A holistic approach

MINIMIZING MERCURY, SOx, AND PARTICLE MATTERS

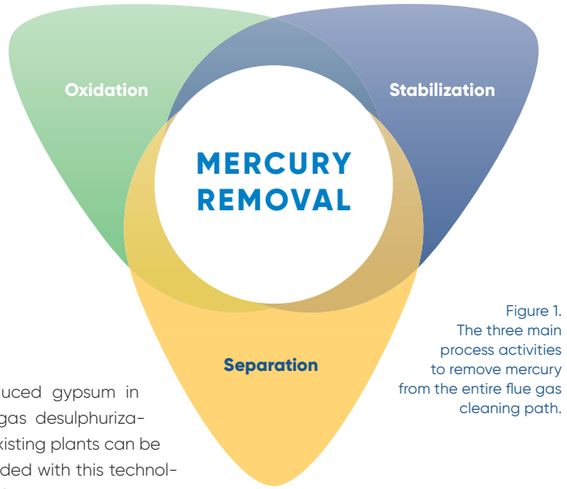

Figure 1.
The three main process activities to remove mercury from the entire flue gas cleaning path.

Harmonization of EU-wide limits on emissions of dust, NOx, SOx, and mercury is currently driving the majority of the investments at large-scale combustion plants. The tightening of these limits will place a major challenge on many existing plants. To make effective use of capital, it will be necessary to integrate new and perhaps innovative equipment into an established, existing plant. This requires a special expertise.

For more information about the mercury control technology, view the video on your smartphone.

Scan this QR-Code!

ANDRITZ's experience is that every plant has the potential to reduce SOx, NOx, dust, and mercury through a combination of *reasonable* operation adjustments and *limited* additional equipment. However, since additional capital is quite often scarce, it is important to take a holistic approach in order to arrive at a successful, reliable, and cost-effective outcome.

A HOLISTIC APPROACH TO MINIMAL MERCURY

Mercury emissions are an environmental concern due to the toxicity and persistence of mercury that accumulates in waterways. To meet stringent limits, ANDRITZ has taken a holistic approach to look at the combustion process as a whole, taking into account not only the various oxidation reactions in the flue gas itself, but all the sources and sinks in the entire flue gas cleaning path. Accurate information about the driving factors influencing mercury oxidation, absorption, and adsorption after the boiler outlet is combined with knowledge of the fly ash removed in the ESP as well as potential byproducts such as gypsum and sewage sludge.

With this data and the right interpretation of the data, mercury flows can be influenced and controlled with known technologies. In simplest terms, the mercury removal process, within the flue gas path, combines three main process activities (see Figure 1).

For each of these main process activities, ANDRITZ has the capability to develop a technical solution that is tailored to the existing equipment and operations. Core capabilities are shown in Figure 2.

Of ANDRITZ's core capabilities (see Figure 2), in particular, the bromine-based oxidation is an important part of the puzzle. This technology, offered exclusively by ANDRITZ, is the most cost-effective solution currently available on the market, even when used, such as sorbent dosing before the ESP.

In addition, the new regulations also provided a window of opportunity by rethinking established technologies. Here ANDRITZ patented a special hydrocyclone technology for the primary dewatering of the produced gypsum in a wet flue gas desulphurization plant. Existing plants can be easily upgraded with this technology, which closes an open gap and will be a game changer in some cases.

Drawing upon holistic knowledge of all relevant processes for mercury control (oxidation to stabilization to separation), ANDRITZ has created models for specific applications. These models are created for long-term view, not just a snapshot in time. Modeling is essential for a realistic assessment of the overall process in terms of re-emissions into the stack, targeted sink transfer, and sustainable operational safety.

FGDplus

FGDplus is an ANDRITZ developed and patented technology to improve SOx and

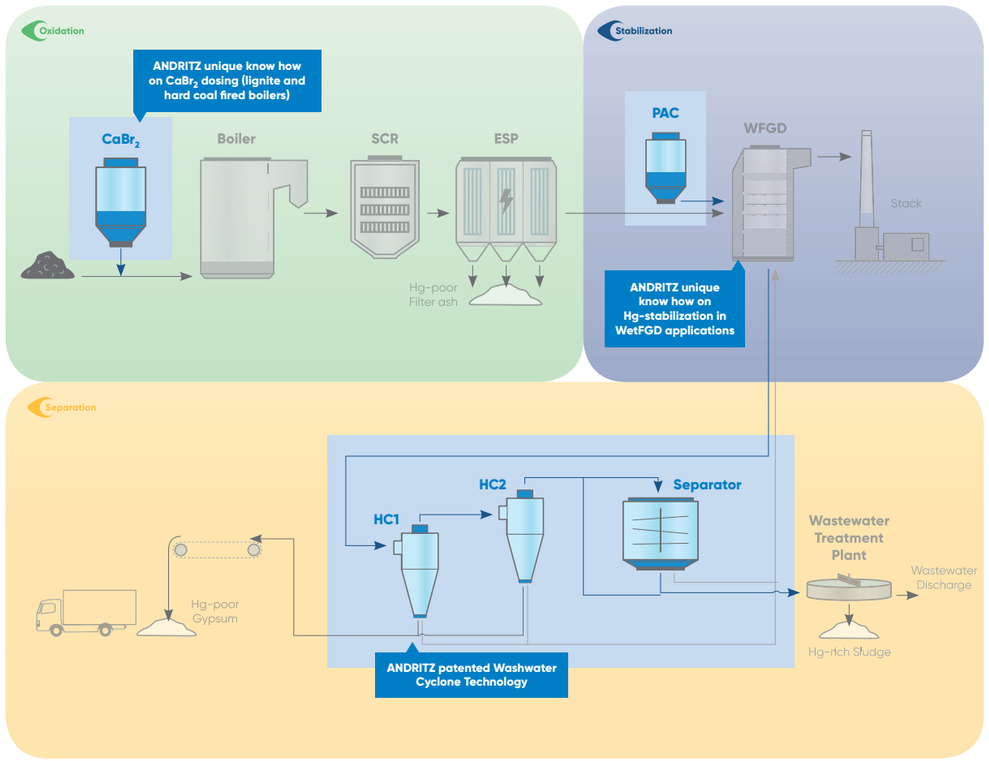

Figure 2.
Overview of a typical flue gas cleaning path for a lignite-fired power plant with key ANDRITZ solutions highlighted.

ANDRITZ scope of supply

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
Taiyuan (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

Table 1. FGDplus technology references

dust removal. After several years of R&D and optimization, the first installations of this technology began in 2014 (see Table 1).

During the development of the FGDplus technology, particular attention was given to creating a robust system that could also prevent the build-up of materials. These features are well proven in all the bituminous coal- and lignite-fired plants in which the technology has been installed.

For all installations to date, the FGDplus elements are constructed of PPH, allowing the units to operate reliably at high inlet temperatures up to 190 °C.

The higher operational reliability, when compared to other air pollution control technologies, is a function of not only the design features, but also the layout and optimized piping design.

Follow-on development work has included testing of the FGDplus technology in a large industrial pilot plant (up to 50,000 Am³/h), allowing engineers to develop precise design models by plotting all inlet parameters under actual operating conditions. This comprehensive model is the basis for making detailed predictions of SOx removal efficiencies, pressure drop, as well as the operating parameters for auxiliary equipment.

The unique design features of FGDplus technology set it apart from other approaches. An operation with almost no material build-up, especially under critical operating conditions, is a key advantage. Energy savings, reduced maintenance costs, and only minor adjustments to local conditions are major benefits.

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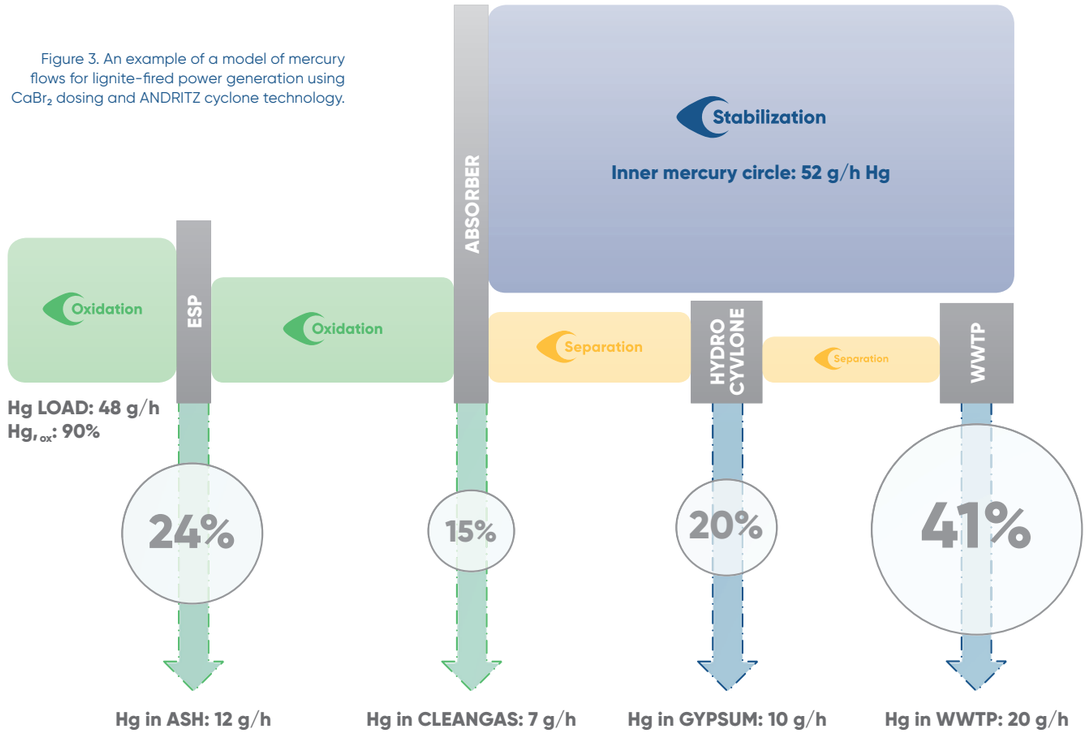
Figure 3. An example of a model of mercury flows for lignite-fired power generation using $CaBr_2$ dosing and ANDRITZ cyclone technology.



GERHARD SCHIEFER
Head of ANDRITZ AUTOMATION

Metris

Enhanced. Embedded. Eco-friendly.

A totally integrated automation solution for tissue producers is on display at the *Prime*Line Tissue Innovation and Applications Center in Graz.

The *Prime*Line Tissue Innovation and Applications Center (TIAC) in Graz, Austria is built around the world's most flexible pilot machine – capable of being configured in eight different ways for conventional, structured, and premium tissues. In order to be able to accomplish this, there is a very high degree of automation to monitor and control the valving, process flows, and machinery on-the-fly. This automation system is known as *Prime*Control E.

The "E" in *Prime*Control E stands for Enhanced operability and maintenance, Embedded drive and quality control systems, and Eco-monitoring for energy and resource efficiency.

Enhanced operability and maintenance. *Prime*Control E provides the utmost flexibility in monitoring and controlling stock preparation and the machine – including different forming, pressing, and drying configurations for conventional, textured, structured, and premium products.

An important aspect of the flexibility is the use of standard networks and protocols along with the integration of several vendor-specific bus systems in one centralized control system. Also included are simulation capabilities for training purposes; automatic reporting/instant messaging of information; onboard web-based engineering documentation (e.g., circuit diagrams); and a control library of modular, standardized software objects. Alarm management and online configuration of alarm task checklists provide a tool for faster and better service of maintenance activities. The capacity of the system is enlarged by utilizing the Metris Platform foundation, which optimizes performance based on proprietary algorithms with artificial intelligence.

For enhanced maintenance, the system's integrated condition monitoring functionality helps identify impending faults or malfunctions – and then gives access to dedicated online documentation. Interconnectivity with mobile devices (smartphones and tablets) allows maintenance people to monitor overall equipment effectiveness and respond to alarm situations wherever they are. There is even Augmented Reality (AR) functionality to provide specific information about an asset at the point of service on the mill floor.

Embedded drive system and quality control system. This unique combination in one automation system increases productivity, quality, and stability of production. Integrating drive control and quality control leverages key synergies, which result in shorter start-up times or changeovers after a grade or configuration change.

Eco-monitoring. ANDRITZ integrated a millwide Resource Management System (RMS) that monitors, tracks, and traces the tissue machine's resource demands and energy flows. The system typically monitors 70-80% of the total resource costs in the mill. With energy and resource efficiency integrated into the *Prime*Control E system, mill personnel gets a detailed overview of costs and energy balances to help optimize energy consumption.

The interconnected data from *Prime*Control E provides a good foundation for Metris OPP (Optimization of Process Performance) services. OPP has Big Data analysis capabilities to sift through historical process and machine data to detect anomalies and deviations and predict future events – allowing ANDRITZ and mill control experts to create counter-measures to stabilize production.