



KC Cottrell

**Global Leader
in Green Technology**

- People & Technology keeping our planet sustainable...

KC Cottrell: Leading development of green technology for global environment and energy

Following its foundation in 1973 as a company specializing in air pollution control technologies, KC Cottrell has delivered numerous successful projects which have led them to become the leading environmental company and to be the most trusted by its clients. KC Cottrell has taken a leap into the global market and the new and renewable energy equipment supply business as a globally leading company.

TECHNOLOGIES FOR
A SUSTAINABLE FUTURE



HISTORY OF CHALLENGES
FOR THE FUTURE



The challenges of innovation and creation continue

The history of KC Cottrell is a history of challenge and innovation. Founded in 1973 and starting with the domestic Boryeong thermal dust collection systems, KC Cottrell has successfully executed the Dangjin thermal FGD project and other projects around the globe to gain the trust of consumers. The challenges for KC Cottrell, which has grown to become a prominent company as the 'leader of the global environment business,' continue today.



FOUNDATION

Nov 1973
Chairman Talwoo, Lee Founded Korea Cottrell Industrial Co Ltd (The first environmental company in Korea)

Sep 1979
Established Fabrication Workshop in Incheon

Nov 1990
Renamed to Korea Cottrell Co Ltd

Nov 1994
Listed the Korea Exchange as the first environment related company

Dec 1998
Relocated and Expanded Fabrication Workshop in Anseong (KCMS)

Mar 2009
Renamed to KC Cottrell Co Ltd

Jan 2010
Split with holding company (KC Greenholdings Co Ltd)

GEOGRAPHICAL DIVERSIFICATION

Oct 1990
Taiwan branch Foundation

June 2002
Changchun KC Envirotech Co Ltd (Changchun, China)

July 2004
Beijing Representative office

Mar 2005
Acquired Lodge Sturtevant and renamed Lodge Cottrell Ltd (Birmingham, UK)

June 2006
Lodge Cottrell Inc Foundation (Houston, USA, merged by Nol-Tec Systems Inc. in 2015)

Jan 2009
KC Cottrell Vietnam Co Ltd Foundation (Hanoi Vietnam)

KC Cottrell India Pvt Ltd Foundation (Delhi, India)

Aug 2010
Acquired Nol Tec Systems Inc (Minnesota, US)

Mar 2012
KC Cottrell Taiwan Co Ltd Foundation (Taipei, Taiwan)

July 2015
KC Energy Technology Co Ltd Foundation (Beijing, China)

Mar 2014
KC Africa Pty Ltd Foundation

GROWTH - DUST COLLECTION TO TOTAL SOLUTION PROVIDER

July 1983
Contract signed with Korea Electric Power Company for 500MW Boryeong Thermal Power Plant ESP (Electrostatic Precipitator)

Apr 1996
Contract signed with Korea Electric Power Corporation for 500MW Dangjin Thermal Power Plant FGD (Flue Gas Desulfurization) Project

July 1997
Contract signed with POSCO for Gwangyang Steel Works Blast Furnace ESP Project

June 2003
Contract signed with Korea East-West Power Co Ltd for Dangjin Thermal Power Station AHS (Ash Handling System) Project

May 2005
Contract signed with POSCO for Gwangyang Steel Works Sinter Plant FGCS (Flue Gas Cleaning System) Project

Aug 2011
Contract signed with KOSEP for Yeongheung thermal power plant (870MW x 2) No.5-6 FGD/ESP/LHS Project

Nov 2012 ~ Oct 2013
Contract signed with Korea Southern Power Co Ltd for SamCheok Green Power (1000MW x 2) ESP/AHS (One of the largest CFB Boilers in the world)

July 2017
Contract signed with Hyundai Rotem for Hyundai steel Dangjin Sinter Plant #1~3 FGCS Project

Sep 2018
Gangneung An-in Thermal Power Plant FGD Project

CHALLENGE - EXPANDING OVERSEAS

June 1992
Contract signed with Taiwan Power Company for Shenao Thermal Power Station ESP Project in Taiwan

Feb 1998
Contract signed with IHI (Ishikawajima-Harima Heavy Industry Co Ltd) for Nippon Steel Co Ltd Kamaisi Power Plant ESP Project in Japan

Jan 2009
Contract signed with Taiwan Power Company for Hsinta Power No.1~2 Retrofit of FGD, ESP, AHS PJT in Taiwan

Sep. 2010
Contract signed with Doosan Heavy Industry for Ghenco Power Plant AHS Project in Thailand

Feb. 2011
Awarding a contract for Gres1 Ekibastuz ESP Project in Kazakhstan

Sep. 2011
Awarding a contract for Krakatau Steel Making Plant Bag Filter Project in Indonesia

Jul. 2013
Contract signed with Hyundai heavy industry for Jeddah South Thermal Power Plant AHS Project in Saudi Arabia

Sep. 2015
Contract signed with Celikler Seyitomer Elektrik Uretim A.S. for FGD Project in Turkey

July 2016
Contract signed with OJSC Power Machine Ltd. for Long Phu 1 Thermal Power Plant ESP/FGD Project in Vietnam

Nov 2018
Contract signed with NTPC for DSI system in India

TAKEOFF - DIVERSIFYING INTO NEW AND RENEWABLE ENERGY AND NEW BUSINESS

Nov 2006
Contract signed with Korea South East Power Co Ltd for 1MW Youngheung Solar Power Station

July 2012
Contract signed with Renault Samsung Motors for 20MWp Solar Power System in Busan, Korea

Nov 2015
Contract signed with Changwon Enertech for Project of Industrial Waste treatment, Incineration, SRF Manufacturing, Steam supply and 2.75MW Power Plant

Apr 2018
Contract signed with Ngodwana Energy for EPC project of 25MW Biomass to Energy Plant in South Africa

From Oct 2018
Contract signed for RTO systems

From Dec 2018
Contract signed for EGCS (De-Sox system for marine engine)





TOTAL SOLUTION PROVIDER

The experts of an environmental system that offers the optimal solution



KC Cottrell has responded to the various demands of customers and has become a trusted environmental company. From the provision of flue gas cleaning systems to Korea's representative steel company, POSCO, KC Cottrell has grown to supply dust collecting and desulfurization equipment for large-scale power plants throughout the world and become recognised for its environmental protection expertise and know-how. As an example the company now provides solutions to various projects in Turkey and South Africa.

In addition to the supply of highly reliable and efficient dust collecting equipment with a customer-focussed plan to satisfy their demands, KC Cottrell has become recognised for its experience and expertise in various fields of the environmental industry including the new renewable energy field that offers clean energy which helps reduce global warming through innovative solutions. These range from the management of ash-handling systems, design and commissioning, offering a clean working environment at many power plants with an ash-handling (or gas-cleaning) system which has been certified for its superior performance and design to produce the optimal economic solution.

Air Quality Control Systems

> Particulate Removal System

- Dry Electrostatic Precipitator
- Wet Electrostatic Precipitator
- Bag Filter
- Ash Handling System
- Tunnel ESP
- Hybrid Module Type Precipitator

> Gas Treatment System

- Wet Flue Gas Desulfurization
- Semi Dry/GSA
- SCR/SNCR
- VOCs Control System
- Exhaust Gas Cleaning System (For Marine)

Retrofit & Maintenance

- Air Quality Control System Retrofit
- Technical Service
- Feasibility Study

Manufacturing Services

- Dampers
- Steel Work

New & Renewable Energy

- Solar Power System
- Biomass & Waste to Energy

KC Cottrell 

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GLOBAL LEADING TECHNOLOGIES
WITH LOCAL SERVICES AND SUPPORTS

**We guarantee world-class
technology and services through
KC networks worldwide.**

From the forefront of environmental preservation, KC Cottrell has pioneered the domestic environmental industry. Our company has over 30 affiliates in four business sectors: environmental engineering, environmental services, environmentally friendly manufacturing, and renewable energy.

Our goal is to achieve customer satisfaction with precise design and perfect construction. To this effect, we create synergy by efficiently sharing and spreading the technological, human and material resources possessed by each of our affiliates.

In addition, we also provide thorough risk management including safety management and project management combined with smooth collaboration.

To reciprocate our customers' trust, at KC Cottrell, we bring together the capabilities of environmental experts in each field to offer you excellent environmental facilities technology, services and systems.



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EXPANDING OUR TERRITORY IN THE WORLD

Environmental Engineering

- KC Cottrell Co Ltd
- Changchun KC Envirotech Co Ltd
- KC Energy Technology Co Ltd
- KC Cottrell Taiwan Co Ltd
- KC Cottrell Vietnam Co Ltd
- KC Cottrell India Pvt Ltd
- KC Cottrell Engineering Services Pvt Ltd
- Lodge Cottrell Ltd
- KC Africa (Proprietary) Limited
- KC VCS Co Ltd
- KC Envirotech E&C(Fushun) Co Ltd
- NOL-TEC Systems Inc
- NOL-TEC Korea Co Ltd
- NOL-TEC Systems (China) Co Ltd
- KC Air Filtertech Co Ltd
- KC Thermal Co Ltd
- Yuyang Technologies Co Ltd
- NWL Pacific Co Ltd

Environmental Services

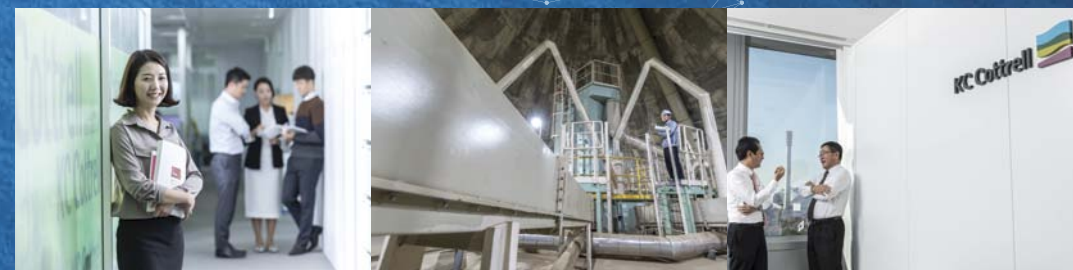
- KC EnviroServices Co Ltd
- Seoul Business Division
- Changwon Business Division
- Yeosu Business Division (Hwachi Factory)
- Changwon Eneritech Co Ltd
- KC Green Material Co Ltd
- KC Landfill Service Co Ltd
- KC Enviro Construction Co Ltd
- KC Eco Logistics Co Ltd

Environmental Manufacturing

- KC Glass & Materials Co Ltd
- KC Envirotech E&C(Fushun) Co Ltd
- Clestra Hauserman SA

Renewable Energy

- KC Solar Energy Co Ltd



Expanding into the global market with quality and technical competitiveness

With the founding of the Taiwan Branch Office in 1990, KC Cottrell took its first step into the global market to operate 15 branch offices and corporations in Asia, North America, and Europe for efficient entry into the overseas market.

KC Cottrell has constructed a global network to speedily respond to the demands of the global market by establishing CCKC Envirotech Co Ltd in Changchun, China in 2002 and acquiring Lodge Sturtevant Limited in the United Kingdom in 2005.

KC Cottrell will continuously strive to offer total environmental solutions swiftly to customers throughout the world.



Leading the evolution of technology
for global value and future happiness

Our futures are guaranteed when we protect the environment and maintain the clean Earth.
KC Cottrell will focus its whole capacity on developing state of the art technologies
for environmental improvements for future generations.
KC Cottrell will help create a path of life that links nature with humanity
and a path of coexistence that links humanity with industry.

GREEN TECHNOLOGIES,
GREENER PLANET



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Air Quality Control Systems

> Particulate Removal System

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- Dampers
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- Solar Power System
- Biomass & Waste to Energy



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Particulate Removal Systems

Dry Electrostatic Precipitator

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For decades we provide State-of-the-Art Technologies in Electrostatic Precipitation Equipments for the power generation, oil & gas and heavy industries. KC Cottrell Electrostatic Precipitators are designed to meet with high reliability and the highest standards for the more and more stringent environmental regulations.

Process

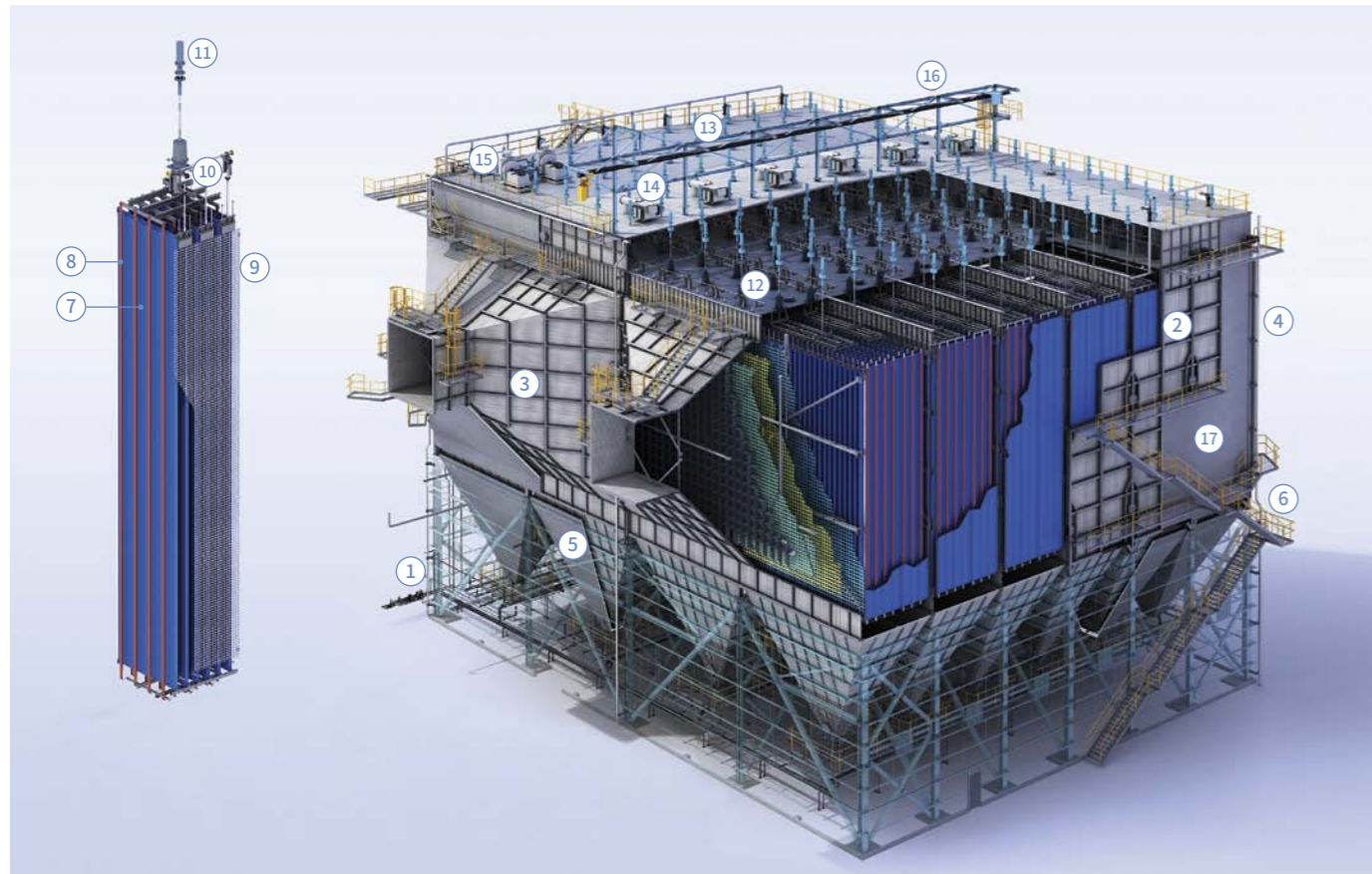
- The gasses pass through an ionized zone created by DC high voltage applied to the discharge electrodes.
- The particles present in the gas are electrically charged and migrate towards the collecting plates.
- Collected particles agglomerate on the collecting plates and are dislodged by efficient rapping system.
- The particles are finally collected in the hoppers.

Advantages

- Optimum design for power generation, cement, steel, petrochemical and heavy industry
- More than 600 references
- Collecting Electrode providing ideal gas flow to minimize re-entrainment
- Discharge Electrode with high durability and high efficient electrical characteristics
- Electromagnetic (Magnetic Impulse) and Mechanical (Hammer) rapping system
- State-of-the-Art energization systems

Part Name

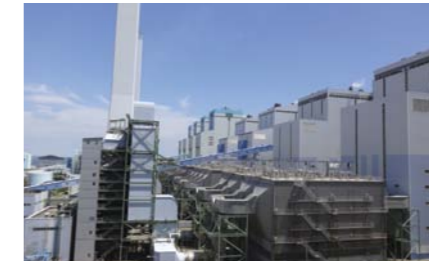
- | | | |
|----------------------|------------------------------|---------------------------|
| 1. Support Structure | 7. Collecting Electrode(C.E) | 13. Penthouse Roof |
| 2. Casing | 8. Discharge Electrode(D.E) | 14. Transformer Rectifier |
| 3. Inlet Nozzle | 9. Perforated Plate | 15. Purge Air System |
| 4. Outlet Nozzle | 10. C.E Rapper | 16. Monorail Hoist |
| 5. Hopper | 11. D.E Rapper | 17. Insulation & Lagging |
| 6. Access Walkway | 12. Hot Roof | |



ESP 3-D VIEW

References : Power Generation

- Dangjin Thermal Power Plant No.9~10 1,000MW X 2, Korea (2016)
- Samcheok Green Thermal Power Plant No.1~2 1,000MW X 2, Korea (2017)
- Pagbilao Thermal Power Plant No.3 420MW X 1, Philippines (2018)
- NTPC Meja Thermal Power Plant 660MW X2, India (2019)
- Long Phu 1 Thermal Power Plant 600MW X 2, Vietnam (2019)
- Shinseocheon Thermal Power Plant No.1~2 1,000MW X 1, Korea (2019)



Dangjin Thermal Power Plant



Samcheok Green Thermal Power Plant



NTPC Meja Thermal Power Plant



Taean Thermal Power Plant

Iron & Steel

- SNNC Gwangyang Fe-Ni Plant No.2, Korea (2006)
- POSCO Gwangyang Steel Mill, Steel Making No.4, Korea (2013)
- POSCO Gwangyang Steel Mill, Sinter Plant No.2, Korea (2015)



SNNC Gwangyang Fe-Ni Plant

Other Industries

- Yeongwol Plant Units 3, 5, Ssangyong Cement, Korea (2008)
- PT. Petrokimia Gresik, Indonesia (2010)
- Yeocheon Plant, GS Caltex, Korea (2012)
- UHV RFCCU Plant, Thailand (2013)
- UOP Plant, Iraq (2016)



UHV RFCCU Plant

Process

The process of the WESP is very similar to the Dry ESP with the major difference residing in the cleaning of the collecting plates. In a WESP the rapping system is replaced by a water spraying or irrigation system.

WESP is particular well proven technology for:

- Gas with high moisture content
- Gas with combustible particulate
- Gas with sticky particles
- Removes moisture droplets



Plate Type(Total 22 Units)



Honey Comb Type(Total 15 Units)

Advantages

- Well proven technology over 100 years
- Very efficient on sub-micron particles
- High Removal Efficiencies –up to 99%+
- Offers multi pollutant control
- Used on Mid-high sulfur coals with saturated flue gas
- Various Types & Configurations
- Low Pressure drop, minimum maintenance and small footprint

References

- POSCO, Korea
- Hatinh Hot Strip Mill, Vietnam (2017)
- Taichang/Dongguan Nine Dragon Paper, China (2019)



POSCO, Korea



Hatinh Hot Strip Mill



Taichang Nine Dragon Paper



Dongguan Nine Dragon Paper

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Particulate Removal Systems

Wet Electrostatic Precipitator

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A Wet Electrostatic Precipitator (WESP or Wet ESP) operates with saturated gas streams (100% relative humidity) or gas with condensates and/or condensable. WESPs are also commonly used to remove liquid droplets such as gas originating from industrial processes. We design and supply plate type and honeycomb type WESP.

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> Particulate Removal System

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- Dampers
- Steel Work

New & Renewable Energy

- Solar Power System
- Biomass & Waste to Energy

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Particulate
Removal
Systems

Bag Filter

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Fabric filters are used for a broad range of industries including steel, non-ferrous metal, cement, power generation, chemicals, lumber and incineration plants. The choice of filter technology and filter media used depends on the composition and temperature of gas being cleaned and the properties of the dust particles being removed.

Reverse Air Fabric Filter

- Suitable for large facilities
- Low air to cloth ratios
- Simple design with few moving parts
- Easy maintenance
- Compartment ventilation during maintenance

Pulse Jet Fabric Filter

- Wide variety of applications
- Bags are kept on the clean side, eliminating the need for ventilation during maintenance
- High air to cloth ratios
- 15m Long Bag test completed and 9.4m long bag in operation in Steel Plant

Cone Bag

A filter bag designed to increase the filtration area and to equalize the air pressure dispersion during exhausting by forming one conical bag in the empty space in the middle of the cylindrical filter bag.

As a result, it is possible to reduce the number of filter bags required, reducing the required area of the facility.

- Reduction of investment cost by reducing the body size
- Reduction of maintenance cost and investment cost by reducing pulsing air amount due to structure of cone bag
- Reduce installation area by reducing body size
- Installation of the additional bag filter for existing bag filter casing, maximum volume increasing the capacity by more than 60%, ex) 100m³/min → 164m³/min
- Improvement of filter area and clogging of existing BF without modification



Cone bag



Round bag



POSCO Gwangyang - 5 Coke

Pleated Bag Filter

- Large filtration area
- Maximum dust collection efficiency
- Compact design
- Operation of compressed air pressure less than 4.0 kg / cm²(The filtration speed is less than 1m / min.)



Pleated bag filter

References

- POSCO Gwangyang No.1~5 Flu Gas Cleaning Systems in Sinter Plant, Korea (2010)
- Krakatau POSCO Sinter Plant No.1, Indonesia (2014)
- Formosa Heavy Industries Corp., Hatinh Steel Plant Steel Making Plant No.6, Vietnam (2014)
- Asia Cement, Jecheon Plant, Korea (2015)
- POSCO E&C CSP Steel Plant Coke Plant No.1, Brazil (2016)
- POSCO Chemtech Gwangyang Lime Plant, Korea (2017)
- POSCO Pohang Cast House, Korea (2017)
- POSCO Pohang PCI, Korea (2017)
- Hyundai Steel No.1~3 Flu Gas Cleaning Systems in Sinter Plant, Korea (2020)



Krakatau POSCO Sinter Plant



POSCO E&C CSP Steel Plant Coke Plant

R&D

Bag filter test tower

Test tower installation and operation for improvement and optimization of bag filter.

- Filter Cloth Length, Type, Fabric Material
- Pulsing Valve Type
- Injector
- Interval with Blow Tube and Tube Sheet
- Pulse Jet Cleaning & Reverse Air Pulsing



Bag filter test tower

Bottom Ash Handling System

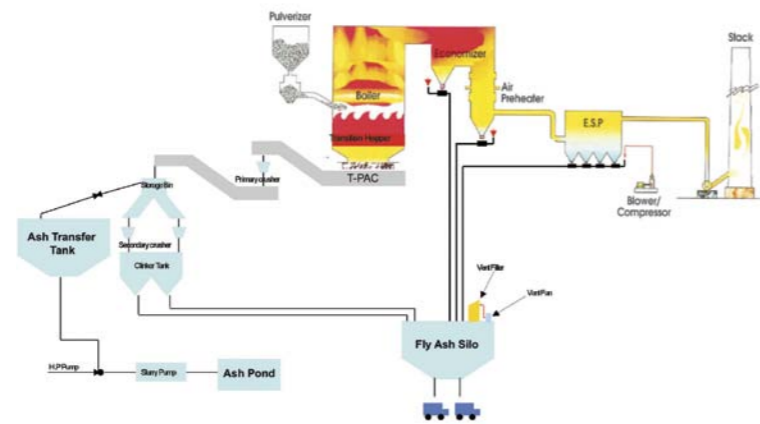
Slag and ash falling from the furnace are temporarily stored in the bottom ash silo. They are then sent to the ash pond using a hydro ejector. Alternatively, a submerged drag chain conveyor or dry ash extraction conveyor will transport bottom ash to bottom ash silo for ash recycling.

- Bottom Ash Hopper System utilizing Hydro-ejectors
- SDCC(Submerged Drag Chain Conveyor) System
- Dry Ash Extraction System
- Ash Water & Slurry System

Fly Ash Handling System

Conveying air from the blower or air compressor is used to transport ash to the ash silo via ash transport pipe line.

- Positive Pressurized Conveying System
 - Lean(Dilute) Phase System
 - Medium Phase System
 - Dense Phase System
- Negative Pressurized Conveying System(Vacuum System)
- Combination System
- Economizer & Air Preheater Ash handling System / Ash Disposal System



Ash Handling System Flow Diagram

References



Bottom & Fly AHS, Dangjin Thermal Power Plant

- Youngnam Thermal Power Plant Unit No.1&2, Korea (2002)
- Samcheonpo Thermal Power Plant Unit No.1&2, Korea (2002)
- Jeju Thermal Power Plant, Korea (2004)
- Dangjin Thermal Power Plant Unit No.5&6, Korea (2006)
- Boryeong Thermal Power Plant Unit No.7&8, Korea (2008)
- Yeosu Thermal Power Plant Unit No.2, Korea (2011)
- Gheco Thermal Power Plant Unit No.1, Thailand (2013)
- Rabigh 6 Power Plant Unit No.1~4, Saudi Arabia (2014)
- Jeddah South Steam Plant Unit No.1~4, Saudi Arabia (2015)
- Semangeum Power Plant No.1~2, Korea (2016)
- Samcheok Green Power Plant Unit No.1&2, Korea (2016)
- Shuqaiq Steam Plant Unit No.1~4, Saudi Arabia (2018)
- Songhau 1 Thermal Power Plant, Vietnam (2019)
- Masinloc Coal Fired Power Plant Expansion Project, Philippines (2019)
- Vinh Tan 4 Extension Thermal Power Plant, Vietnam (2020)

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Particulate Removal Systems

Ash Handling Systems

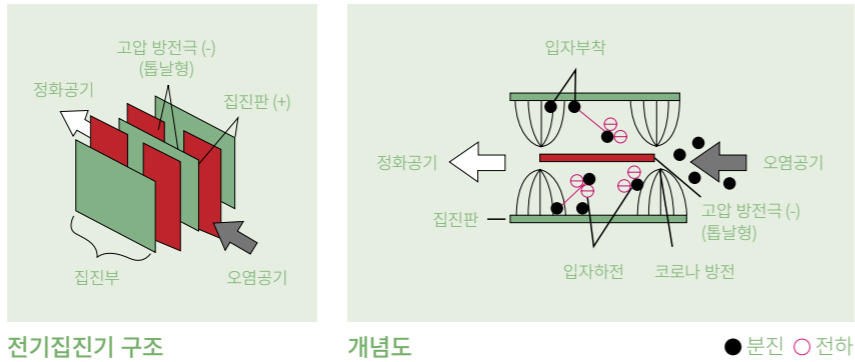
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In a coal or fuel oil fired power plant, ashes from the combustion process are collected in different locations. The Bottom Ash, representing 15 to 20% of the total ash, is collected below the boiler. The ash collected below the economizer and the air-preheater represents 5% and the Fly Ash collected in the Electrostatic Precipitator or Fabric Filter represents 75 to 80% of the total generated ash. KC Cottrell has a wide proven experience in handling these ashes with specific physicochemical properties.

전기집진기 원리



특장점

- 톽날형 방전극을 사용하여 코로나 방전의 극대화 및 반영구적인 수명
- 동일공간에서 집진과 방전이 동시에 일어나는 1단 하전방식의 단일전원 구조
- 상용화된 하전장치(정류형 변압기)의 적용으로 별도의 전원계통 개발이 불필요
- 정밀제어, 최적 전압 및 전류 유지를 위한 GVC방식 적용
- 고속기류 조건에서 운전가능한 전기집진 설비

기술개발현황

- 신기술인증서 취득 (2008.8.26)
'1단 하전 톽날 방전극 장착 도로터널용 전기집진 기술'
- 신기술인증서 재인증 (2011.08.25)
- 특허 등록 제10-0871601호 (2011.11.26)
'단일 고전압 인가 방식의 고속용 전기집진장치 및 이의 전기집진방법'
- 고속용 터널 전기집진기 개발시험 완료 (2012.09.17)
- 도로 터널용 전기집진기 NEP 인증 개발시험 완료 (2017.10.17)
도로 터널 집진용 ESP의 NEP 인증 개발시험 완료



신기술인증서



특허증



시험성적서



실적 사진



터널ESP-강남순환고속도로



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Tunnel ESP

터널/지하공간용 전기집진기

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터널/지하공간용 전기집진기 특징

- 터널 및 지하공간용 전기집진기는 해당 시설 내 미세먼지를 깨끗이 제거할 수 있는 장치로, 매연과 미세먼지가 뒤섞여 있는 터널 안의 공기가 집진기를 통과하면 음극을 떠는 방전극에 의해 (-)로 대전되어 양극을 떠는 집진판으로 부착되어 깨끗한 공기만 외부로 배출시킨다.
- 부착된 매연 및 미세먼지는 집진기 비 가동 시 세정수 공급장치를 통해 물 세척하여 집진기 내부를 청소한 뒤 우수처리시설에서 처리된다.
- 본 장치는 고속기류(13 m/sec) 이상에서도 집진효율 80% 이상으로 안정적인 운전이 가능하고, 톽날형 방전극을 장착하여 하전효율을 극대화 하였기 때문에 컴팩트한 장치로 대용량의 가스를 처리하는 것이 가능하다.

Air Quality Control Systems

> Particulate Removal System

- Dry Electrostatic Precipitator
- Wet Electrostatic Precipitator
- Bag Filter
- Ash Handling System
- Tunnel ESP
- Hybrid Module Type Precipitator

> Gas Treatment System

- Wet Flue Gas Desulfurization
- Semi Dry/GSA
- SCR/SNCR
- VOCs Control System
- Exhaust Gas Cleaning System (For Marine)

Retrofit & Maintenance

- Air Quality Control System Retrofit
- Technical Service
- Feasibility Study

Manufacturing Services

- Dampers
- Steel Work

New & Renewable Energy

- Solar Power System
- Biomass & Waste to Energy

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Particulate
Removal
Systems

Hybrid Module Type Precipitator

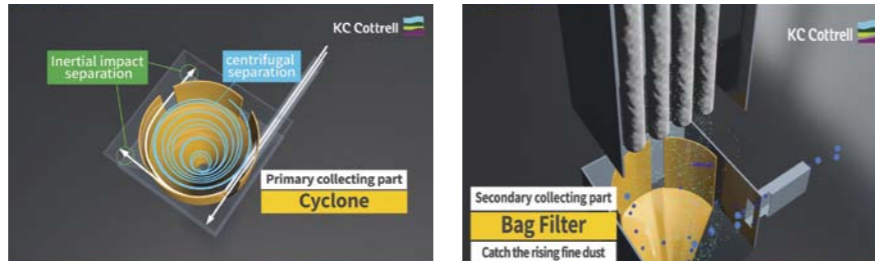
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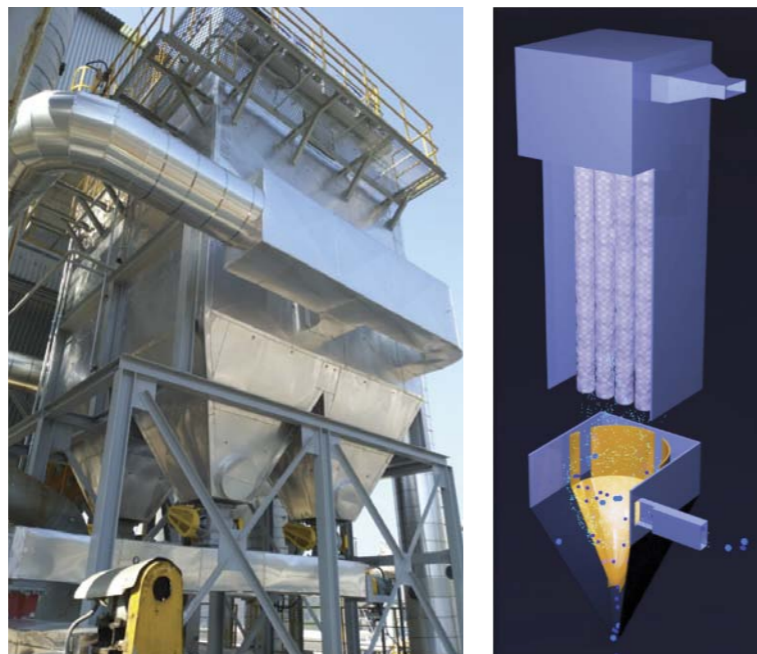
Hybrid Dust Collector

Hybrid dust collector technology is a new technology that realizes the performance of high-efficiency dust collectors with conventional dust collector cost. Hybrid dust collectors are composed of two parts. In the primary separation process using inertial impact, dust with kinetic energy is first removed. In addition, since most of the dust is removed during the secondary separation process through the cyclone, the bag filter, which is responsible for the 3rd separation process, can be designed for ultrafine dust filtering. The combination of a new dust collection technology between cyclone and bag filter is the key to this technology which has lowered costs and improved performance.



Advantages

- Achieved emission concentration below 5mg/m³
- Easy to scale-up through modularization
- Facilities Cost 60% or less of high performance dust collector
- Power reduction
- Extended filter life by 2 years

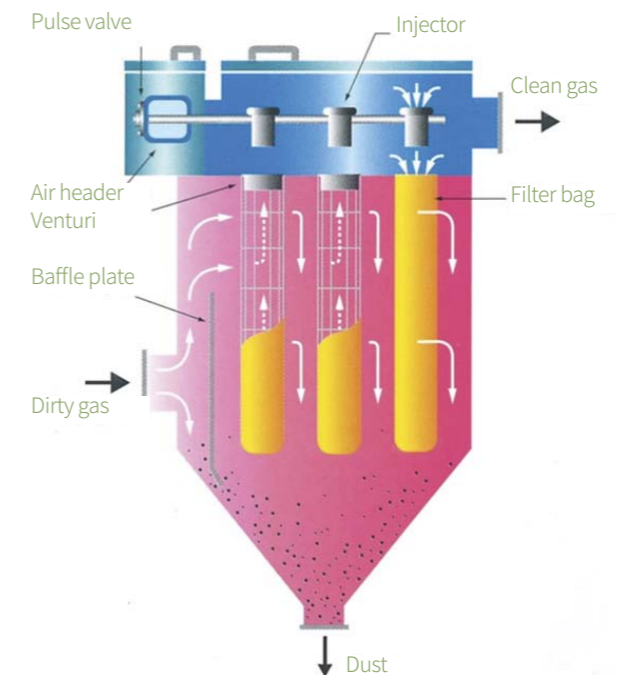
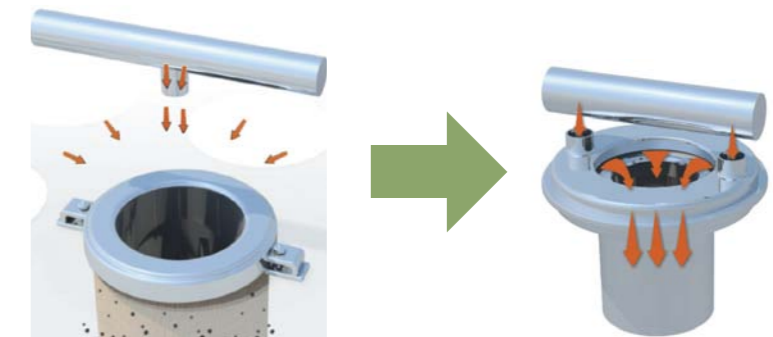


Coanda Injector(Related Parts)

Coanda injector technology is bag filter's core part for collecting fine dust in power generation, iron manufacture, steel industries, cement industry. The coanda injector supplies compressed air to the bag filter, where it induces 2.5 times the amount of compressed air with coanda effect compared to the existing type.

Advantages

- Reduce compressed air consumption
- Increase efficiency and eliminates clogging
- Increase bag life time
- Simple installation



Advantages

A wealth of experience

across various fuels & applications

High SO_x removal efficiency

≥ 99%

Low operating cost

due to optimized engineering & compact design

References

Wet Limestone-Gypsum Process: Limestone is the most widely applied sorbent in the world. This process shows high de-SO_x efficiency and its by-product can be supplied as a resource to other industries.

- Hadong Thermal Power Plant No.7~8 500MWx2, Korea (2009)
- Recycle Facilities, GRM Danyang Plant, Korea (2010)
- Hsinta Thermal Power Plant No.1~2 500MWx2, Taiwan (2012)
- Tufanbeyli Thermal Power Plant No.1~3 150MWx3, Turkey (2013)
- Ma'aden Steel Mill, Saudi Arabia (2014)
- Youngheoung Thermal Power Plant No.5~6 860MWx2, Korea (2014)
- Seyitomer Thermal Power Plant No.1~4 150MWx4, Turkey (2019)



Hsinta Thermal Power Plant



Tufanbeyli Thermal Power Plant



Yoengheoung Thermal Power Plant



Jeju Internal Combustion Plant

Wet Mg-Na FGD Process: We also utilize magnesium hydroxide and sodium hydroxide for sorbents depending on customers' situations. The system in this case is compact and therefore it is relatively easy to operate and maintain

- Jeju Internal Combustion Plant No.1~2, Korea (2005, 2010)
- BLCP Thermal Power Plant, Thailand (2005)



Daegu Dyeing Complex Cogeneration Power Plant

FGD Using Alkaline Waste Water: Alkaline waste water can be used to reduce operating costs as well. Utilization of waste from another process saves expenses for chemicals and energy.

- Daegu Dyeing Complex Cogeneration Power Plant, Korea (2017)

Sea Water FGD: When the power plant is located near the sea, Sea Water FGD(SWFGD) can be an appropriate solution. This is a very competitive process because it uses seawater as a sorbent. The by-product of SWFGD, sulfates, can be found naturally, and therefore returned to the sea.

- Duyen Hai Sea Water FGD No.3, Vietnam (2018)



Gas Treatment System

Wet Flue Gas Desulfurization

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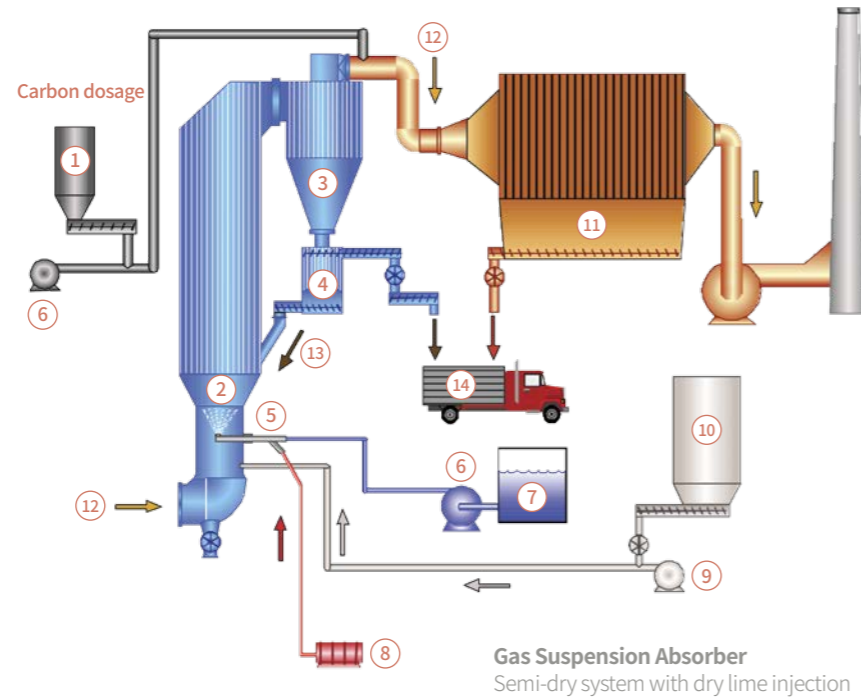


Flue Gas Desulfurization(FGD) uses a wet scrubber where reactions between sorbents and sulfur oxides occur. KC Cottrell can provide various solutions of FGD system for customers' various requests. Our optimized design and project management also guarantee minimum investment and operating costs based on the wealth of experience we have accumulated so far.

Advantages

- Short installation period due to flexible module design
- Small area required and no wastewater generated
- Low maintenance/repair cost
- Operating cost savings due to reuse of chemicals
- High removal efficiency

1. Active carbon silo
2. Reactor
3. Cyclone
4. Re circulation box
5. Nozzle lance
6. Pump or blower
7. Water tank
8. Air compressor
9. Blower
10. Lime silo
11. ESP or FF filter
12. Flue gas
13. Re-circulated sorbent
14. By-product



References

- Formosa Plastic Factory Power Plant, Pt. Comfort USA (2010)
- Petron Chemical, Philippines (2011)
- Cheng loong Paper, Taiwan (2011)
- Gunjang Energy(GE3), Gunsan, Korea (2014)
- Saemangeum Thermal Power Plant, Korea (2015)
- Hyundai Oilbank, Korea (2016)
- Chongqing Nine Dragons Paper, China (2016)



Saemangeum Thermal Power Plant



Hyundai Oilbank



Chongqing Nine Dragons Paper



Gas Treatment System

Semi Dry / Gas Suspension Absorber (GSA)

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In a Gas Suspension Absorber(GSA) system, fresh alkali sorbent is injected into the flue gas stream to react with acid gases present in vaporous form contained within the particulate contaminated flue gas. The reactor chamber actively encourages the mixing of the agents in a turbulent zone. The resultant interaction of the alkali sorbents with the vaporous acid gases produces a highly efficient de-acidification reaction of SO_x, HF and HCL, with the formation of salts as the product. The dust concentration inside the GSA system reactor is typically 50 to 100 times higher compared to conventional reactors, providing a high stoichiometric ratio of alkali to acid.

The next step is the cyclone, where most of the dust is removed. Dust is completely removed by the ESP or Bag Filter later in the process so that only clean air is released into the atmosphere.

The reaction products and dust captured in the cyclone are recycled to the reactor and used as an absorbent. This means lower operating costs due to the reuse of alkaline chemicals. The GSA system can be run at minimal cost according to the target discharge rate if it is linked up to an acid gas monitoring system.

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Gas
Treatment
System

Denitrification System - SCR / SNCR

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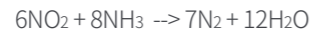
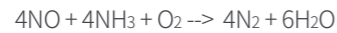
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De-NOx system is based on reactions between reductants and nitrogen oxides. KC Cottrell has supplied highly reliable De-NOx systems fitting the diverse needs and situations of our customers throughout the world. We have successfully installed DeNOx systems in Power Plants, Waste to Energy and heavy industries like steel and non-ferrous.

Process

Denitrification or DeNOx system eliminates NOx (Nitrogen Oxides) by reaction with injection of ammonia or urea based on the following equations:



Advantage

A wealth of experience

across various fuels & applications

High NOx removal efficiency

≥ 90%

Low catalyst cost

due to optimized engineering & compact design

Selective Catalytic Reduction(SCR)

Selective Catalytic Reduction(SCR) process has a reduction reaction at comparatively low temperature using catalysts. This process shows the highest efficiency and stability in removing nitrogen oxides.

References

- Samcheonpo Thermal Power Plant No.1~2 500MWx2, Korea (2009)
- Gheco Thermal Power Plant No.1 700MW, Thailand (2010)
- POSCO Gwangyang Sinter Plant No.5, Korea (2010)
- North Jeju Thermal Power Plant No.2~3 75MWx2, Korea (2010)
- Atomtech Cheng loong Paper Plant, Taiwan (2011)
- POSCO SNNC Gwangyang Fe-Ni Refining Plant, Korea (2014)
- Sejong Thermal Power Plant 500MW, Korea (2013)
- Shinseojeon Thermal Power Plant 1000MW, Korea (2019)



Saemangeum Power Plant



Atomtech Cheng loong Paper Plant



Shinboryeong Thermal Power Plant

Catalyst Regeneration Process

Catalysts account for a large part of operating costs. Therefore, we developed a technology to regenerate used catalysts. Regenerated catalysts can show efficiencies more than 90% of new ones while reducing expenses and protecting environments.



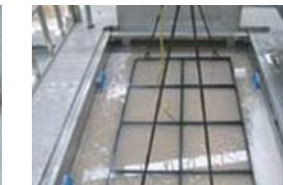
0 Used catalyst



1 Pre-washing



2 Bubbling



3 Ultrasonic



4 Washing



5 Coating



6 Drying

Selective Non-Catalytic Reduction(SNCR)

Selective Non-Catalytic Reduction(SNCR) process happens in a higher temperature (850°C~1,050°C) area than SCR. KC Cottrell guarantees the best performances of SNCR by selecting exact areas to spray reductants based on the simulation of flue gas flow pattern.

References

- POSCO Pohang Steel Mill No.1~12, Korea (2011~2012)
- CFBC Boiler, LG Chem Company, Korea (2008)
- Yecheon Plant, KCES Company, Korea (2004)
- Sunglim Oil & Chemical Company, Korea (2003)
- Taiwan Taoyuan International Airport (Chiang Kai-shek International Airport), Taiwan (2000)



CFBC Boiler, LG Chem Company

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Gas Treatment System

VOCs Control Systems

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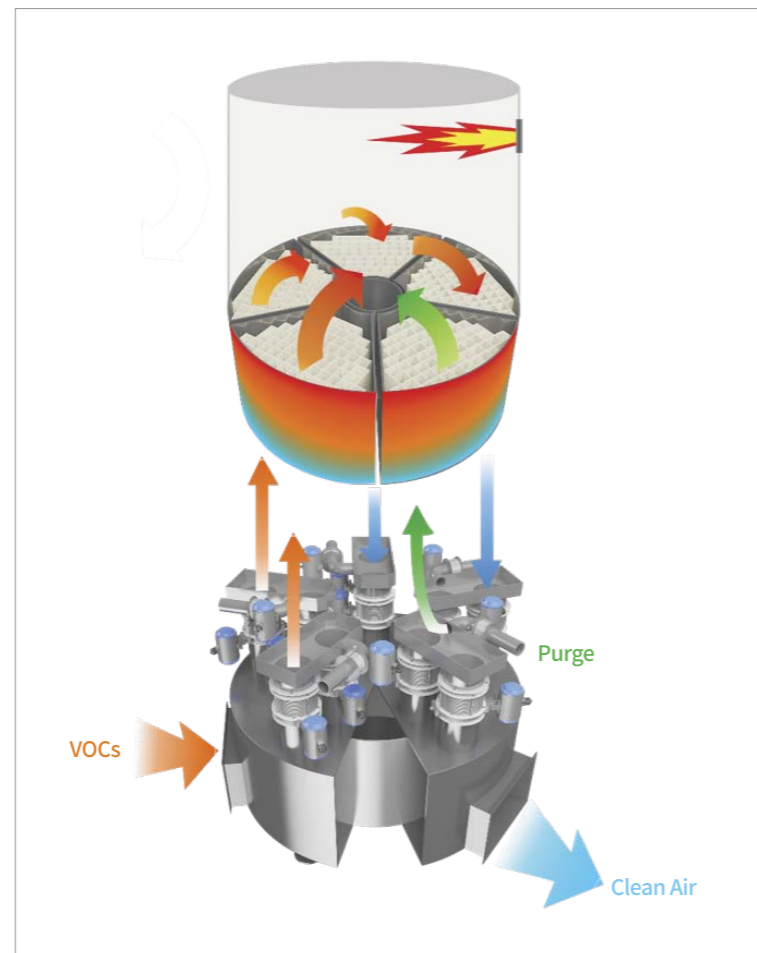
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RTO

Remove offensive odors and VOCs through direct combustion. The heat energy from combustion is recovered and accumulated for reuse. It can also function as a production facility by supplying surplus energy to the production line.

Advantages

- Excellent VOC removal efficiency(99~99.5%).
- Sustainable processing efficiency rate
- Robust design for temperature change and rotary sealing
- Easy rotary self-maintenance
- Operating even with some valve malfunction
- Controllable rotary size depending on air flow, operating with large air flow as well
- Easy to operate & maintain
- Good heat recovery rate due to large air distribution range
- Power cost saving due to low pressure loss
- Low cost for maintenance



References

- Daewoo Shipbuilding & Marine Engineering(Shipyard Pretreatment Painting) RTO Replace 31,200 m3/hr, China (2013)
- NICHYU(Painting) RTO 3,600 + Enrichment 48,000 m3/hr, China (2016)
- Imaoka Shipyard(Shipyard_Painting) RTO 60,000m3/hr, China (2017)
- WAPO(Printing and Drying) RC 120,000 + RTO 30,000 m3/hr, Taiwan (2017)



NICHYU



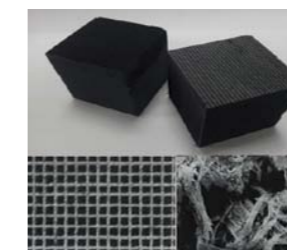
Imaoka Shipyard

Bellaria Catalyst

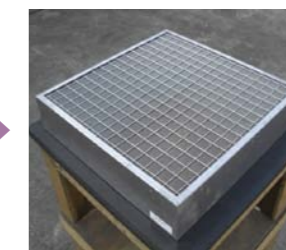
Bellaria means 'clean air' in Italian. It is a product that maximizes absorption performance by adding specific catalytic material. It has absorption efficiency about 10 times or more than the general activated carbon.

Advantages

- Repeatable use(over 200 times)
- Honeycomb type structure mainly composed of porous ceramics
 - Low pressure drop
 - less electricity
 - large surface area
- Cartridge Type
 - Easy replace Excellent VOC removal efficiency(99~99.5%).



Honeycomb Type



Cartridge Type



Replaceable Type

Advantages

- Engineering, Procurement and Construction(EPC), Operation and Maintenance (O&M) for Biomass and Waste to Energy Power Plants
- Hazardous Industrial Waste Treatment Facilities
- Integrated Technical Consulting Service with Our Specialized Engineers

References

- KC EnviroServices Changwon Rotary Kiln+Stoker Incineration Plant, Korea (1997/2002)
- KC EnviroServices Yeosu Fluidized Bed Combustion(FBC) (2015) and Rotary Kiln+Stoker Incineration Plant, Korea (2002)
- Dong Tai Industrial Waste Treatment, Rotary Kiln+Stoker Incineration Plant, China (2012)
- KC EnviroServices Jeonju Rotary Kiln+Stoker Steam Power Plant, Korea (2015)
- Changwon Enertec Stoker, SRF Boiler & Manufacturing, Steam Supply and Power Plant, Korea (2016)
- Ngodwana 25MW Biomass Power Plant, South Africa (2020)
- Chung Tai Industrial Waste Incinerator, Taiwan (2021)



KC Enviro Services(Yeosu-Hwachi) : Industrial Waste Treatment, Fluidized Bed Combustion(FBC), Steam Supply and Sanitary Landfill



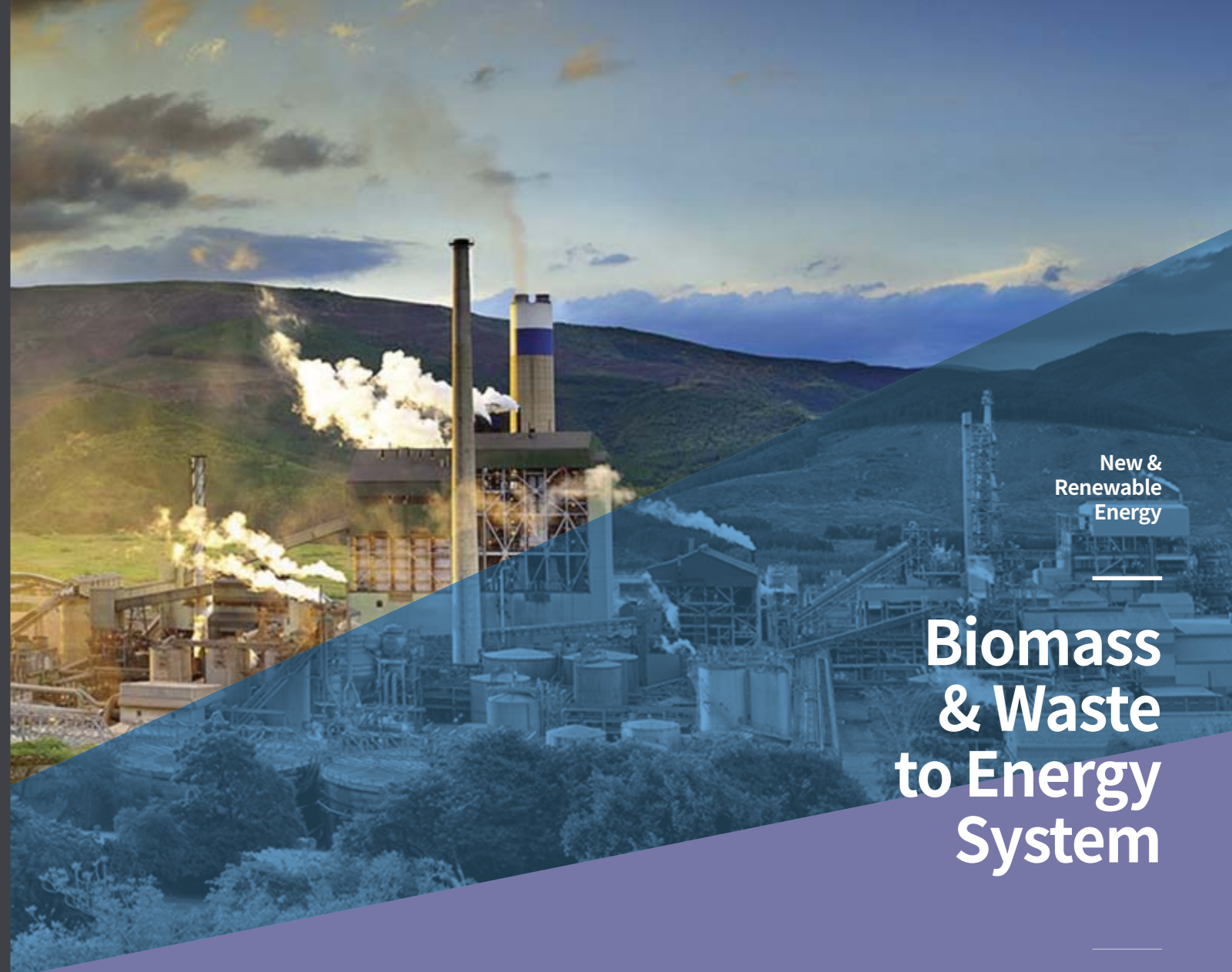
Changwon Enertec : Industrial Waste Treatment, Stoker, SRF Boiler, SRF Manufacturing, Steam Supply and 2.75MW Power Plant



KC EnviroServices(Jeonju) : Industrial Waste Treatment, R/K+Stoker, SRF Boiler & Manufacturing, Steam Supply and Power Plant

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New & Renewable Energy

Biomass & Waste to Energy System

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KC Cottrell provides Engineering, Procurement and Construction(EPC), Operation and Maintenance(O&M) and other services for waste treatment facilities and power plants from renewable energy sources such as Biomass, Municipal solid waste and Hazardous industrial waste.

KC Cottrell's product line covers a wide range of combustion systems with specialized flue gas cleaning by providing the technologies and experiences of the Fluidized Bed, Rotary Kiln, Stocker and RKS Hybrid combustors for both solid and liquid wastes such as sludge, waste oil, waste paint, waste plastic, halogenic waste, refuse derived fuel as well as municipal solid waste.

> Synthetic Segment

The steel segment is in the shape of a box, and generally has excellent economic efficiency in small-diameter tunnels; it is excellent in terms of load-bearing capacity, manufacturability and workability even in medium- and large-diameter tunnels. Therefore, it is often used in special areas such as rapid curves and openings that are difficult to apply concrete segments. Its advantages include uniform material, strength, good weldability and a relatively light weight, making it easier for machining or modification at the site.



AQCS & Industrial Equipment



References

- **Synthetic Segment;** Sendai Subway East-West Line: Shindera Cite, Japan (2011)
- **Steel Segment;** Hachioji Shield Work, Japan(2018)
Tokyo Gaikaku B&F Ramp, Japan (2020)
Toranomom Subway Station to Mori Building, Japan (2018)
Hiroshima Expressway No.5, Japan (2020)

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Manufacturing Service

Dampers / Steel Work

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KC Cottrell is providing manufacturing service not only industrial equipment but also all the steel work to all of our customers.

Dampers

Dampers have a wide range of applications in manufacturing lines. For example, they are used to control the amount and direction of air flow in the duct line and to isolate toxic gases. Dampers come in a variety of forms depending on the application.

Types of Dampers

KC Cottrell produces seven types of dampers: louver, guillotine, diverter, wafer(butterfly), poppet, radial vane, and stack damper. Depending on their operating method, dampers can be classified into isolation type and modulation type. They can also be categorized into zero leakage damper and low leakage damper depending on the allowed leakage rate.



Louver Dampers

- Control the amount of airflow into a duct
- Manual and automatic operation
- Can be used for operation at high speeds
- Applicable for low leakage and zero leakage



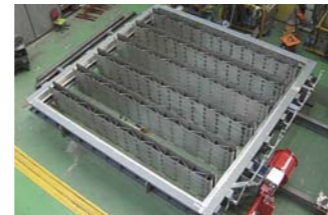
Stack Isolation Dampers

- Used in stacks
- Suitable for protecting equipment or blocking rain during downtime



Guillotine Dampers

- Suitable for intermittent operations
- A drawback is low operating speed
- Horizontal, vertical or lateral installation



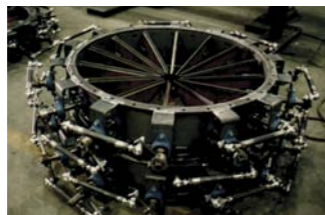
Tandem Dampers

- Zero Leakage Type that has similar function with Double Louver Dampers
- Decrease in cost due to lower damper size and weight



Diverter Dampers

- Main application is HRSG
- Flow rate inside the damper can be set to 45m/sec
- More economical than using two damper sets
- Operation possible at high temperatures



Radial Vane Dampers

- Installed before or after the fan
- Used for speed and flow rate control



Wafer Dampers

- Mainly used in circular duct lines
- Economical and appropriate for low pressure conditions
- Double & single wafer are available depending on the leakage rate



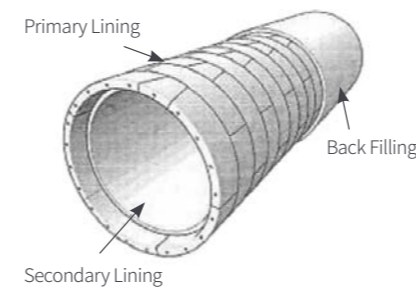
PoPPet Dampers

- Used for explosion prevention in times of emergency in production lines
- Applicable for high speed operation

Steel Work

Steel Work is the creation of steel structures by cutting, bending, and assembling processes. It is a value-added process involving the creation of machines, parts, and structures from various steel materials.

Segment



The shield method, which is the mainstream of the tunnel construction method of the city, has made remarkable progress since it was first introduced in Japan at the Ouhamami Line construction project in 1920. The scope of the shield method is the tunnels of sewerage, power, communication, gas, underground waterways, railroads, roads, etc. The materials required for the shield method are segments, and the products manufactured by our company are steel segment and synthetic segment(Exterior is steel segment and interior is filled with cement along with rebar).

> Steel Segment

The steel segment is in the shape of a box, and generally has excellent economic efficiency in small-diameter tunnels; it is excellent in terms of load-bearing capacity, manufacturability, and workability even in medium- and large-diameter tunnels. Therefore, it is often used in special area such as rapid curves and openings that are difficult to apply concrete segments. Its advantages include uniform material, strength, good weldability and relatively light weight, making it easier for machining or modification at the site.

Rectangular Steel Segment(Passenger Tunnel from a Subway Station to Basement of a Building)



Round Steel Segment(Tunnel for Highway)

