



MERCURY, SO_x AND DUST CONTROL

BREF - BEST AVAILABLE TECHNIQUES REFERENCE

Two small, cylindrical metal components with threaded ends are shown on a reflective surface. One is upright and the other is lying on its side. Their reflections are visible on the surface below them.

ANDRITZ

ENGINEERED SUCCESS



MACRO VIEW / ANDRITZ washwater hydrocyclone

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A PRODUCT RANGE FOR ALL REQUIREMENTS

Clean environment for a better tomorrow. ANDRITZ is a leading global supplier of innovative air pollution control technologies with more than 30 years of experience and over 200 installations around the world.



FOCUS ON MERCURY REDUCTION

Based on local conditions and individual requirements, ANDRITZ works closely with its customers to develop a tailor-made solution.



REFERENCES

References and current projects from ANDRITZ in the field of air pollution control technologies.



SMART SOLUTIONS INTEGRATED INTO EXISTING SYSTEMS

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.



SO_x AND DUST REDUCTION

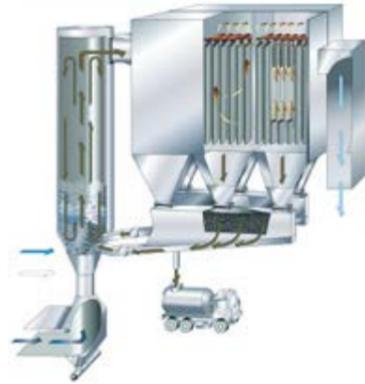
Energy savings, reduced maintenance costs, and only minor adjustments to local conditions clearly speak for ANDRITZ's FGD-plus technology. The unique design benefits set the FGDplus apart from comparable technologies.

A product range for all requirements



WET LIMESTONE FLUE GAS DESULPHURIZATION (FGD)

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



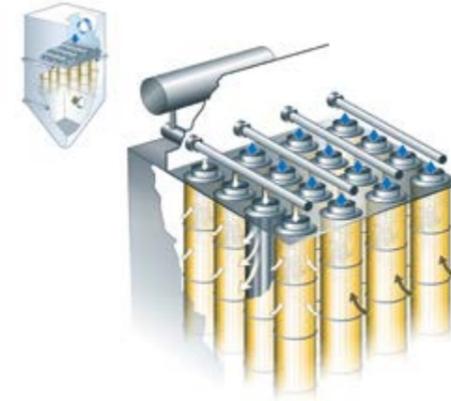
DRY FLUE GAS CLEANING (FGC)

ANDRITZ dry flue gas cleaning 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 Energy from Waste plants and other industrial applications.



DENOX/SCR

ANDRITZ utilizes the Selective Catalytic Reduction (SCR) process technology for the denitrification of flue gas – as high- and low-dust as well as tail-end configuration. Dioxins and furans can also be decomposed with the SCR tailend configuration.



FABRIC FILTER & ELECTROSTATIC PRECIPITATOR (ESP)

Dust filters in the form of fabric filters or electrostatic precipitators are used as the second stage in the ANDRITZ TurboSorp process. In addition these filter types are applied in Dry Sorption Processes (DSI) together with an upstream sorbent injection, with Calcium or Sodium based or carbon based adsorbents. Finally ANDRITZ offers fabric filters or ESP's as stand-alone equipment for particulate separation after all kinds of incineration processes or other industrial applications.



ANDRITZ patented washwater hydrocyclone for mercury reduced gypsum dewatering.

POWER STATION APPLICATIONS:

- Wet limestone flue gas desulphurization
- FGDplus
- Mercury removal

INDUSTRIAL APPLICATIONS (INCL. EFW AND BIOMASS PLANTS):

- Wet flue gas cleaning
- Multi-stage scrubber
- Combined systems

POWER STATION APPLICATIONS:

- Turbo-CDS
- Dry sorption

INDUSTRIAL APPLICATIONS (INCL. EFW AND BIOMASS PLANTS):

- TurboSorp
- Dry sorption

POWER STATION APPLICATIONS:

- SCR (high-dust application)
- SCR for combined cycle power plants (CCPP)

INDUSTRIAL APPLICATIONS (INCL. EFW AND BIOMASS PLANTS):

- SCR (low-dust / clean gas application)

POWER STATION APPLICATIONS:

- Electrostatic Precipitator (ESP)
- Fabric Filter Installations

INDUSTRIAL APPLICATIONS (INCL. EFW AND BIOMASS PLANTS):

- Dry Sorption Processes (DSI) with sorbent injection

Smart solutions integrated into existing systems

An European Union wide harmonization of dust, NO_x, SO_x and mercury limits in large-scale combustion plants („BREF regulations“ - Industrial Emissions Directive (2010/75/EU)) requires each member state to implement newly specified emission ranges through national limits within a fixed period of four years (deadline: 18-Aug-2021). The tightening of these limits will be a major challenge for existing plants. Therefore, smart solutions integrated into existing systems are required. ANDRITZ's experience shows that every plant has the potential to realize the required improvements of SO_x, NO_x, dust and mercury removal

with reasonable operational adjustments and manageable plant expansions. For this reason, ANDRITZ takes a holistic approach, especially when it comes to optimizing existing plants. Our goal is to work closely together with our customers and offer a reliable and cost-effective process solution. Based on many years of experience in the design, supply and construction of turnkey air pollution control systems as well as multiple in-house developments in the areas of mercury, dust and SO_x removal, ANDRITZ is perfectly equipped to implement the BREF regulations.

CUSTOMER REQUIREMENTS

- Tightening of emission values for several pollutants
- Plant optimization required (“every plant has some potential”)
- Sustainable solutions for stable operation taking account of the operating environment (disposal costs, ...)
- Manageable operating costs
- Short response times between individual load ranges
- Multi-pollution control solutions (e.g. combined SO_x and dust separation)

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BREF (BEST REFERENCE) REQUIREMENTS

- Mandatory implementation period for dust, Hg, SO_x, NO_x, ... by August 17, 2021
- Mandatory increase in the efficiency of the entire plant

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ANDRITZ VALUE PROPOSITION

- Innovative solutions (e.g. mercury-free gypsum)
- Assessment of the entire process chain for all pollutants (internal loops, sink formation)
- Consideration of long-term behavior (e.g. Hg re-emissions)
- Merging of several requirements in a move towards multi-pollution control

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KARLSRUHE
GERMANY

Wet limestone FGD

MACRO VIEW / ANDRITZ patented
washwater hydrocyclone





FIG. 2 Reference FGDplus
Niederaussem 2014

SOx and dust reduction

Keep it simple!

FGDplus is a technology developed and patented by ANDRITZ to improve SO_x and dust removal. After several years of R&D and optimization, ANDRITZ was able to install its first FGDplus references in power plants beginning in 2014 (see fig. 1).

During the development of the FGDplus technology, ANDRITZ paid particular attention to the robustness of the system and the prevention of material build-up. These features were proven successfully in all bituminous coal and lignite-fired reference projects. The resulting higher operational reliability compare to other air pollution control technologies is, amongst other things, based on the chosen layout and optimized piping design (see fig. 2).

In all our reference projects, FGDplus elements made out of PP were used. These operate successfully even at high inlet temperatures up to 190°C. The successive R&D including testing of the FGDplus technology in a large industrial pilot plant (up to 50.000 Am³/h) at RWE Niederaussem gave ANDRITZ the advantage to develop precise design models by plotting all main inlet parameters examined under real operating conditions. This comprehensive design

model enables ANDRITZ to make detailed predictions of achievable removal efficiencies as well as operating conditions of all auxiliary equipment.

Energy savings, reduced maintenance costs, and only minor adjustments to local conditions clearly speaks for ANDRITZ's FGDplus technology. The unique design benefits set the FGDplus apart from comparable technologies. An operation with almost no material build-up, especially under critical operating conditions, is another key advantage.



Fig. 1: FGDplus technology references

REFERENCES

PROJECTS	BOILER	INSTALLED UNITS	SO ₂ EMISSION mg/m ³ _{stp}	DUST EMISSION mg/m ³ _{stp}	FOCUS
Niederaussem Block G (GER) – RWE	660 MW	1 x Ø 18,5 m	200	< 7	energy saving
Niederaussem Block H (GER) – RWE	660 MW	2 x Ø 18,5 m	200	< 7	energy saving
Taicuan (CN) – Datang	300 MW	1 x Ø 13,5 m	50	< 6	SO ₂ removal
Nanjing (CN) – Tongfang	120 MW	3 x Ø 8,4 m	35	≤ 5	Dust removal
Tusimice II (Cz) – CEZ	200 MW	2 x Ø 14,5 m	200	< 20	SO ₂ removal Dust removal

References



HG SEPARATION PROTOTYPE – MUL LEOBEN, AUSTRIA

Task: Development of ANDRITZ WashWater
Hydrocyclone Technology
Year: 2012



HG SEPARATION, BENCH SCALE – ANDRITZ TECHNIKUM, GRAZ, AUSTRIA

Task: Optimization and comparison tests of ANDRITZ Washwater
Technology, with various suspension from full scale FGD installations
Customer: Steag AG, E.On, Verbund AG
Year: 2014 – 2016



HG SEPARATION, FULL SCALE – SEVERAL CUSTOMERS (LIGNITE)

Task: Demonstration of ANDRITZ Washwater Hydrocyclone Technology
Customer: LEAG, RWE
Year: 2016



MERCURY, FULL SCALE – ENBW (HARD COAL)

Task: Balance of plant for fate of mercury within
the whole APC system
Year: 2016



MERCURY, MEASUREMENT CAMPAIGN – SEVERAL CUSTOMERS (LIGNITE)

Task: Bromine Dosing, Bromine+ Dosing, KAT Dosing, Stabilization
Customer: LEAG, MIBRAG mbH, eins energie in sachsen GmbH & Co. KG
Year: 2016, 2017



FGDPLUS – TUSIMICE II CZECH REPUBLIC

Task: SO_x, dust removal
Year: 2017





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. Contact us all over the world.

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