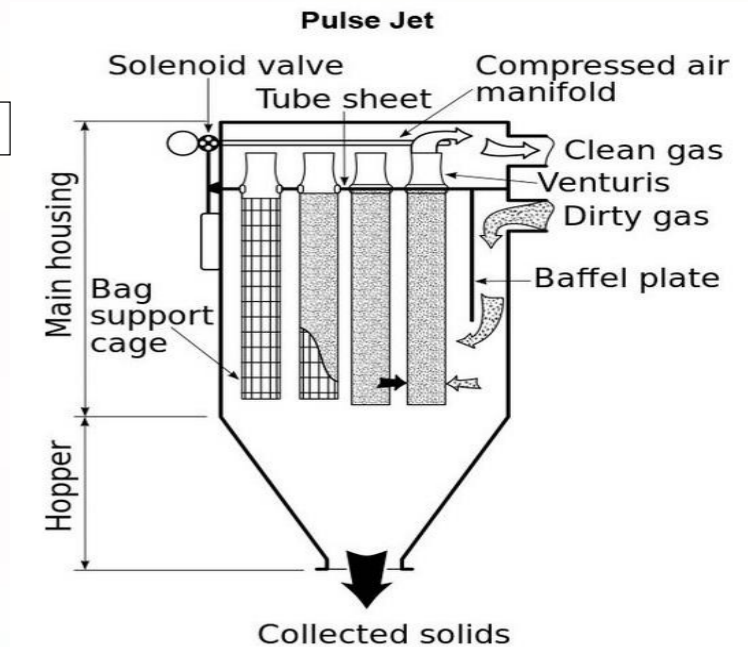
• HEPA filters



• Bag filters

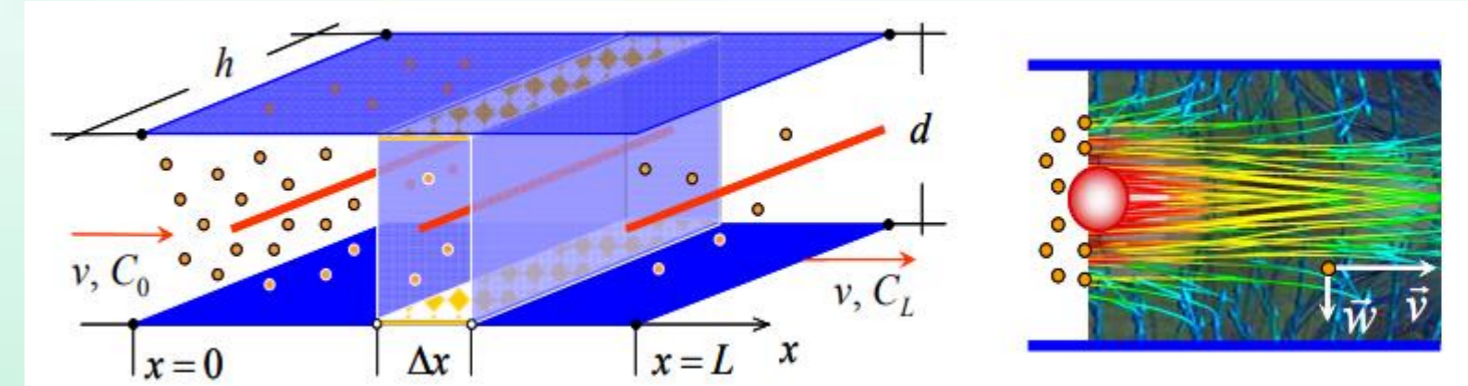


• Jet-pulse filters



Filter efficiency equation for PM

Particle deposition and collection efficiency



The equation given in the text below is known as Deutsch-Anderson equation:

$$\eta = \frac{C_0 - C_L}{C_0} = 1 - \frac{C_L}{C_0} = 1 - e^{-\frac{wS}{Q}}$$

$$C_L = C_0 e^{-\frac{wS}{Q}} \quad S = 2hL, Q = vhd$$

Where: C_0 is concentration of PM in canal inlet and C_L is concentration of PM in canal outlet.

CONCLUSION

Air purification in modern environmental conditions is very important. When it comes to the industrial process, air purification devices play an important role in air purification. As a result, new air filtration technologies have been developed to improve filtration efficiency itself. In order to purify the air, and thus protect health, special attention should be paid to which type of filter should be chosen depending on the production process.

The technical solution of a filter plant depends primarily on the pollutant that is dominant in the technological process, and then on the flow of air that is filtered, the desired outlet purity of air, etc.

The problem that arises in the exploitation of the filter plant in technological processes in which the flow of "dirty" air is large, and in which large amounts of powdery substances - suspended particles are generated, is that a large amount of powdery substances quickly stick to the filter bags. to perform the function of purification, whereby there is an increase in resistance to air movement and congestion of the filter itself.

The best solution for regulating this problem proved to be the previously mentioned filters: electrostatic filters, bag filters, HEPA filters and jet - pulse filters, which showed that they have the highest efficiency in the technological process for purifying polluted air and air quality management.

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