

## Dust filtration – how does it works?

### Discover more about dust filtration and collection alternative technologies and their working principles

We want to start this series of articles in order to better understand what are the plants for emissions abatement.

First you need to know that there are different types of abatement systems, in particular:

- dust suppression
- oil mist abatement
- abatement of VOC and abatement of VIC

In the past articles, we have already dealt with what are dust, oil mist and VOCs.

Today we would like to start understanding which equipment is needed in order to achieve the desired effect, that is, dust filtration and collection.

To do this, we would like to try to answer these questions:

- what does it means reduce dust?
- through which systems can you achieve dust removal?
- how do the different systems work?

### What is the menaing of “dust filtration”?



To answer our question, we can simply say that dust suppression does not mean anything other than remove, with the highest possible rate, dust from an air stream. In productions is quite normal “produce” dust, just think of the powder mixing plant, the processing of stones and marble for building or on woodworking processes that are known to release in the environment small or large particles, usually very troublesome for operators and people working within these areas. There are several tools to avoid filling up the work zone of dust. Just think of the application of exhaust hoods placed in the sensitive points of the production, whether fixed or mobile, and

similar systems in order to preserve the health of the operators.

But once these powders are sucked and conveyed, what do you do? Do you want to risk to “throw them out” smearing maybe neighbors with our dust? So, we try to answer to our second question:

## Which technologies are used to achieve dust control and collection? With which results?

To avoid smearing neighbors with our dust, perhaps avoiding a quarrel and finally go to court, you can install systems that initially allow to tear them down, then recover and maybe reuse them in some way within the production.

Let us think, for example, to recover dust by a mixer ... these could be reused in the production cycle minimizing waste.

In some cases, however, they can be sold as a waste product to someone for which can be the raw material.

But back to us ... the systems used for dust removal are different and their choice mainly depends on a few factors:

- air flow rate to be treated
- temperature
- humidity
- dust concentration
- dust particle size
- nature of the dust, and then type of production

With these simple data, Tecnosida® is able to study the best system for your needs of dust collection.

There are several filtration systems each of which has its strengths and typical defects of their physical conformation mainly linked to the principle of operation. Below is a list of applicable systems:

- Cyclones
- Multicyclones
- Bag / cartridges filters
- Cell filters
- ESP
- Venturi Scrubber

Now we see a little more in detail how they work, then we answer to our third question

## How do the different systems work?

### Cyclones

The cyclones principle of operation is based on the physical principle of the centrifugal force. The cyclone is simply constructed of two concentric cylinders. The external one usually ends in cone. The inside one conveys the treated effluent to the exit. This conformation, joined at the tangential entrance, allows the effluent to be purified, to create a spiraling motion in the part left free between the two cylinders. The gas is then forced by the geometry of the system out of the

inner cylinder once it has made a series of vortices around this. This centrifugal movement, together with the force of gravity, allows the heavier particles to fall toward the bottom of the system where they are retrieved.

## Multicyclones

The multicyclones in filtration systems are machines for the filtration of dust compounds built by more cyclones in order to increase the removal efficiency, even for smaller particles than those treatable with a simple cyclone.

The principle of operation is identical to that of the cyclone, of which the multi-cyclone is made with N systems.

Tecnosida® has developed a proprietary technology for these systems, putting them in his multicyclone system called Turbovortex®

## Bag and cartridges filters



The bag or cartridges filters are systems that, instead of exploiting laws of physics such as centrifugal force, utilize a filter media to purify the air and retain polluting particles.

We clarify immediately that the filter medium is the element that actively performs the filtration. It is chosen depending on the type and quality of filtration required. There are many variations of papers, non-woven fabrics, wire mesh rather than ceramic.

The particles then are deposited on the surface of the medium and, thanks to a suitable cleaning system of the same, the dust is collected within the collecting hoppers placed in the lower part of the filter.

The cleaning system allows in this way to maintain the filter always efficient and, at the same time, it facilitates the recovery of the powder in the lower part of the filter.

The yields of these machines are higher compared to cyclones because the filter medium allows to treat particles in the order of microns and it is thanks to the choice of the medium and its type and characteristics such as its size, material, detailed surface treatments that can make it possible to confer specificity in order to realize the filter closely related to the ecological and economic needs of the customer. Tecnosida® has infused all its experience in DUSTDOWN® filters, whether bags or cartridges.

The choice between bags and cartridges is a dilemma that only a good expert that assesses the nature of the pollutants and the nature of the powders can unravel. Read the article about strengths and weaknesses of the two filters media and criteria for the choice.

## Cell filters

The filtration systems in cells are also equipped with filtering means which are interposed between the dirty and the clean area.

Usually the dirty area is one in which the effluent enters the filter, while the clean one is downstream of the cells.

As you can see from the picture on the right, these filters are modular. In fact it can be interposed more filtering cells, with unique physical characteristics and made of different materials, so as to achieve the treatment of complex waste stream.

In this type of machines can be inserted, thanks to particular cells, also activated carbons to filter even small concentrations of VOCs or special coalescing cells to filter low presence of oil mists.

These filters can treat a broad spectrum of substances, but the same must be present with a rather low degree of concentration.

## ESP

**Electro Static Filters** is the meaning of the above acronym.

They exploit an induced potential difference between two electrodes (emission and collection) so as to capture the contaminating particles prior to the treated waste stream to flow to the stack.

In practice the difference of induced potential between the two electrodes, generates an electric field that ionizes the area around the electrodes. These ions charged positively or negatively polluting particles so that they are attracted by the electrodes by removing them from the stream.

Once so captured particles may be removed from the electrode with a dry or wet cleaning system.

## Venturi Scrubber

The abatement systems called **venturi scrubber** are purification systems of the stream that use liquid to purify the effluent. All this happens in a wet scrubber called precisely **Venturi**. The scrubber venturi exploits a particular geometry, the venturi tube precisely, where inside its throat the liquid and air are closely in contact. This contact allows the polluting particles to flow towards the liquid.

Once past the throat, in the next zone of enlargement pollutants they can no longer go to the effluent and remain trapped in the liquid.

