

High-efficiency and low-cost dust collection technology and device

High Efficiency and low cost Cyclone dust technology and dust



Patent title Cyclone dust collection device and dust collection method using dust collection device
Patent application No. KR 10-2018-0148163 (2018.11.27) / 10-2142306 (2020.08.03)

Inventor Korea Institute of Energy Research / Park Hyun-seol and three more
Authority status Registered

Patent title Filter dust collection device including high performance dust removal device, and operation method thereof
Patent application No. KR 10-2012-0048457 (2012.05.08) / 10-1385115 (2014.04.14)

Inventor Korea Institute of Energy Research / Park Hyun-seol, Choi Ho-kyeong
Authority status Registered

Technicality

Technology overview

A high-efficiency and low-cost dust collection technology is a hybrid dust collection technology obtained by combining a low pressure loss cyclone technology and a filter dust collection technology using a high-performance dust extraction device. The technology has stable operating characteristics, excellent dust collection efficiency, and lowered facility/operation costs. The low pressure loss cyclone is horizontally arranged and has a slit/double wall structure which can lower air resistance, and thus the cyclone is space-efficient. A high-performance filter regeneration technology of a filter dust collection device enables stable dust removal even with low air pressure, and also enables dramatical reduction of dust emission.

Development background and problem to be solved

- A cyclone for removing relatively large dust particles has a simple structure and low facility costs, but a high pressure loss increases operating costs and is vulnerable to dust abrasion.
- Since most of the total amount of discharged dust is discharged by a filter dust collector during a dust removal process of dusting off dust collected on a filter surface, a new concept of a high-performance dust extraction technology is needed to dramatically reduce the dust concentration.

Excellence and discrimination of technology

Excellence of technology

- The technology is a dust collection technology for minimizing the pollution of fine dust discharged by industries.
- The technology is a high-efficiency dust collection technology with a dust discharge concentration of 1 mg/m^3 or less (dust collection efficiency of 99.99% or greater).
- The technology is a low-cost dust collection technology in which high-efficiency dust collection performance is maintained and facility costs are lowered.
- By applying a high-performance dust extraction technology, the dust emission concentration is reduced to a 1/10 level compared to an existing dust collector, and the filter life is improved by two times or more.

Discrimination of technology

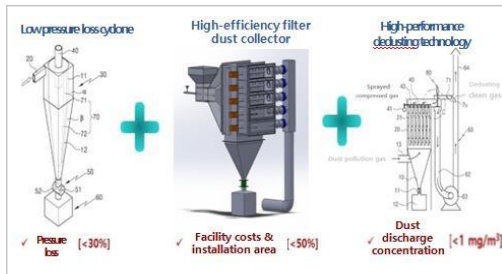
- A high-performance dust extraction technology is applied to simultaneously achieve stable dust removal of a filter dust collection device and epochal dust emission reduction.
- Due to the slit/double wall structure inside a cyclone, a pressure loss is greatly reduced to 30-40%.
- The dedusting efficiency is greatly improved by performing dedusting while allowing a clean gas discharged through a filter to flow into a filter bag. Thus, since a filter with a length of 15 m can also be applied, an installation area can be reduced by 50%, and facility costs can be reduced by 30%. In particular, the dust discharge concentration can be reduced to a 1/10 level compared to an existing technology.
- Since a significant amount of dust flows into a filter dust collector through a low pressure loss cyclone, a dust load on a filter is reduced, and thus the dust removal cycle and filter life increase.

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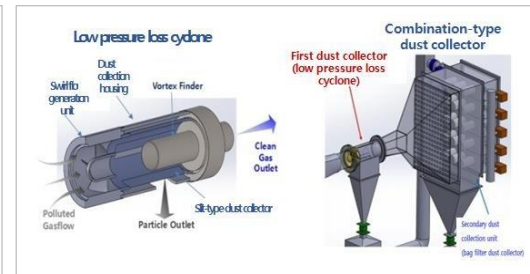
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Implementation method

- A high-efficiency and low-cost dust collection technology of the present invention is a combination-type dust collection device obtained by combining a low pressure loss cyclone and a filter dust collection technology using a high-performance dedusting device. Operating characteristics are stable. Dust collection efficiency is excellent. Also, facility/operation costs are lowered.
- Since a significant amount of dust injected by a low pressure loss cyclone is removed and then introduced into a filter dust collector, a dust load on a filter is greatly reduced. Thus, the dusting cycle is extended, and the life of the filter increases.
- By concentration is reduced to a 1/10 level compared to an existing dust collector.



Picture 1 Configuration of a high-efficiency and low-cost dust collection technology



Picture 2 High-efficiency and low-cost combination-type dust collection device

Degree of technology completion (TRL)

Degree of technology completion: TRL5 (implementation environment application experiment stage)

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Technical principle presentation	Technology concept setting	Technology concept verification	Lab Scale prototype development	Implementation environment application experiment	Full Scale prototype development	Quasi-commercial product development	Commercial product development	Commercial product implementation

Utilization

Utilization field and applied product

Utilization field

- Industrial fields such as power generation, steelmaking, cement, and incinerators
- Air pollution prevention facilities, textile facilities manufacturing facilities, and the like



Picture 1 Waste incineration facility

Applied product

- Cement and limestone plants
- Pharmaceutical factories, a powder transfer process
- A polishing process, a sand removal process
- Other dust generating business sites



Picture 2 Filter dust collection device

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Technology trend

- As interests in the air environment, such as fine dust issues and severe smog in the city, increases, a process technology for achieving a clean air environment has become very important. Depending on the characteristics of the process of thermal power plants, cement and steel mills, and oil refineries that emit air pollutants on a large scale, dust and nitrogen oxide removal processes are required.
- Large corporations such as Hyundai Heavy Industries, Doosan Heavy Industries & Construction, Samsung Heavy Industries, POSCO ICT, and KC Cottrell are taking the lead in building large-scale material processing facilities such as thermal power plants and steel mills. Aerix and J-Tech has succeeded in securing domestic technologies and entering the global market.
- Among the atmospheric environment facilities, Japanese companies such as Mitsubishi Heavy Industries, Hitachi Construction Machinery, Kawasaki Heavy Industries, and Chiyoda Engineering had high technological competitiveness in the world, but Chinese companies are growing rapidly.
- In particular, the emission standards for air pollution prevention facilities in the industry have been gradually tightened. Thus, with the development of a technology for reducing installation spaces and costs, POSCO ICT, Aerix, J-Tech, and the like have improved dust collection efficiency and operation rates with dust collection systems composed of cyclones and bag filters.

Family patent status

Application nation	Application No. (Application date) / Registration No.	Title of the invention
KOR	KR 10-2018-0148163 (2018.11.27) / 10-2142306 (2020.08.03)	Cyclone dust collector and dust collection method using same
KOR	PCT / KR 2018 / 014733 (2018.11.27)	Cyclone dust collector and dust collection method using same

Market prospect

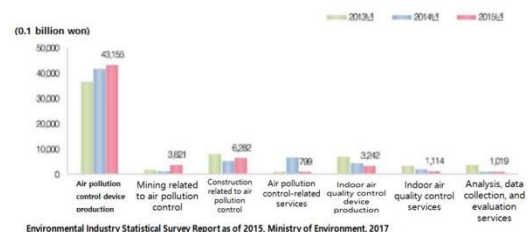
Target market size and prospect

The global air pollution prevention facility market size is expected to grow from USD 6.7 billion in 2016 to USD 8.7 billion in 2021, growing at an annual rate of 5.2%. The growth is being developed mainly with flue gas desulfurization facilities, denitrification facilities, and electric dust collectors for dust collection and bag filters. The domestic market in the air management industry is expected to grow from KRW 6.2 billion in 2016 to KRW 8 billion in 2021. The facility manufacturing and construction industry market accounts for 89% (about KRW 5 trillion) and is expected to lead the domestic market in the future.

(Unit : million dollars, %)

Division	2016	2017	2018	2019	2020	2021	CAGR	
Air pollution prevention facility	Desulfurization facility	18,613	19,562	20,560	21,608	22,710	23,868	5.1
	Electrostatic precipitator	13,769	14,443	15,151	15,893	16,672	17,489	4.9
	Denitrification facility	14,168	15,060	16,009	17,018	18,090	19,230	6.3
	Bag filter	12,957	13,644	14,367	15,128	15,930	16,774	5.3
	Scrubber	4,619	4,817	5,024	5,240	5,466	5,701	4.3
	Others	3,295	3,394	3,496	3,601	3,709	3,820	3.0
	Total	67,420	70,921	74,607	78,489	82,577	86,883	5.2

Table World market size by types of air pollution prevention equipment
 <Data: SME_Technology Roadmap (2018-2020)_Energy >



Picture Sales in the domestic air management industry
 <Data: SME_Technology Roadmap (2018-2020)_Energy >

Technology transfer query

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Technology transfer process

