

Doosan Lentjes

Air quality control systems



Wet flue gas desulphurisation

Our innovative technologies offer high reliability and availability.

Dry flue gas desulphurisation

Requiring minimum investment costs. Achieving high flexibility for varying sulphur fuel contents and reduced water consumption.

Dedusting

We have a wealth of expertise in dedusting solutions and one of the largest reference lists, with over 800 dedusting plants installed worldwide.

Doosan Lentjes specialises in Air quality control systems across the utility, municipality and industrial sectors. Our wet desulphurisation technologies help customers all over the world achieve cleaner power generation.

Your partner for environmental technologies

Doosan Lentjes started out life as Lentjes in 1927, when Ferdinand Lentjes established the business as a boiler manufacturing company. Since Bischoff (acquired by Lentjes in 1984) pioneered the wet lime/limestone FGD process with in-situ oxidation, Doosan Lentjes has further improved the process and today ranks amongst the most experienced providers of this technology. Doosan Lentjes has successfully installed its wet desulphurisation technologies in over 100 locations worldwide, with the equivalent of 77 GWel installed.

This includes more than 6 GWel of seawater FGD references and around 50 applications for dry circulating fluidised bed (CFB) plants, equivalent to 42 Mio m³/h STP, with special experience gained for high-sulphur applications, such as lignite.

We are committed to the continued development of industry-leading technologies and solutions for our customers and focus on being at the forefront of new trends and developments, enabling us to provide you with comprehensive, future-orientated concepts. We have the capacities and skills to solve your power generation and environmental challenges, from early planning through to finalisation.

Sustainable emission reduction

We implement environmentally friendly flue gas cleaning solutions, tailored to the needs of our clients and their local environments and designed for sustained emission reduction. Our vast proprietary product portfolio allows us to select the most advantageous process for each type of application to the benefit of our clients.

Innovative skills

With our long experience of project management and plant engineering, we can handle any of the challenges posed by your process. Reliability and innovative skills make us the ideal partner to help meet your environmental and financial goals.

Bespoke solutions

Maintaining the energy efficiency of your processes, complying with the strictest licensing procedures and developing tailor-made solutions for your plant are the cornerstones of our approach.

Limestone flue gas desulphurisation: a highly efficient process for low emissions

We have played a pivotal role in improving limestone FGD technologies and today we rank amongst the most experienced technology providers in this field.

Limestone FGD is the most commonly used FGD process in the world. Sulphur dioxide, hydrogen chloride (HCl) and hydrogen fluoride (HF) are removed by absorption with an alkaline scrubbing suspension, normally limestone. We can also use lime or calcium hydroxide where necessary.

Our advanced Doosan Lentjes scrubber design and system optimisation offers minimum investment and operating costs as well as the highest levels of availability.

Use of the latest materials and construction techniques

As well as a sophisticated technical design, we place high priority on the use of the latest materials and construction methods. A variety of materials are used (high alloy, carbon steel with rubber lining, concrete with polypropylene lining, glass fibre reinforced plastics) adaptable scrubber entry and exit geometry, and the optimum layout of spray nozzles and spraying banks.

Wet flue gas desulphurisation

Especially suitable for high sulphur applications and large size power plants.

SO₂ removal of over
99%

Low operating costs and power consumption.

- Outstanding references for all fuels (lignite, hard coal, oil, biomass, waste)
- SO₂ removal of over 99%
- Maximum HCl and HF removal levels
- Gypsum as a saleable end product
- Flue gas volume flows of up to approximately 5,000,000 Nm³/h per scrubber
- Limestone as a favourably priced absorption agent
- Low operating costs and power consumption
- Open spray tower, low pressure loss

Advanced scrubber design

The nucleus of our limestone FGD design is the scrubber, which takes the form of an open spraying tower that has been systematically developed using computerised simulation techniques. Our research in this field has allowed us to simulate process parameters in the scrubber. The result is an advanced scrubber design characterised by minimum dimensions and liquid to gas ratio.

Seawater FGD a cost-effective wet process for coastal regions

Our seawater flue gas desulphurisation (FGD) is an attractive alternative for cleaning flue gas from oil and coal-fired power plants located in coastal regions. We can use this technology to achieve the same levels of desulphurisation as those attained by using the limestone process, however the seawater process is more cost-effective and does not create any by-product.

Natural process

We take seawater from your power plant cooling circuit and use it as an absorbent. The naturally dissolved bicarbonates in the seawater react with the acid components of the flue gas, such as sulphur dioxide. After absorption, the sulphur dioxide is bonded in the scrubber solution and oxidised into sulphates, which are a natural component of seawater.

Innovative system

The core components of our seawater FGD plants are the scrubber and the neutralisation and oxidation basin. Our extensive experience of wet FGD systems has strongly influenced this technology and we equip the neutralisation basin with ultra-modern, highly efficient aeration membranes. We design each system to the specific operating conditions by using effective modern simulation software and mathematical reaction modelling.

- SO₂ capture above 99%
- No auxiliaries for limestone, gypsum and waste water necessary
- Low investment, operating and maintenance costs
- Minimum air and energy use
- Simple system configuration with reliable components, resulting in high availability
- Excellent environmental performance, verified by independent institutes
- Flexible part load operation
- Dosing of sodium hydroxide in case of low alkalinity seawater



over
280
wet FGD units
installed worldwide

Experience makes the difference

Excellent environmental performance, verified by independent institutes.

over
90
selective catalytic reduction units installed worldwide

over
800
filter plants installed worldwide



Circulating fluidised bed (CFB) FGD

In addition to the wet FGD processes, we have continued to further develop our dry desulphurisation process which can be used downstream of coal and oil-fired boilers, as well as biomass, refuse-derived fuel, domestic and industrial waste incineration plants.

Our CFB FGD process for utility boilers operates at a temperature of approximately 70°C and uses hydrated lime for the absorption of SO₂, SO₃, HF and HCl. We can achieve SO₂ reduction efficiencies of up to 99% due to the intensive mass transfer and the high velocity in the absorber's circulating fluidised bed, yet still only require a small footprint.



Dry flue gas desulphurisation

A compact design which is ideal for the removal of multi-pollutants.

Process

Our dry flue gas cleaning process is based on well proven CFB technology. The flue gas flows through a fluidised bed reactor and then enters a downstream particulate control device, which can either be a fabric filter or an electrostatic precipitator.

We dose fresh additives into the flue gas upstream of the fluidised bed reactor while a large part of the solid material from the reactor is fed back to the fluidised bed as a recirculate. Water is also injected to lower the flue gas temperature and to achieve higher separation performance.

Our advanced process management minimises material consumption and residues.

Low investment and maintenance costs

One of the key advantages of our CFB FGD system is its compact design. Our fluidised bed technology benefits from not using rotating or wearing parts, which not only reduces investment costs, but also maintenance expenditure. More importantly the simplicity of our system design provides high levels of availability.

- Proven technology with excellent references
- Removal of air pollutants in one step (dust, SO₂, SO₃, HCl, HF, dioxins, furans, polychlorinated biphenyls (PCBs), heavy metals)
- Relatively low investment cost
- Compact design, easy to retrofit
- Simple aggregates, operation above dew point
- No corrosion, low maintenance
- High availability
- Low sorbent consumption due to product recirculation
- High desulphurisation efficiency and low emissions
- Wastewater-free



With over **800** dedusting plants installed worldwide, we have a wealth of expertise in dedusting solutions and one of the largest reference lists.

We have equipped over **500** plants worldwide with ESPs, ranging from one to 16 units per plant

Fabric filters and electrostatic precipitators: the right technology for your type of ash

A modern dedusting system is a crucial component of every flue gas cleaning plant and we can apply one to your plant, whether industrial or utility. Our dedusting systems can assist your plant to achieve high reliability, strict compliance with prescribed threshold values and reasonable operational costs.

Fabric filters

Our fabric filters are not just used for dust collection, but also for the absorption or partial absorption of gaseous pollutants such as SO₂, HCl and HF, as well as heavy metals and polychlorinated hydrocarbons. Our fabric filters are virtually unaffected by most critical ESP influence factors and maintain low ash emissions even under changing coal and ash qualities. To date we have installed more than 300 fabric filters worldwide.

High-pressure pulse jet fabric (HPPJF) filters – typically applied for smaller gas volumes

Dust laden gases pass from outside the filter bags through to the inside and the dust deposited is removed by using pulses of compressed air. The dust cake falls into the filter hopper and can be discharged. The fabric filters are designed with multiple compartments, so that the plant sections can be easily separated from the gas stream for inspection and maintenance purposes.

Low-pressure pulse jet fabric (LPPJF) filters – designed to handle large volume flows from 200,000 m³/h to several millions m³/h.

The main advantage of this type of filter is that the low scavenging air reservoir pressure is below 1 bar, as opposed to between 2 to 7 bar in conventional systems, requiring far less energy for the cleaning process. Clean gas dust content below 5mg/Nm³ can be achieved.

Electrostatic precipitators (ESP)

We have one of the largest precipitator databases in the world and have equipped over 500 plants worldwide with ESPs, ranging from one to 16 units per plant. Dust particles or droplets floating in the gas are negatively charged by discharge electrodes connected to a high voltage transformer rectifier unit. The particles migrate towards the collecting electrodes under the influence of a strong electrical field where they adhere. Electrodes are purged periodically and deposits are collected in hoppers located under the precipitator. Clean gas dust content below 10 mg/m³ can be achieved.

At your side after completion

Even after your plant has been commissioned, our expertise remains at your disposal. Our service portfolio includes a comprehensive programme of maintenance and modernisation support for power plants and industrial facilities. If required, we can even train your personnel or operate your plant.

Our service teams know their trade inside out. Our expertise cover every aspect of plant engineering, maintenance and modernisation. We aim to minimise downtime, ensuring a cost-effective operation and optimised cost-benefit ratio.



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- We can take care of your entire maintenance requirements, from planning to implementing maintenance programmes.
- In the event of a malfunction, our rapid, efficient, on-site deployment handles the problem reliably and competently.
- We analyse specimens in the laboratory and provide accurate conclusions without delay.
- We develop and implement optimisation concepts for your plant.
- We promptly deliver spare parts, directly ex-warehouse.
- We can provide thorough, individual training for your personnel.

Expertise from our network of specialists:

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Doosan Lentjes and Doosan Power Systems

Doosan Lentjes is part of Doosan Power Systems, which specialises in the build, maintenance and life extension of power plants across the world. We provide clean, efficient, flexible and integrated power solutions, using the latest technologies and best-in-class engineering expertise. From advanced turbine design and a range of boiler technologies to comprehensive after-build services, we offer a wide breadth of capabilities spanning both traditional and renewable fuels, as well as the industrial and petrochemical sectors.

We unite the rich heritage of Doosan Lentjes and Doosan Babcock in advanced steam generation, waste-to-energy and nuclear with the global leadership of Doosan Škoda Power in the design and manufacture of turbines. Supported by our global service capabilities, this winning combination gives Doosan Power Systems the capability to provide efficient and cost-effective solutions that create real value for our customers and their assets around the world.



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