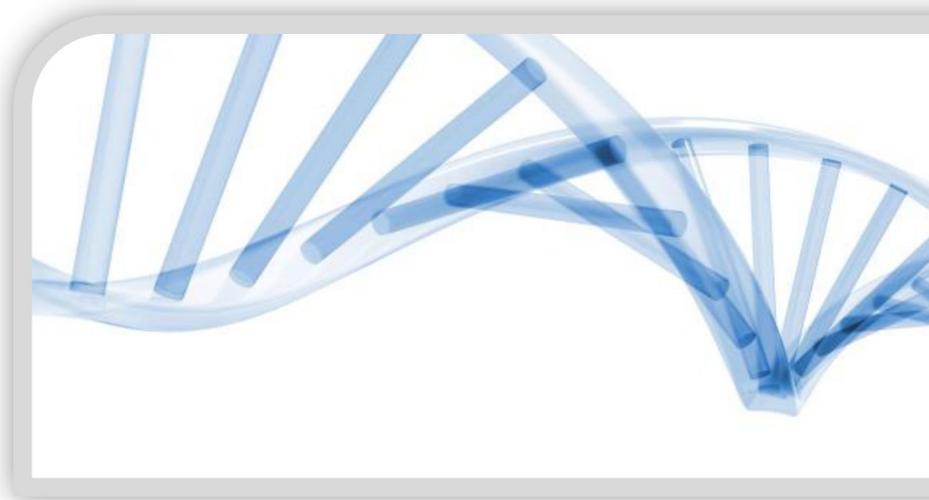


# PREINVEL TECHNOLOGICAL INNOVATIONS



## Environmental Dust Collector

Preinvel Ltd  
Viale Ionio n. 3  
Zona Industriale  
74023 - Grottaglie (TA)  
Italy

[info@preinvel.com](mailto:info@preinvel.com)

## Introduction

Manufacturing scenarios like industrial steel mills, cement plants and blast furnaces are source of significant level of particulate matter responsible for environmental contamination with dangerous consequences on the human health.

Unfortunately, in most of those contexts, still the technology to filter out the particulate from the air is outdated and expensive.

Environmental innovations are focused on designing dust and particulate collectors for industrial application providing an adequate level of abatement of the pollutant agents in the air with reasonable installation and operative costs.

PREINVEL dust collectors are the result of an innovative research project to remove pollutant agents from the air with high efficiency, on micro and nanoscale, at low cost without relying on expensive mechanical or chemical filters.



The system is a revolutionary “*dust and particulates industrial filter without filters*” and pretends to be one of the key environmental control technologies of the future designed to support the manufacturing industry processes in cleaning the air from pollution, improve the quality of our environment with important positive effects on social scale and human health.



**Contents**

Introduction..... 1

Contents..... 2

Particulate matter..... 3

Air Pollution Control Technologies.....3

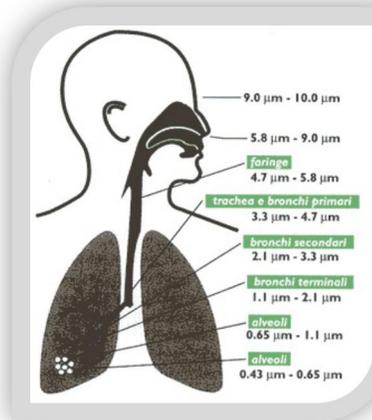
PREINVEL Technology..... 5

Contact Details..... 6

## Particulate matter

Particulates are minute portion of matter suspended in the Earth's atmosphere, in solid or liquid state. Various industrial processes can generate significant amounts of particular matter with known impacts on climate and human health.

The main problem is still the elimination of the so-called ultrafine particles of smaller than 5 micron which represent a serious danger to human and environmental health. In particular the anhydrides, the monoxide and nitrogen dioxides are irritating to the respiratory systems in humans causing asthma, bronchitis and respiratory infections. Furthermore, the same particulate, especially the ultrafine, can also convey pollutants in the lungs and blood streams causing permanent DNA mutations, cancer and premature death.



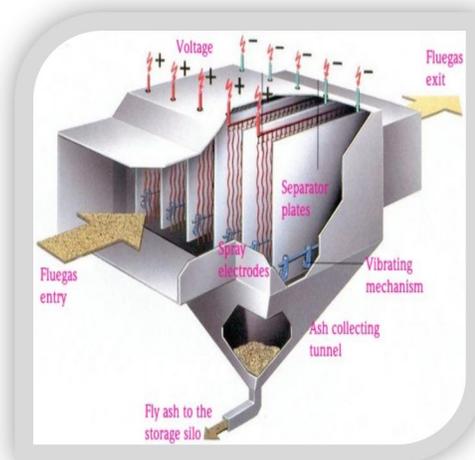
Most often contaminating sites support the development of local and regional economies creating jobs and new infrastructures however exposing people living in the surrounding areas to higher risk of health issues. The importance of air filters with adequate levels of pollutants abatement is crucial to join the divergences between economic interests and environmental issues.

## Air Pollution Control Technologies

The particulate material is constituted by the ash entrained in the flue gas flow. In the particulate matter they are found different components of heavy metals that could be toxic or highly poisoning.

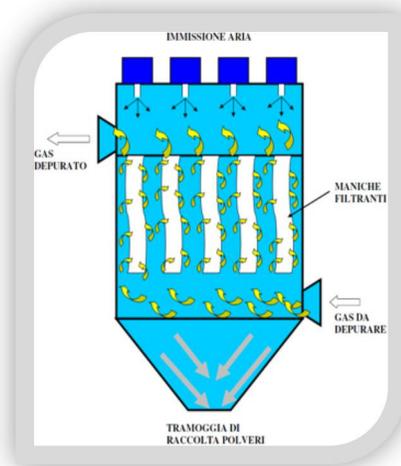
Dust collectors are used to enhance the quality of air released from industrial and commercial processes by collecting dust and other impurities from air or gas. They can remove sub-micrometer-size particulates from the air filtering fumes and smoke. There are mainly four types of industrial dust collectors:

*Electrostatic precipitators* use electrostatic forces to separate dust particles. Particulates in the gas stream first are charged and then collected by means of electrodes. The performance of this system may vary depending on process and electrical conditions. Particles with high resistivity are difficult to charge and to collect on the discharging electrode. Particles with low resistivity are difficult to collect because they are easily charged and rapidly lose their charge on arrival at the collection electrode. The particles take on the charge of the collection electrode, bounce off the plates, and become re-entrained in the gas stream.



Resistivity is function of the temperature and the electrodes have to be cleaned constantly. Electrostatic precipitators are complex, expensive dust collectors, with efficiency highly dependent on particle properties and process environment and require constant maintenance to keep the system in its operational conditions.

*Fabric filters*, also known as baghouses, use bag filters to separate dust particulates from dusty gases. They are efficient and cost effective types of dust collectors designed to handle high volume dust loads but also they have several limitations. They can operate only in certain range of temperature to avoid the damage to the bags. Filters have to be constantly cleaned to keep low the resistance of the air flow (pressure drop) across the baghouse. They cannot be used for to filter acid particles. They cannot collect ultra-fine particles because reducing the pore size of the bags will increase both the pressure drop and the temperature within the system with serious impact on its overall performance and functionality.



The sleeve filters are widely used in almost all industrial processes but they suffer from considerable limitations because of their principle of operation based in retaining the powder particles by means of micro perforated mesh, as a vacuum cleaner for all purposes. The meshes retain the dust particles, while the air passes through the appropriate pinholes. However through the pinholes can pass the filtered air but also the polluting particles which size is smaller than the mesh pores. Hence the sleeve filters only work well with particles above 10 microns but have important efficiency limitations in process microscopic dust.

*Cyclone dust collectors* use cyclonic action to separate dust particles from the gas stream. The centrifugal force created by the circular flow throws the dust particles toward the wall of the cyclone and, after striking the wall, these particles fall into a hopper located underneath. They are simple in design and can be manufactured from almost any material however they cannot be use as primary dust collectors, due to their large space requirements and low efficiency.

*Wet scrubbers* use water, or other liquids, that comes into contact with a gas stream containing dust particles. The liquid encapsulates the dust particles and the gases are cleaned through a mist eliminator. Greater contact of the gas and liquid streams yields higher dust removal efficiency. They can handle high temperatures, remove both gases and particulate matters and neutralize corrosive gasses but have corrosion problems, have high power requirements and difficult management of the contaminated water disposal.

Recently plasma incinerators have been proposed for washing and drying of the fumes (see system described by the patent KR20020044845, or with systems as described by the WO2009087100 patent, WO8800610A1, WO0006289) but none of them can efficiently achieve the purification of the fumes with contained costs of installation and management.

In summary, current dust collector technologies suffer heavily periodic maintenance problems for cleaning and replacement of many components, are very often inefficient and they cannot eliminate ultrafine dust particles with a percentage that never exceeds 40%.

In addition, many of these systems are not compatible with high temperatures and humidity (fabric filters) or have they have reduced particulate filtration efficiencies (traditional cyclones) or are dependent on the electrical characteristics of the particles (electrostatic filters) or have corrosion and contaminated liquid disposal problems (wet scrubbers).

## PREINVEL Dust Collector

PREINVEL have researched, developed and prototyped an innovative dust collector for industrial application to tackle the limitations of the current technologies. The project was driven by two main goals:

***high efficiency in filtering both dust and ultrafine particulates  
at lower costs.***

The system has been designed to create internal areas with different values of pressure and use the pressure gradient to convey dust and micro particulates in defined collection points for disposal. The important innovation is that the industrial filter requires only an aspirator to pull in the contaminated fumes and push out from the system the filtered air. It is not a cyclonic separator and there are neither filter bags to obstruct the air flow or electrodes. Particulate motion is driven only by pressure gradient and almost all the energy from the system aspirator is used for driving the particulate matter in collection points, different for dust and fine particles.

The system process can work at high temperatures, any humidity level, handle corrosive particles and it is totally independent by particle properties.

There are no obstructions in the air flow hence no associated risk to create any resistance in the air stream that could compromise the functionality of the entire system, as it may happen in the fabric filters with pollutants obstructing the pores of the filter bags.

The filter does not require to be cleaned constantly to preserve the operational conditions and maximize the efficiency of the process.

The overall system is relatively simple hence low probability of failure and considerably low maintenance and operative costs compared to the other dust collectors currently available in the market.

## Contact Details

---



Chief Executive  
**Dr PhD Angelo di Noi**  
*mobile: +39/328 231 2816*  
*email: [info@preinvel.com](mailto:info@preinvel.com)*

*Head Office:*  
*Viale Jonio n.3*  
*74023 –GROTTAGLIE(TA)*  
*ITALY*

---

---

---

---