Industrial Dust Collector (Dedusting System) What is a Bag Filter (Industrial Dust Collector)?

An industrial dust collector, commonly referred to as a bag filter, is a system designed to capture and remove particulate matter and dust suspended in exhaust gases. This is achieved through fabric or felt filter media that traps the particles. Bag filters are widely used across various industries such as steel manufacturing, cement plants, asphalt production, hot rolling mills, and others.

Types of Industrial Dust Collection Systems

- Shaking-type dust collector
- Reverse air dust collector
- Pulse jet dust collector
- Sonic dust collector
- Cartridge-type dust collector

Technical Specifications

The technical specifications of an industrial dust collection system include a filter unit equipped with fabric or felt bags designed to capture and retain airborne dust particles. Depending on the application, the number of bags may range from 3 to 10 or even more. The filter media used in bag filters can withstand temperatures up to 120°C, and with advanced materials such as polyimide or fiberglass, they can be customized to endure temperatures up to 260°C. Additionally, bag filters can be integrated with PLC-based control systems for automated operation.

Technical Specifications of Bag Filter Materials in Industrial Dust Collection Systems

Bag filters used in dust collection systems can be manufactured and supplied in various materials, including polyester, Nomex, and others. While polyester filter bags are commonly used in most dust collectors, the selection of filter material can be tailored to the specific physical and chemical properties of the pollutants present in the target industry. Accordingly, a system with suitable material composition can be chosen to meet industrial requirements.

The table below presents the technical specifications of bag filters made from different materials:

Type	Polyester	Polypropylene	Nomex	Polyamide	Acrylic	Teflon (PTFE)
Continuous Operating Temperature	135°C	90°C	205°C	245°C	121°C	260°C
Maximum Tolerable Temperature	150°C	100°C	220°C	260°C	135°C	280°C
Biological Resistance	Null	Great	Null		Very Good	Very Good
Alkali Resistance	Weak		Good	Weak		
Resistance to Mineral Acids	Very Weak		Weak	Very Good		
Resistance to Organic Acids	Weak		Very Weak			
Resistance to Oxidizing Agents	Good		Weak			
Resistance to Organic Solvents	Good		Great			

Introduction to Types of Industrial Dust Collectors

Industrial dust collectors capture solid particles present in the incoming air using their bag filters. Over time, a layer of dust accumulates on the surface of these bags. Various methods are employed to clean the bag filters from dust particles, and based on these cleaning mechanisms, different classifications of dust collectors have been established.

Mechanical Shaking Dust Collector

In this type of dust collector, the filter bags are attached to a metal plate that is horizontally shaken by a motor. This motion causes the bags to shake, dislodging the dust, which then exits through the open bottom section. The cleaning efficiency of mechanical shaking dust collectors depends on several factors, including the material and design of the bags, the nature of the dust particles, and the amplitude and frequency of the shaking motion.

Due to the relatively low air-to-cloth ratio in mechanical shaking systems, larger filter surfaces and more space are required to achieve effective cleaning.

Reverse Air Industrial Dust Collector

In the reverse air method, the dust collector's filter bags are attached at one end to a metal rod and suspended at the other. As contaminated air enters the bags, airborne particles accumulate on their surface. Subsequently, clean air is introduced in reverse direction, causing the bags to collapse and deform, which results in the dust layer detaching from the inner walls. Similar to mechanical shaking systems, reverse air dust collectors require considerable space for installation.

Sonic Industrial Dust Collector

The sonic dust collector operates by generating low-frequency sound waves through an acoustic blower, which causes the filter bags to vibrate. These vibrations dislodge accumulated dust from the bags. This method is less commonly used and is typically combined with other cleaning techniques to enhance performance.

Cartridge Industrial Dust Collector

In this type of dust collector, the filters are pleated and mounted on a wire frame. This configuration increases the filtration surface area, allowing for greater dust capture. Cartridge dust collectors are available in two models: single-cartridge and alternating. In the single-cartridge model, the cartridge must be removed and cleaned after dust accumulation. In the alternating model, the system integrates pulse jet cleaning, enabling filter cleaning without the need for cartridge removal.

Operating Principle of Industrial Dust Collectors

Contaminated air or gas is drawn into the dust collector via a suction fan and directed toward the bag filters. Dust particles and airborne contaminants are trapped on the surface of the filter bags, forming a layer over time. At designated intervals, this layer is removed using various cleaning methods such as mechanical shaking, reverse

air, or pulse jet compressed air. Clean air then passes through the bags and exits the system, while the separated dust particles are collected in the bag filter hopper.

Key Considerations for Purchasing a Bag Filter or Selecting a Dust Collector

- Assessing the suitability of the equipment for the intended industry and installation site
- Evaluating the dust collector's capability to capture particles of various shapes, sizes, and volumes
- Reviewing the system's resistance to toxic dust or chemically reactive particulates
- Ensuring the filter bags can withstand high temperatures or humidity levels
- Verifying the fabric's air permeability performance
- Paying attention to the dimensions of the dust collector and the auxiliary equipment required for installation
- Considering installation, maintenance, and repair costs
- Examining build quality, filter bag material, suction efficiency, and compliance with relevant standards

Installation and Commissioning of the Dust Collector

The installation and commissioning of a bag filter dust collector may take several months depending on its type and dimensions. During installation, it is essential to ensure the following points are properly addressed to guarantee correct setup and facilitate future maintenance:

- Ensuring easy access to all parts of the equipment
- Checking for leakage in seams, welds, and other joints
- Verifying correct installation of filter bags according to the manufacturer's instructions
- Aligning moving components and balancing fans to prevent excessive vibration
- Regulating suction flow by installing a damper in front of the fan
- Using localized heaters or impact devices on hopper surfaces in humid conditions to prevent condensation
- Installing dust collection and transfer systems such as rotary valves and screw conveyors to avoid excessive dust accumulation in the hopper, which may lead to pressure drop, filter clogging, and other operational issues

Applications of Industrial Dust Collectors

Bag filter dust collectors are utilized in any industry that requires the collection of dust and pollutants generated during production processes. The following are examples of industries and factories where the installation of bag filters is essential:

- Asphalt plants
- Mineral processing facilities
- Chemical manufacturing plants
- Cement factories
- Iron and metal melting furnaces
- Pharmaceutical production facilities
- Food industries

Advantages of Industrial Dust Collection Systems

In addition to capturing pollutants and mitigating environmental hazards, dust collectors offer numerous benefits to various industries. Below are some of the key advantages of these systems:

- Pollution control and preservation of environmental health
- Increased profitability in precious mineral processing plants (e.g., gold) by capturing fine mineral particles along with dust
- Enhanced operational efficiency and productivity
- Capability to separate various types of particles
- Relatively easy to operate