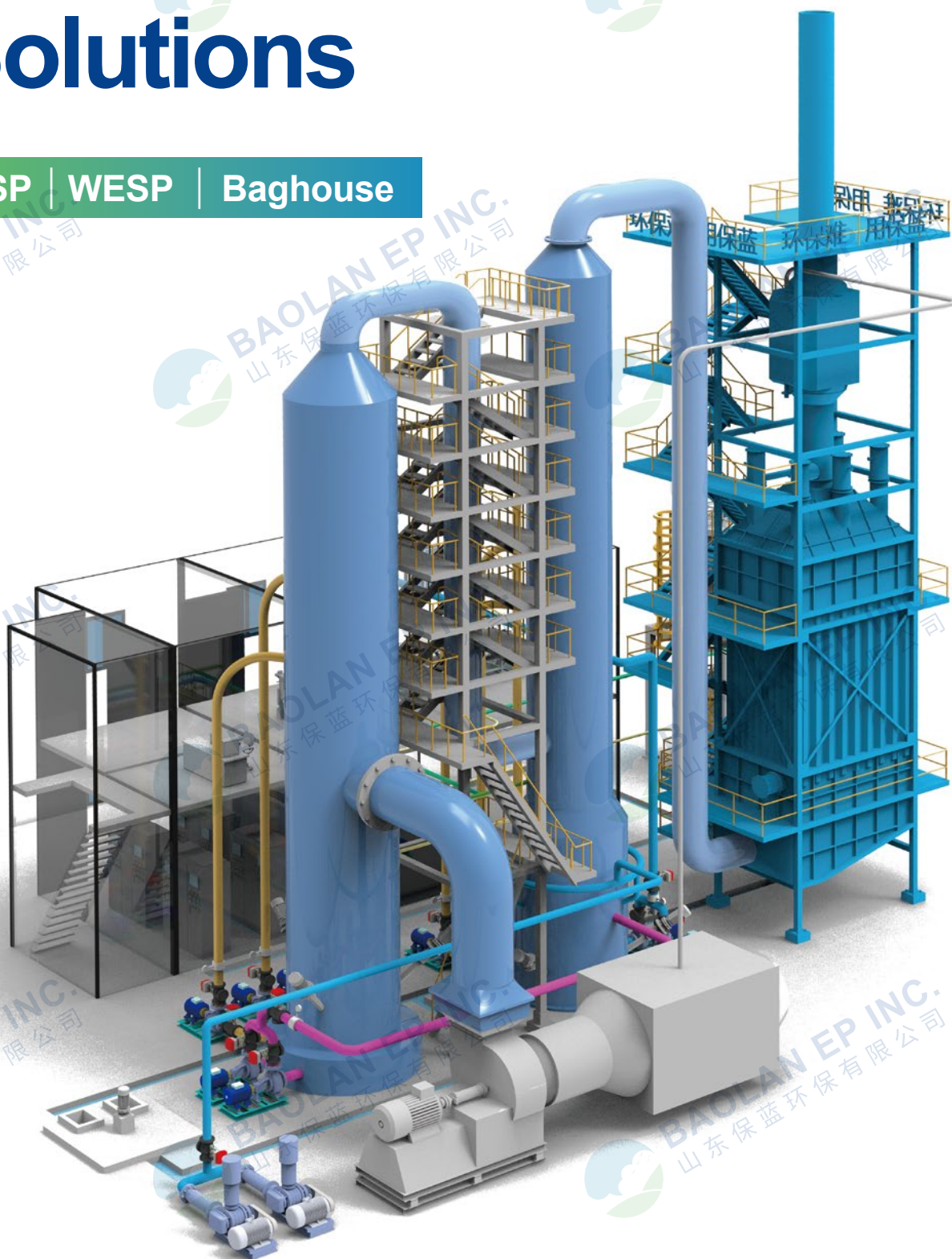


Particulate Matter Solutions

ESP | WESP | Baghouse



Electrostatic Precipitator



Wet Electrostatic Precipitator



Wet Electrostatic Precipitator



Baghouse Dust Collector



ESP

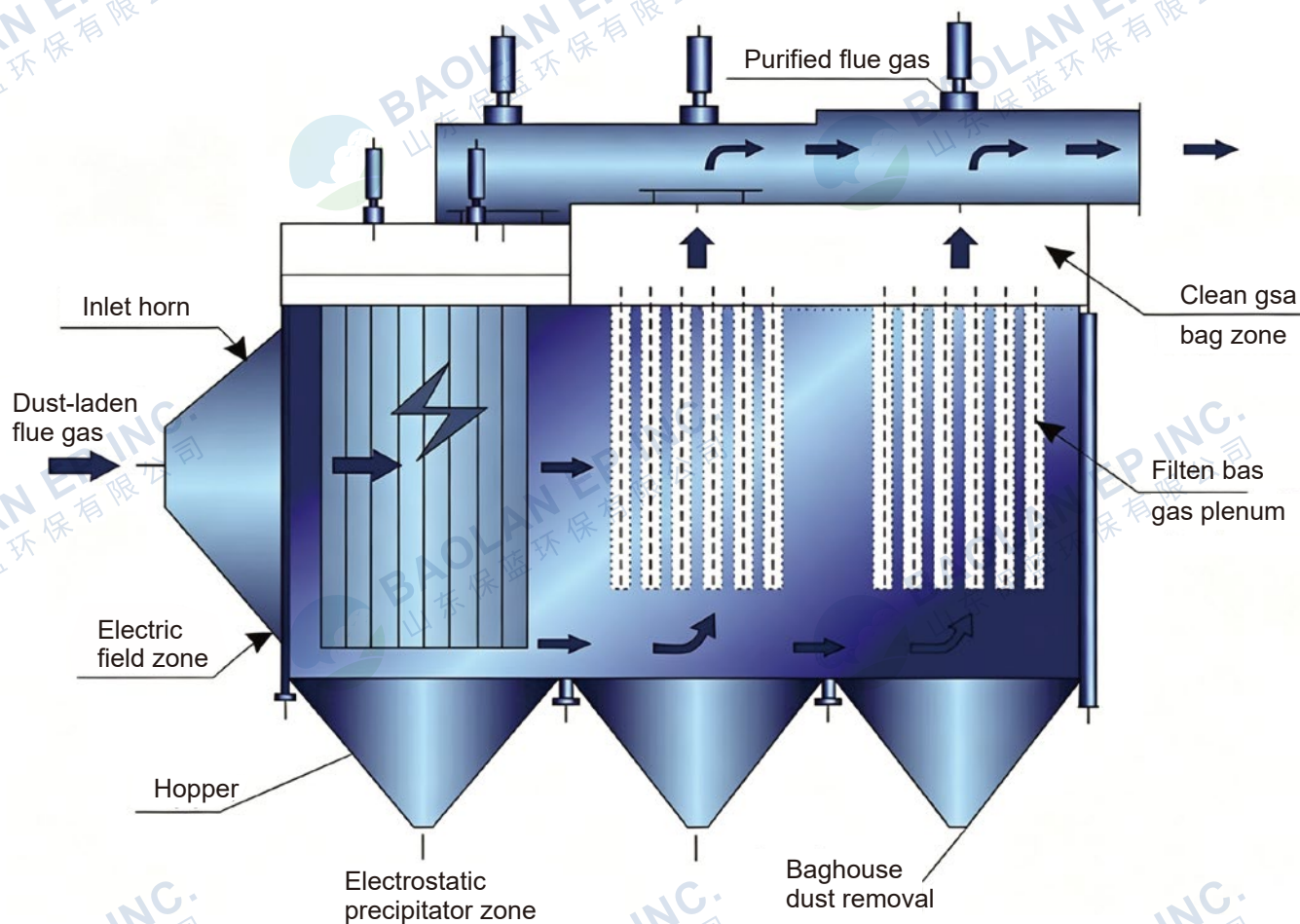
Particulate Matters

Overview

Electrostatic Precipitator (ESP) is a high-efficiency industrial air pollution control device widely used for flue gas dedusting and particulate removal. Different from fabric filtration equipment, it adopts electrostatic adsorption technology to separate fine dust and suspended particles from industrial exhaust gas, serving as a core environmental protection facility for industrial clean production.

The main components of an ESP include discharge electrodes, collecting plates, high-voltage power supply system, ash hoppers, rapping devices and an automatic control system. During operation, the high-voltage electric field ionizes the passing dust-laden flue gas, making the dust particles charged. The charged particles are driven by electric force to adhere to the grounded metal collecting plates. After accumulating a certain thickness of dust layer, the mechanical rapping system regularly shakes the plates to peel off the dust, which falls into the bottom ash hopper for centralized collection and discharge, while the purified clean gas is discharged into the atmosphere.

Electrostatic precipitators feature outstanding advantages such as ultra-low resistance loss, large air volume processing capacity and stable long-term operation. It can efficiently capture fine particulate matter including PM2.5, with a dust removal efficiency up to 99% and above. The equipment is well adaptable to high-temperature, high-humidity and high-dust-concentration flue gas working conditions, and supports continuous 24-hour industrial operation with low energy consumption and minimal wear of core components.



ESP

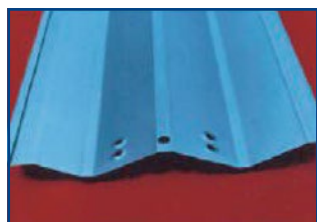
Particulate Matters

Working Principle

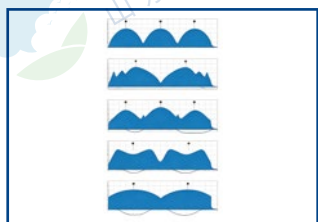
Electrostatic precipitator is a kind of dust removal device which is used to separate particles from gasstream by using electrostatic force (Coulomb force). It is one of the most efficient dust removal equipments in the world and is ideal for purifying exhaust gas during the production. Two electrodes, a discharging electrode (cathode) and a collection electrode (anode), help to complete the function of gas purification. When the two electrodes are charged with high direct current, an electric field will be created. Under the field strength gasstream is ionized and ions together with anions appear. At the same time, it charges the suspended particles, causing them to move toward the opposite electrodes and stick to the collection plates. Accumulated particles are removed from the collection plates at periodic intervals by rapping. The dust falls to the base of the ESP where hoppers hold the removed particles for disposal. Then purified fumes and exhaust gas are expelled into the atmosphere through a chimney. Thus the purifying process is completed.

Internal Structure

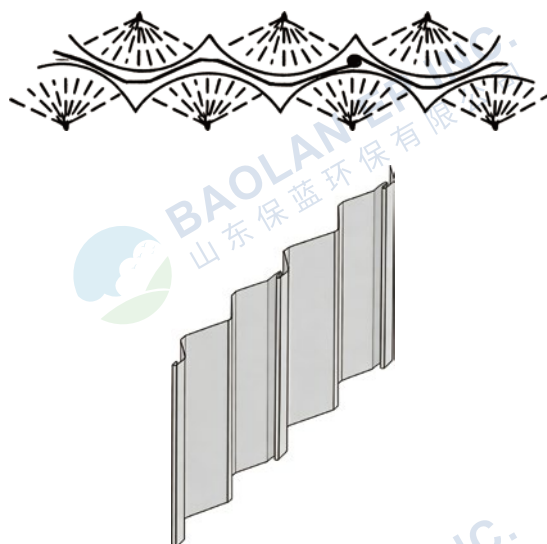
Collecting Electrode: ZT24 electrode is adopted, having the following features: Very good discharging performance, uniform current density, 10% higher in effective dust collecting area compared with others under the same space dimension.



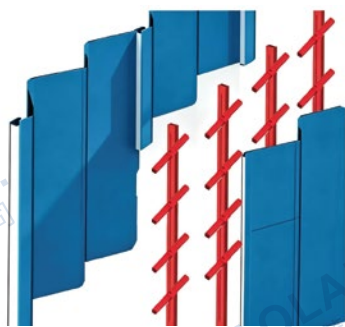
Collecting Electrode



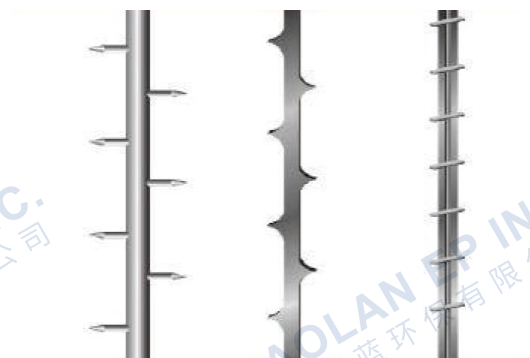
Comparison of current distribution of different types of collecting electrode



Discharge Electrode: Different electrode type can be used as per the gas conditions, adapted for very good discharging performance, solidity, endurance and non-breakability.



Reasonable matching of CE & DE



Different type of discharging electrode

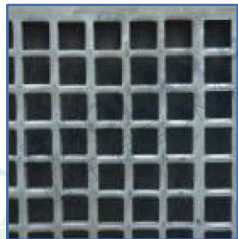
ESP

Particulate Matters

Distribution: X type, square hole type and round hole type, featuring high perforation rate, unifor flow andlong service life.



X type screen



Square hole type screen

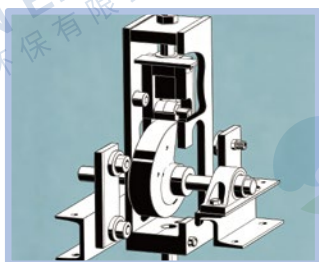


Round hoele type screen

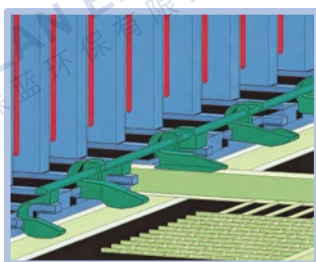


Loure damper type screen

Rapping and Dust Cleaning Device : Top Cam Lifting Mechanism or Internal Vertical Driving Device is used asRapping Drive for discharge electrode. The rmpping is continuous aud relinble and stable in operation, Side drivingrevolving-arm hammer method for rapping is used for the collecting electrode.



DE Rapping Driving Set



CE Rapping



DE Rapping



DE Rapping Driving Set



Rapping Hammer



Rapping Hammer



DE Rapping



Rapping Anvil



Rapping Anvil

WESP

Particulate Matters

Overview

WESP, short for Wet Electrostatic Precipitator, is an advanced flue gas deep purification equipment widely applied in industrial ultra-low emission systems. Different from dry electrostatic precipitators, WESP adopts a water-film washing cleaning method and is specially designed for treating high-humidity flue gas containing fine dust, PM2.5, acid mist, tar, aerosol and heavy metal pollutants.

The working principle of WESP consists of three core procedures. Firstly, high-voltage corona discharge ionizes the flue gas, enabling fine pollutants to be charged rapidly. Secondly, the charged particles migrate to the anode collecting plates or tube walls under Coulomb force and are captured on the electrode surface. Finally, continuous or intermittent spraying water forms a uniform flowing water film to wash all captured pollutants into the wastewater collection tank. This water-washing mode eliminates mechanical rapping and thoroughly prevents secondary dust re-entrainment, achieving stable and efficient purification performance.

WESP is mainly divided into horizontal plate type and vertical tubular type. The horizontal plate-type WESP features simple structure and convenient maintenance, which is commonly used for large thermal power units. The vertical tubular WESP has higher purification efficiency, smaller floor area and better adaptability, and has become the mainstream type for steel, coking, chemical industry, waste incineration and other industrial scenarios.



WESP

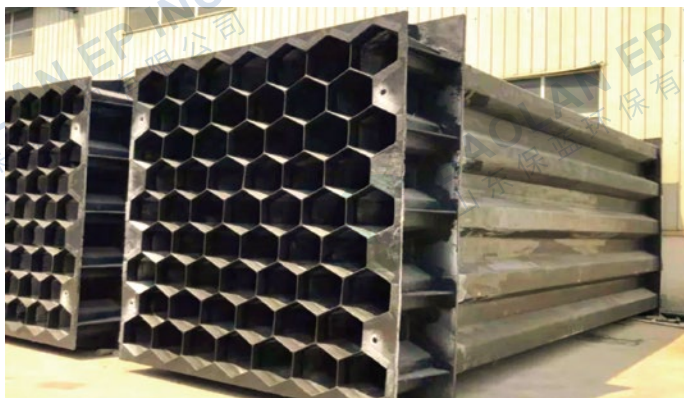
Particulate Matters

Working Principle

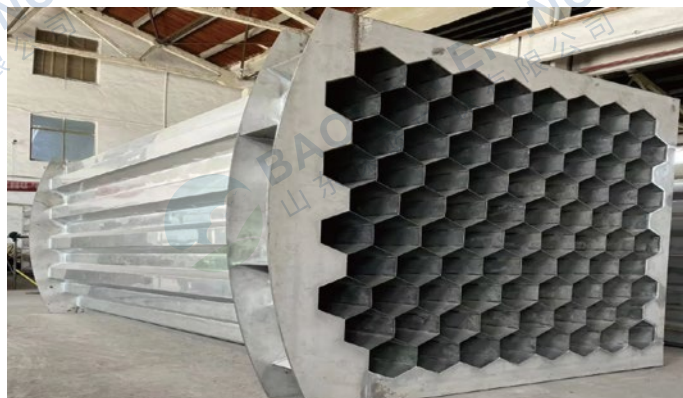
The principle of wet electrostatic dust removal technology is to apply tens of thousands of volts of DC high voltage between the anode tube and the cathode wire. Under the action of a strong electric field, the gas between the positive and negative electrodes is fully ionized, generating a large number of electrons and ions. During their movement toward the electrodes under the electric field force, they collide with dust particles in the flue gas and charge them. The charged dust particles are separated from the airflow and move toward the anode tube under the electric field force. When the charged dust reaches the electrode plate and electrode wire, it is adsorbed onto the electrode tube due to electrostatic force, and finally flows into the slurry zone by gravity. The wet electrostatic dust removal system requires a washing system to wash the electrode tubes and electrode wires during startup, shutdown, and continuous operation of the wet electrostatic dust removal.

Internal Structure

Anode tube: Made of conductive fiberglass honeycomb type or 2205 material honeycomb type, with the following characteristics: good electrical conductivity, strong corrosion resistance, a large number of tubes arranged per unit cross-section, and a large effective dust collection area.



Conductive Glass Anode Tube



Stainless Steel Anode Tube

Cathode wire: According to flue gas conditions, lead-antimony alloy barbed wire, 2205 stainless steel barbed wire, or tubular barbed wire can be selected. The matched cathode wire has advantages such as good discharge performance, durability, and no breakage.



Lead-antimony alloy barbs line



2205 Stainless Steel Barbed Wire

WESP

Particulate Matters

Internal Structure

Distribution Screen: X type, square hole type and round hole type, featuring high perforation rate, uniform flow and long service life.



X type screen



Square hole type screen



Round hole type screen

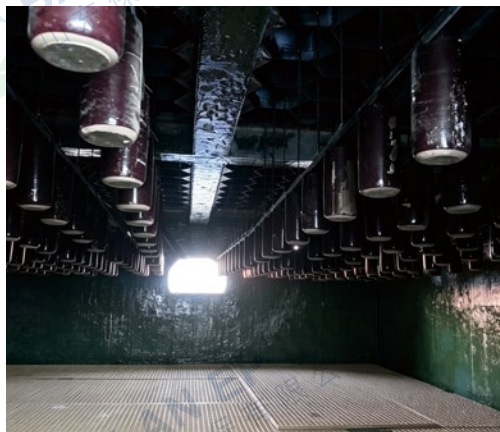
Insulator Box and Tensioning Device: A key subsystem integrating high-voltage insulation, mechanical support, environmental sealing, and tension adjustment.

Insulator Box: The high-voltage "isolation barrier" and "protective umbrella," ensuring the safe introduction of high voltage into humid environments.

Tensioning Device: The "backbone" of the cathode system, ensuring its stability, straightness, and tension.



Insulator Box



Hammer



Insulator



Bushing



High-frequency power supply

Baghouse

Particulate Matters

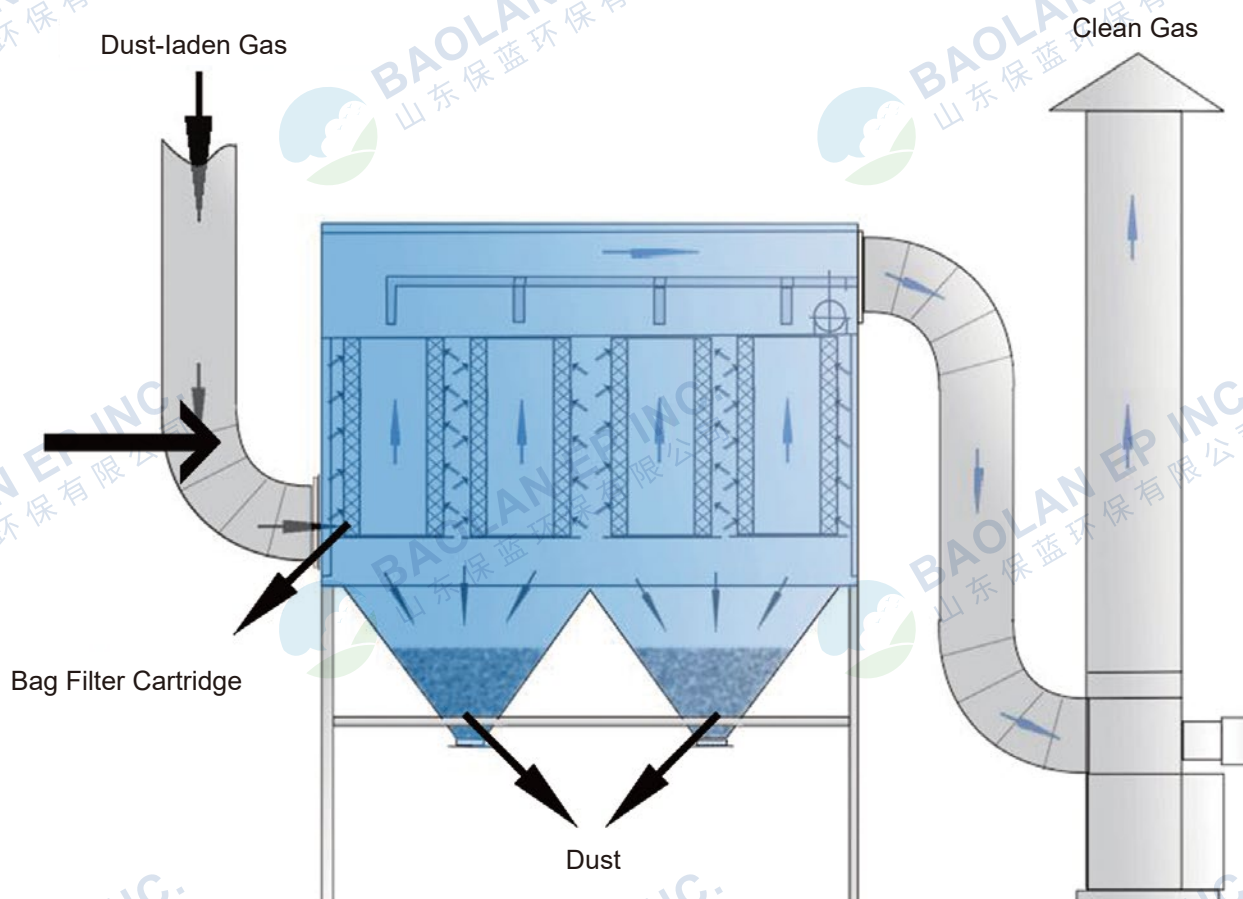
Overview

A baghouse dust collector, also known as a fabric filter, is one of the most efficient and widely used industrial dust removal devices for flue gas purification and particulate pollution control. It is designed to capture fine dust, smoke, and solid particles from industrial exhaust air to meet environmental emission standards.

The equipment consists of a sealed metal housing, filter bags, a pulse cleaning system, an ash hopper, and an automatic control unit. Dust-laden gas enters the collector, and coarse dust settles down by gravity. Fine particles are trapped on the outer surface of the filter bags while clean air penetrates through the fabric and is discharged out of the system. As dust accumulates on the bag surface, a periodic pulse jet cleaning system automatically blows off the dust layer, ensuring stable airflow and continuous operation.

Baghouse dust collectors achieve extremely high dust removal efficiency of over 99.9%, especially for fine particulate matter such as PM_{2.5}. With optional filter media including polyester, PPS, Nomex, fiberglass and PTFE, the equipment can adapt to different working conditions, including normal temperature, high temperature, corrosive and sticky flue gas.

Thanks to its reliable performance, simple structure, low maintenance cost and stable emission effect, the baghouse dust collector is widely applied in cement plants, thermal power plants, steel mills, chemical factories, waste incineration plants, asphalt stations and mining industries. It is an essential environmental protection device for industrial air pollution control and clean production.



Baghouse

Particulate Matters

Working Principle

A baghouse dust collector is a high-efficiency dry dust removal device that uses fiber filter bags to capture dust. Its core principle is a cyclic process of physical filtration and pulse cleaning: dust-laden gas enters the dust collector from the lower part and passes through a baffle into the ash hopper. Due to the collision with the baffle and the reduction of gas velocity, coarse dust particles fall into the ash hopper, while the remaining fine dust particles enter the filter bag chamber with the gas. Due to the inertia, diffusion, interception, and electrostatic effects of the filter material fibers and fabric, dust is retained on the outer surface of the filter bags. The purified gas escapes outside the bags and is discharged through the exhaust pipe. The dust accumulated on the filter bags can also be removed by a pulse jet airflow method to achieve cleaning, and the removed dust is discharged by the ash removal device. The high dust removal efficiency of the baghouse dust collector is closely related to the performance of the filter material. The quality and performance of the filter material directly affect the performance and service life of the baghouse dust collector. Filter material is the main material used to make filter bags, and its performance and quality are important factors promoting the advancement of baghouse dust removal technology, directly influencing the application range and service life of the dust collector.

Internal Structure

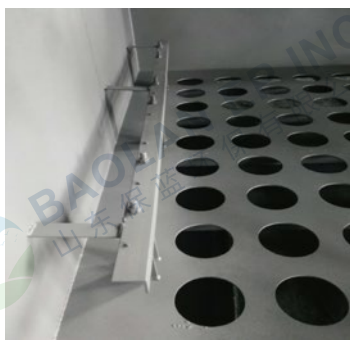
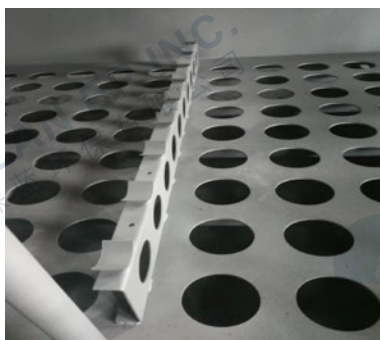


Plate: The plate is located at the upper part inside the dust collector body, serving as the boundary between the dust collector's fly ash settling chamber and the clean air chamber. A certain number of plate holes are opened on the plate to hang filter bags. The plate holes are arranged concentrically, with the specific number and size determined by the dust removal process. Each hole is circular. The plate surface is made of 5-8mm thick low carbon steel plate, manufactured by positioning processing on a CNC laser cutting machine. Using CNC laser cutting can minimize deformation during plate processing, and the processed plate holes have high and accurate positional accuracy. The cut surface after hole opening is smooth and flat, with an inner hole surface roughness of $Ra=12.5$, which can be finished in one step. The deviation from the theoretical position is less than $\pm 1\text{mm}$, and the center distance error between any two bag holes is within $\pm 2\text{mm}$. The inner edges of the holes are smooth and burr-free. The plate surface is smooth and flat without warping, unevenness, or other defects, with a flatness deviation of less than $\pm 2.5\text{mm}$.



PTFE filter bag



Polyester needle felt



M-HSGL filter media



PPS filter bag



Metal filter bag



Ceramic fiber filter tube

Filter bag: As the core component of the baghouse dust collector, the filter bag directly determines the performance of the baghouse dust collector. Whether the choice of filter material is appropriate will directly determine the performance and cost of the dust collector.

Baghouse

Particulate Matters



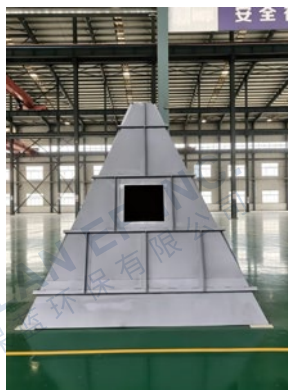
Bag cage: The bag cage is made of carbon steel treated with anti-corrosion. The material of the bag cage is #20 steel. The bag cage is designed to be lightweight and sturdy, with longitudinal ribs and support rings evenly distributed, using Ø4mm carbon steel longitudinal rib wires. The spacing between the support rings and rib wires is generally 200mm.

The bag cage is designed in three sections, making installation very easy. The three parts of the bag cage are connected by a simple internal locking device that requires no special tools. The upper part of the bag cage will connect to a 1.6mm thick carbon steel ring, which can lock the bag mouth of the filter bag onto the plate hole without tools. Even if maintenance personnel walk on the plate surface, no damage will occur.

The bag cage is produced on an automatic assembly line, with firm welds and no burrs, using reliable anti-corrosion processes to ensure the cage frame is wear-resistant and corrosion-resistant. After spot welding the filter bag frame, the weld points are smooth and burr-free. There is no damage to the filter bag at the connection between the plate and the bag cage. The bag cage is easy to assemble and disassemble, and has sufficient strength to prevent welds from coming off. After matching the cage frame with the filter bag and hanging it on the plate, the distribution is even. The maximum deviation of the distance between the bottoms of two adjacent filter bags is less than 40mm, avoiding ash bridging.



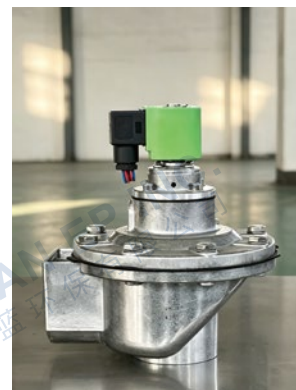
Air Header



Hopper



Rapper



Solenoid Valve

Cyclone Dust Collector

Particulate Matters

Overview

The cyclone dust collector is the most widely-used dry-type dust-removal equipment among mechanical dust collectors. It generates rotary motion of dust-laden gas flow, separates dust particles from the gas stream by centrifugal force and captures particles onto the wall of the collector. Dust then falls into the ash hopper under gravity for collection. Since its first industrial application in 1885, various structural configurations have been developed. Featuring simple structure, reliable operation and good adaptability to working conditions, it has become one of the fundamental equipment for industrial dust control.

Working Principle

The separation core of a cyclone dust collector is the centrifugal-force field. Under normal working conditions, the centrifugal force acting on particles can be 5-2500 times of gravity, and its separation efficiency is much higher than that of a gravity settling chamber. The internal gas-flow movement consists of three core parts:

Outer vortex (downward spiral flow): Dust-laden gas enters the cylinder tangentially through the inlet at an optimum velocity of 12-20 m/s and performs a downward spiral motion along the inner cylinder wall, which is known as the outer vortex. During rotation, dust particles with density far higher than gas obtain centrifugal acceleration, gradually move away from the rotation center, finally strike the wall to lose kinetic energy, slide down along the wall and fall into the ash hopper via the cone section.

Inner vortex (upward spiral flow): When the outer vortex travels down to the bottom of the cone, it converges toward the center due to cross-section contraction. It then reverses direction and flows upward with the same rotating sense to form a bottom-to-top spiral airflow (inner vortex). Eventually the purified gas is discharged through the exhaust pipe. The inner vortex forms a low-pressure core zone and serves as the main outlet passage for cleaned gas.

Top vortex (top circulating flow): A small fraction of inlet gas forms a local upward vortex along the outer wall of the exhaust pipe at the top of the cylinder. This vortex carries part of fine dust particles and will reduce the overall efficiency if these particles cannot be effectively separated. The bypass-type cyclone dust collector is an improved structure designed to solve this problem.

Internal Structure

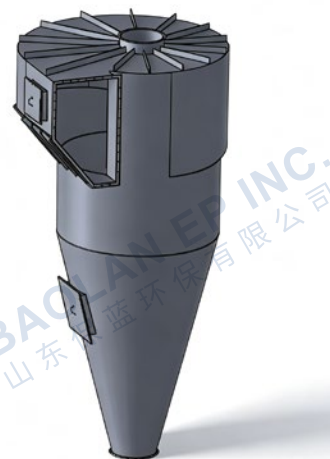
Air Inlet: It serves as the flow-guiding passage for incoming gas. The main-stream adopts a tangential design, which converts linear airflow into rotating airflow along the cylinder wall.

Cylinder: The main cylindrical section, which is the primary space where airflow forms stable rotary motion. Dust particles initially acquire centrifugal force here and start migrating toward the equipment wall.

Cone: An inverted-cone structure connected below the cylinder with a conventional cone angle of 7° - 8° . As the cross-section shrinks, the airflow gains rotational acceleration and the centrifugal force keeps increasing. This is the core zone for dust separation; meanwhile, it guides dust adhering to the wall to slide down into the ash hopper.

Exhaust Pipe: It is inserted into the cylinder from the top of the dust collector for discharging purified gas. Its diameter and insertion depth are critical parameters. Normally, the ratio of exhaust-pipe diameter to cylinder diameter ranges from 0.4 to 0.5, and the insertion depth shall be greater than the height of air inlet to prevent dust from short-circuiting and being discharged without separation.

Ash Hopper and Dust Discharge Device: Located beneath the cone for storing separated dust. Dust is discharged periodically or continuously via rotary airlock valves, slide gate valves and other components. The ash hopper must maintain good sealing. Air leakage will cause re-entrainment of dust and significantly reduce dust-removal efficiency.





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