GET MORE FROM YOUR ESP. AND LESS FROM THE STACK

Coromax® micro-pulse system for coal-fired power plants

Airnord

Lowest emissions
Highest ambitions

TRUSTED TO MINIMISE EMISSIONS OF HIGH-RESISTIVITY DUST

Get more from the ESP you already have:

- **Reduce power consumption**
- **Reduce emissions**
- **Reduce capital expenditures**

The Coromax® micro-pulse system is a proven, patented technology. Launched in 1985, more than 500 systems have been installed around the world.

For many years, it has been the preferred power supply for coal-fired power plants applications given that it enhances the performance of the electrostatic precipitator (ESP) significantly.

Conditions as very fine dust particles, and high resistivity are all parameters which prevent the ESP in achieving maximum efficiency if controlled by a conventional DC or high frequency power supply.

Maximise ESP efficiency
If dust emissions from the ESP exceed permitted levels, the ESP efficiency has to be improved. Normally this would be done by increasing the collecting area, but that assumes availability of space and requires a prolonged shutdown of the plant.

Therefore, more and more plants decide to replace the existing DC power supplies with the highly efficient Coromax micro-pulse system.

This solution makes it possible to reduce dust emission without increasing the footprint of the ESP, and restricts plant shutdown to a minimum.

For new ESP installations, the Coromax micro-pulse system results in a smaller ESP footprint as compared to an ESP unit energized by other power supplies.

With more than 500 installations worldwide, Coromax is a tried and trusted pulse power solution.

The Coromax micro-pulse system reduces both the capital expenditures and the operating costs considerably. Additionally, dust emission guarantees below 10 mg/Nm³ can be given.

How it works
In an ESP, airborne dust is designed to flow between rows of electrodes and collecting plates. A high voltage transformer is connected to the electrodes. When a high voltage is applied, electrons charge the dust with electrical energy, causing the dust to move towards the collecting plates.

The collecting efficiency depends on various factors, such as the size of dust particles, the high voltage peak value and its mean value. If dust resistivity is high, the maximum attainable voltage level in the precipitator is limited to the level where back corona and sparks occur.

Back corona is a phenomenon where positive ions in the dust layer on the collecting plates are released back into the gas stream, thereby eliminating the charge on the dust particles. Without this charge, the dust particles cannot be collected leading to higher dust emissions. Sparks likewise limit efficiency, but Coromax can operate at higher voltages without sparks having this effect.

Independent mean and peak voltage control
During plant operation, variations occur in the coal composition, fuel, particle size, temperature, humidity, dust load or resistivity. To ensure consistency in the performance of the ESP, adjustments have to be made to the base voltage, pulse voltage and current.

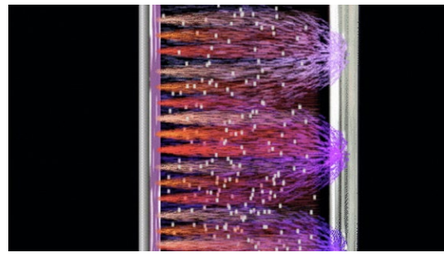
With the Coromax® micro-pulse system voltage, current and frequency are automatically changed to match current operating conditions. The ability to control the current independently of the high voltage is not available in either a conventional DC power supply or a high-frequency power supply.

Power consumption savings
The Coromax micro-pulse system superimposes an extremely narrow high-voltage pulse (up to 80 kV), lasting only 75 microseconds, on to a base voltage of up to 60 kV. This generates a total peak or pulse voltage of approximately 140 kV which is almost double the voltage of a conventional DC supply.

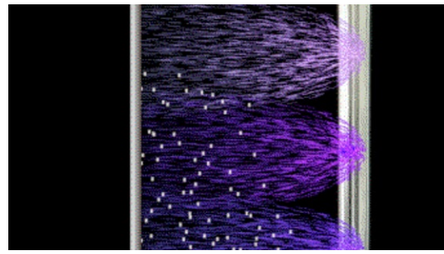
Usually, with a high voltage level, the current is high and may generate back corona using conventional DC or high frequency power supplies. The high current is wasted and may result in intensive sparking in the collecting process, resulting again in increased power consumption which is unnecessary. The charging of dust particles is essential to ensure low emission.

No waste of current
Coromax eliminates the occurrence of back corona as the current is efficiently used only for charging the particles and hence there is no waste of current. Sparking originating from back corona is also eliminated.

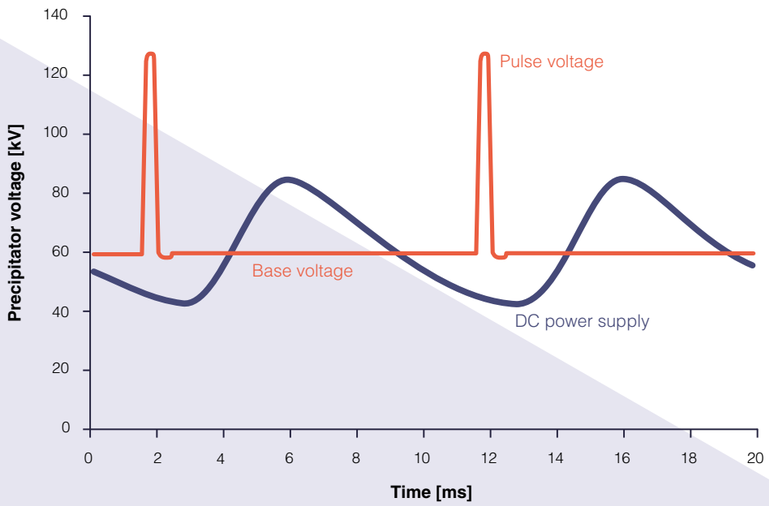
Despite the much higher peak voltage obtainable by the Coromax micro-pulse system the power consumption is significantly less compared to conventional DC power supplies. Since power supplies account for the largest share of operating costs, the installation of Coromax micro-pulse systems will significantly reduce total ESP operating costs.



Back corona resulting from conventional DC power supply.



Coromax at work. Note the elimination of the back corona.



Coromax's pulse voltage waveform compared to that generated by a conventional DC power supply.

OPTIMISE YOUR ESP: WHATEVER THE TECH, WHATEVER THE AGE

Dust emissions from coal-fired power plants are typically in the range of 40-100 mg/Nm³. To comply with new stricter legislation, plants are often obliged to limit emissions to 10-30 mg/Nm³.

However, to satisfy ever-stricter limits in the future, many plants are already achieving emissions as low as 5 mg/Nm³.

How to be future-ready
Coromax® is compatible with all existing installations – regardless of their age and the type of and dust-removal technology deployed. The following evaluates these technologies, and summarises and compares their performance in a convenient table.

Coromax micro-pulse system
The Coromax micro-pulse system is a simple replacement of the existing high voltage power supply. Retrofitting can be done very quickly with a minimum of downtime and does not create additional environmental challenges.

The system significantly reduces both power consumption and PM2.5 emissions. Coromax also provides the ability to work with high efficiency regardless of coal type.

The Coromax micro-pulse system requires a well-maintained ESP. Therefore, Airnord specialists can inspect the ESP and compile a detailed recommendation for upgrading the ESP. Upgrading can include improvements or modification of internal parts.

High Frequency Power Supply
High Frequency Power Supply (HFPS) units represent an alternative solution to replace an existing DC high voltage power supply. Replacing the HFPS is often not sufficient to achieve the required efficiency improvement. A short downtime for installation is required. However the HFPS cannot increase capture of PM2.5 fine particles.

Moving Electrode ESP
Moving Electrode ESP (MEEP) consists of movable electrodes which mechanically removes high-resistivity dust from the collecting plates. The technology has many moving parts inside the ESP which increases the need for maintenance and downtime.

Hybrid filter
The hybrid filter is a combination of ESP and fabric filter technologies in series in the same casing. The inlet ESP fields take out the major part of the dust leaving less to be collected on the bags. This reduces the required cleaning frequencies of the bags and thereby increasing bag life.

The bags act as a barrier and increase the pressure loss. In most cases a fan upgrade or replacement is required. A relative long down-time is required for removal of ESP internals and bag installation.

Extending ESP footprint
Increasing the collection area of the existing ESP is in most cases not sufficient to meet low-emission limits. In addition, layout constraints often make this solution obsolete. Extending the ESP demands a downtime of several months.

Coromax is compatible with any type of ESP. Here, an installation with tumbling hammers.

Coromax upgrades installations of any age, as with this ESP featuring older electrodes.

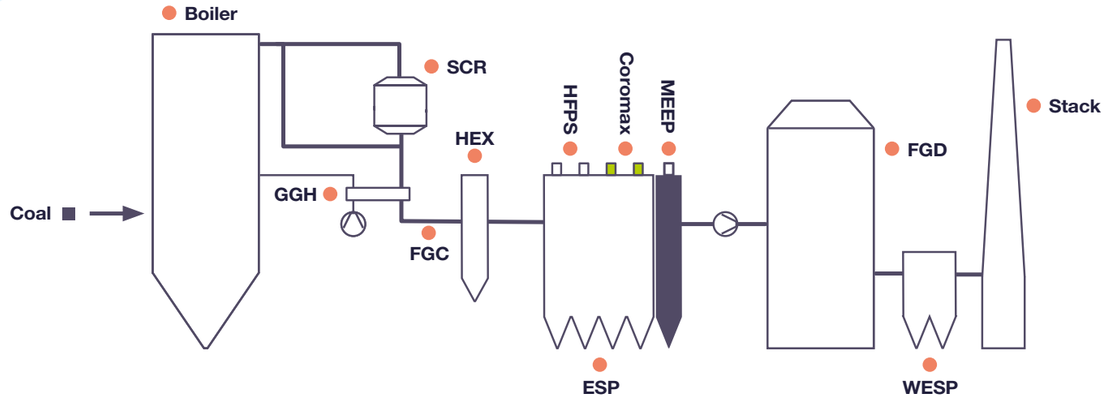
ESPs of any layout/footprint can be upgraded with Coromax. This upgraded installation features a rapping system with adjacent gangway.

Wet ESP
Wet ESP (WESP) is a solution that is installed after the FGD system. This requires a low emission from the dry ESP, but has the ability to provide a very low stack emission. A wet ESP is expensive because it is made of stainless steel or alloy steel, and requires additional space and waste water treatment.

Heat Exchanger
The Heat Exchanger (HEX) reduces the flue gas temperature before reaching the ESP in order to reduce the resistivity of the dust.

The gas volume decreases which then reduces dust emissions. However, there is a risk of exposing the ESP to acid corrosion, and shorter component lifetime due to the lower temperature.

Flue gas conditioning
Flue gas conditioning (FGC) reduces the resistivity of the dust by injection of SO_3 and/or NH_3. This enhances the collection process in an ESP. FGC requires very short downtime, but efficiency improvement is not always sufficient if the difference between the existing and required emission level is too high. Depending on the type of chemical used for the FGC, storage facilities of chemicals must be established which creates a new environmental risk.



	Emission <20mg/Nm³	Reduce PM2.5	Power consumption	Secondary pollution	Fan upgrade	Extra space required	Reliability	Delivery time	Installation boiler stop
Coromax®	Yes	Yes	Low	No	No	No	High	Short	Short
HFPS	Maybe	No	Low	No	No	No	High	Short	Short
MEEP	Maybe	No	Medium	No	No	No	Low	Long	Long
Hybrid	Yes	Yes	High	Yes	Yes	No	Low	Long	Long
Extend ESP	Yes	No	Medium	No	No	Yes	High	Long	Long
WESP	Yes	Yes	High	Yes	Maybe	Yes	High	Long	Medium
HEX	Maybe	No	Medium	No	No	Yes	Low	Medium	Medium
FGC	Maybe	No	No	No	No	No	Medium	Medium	Short

CLEARING THE AIR IN CHINA

Emissions reduced at Baosteel Group Corporation

The Baosteel Group selected Coromax® in connection with an ESP upgrade.

Baosteel and the local authorities in Shanghai reached an agreement on reducing the high level of dust emission from the plant's coal-fired boilers of 350 MW. The project scope involved upgrading of ESPs with two additional fields and Coromax micro-pulse systems.

A total of 16 Coromax units for all new sections deliver a dust emission which is significantly reduced and meets the local requirement of maximum 20 mg/Nm³.

Project scope
Boilers: 2 x 350 MW
Fields: 3 HFPS + 2 Coromax
Gas volume: 1,350,000 Nm³/h
Temperature: 150 °C
Dust load: 20 g/Nm³
Guarantee: 20 mg/Nm³
Inside voltage: 120 kV

Performance test results:
Emission: 19 mg/Nm³

Mawan reduces emission and power consumption

Shenzhen Energy Group, one of the main power generation companies based in Shenzhen, Guangdong, has four power boilers of 300 MW and two boilers of 320 MW at its Mawan power plant.

To succeed with the required emission reduction, a comprehensive upgrade of the existing ESPs, which are more than 20 years old, was essential. The project also involved replacing the existing DC power supplies with Coromax on the three fields – a total of 12 sets per boiler.

Project scope
Boilers: 6 x 300-320 MW
Fields: 1 HFPS + 3 Coromax
Gas volume: 1,228,000 Nm³/h
Temperature: 129 °C
Dust load: 28,9 g/Nm³
Guarantee: 20 mg/Nm³
Inside voltage: 116 kV

Performance test results:
Emission: 15 mg/Nm³

Coromax® micro-pulse system installed at Shajiao B power plant

Coromax was installed in connection with an ESP upgrade at Shenzhen Energy Group's Shajiao B power plant in Guandong. The plant has two power boilers of 300 MW.

Internal ESP parts were updated, and Coromax micro-pulse systems were installed on three fields.

Project scope
Boilers: 2 x 350 MW
Fields: 1 HFPS + 3 Coromax
Gas volume: 1,230,000 Nm³/h
Temperature: 140 °C
Dust load: 20 g/Nm³
Guarantee: 80 mg/Nm³
Inside voltage: 115 kV

Performance test results:
Emission: 52 mg/Nm³

Datang Qitaihe installs Coromax

In order for Datang Qitaihe Power Generation Co., Ltd., Heilongjiang Province, to comply with the new regulation of a maximum emission of 30 mg/Nm³, Coromax micro-pulse systems wereinstalled at two of the plant's boilers. The boilers were installed in 2001 and have a traditional two-chamber ESP layout.

The Coromax solution guarantees an emission of 30 mg/Nm³. The internal parts of the ESP remain and only minor adjustments were made.

Project scope
Boilers: 2 x 350 MW
Fields: 1 DC + 3 Coromax
Gas volume: 1,245,000 Nm³/h
Temperature: 117 °C
Dust load: 35 g/Nm³
Guarantee: 30 mg/Nm³

If you're committed to achieving the lowest emissions while realising the highest productivity goals, then Airnord is here to help. For almost 100 years we've been ensuring pulp and paper, power generation, non-ferrous metals, iron and steel, cement and other plants meet the most stringent emission limits.

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Highest ambitions

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