
ANDRITZ
Air pollution control.
High-tech solutions are often based on simple ideas.
www.andritz.com

Clean environment
for a better tomorrow

ANDRITZ is a leading global supplier of innovative air pollution control technologies. Our product range combines 30+ years' experience with the specific knowledge gained from over 200 installations around the world. ANDRITZ offers high-end technologies and is a partner you can rely on.

CONTENTS

▲ Turbo-CDS (Dry FGD) waste to energy power plant, Haikou, China

Thanks to our wide portfolio of flue gas cleaning technologies and extensive experience in executing projects, ANDRITZ is more than capable of handling all of the challenges involved in your project. We are reliable and innovative – an ideal partner to help you meet your environmental and financial goals. Maintaining the energy efficiency of your processes, complying with the most stringent environmental regulations and developing tailor-made solutions for your plant are the cornerstones of our approach.

With offices in the USA, Europe, South America, and Asia, ANDRITZ is able to provide well-proven solutions for each respective market and has the dedicated personnel to meet all clients' needs.

Air pollution control technology applications for

- Power stations
- Waste-to-energy plants
- Biomass plants
- Industrial plants

▲ Wet limestone FGD, Trbovlje, Slovenia

▲ Wet limestone FGD, Tušimice, Czech Republic

Working hand in hand with the environment: Air Pollution Control

Clean air is the basis of a healthy life. Air pollution causes discomfort or harm to human beings and other living organisms. It is our mission to prevent air pollution from power generation and industrial processes.

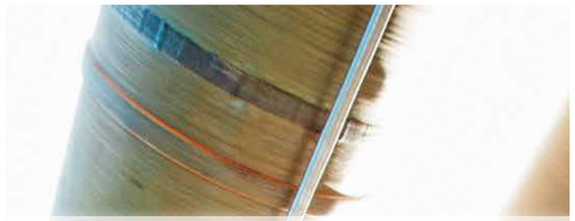
Even with heavy subsidies and incentives, renewable and environmentally friendly energy sources will only meet part of the world's future demand for power. Reliance on thermal power stations will continue to be important for the future. With this reality, it is critical to make thermal power generation cleaner and more sustainable. It is our mission to allow power plants to continue in long-term operation without impacting the environment.

ANDRITZ delivers environmentally friendly flue gas cleaning solutions, tailored to the needs of our clients and their operating environments. We are an environmental technology pioneer with a history in air pollution control spanning 30+ years. Our products range from flue gas scrubbers and SCRs for power stations to complex flue gas cleaning systems for waste-to-energy and industrial plants.

Use of cutting-edge engineering tools and global R&D collaboration with a network of recognized partners and universities are the foundations of our work. Early identification of each client's needs help us make a long-term contribution to clean air and a clean environment.

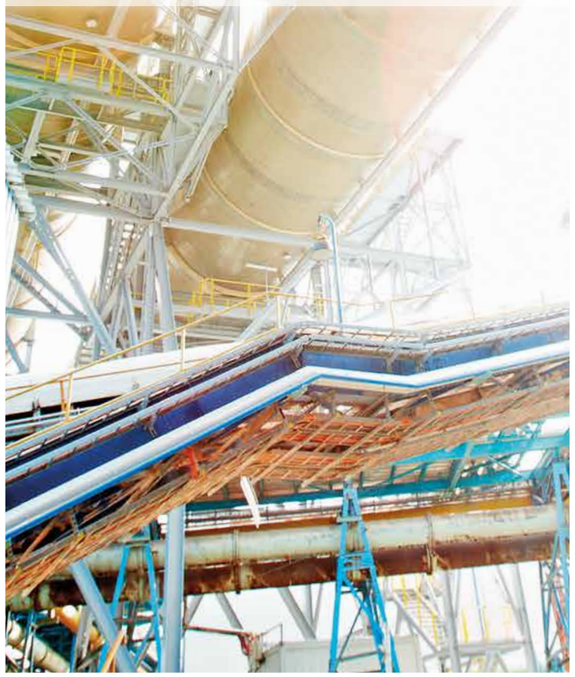
▲ Circulating dry scrubbers (Dry FGD), Virginia, USA

A product range for all requirements



From single systems to turnkey plants

Several design options are available to choose from depending on the upstream processes and potential pollutants to be filtered out, including tailored solutions for industrial applications. Our goal is the removal of acid gases (SO_x, HCl, HF), particulate matter, mercury (Hg), heavy metals and nitrogen oxides (NO), dioxins and furans.



Wet limestone flue gas desulphurization

ANDRITZ offers wet limestone flue gas desulphurization (WFGD) scrubbers with high reliability and availability based on a well-known principle of washing flue gas with a limestone slurry and generating gypsum as a saleable end product. We have enhanced this basic process and now offer the most advanced scrubbing technology (FGDplus).

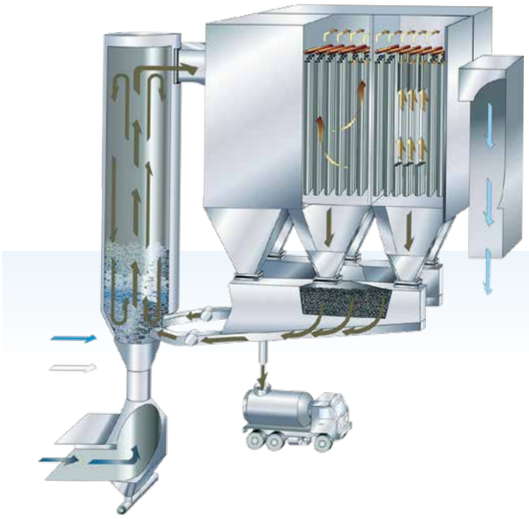
Power station applications

- Wet limestone flue gas desulphurization (WFGD)
- FGDplus
- Mercury removal
- Seawater FGD
- CO_2 absorption

Industrial applications (including waste-to-energy and biomass plants)

- Wet flue gas cleaning (calcium and NaOH based)
- Multi-stage scrubber
- Combined systems

Dry flue gas cleaning



ANDRITZ dry flue gas scrubbing processes are based on circulating fluidized bed technology and offer an ideal solution for flue gas cleaning downstream of conventional thermal power stations, biomass incineration plants, RDF-fired boilers (Refuse Derived Fuels), or waste-to-energy plants and other industrial applications.

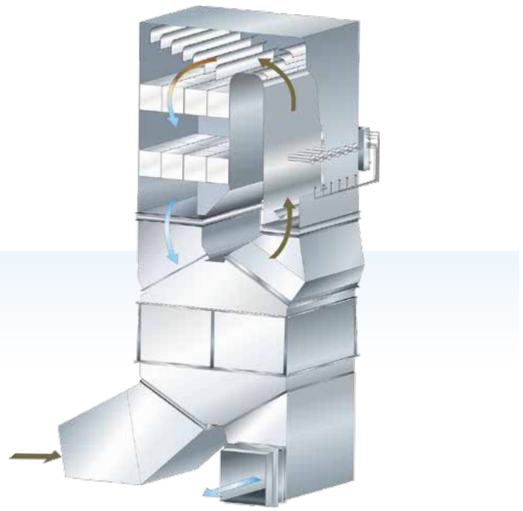
Power station applications

- Dry sorption
- Turbo-CDS/TurboSorp
- Mercury removal
- Particulate removal

Industrial applications (including waste-to-energy and biomass plants)

- Dry sorption
- TurboSorp
- Particulate control

DeNOx systems – SCR



ANDRITZ offers Selective Catalytic Reduction (SCR) technology for the de-nitrification of flue gas. High- and low-dust as well as tail-end configurations are available. Dioxins and furans can also be removed with the SCR tail-end configuration.

Power station applications

- SCR (high-dust, low-dust, or tail-end application)
- SCR for combined cycle power plants (CCPP)

Industrial applications (including waste-to-energy and biomass plants)

- SCR (low-dust)

Wet flue gas desulphurization systems

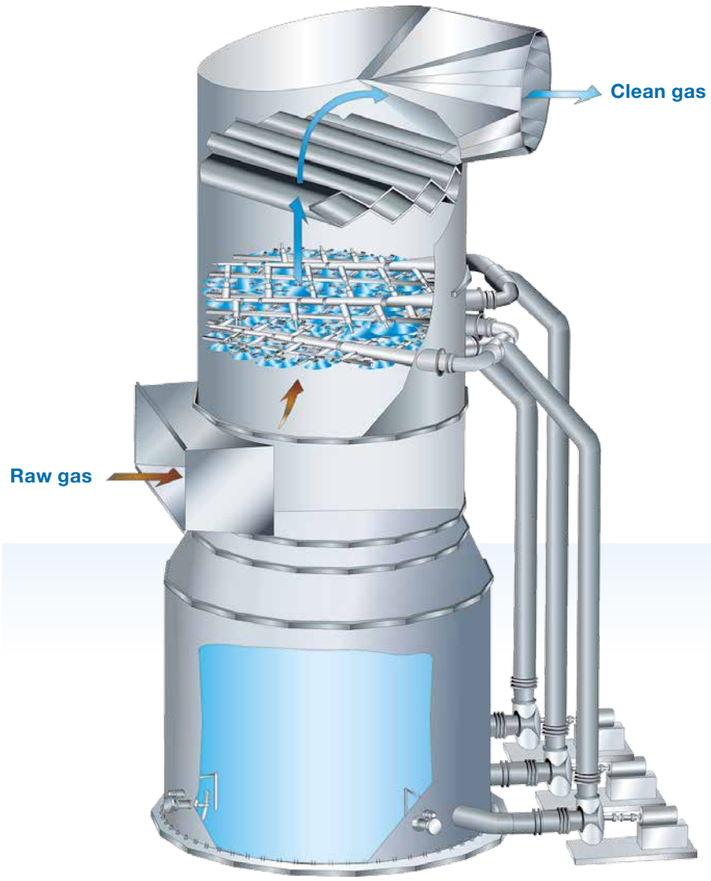
Highly efficient processes for low emissions

Limestone flue gas desulphurization systems (FGDs) are well-proven and cost-effective. They have been in use in power stations since the 1970s. Over the years, we have created an advanced scrubber design with outstanding reliability and excellent availability. Plant economics have also been optimized, ensuring low capital and operating costs.

Limestone FGD: a new dimension

ANDRITZ has set a new global standard of excellence with its wet limestone FGD design, featuring the world's largest wet scrubbers at the Neurath power plant (2 x 1,100 MW). These two scrubbers (with diameter of 23.6 m/77.4 ft) have been operating successfully since 2008, and each one can accommodate a flue gas flow of 4.75 million m³/h or 2.8 million ACFM.

The unique scrubber design combined with optimum use of our technology to meet our customers' needs has become our trademark. Technical and economic optimization guarantees lower capital and operating costs.



▲ Wet limestone scrubbing process

▲ Ligang, China

▲ Scrubber at Neurath Power Plant,, Germany

Limestone FGD: advanced scrubber design

The nucleus of our design is the scrubber, which is an open spray tower that has been enhanced using computerized simulation techniques. We have been conducting intensive development work in this field since 1995 and today enjoy a leading position that not only allows us to simulate flow and temperature profiles, but also to calculate the distribution of SO_2 concentrations in the scrubber.

During comparisons of simulator data with actual plant measurements, the flow and temperature profiles have verified our design parameters. Compared to traditional scrubbers, the result is a scrubber that is substantially smaller than conventional designs and features adaptable scrubber inlet and outlet geometry, as well as optimum layout of the spray nozzles and spray banks. This results in a uniform SO_2 profile in combination with the highest possible gas velocity in the scrubber – removing the most pollutants while utilizing the least power.

The scrubber also benefits from use of the latest materials and construction methods. Fiber reinforced plastic (FRP) absorbers and reinforced concrete absorbers with polypropylene linings are used in addition to the proven stainless steel and alloy absorbers as well as carbon steel absorbers with a variety of inner linings.

Key features

- Outstanding for all fuels (lignite, hard coal, oil, biomass, waste)
- SO_2 removal > 99%
- Maximum HCl and HF removal levels
- Gypsum as a saleable end product
- Flue gas volume flows of up to 5 million m³/h [stp, wet] per scrubber
- Limestone as a favorably priced absorption agent
- Low operating costs and power consumption
- Open spray tower, low pressure loss
- Options for materials of construction (high-alloy carbon steel with rubber lining, concrete with PP-lining, glass fiber reinforced plastics)

▼ World´s largest absorber in Neurath, Germany

FGDplus

The optimized mass transfer upgrade for improved removal of SO_x, dust, and aerosol

The drivers for process development in the field of flue gas cleaning technologies are no longer limited to more stringent, country-specific emission limits.

Meanwhile, there are other drivers, such as optimization of the separating efficiency in order to improve input of energy and resources. Another determining factor is the need to minimize the maintenance effort over the entire lifecycle of a flue gas desulphurization plant (FGD plant).

A new type of FGD technology based on the proven ANDRITZ limestone wash technology meets these new requirements. The patented FGDplus technology from ANDRITZ is based on an optimized “tracked mass transfer” inside the scrubber. With this system, an optimized combination of different absorption regimes leads to improved SO_x, dust, and aerosol removal, which helps to improve the efficiency of any installed system. Especially in high sulphur applications, these advantages are outstanding.

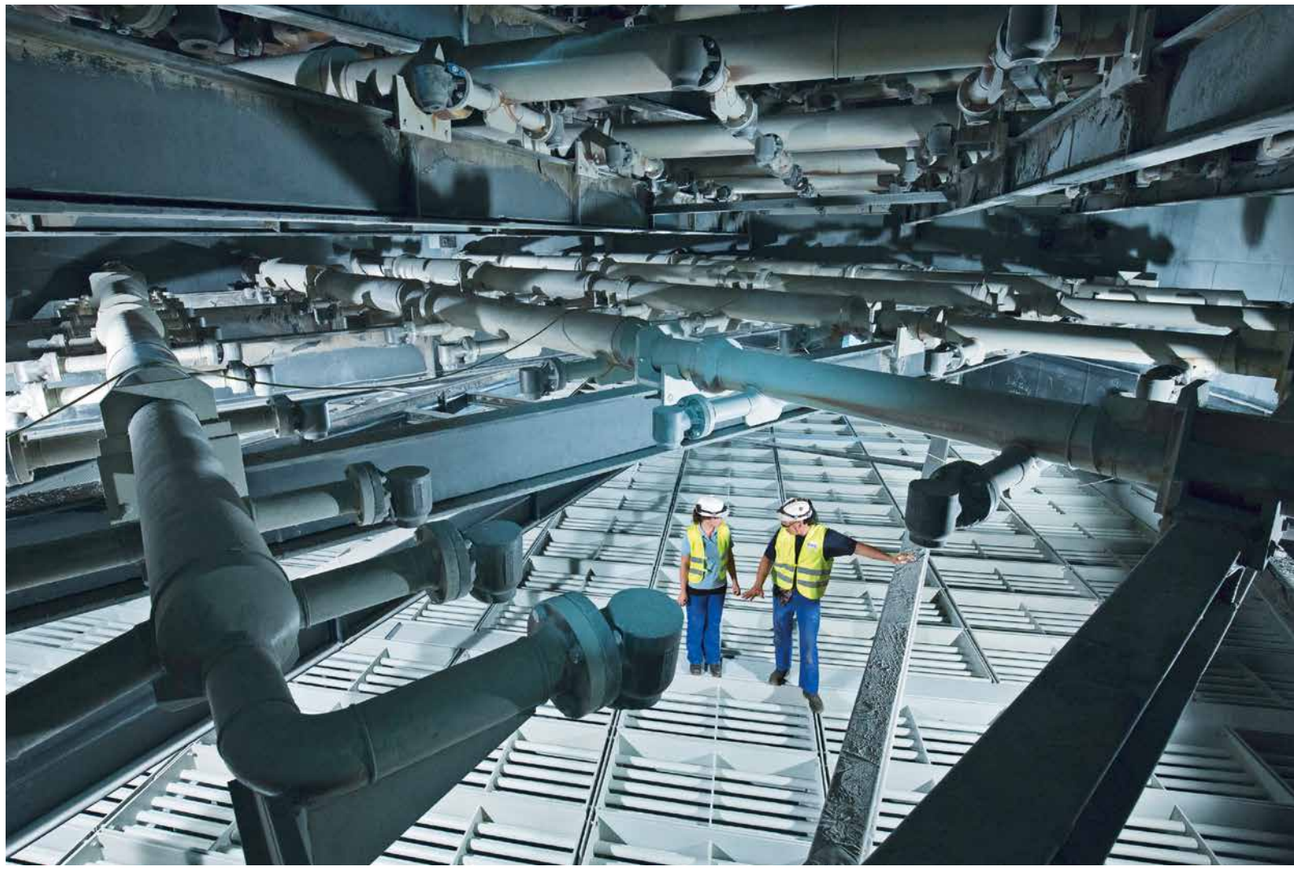
Existing open spray tower scrubbers can be retrofitted easily to a new level of performance with this innovation, where the design will be optimized to meet the requirements on site. Influence on the existing design of the scrubber sump and the recirculation system is minor. Challenging implementation time and special maintenance requirements will also favor the FGDplus system.

A very robust and reliable FGD system was introduced with the FGDplus design. Based on long term investigations on lab and pilot scale, but especially with an industrial-size pilot plant at a lignite-fired power plant in Germany, a new and innovative design was developed. The first applications and long-term experience in Germany and Asia confirm these findings and show a clear advantage over comparable designs on the market.

Key features

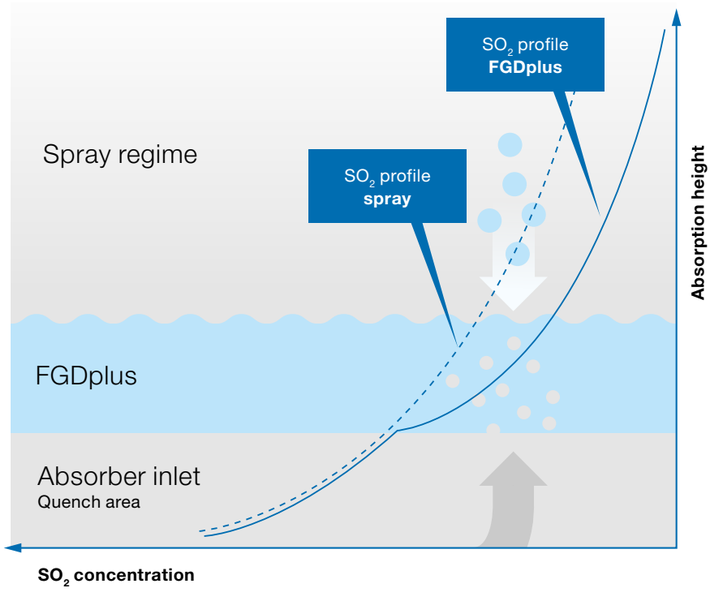
- Optimized combination of favorable mass transfer regimes from inlet to outlet of absorber
- Easy to implement and update existing systems
- Short implementation time
- Robust design, absolutely blocking resistant
- Minimized operation and maintenance costs
- Designed for optimized removal of SO_x, dust, and aerosol

▲ Spray tower, Karlsruhe, Germany



▲ RWE Power AG

▲ FGDplus demonstration plant at RWE lignite power plant, Niederaussem, Germany



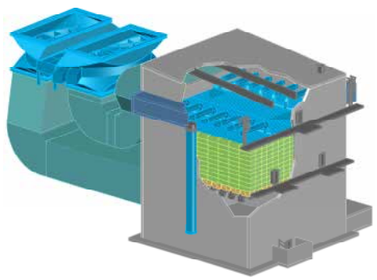
Seawater Flue Gas Desulphurization (FGD)

Process with low operating and maintenance costs for use in coastal regions

ANDRITZ has developed the seawater FGD process by taking full advantage of the cooling water circuit downstream of the condenser of power plants in coastal areas.

Ideal solution for coastal plant

ANDRITZ´s seawater FGD system is able to work without additional absorbent, and there are no by-products or waste created that need further treatment or disposal. Raw flue gas enters the scrubber and is cleaned in counter-current by seawater. The principle applied here is similar to the limestone process. Depending on the application, ANDRITZ offers an FGD scrubber based on the well proven open spray tower technology, combined with an FGDplus system. In addition, ANDRITZ also has experience with a packed tower design for seawater FGD systems. These systems are beneficial in optimizing the plant's footprint and efficiency at high SO_2 inlet concentrations.



◂ Seawater FGD at Central Power Plant #6,Venezuela

▾ Seawater FGD at Vung Ang power plant, Vietnam

Wise principle

The principle of our process is to make use of the natural alkalinity of seawater instead of using limestone solution to absorb acidic substances in the flue gas. The SO_2 is first converted into sulphite. Then the sulphite is oxidated to form sulphate in the CFD-optimized aeration basin in order to maintain the pH, raise the DO (dissolved oxygen), and reduce the COD (Chemical Oxygen Demand). In the meantime, CO_2 formed by the neutralization reaction is stripped by aeration membranes, and the pH value is increased consequently to meet legal requirements.

Flexible arrangement

ANDRITZ is able to provide customized seawater FGD design and planning to suit the general power plant arrangement.

Key features

- Outstanding for various fuels (lignite, hard coal, oil, and biomass)
- Up to 99% SO_2 removal
- No by-products
- Seawater as absorbent
- Open spray tower technology and packed tower design
- Low operating and maintenance costs
- High availability
- Options for materials of construction (high-alloy carbon steel with rubber lining, concrete with PP-lining, glass fiber reinforced plastics)

Turbo-CDS

Multi-pollutant control for boilers up to 300 MWel

ANDRITZ Turbo-CDS technology is the ideal solution for flue gas cleaning downstream of boilers fired with fossil fuels and other energy sources. It is an optimum one-step solution that has demonstrated not only high efficiency in removal of SO_x and particulate, but also of HCl, HF, heavy metals like mercury, and other hazardous pollutants.

Process

ANDRITZ´s Turbo-CDS system based on the well proven circulating fluid bed (CFB) technology. It has shown excellent performance as a multi-pollutant control system in just one step.

The flue gas flows through a cylindrical apparatus (CFB scrubber). The scrubber inlet uses multiple venturi nozzles to increase gas velocity in order to support the fluidized bed. The bed material in the fluidized bed consists of unreacted lime, which is injected as a dry powder, reaction by-products, and fly ash. These materials are recirculated between the scrubber and the connected filter. In addition, process water is injected separately into the scrubber in order to enhance the desulphurization capacity of the process. Wastewater from other processes can be used as process water, which is beneficial if waste water disposal is desired or if fresh water availability is limited on site. To collect particulate matter exiting the scrubber, either a fabric filter or an electrostatic precipitator may be used. The separated material is recirculated back into the scrubber by means of fluidized "air slide" conveyors. This recirculation system also regulates disposal of the by-product, which is a dry powder that can be landfilled or used beneficially as structural fill or in agricultural applications.

Other equipment has also been optimized and designed especially for the ANDRITZ Turbo-CDS. The lime hydrator, for example, can be made an integrated part of the overall ANDRITZ technology so that pebble (or "burnt") lime (CaO) can be used as the reagent, which is less expensive than using hydrated lime.

Advantages

ANDRITZ Turbo-CDS has been optimized for a minimum footprint requirement and is, therefore, an excellent solution for retrofits where space for the necessary plant is limited. With this system, no wastewater is generated. Also the short implementation time, and the low investment and maintenance costs are clear advantages over comparable systems. The ANDRITZ Turbo-CDS has demonstrated its high availability in multiple applications around the world.

Key features

- Focus on optimized SO_x and dust removal (> 99%) – high reliability and flexibility
- Multi-pollutant control in one step, suitable for an expanded set of pollutants newly regulated in the US, the EU, and China
- Experience using a single scrubber train handling up to 1.2 million m^3/h (0.7 million acfm), equivalent to 300 MWel per CFB scrubber
- CFD modelling used as an engineering tool – optimization of fluid dynamics
- In-house lime hydration design, optimized for ANDRITZ Turbo-CDS

Timişoara

Timişoara, Romania ▶

Dry flue gas cleaning systems
Effective and compact – in one step

ANDRITZ dry flue gas cleaning systems meet the requirements for complying with the world's strictest emissions legislation, the desire for low consumption of additives, the need for minimal residues, and the installation simplicity of a compact design.

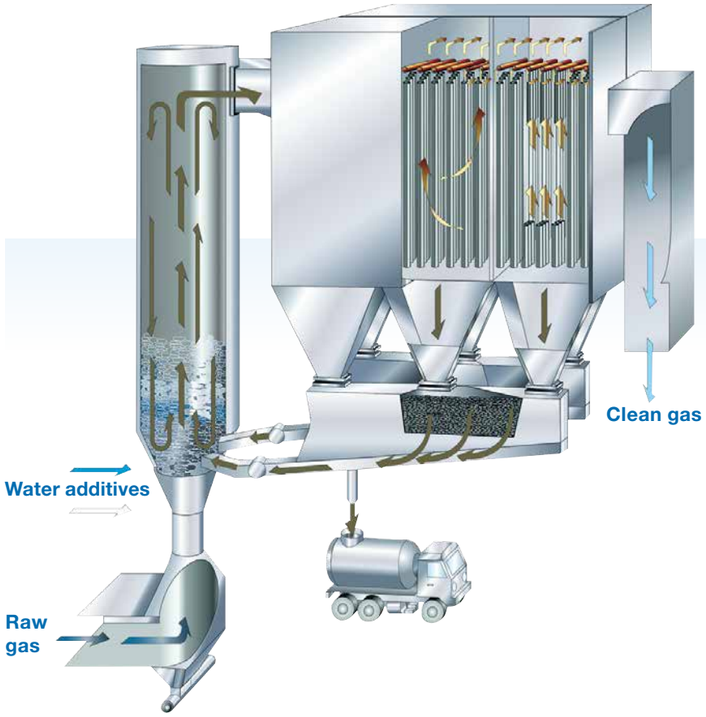
Activated carbon can be used to achieve excellent removal of mercury, heavy metals, and dioxin/furan. As a result of advanced process management in terms of operating temperature, solids recirculation, and the dosage of additives, material consumption and generation of waste are kept to a minimum. The by-product of the process is a dry, powdery residue, which – depending on its composition – can be landfilled or used as a filler (e.g. road construction).

Low investment and maintenance cost

Turbo-CDS systems are noteworthy for their compact designs. This allows for easier installation in a plant. Fluidized bed technology does not use rotating or wear parts, reducing the initial investment cost and the ongoing maintenance costs. Due to the simplicity of the design of the system components, very high levels of availability are achieved.

Dry Sorbent Injection (DSI)

In certain cases, especially for smaller plants, dry sorbent injection is used for removal of SO_x and/or HCl, and even as a multi-pollutant control system. DSI has been optimized for a minimum footprint requirement and is, therefore, an excellent solution for retrofits where space is limited and plant upgrades are necessary. Hydrated lime neutralizes the acid components in the flue gas, whereas activated carbon injection can be used for heavy metal and dioxin/furan removal. A downstream bag filter is usually used for particulate removal, where dust and by-products are collected.



▲ Circulating Dry Scrubbing (CDS) process

◀ TurboSorp, Fabric Filter, SCR, Moerdijk, Netherlands

▼ Dry Sorbent Injection and Tail-End SCR, Conyers (GA), Pratt, USA

Sodium bicarbonate

The sodium bicarbonate process is used wherever waste production must be kept to a minimum. Due to the very high reactivity of sodium bicarbonate, only a small amount of sorbent is required. The process is independent as long as the temperature is high enough. This technology is also compatible with low temperature SCR, where no reheating is required.

TurboSorp

Similar to the Turbo-CDS technology, the TurboSorp process consists of a CFB scrubber connected to a bag filter, where the product is circulated multiple times before it is released from the process. The TurboSorp process is designed to optimize the footprint and keep the installation time to a minimum. Due to product recirculation and water injection, the sorbent consumption is minimized.

Key features

- Proven technology know-how with excellent references
- Dry sorbent technologies optimized for any onsite conditions, with a focus on multi-pollutant control solutions:
  - SO_x, HCl, HF removal
  - Dust and particulate matter
  - Heavy metal including mercury, organic, and other pollutants like dioxins/furans
- Low investment costs
- Low maintenance, high availability
- Wastewater free

Particulate removal technologies

Pulse Jet Fabric Filters (PJFFs) and Electrostatic Precipitators (ESPs)

ANDRITZ Pulse Jet Fabric Filter technology has been developed through the design and installation of more than 80 fabric filter systems worldwide.

Pulse Jet fabric filters (PJFF)

These fabric filters treat approximately 54 million m^3/h (32 million ACFM) of flue gas, primarily at coal-fired boiler power plants (over 7,000 MW capacity), but also including waste incinerators, biomass, and other industrial processes.

ANDRITZ fabric filters are used to meet the most stringent particulate emissions requirements, but also for ash recirculation and collection, as well as the adsorption or absorption of partially gaseous pollutants in conjunction with the ANDRITZ CFB scrubbers or Dry Sorbent Injection (DSI) systems.

Key features

- Modular fabric filter (PJFF) designs available up to 150 MW
- Structural designs up to 500 MW in a single fabric filter
- As many as 1,800 bags per compartment
- ASME stamped pulse headers with multiple pulse valve designs
- High- and medium-pressure cleaning system designs
- Filter bags up to 10 meters (32.8 ft) in length
- Multiple filter bag and cage designs to suit any application

▲ Cleco, USA

▼ Hoppers for the pulse jet fabric filter - Big Stone - Otter Tail

- Filter bag life in excess of five years
- Low pressure drop on stand-alone filters as well as downstream of CFB scrubbers
- Unparalleled fossil fuel experience
- Ideal solution for dry scrubber applications, low sulphur, and PRB coals
- > 99.9% particulate removal, with demonstrated emissions less than 0.005 lb/MMBtu

Wet Electrostatic Precipitator (WESP)

Extensive experience with wet-type electrostatic precipitators that are now operating worldwide. The WESP is used to collect sub-micron particulate and aerosols (PM10) from gas streams.

Key features

- No emission of aerosol
- Dust removal down to PM2.5 and <1 mg/m^3 [stp]
- Reduction of heavy metals
- High velocity operation up to 4 m/s

Dry electrostatic precipitators

Dry electrostatic precipitators are offered as part of our Circulating Fluid Bed (CFB) scrubber system as well as on integrated air quality control system projects.

Key features

- Dust removal down to 10 mg/m^3 [stp, dry]
- Retrofit of existing ESP

▲ Otter Tail Power, USA

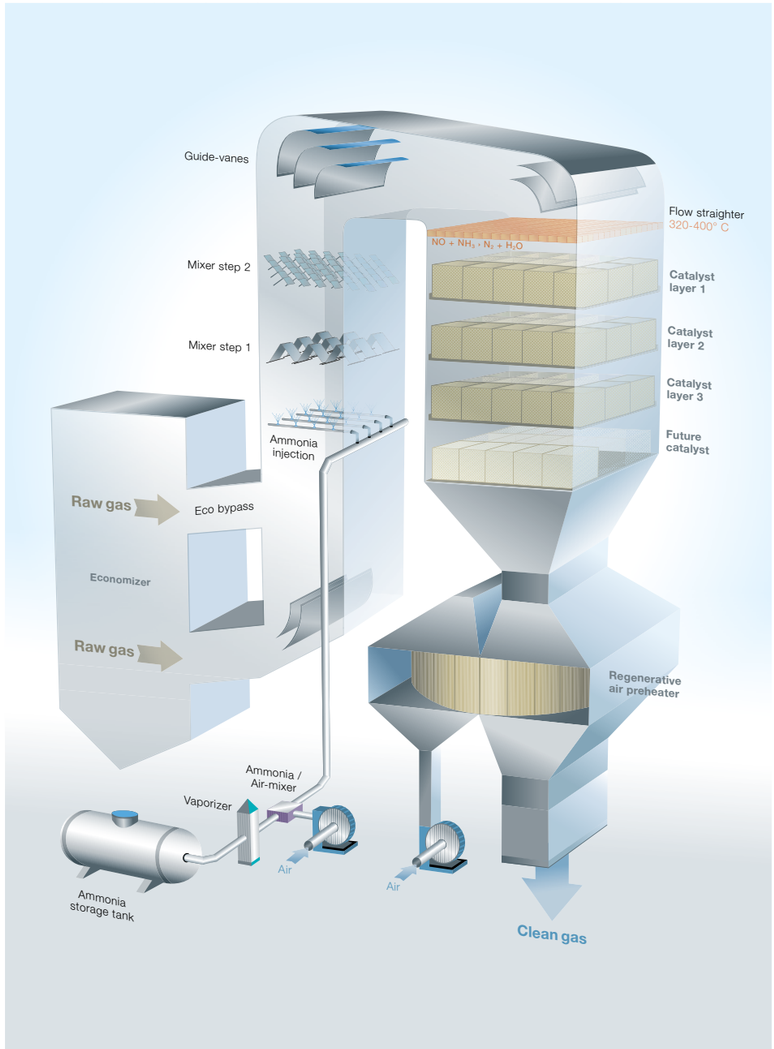
DeNOx plants
Selective Catalytic Reduction (SCR)

ANDRITZ was among the first companies in Europe to use SCR technology successfully.

▲ Tail-end configuration, Moerdijk, Netherlands

The company has numerous references in the DeNOx/SCR sector encompassing a variety of applications. In addition to use in power plants (high- and low-dust configuration), we have also used SCR technology successfully for waste incineration and other industrial processes.

We are able to to select specific operating parameters, catalyst geometry, and composition, thus ensuring optimum operation.



▲ High-dust configuration at Hoosier Energy Merom Power Station, Units 1 & 2, Sullivan (IN), USA

Our DeNOx/SCR systems are used in the following plants

Power plants
- Gas-fired
- Oil-fired
- Coal-fired
- Biomass-fired

Waste incineration plants
- Household waste
- Hazardous waste
- Hospital waste

Industrial plants
- Steel industry
- Oil industry
- Pulp and paper industry

The location of the DeNOx/SCR system within the flue gas cleaning process depends on the type of fuel involved. Our tail-end configuration has proved to be highly effective in waste incineration and biomass-fired plants. The active centers of the catalyst are only exposed to a minimum of catalyst poisons, resulting in a longer lifetime.

Due to the necessity of a reheating system, the investment and operating costs are higher for the tail-end configuration, which is thus mainly used in industrial applications.

The high-dust configuration is preferred for power plants (coal, gas, oil), as the costs for reheating can be avoided. ANDRITZ has an extensive database on catalyst life for a variety of fuels. Consequently, we are able to optimize and minimize the catalyst volume for every application.

Key features
- Aqueous ammonia direct injection
  - Latent heat of flue gas used to vaporize reagent
- Injection of pre-vaporized ammonia with optimized Ammonia Injection Grid (AIG)
  - Optimum NO_x to ammonia distribution at minimum pressure drop
- Experience with wide fuel range
  - Most coal types (PRB, subbituminous, bituminous, and lignite)
  - Oil refinery wastes, lean gas, natural gas
  - MSW, industrial sludge
  - Biofuels, sewage sludge
- Experience with various SCR arrangements
  - High dust
  - Low dust
  - Tail end
- SCR cleaning devices
  - soot blowers
  - sonic horns

Multi-stage/combined flue gas cleaning
Compliance with lowest emission values

ANDRITZ has the competence to combine and optimize systems for special requirements.

Current legislation regarding waste disposal and emission levels requires state-of-the-art flue gas cleaning systems. Selective pollutant removal is required, which not only aims to achieve minimum emissions in tandem with low operating costs, but also enables the recovery of recyclable by-products and a linked reduction in the volume of highly pollutant residues.

ANDRITZ is the perfect partner for tailored solutions meeting both environmental and procedural requirements. We accompany our clients through the whole investment process, beginning with project development through plant commissioning, and then service support for the lifetime of the system.

▲ SCR, spray dryer, fabric filter, two-stage wet scrubber, two trains, Mainz, Germany

◀ Recirculation pumps, Pfaffenau, Austria

▲ Wet scrubber, tail-end SCR, two trains, Spittelau, Austria

Our flue gas cleaning systems are designed in modules. This helps us to configure and combine technologies in order to meet specific requirements:

- Dry flue gas cleaning
- DeNOx/SCR systems
- Multi-stage wet scrubbing
- Particulate control
- Spray absorption
- Activated carbon

Key features

- Process/project development for complex, unique process requirements
- As an experienced EPC contractor, knowledge of the complex project set-up throughout the entire project lifetime
- Focus on holistic project set-up – minimizing operation costs, recovery of recyclable by-products
- Process know-how, experience from tip to toe for multiple industry sectors

Mercury control

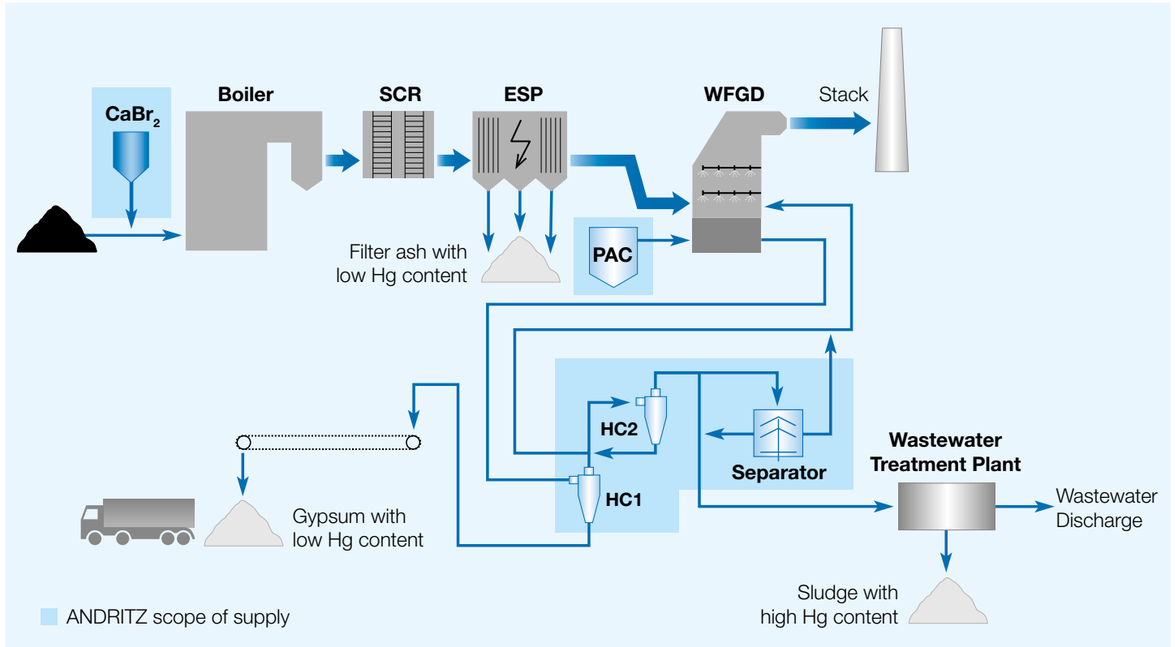
Holistic approach to minimize mercury emissions throughout the process chain

Of the several processes for removing mercury from the emissions of coal-fired power stations, the most preferred are those that have synergy with existing air pollution control equipment.

Mercury is a potentially deadly neuro-toxin. Mercury emissions from coal-fired power stations are a major environmental concern due to the toxicity and persistence of mercury that accumulates in our waterways.

Stringent mercury emission limits in the USA and upcoming BAT and IED regulations in Europe present a significant challenge. To meet these limits, ANDRITZ follows a holistic approach by taking not only the various oxidation reactions in the flue gas pathway, but also the processes within the wet FGD system and downward streams into account. We expect that this issue will become a main topic worldwide for coal-fired boilers within the next few years.

If the conventional oxidation in the gas phase, based on the gas condition and process set-up, is not sufficient to meet the emission limits, ANDRITZ offers a well proven calcium bromide oxidation system. Dosing calcium bromide into the boiler is an adequate and easy way to oxidize the greater part of the mercury originating within the boiler. Other process steps within the flue gas path are crucial for any further mercury oxidation downstream of the boiler as well. For instance, any enhanced oxidation within an existing SCR unit has to be considered for any process developments. Finally, the oxidized mercury will be caught at the FGD scrubber. ANDRITZ considers all the important process steps and the gas composition in order to optimize the mercury emission control system implemented.



▲ Hg removal

ANDRITZ has long-term experience with wet and dry FGD systems. A well designed dry flue gas cleaning system will help to minimize the additional additive costs. ANDRITZ has introduced and constantly improved the TurboSorp Circulation Dry Scrubbing (CDS) system.

The wet FGD is not only a very efficient way of separating acidic components from the flue gas stream, it is also highly efficient when it comes to removal of the oxidized mercury species. However, inconsistencies in the wet scrubber chemistry can be linked to re-emissions of mercury that has already been captured. In order to avoid any re-emissions from the FGD process, ANDRITZ focuses particularly on binding and stabilizing the dissolved mercury in the limestone slurry. If, for instance, PAC (powdered activated carbon) injection is applied to inhibit re-emission, the main mercury sink in the conventional process chain will be the FGD by-product – the gypsum. This is unacceptable for two major reasons if the plant management is targeting beneficial use of the FGD product. Firstly, it greatly increases the mercury content in the gypsum, which could render the FGD product useless as a resource for the drywall industry. Secondly, the gypsum whiteness will deteriorate and hence be unattractive for commercial use.

With conventional hydrocyclone systems, the specifically bound mercury cannot be removed efficiently from the gypsum. Thus, ANDRITZ offers a patented hydrocyclone design that clearly separates the mercury-loaded particles (e.g. PAC) from the gypsum and thereby reduces the mercury content in the FGD product to a minimum. This system is easy to implement and has a clear advantage for any upgrade of existing FGD installations. In order to enhance the mercury transfer to the waste water treatment plant and also to prevent an increase of the mercury concentration within the scrubber, ANDRITZ offers an upgrade of any mercury reduction system with a clear mercury sink within the FGD system. ANDRITZ can draw on long-term experience with any dewatering technology. Thus, a controlled mercury sink is created.

Key features

- Offering a complete, holistic mercury reduction system including flue gas path and FGD by-products
- Proven system for mercury removal in the flue gas path
- Patented new hydrocyclone system for mercury removal from by-products
- Easy to implement and to upgrade existing systems
- Defined mercury sink within the waste water plant

Making your plant fit
for upcoming, stringent emission limits

Increasingly stringent emission limits worldwide for dust, NO_x, SO_x, mercury, and other flue gas pollutants, but also further overall plant efficiency standards (guidelines) require individual solutions (solution approaches) for existing facilities.

In order to find the best suitable solution (for the individual frame conditions), ANDRITZ can draw from an extensive pool of know-how and a variety of test and measurement facilities, as well as offering full support for modernization of the air pollution control systems of older power plants and industrial facilities.

Together with our own measurement and laboratory team, ANDRITZ has gathered extensive know-how for all of the flue gas pollutants mentioned. Within the past few years, we have analyzed several existing facilities in order to pinpoint different pollution tracks on several different process parameters.

After a first facility process check with our modernization specialists, we aim to gain a detailed insight into the whole process chain, from the boiler to the stack. In combination with our simulation models, developed and tested in-house, like our Computational Fluid Dynamics (CFD) model, we find the most suitable solution together with our clients. With the CFD model, we can provide local and/or time-resolved visualization of flow and transport processes in multi-phase processes. For example, pollutant concentrations in apparatus can be pinpointed locally and temporarily.

Key features

- Increasingly stringent flue gas emission limits for dust (down to 5 mg/m^3 [stp, dry]), NO_x (< 75 mg/m^3 [stp, dry]), SO_x (< 35 mg/m^3 [stp, dry]), mercury (< 3 $\mu g/m^3$ [stp, dry]), and other pollutants
- We analyze specimens in our laboratory and our own measurement team conducts the measurements
- We develop and implement optimization concepts for your plant
- We identify the most cost-effective solution for your specific challenges with respect to both investment and operating expenses
- We take care of the planning and execution from project development to plant commissioning, to support during the warranty period

▲ RWE Power AG

References

Neurath F/G, Germany
Wet limestone FGD

Customer: RWE Power
Capacity: 2 x 1,100 MWel, 2 x 4,850,000 m³/h [stp, wet]
Fuel: Lignite
Start-up: 2011

Karlsruhe, Germany
Wet limestone FGD

Customer: EnBW
Capacity: 910 MWel, 2,500,000 m³/h [stp, wet]
Fuel: Hard coal
Start-up: 2011

Rybnik, Poland
Wet limestone FGD

Customer: Elektrownia Rybnik
Capacity: 4 x 200 MWel, 2 x 1,320,000 m³/h [stp, wet]
Fuel: Hard coal
Start-up: 2008

Tusimice II, Czech Republic
Wet limestone FGD

Customer: CEZ
Capacity: 4 x 200 MWel , 2 x 1,780,000 m³/h [stp, wet]
Fuel: Lignite
Start-up: 2009 / 2010

Virginia City, VA, USA
CFB scrubbers, PJFF and ESP

Customer: Dominion Energy
Capacity: 2 x 335 MWel, 2 x 1,046,000 acfm
Fuel: Waste coal, biomass
Start-up: 2011

Moerdijk, Netherlands
TurboSorp PJFF, ESP and SCR/DeNOx

Customer: BMC Moerdijk
Capacity: 250,000 m³/h [stp, wet]
Fuel: Poultry litter
Start-up: 2008

Linz 04-05, Austria
SCR DeNOx

Customer: VA STAHL
Capacity: 2 x 150,000 m³/h [stp, wet]
Fuel: Blast furnace gas, coke oven gas
Start-up: 2004-2005

Sandow, Texas County, USA
CFB scrubber, PJFF

Customer: Bechtel Corporation / Luminant
Capacity: 2 x 315 MW, 2 x 1,118,200 m³/h [stp, wet]
Sorbent: Hydrated lime
Start-up: 2008

TA Lauta, Germany
Multi-stage FGC plant

Customer: Ravon Lauta
Capacity: 2 x 76,000 m³/h [stp, wet]
Fuel: Domestic waste
Start-up: 2002

Haikou, China
Turbo-CDS WtE power plant

Customer: CPI New Energy Holding
Capacity: 2 × 600 t/d, 2 × 108700 Nm³/h
Sorbent: Ca(OH)2
Start-up: 2012

Guacolda, Chile
Turbo-CDS (dry FGD) and SCR plant

Customer: Empresa Electrica Guacolda
Capacity: 3 x 140 MW, 3 x 560,000 m³/h (std, wet)
Fuel: Coal
Start-up: 2015-2016

Lünen, Germany
Wet limestone FGD

Customer: Trianel
Capacity: 1 x 800 MWel, 1,965,000 m³/h [stp, wet]
Fuel: Hard coal
Start-up: 2012

Turceni, Romania
Wet limestone FGD

Customer: S.C. Complexul Energetic Turceni S.A.
Capacity: 4 x 330 MWel, 4 x 1,723,000 m³/h [stp, wet]
Fuel: Lignite
Start-up: 2011

Yunus Emre, Turkey
Turbo-CDS and ESP

Customer: Vitkovice, Adularya
Capacity: 2 x 145 MWel, 2 x 610,000 m³/h [stp, wet]
Fuel: Lignite
Start-up: 2013

Central Power Plant #6, Venezuela
Seawater FGD

Customer: Beijing Boqi Electric Power Sci-tech Co., Ltd
Capacity: 1 × 600 MW, 1 × 1,973,209 Nm³/h
Sorbent: Seawater
Start-up: 2014

Glückstadt, Germany
Dry FGC (TurboSorp)

Customer: HKWG Glückstadt
Capacity: 160,000 m³/h [stp, wet]
Fuel: RDF, sludge, coal
Start-up: 2009

Mellach, Austria
SCR DeNOx

Customer: Siemens, Verbund ATP
Capacity: 2 x 400 MWel, 2 x 2,100,000 m³/h [stp, wet]
Fuel: Natural gas
Start-up: 2011

Luke, MD, USA
Pulse Jet Fabric Filter (PJFF)

Customer: New Page
Capacity: 1 x 179,900 and 1 x 349,800 m³/h [stp, wet]
Fuel: Eastern bituminous coal
Start-up: 2007

CONTACT

GRAZ, AUSTRIA
ANDRITZ AG
Headquarters
Stattegger Strasse 18
8045 Graz
Phone: +43 (316) 6902 0
welcome@andritz.com

COLUMBIA, USA
ANDRITZ Inc.
7110 Samuel Morse Drive- Suite 150
Columbia, MD 21046
Phone: +1 (410) 910 5100
apc-USA@andritz.com

FOSHAN, CHINA
ANDRITZ (China) Ltd.
9 Tian Bao Road, West City Industry Zone,
Chan Cheng District,
Foshan, Guangdong 528000, China
Phone: +86 (757) 8296 9222
apc-CN@andritz.com

GRAZ/RAABA, AUSTRIA
ANDRITZ AG
Waagner-Biro-Platz 1
8074 Raaba-Grambach
Phone: +43 (316) 501-0
apc-AT@andritz.com

SANTIAGO, CHILE
ANDRITZ Chile Ltda.
Isidora Goyenechea 3600, Oficina 1002,
Las Condes 7550053 Santiago
Phone: +56 (2) 462 4605
apc-CL@andritz.com

NEW DELHI, INDIA
ANDRITZ India Private Limited
602, Eros Corporate Tower, Nehru Place,
New Delhi-110019, INDIA
Phone: +91-11-46074984~5
apc-IN@andritz.com

www.andritz.com

PP.APC.02.eng.10.16