PRIMETALS TECHNOLOGIES

MEROS®
MAXIMIZED EMISSION REDUCTION OF SINTERING

primetals.com

MEETING FUTURE ENVIRONMENTAL DEMANDS NOW!
WITH MEROS® - MAXIMIZED EMISSION REDUCTION OF SINTERING

YOUR CHALLENGE

Requirements placed on availability, process quality and productivity of sinter plants are continuously growing, and can only be met with designs suitable for the rugged iron and steelmaking environment. At the same time, a growing number of environmental regulations necessitate extensive investment. This especially affects sinter plants with their high quantity of emissions, which has become a focal point of authorities responsible for environmental protection. As plant designers, our job is to create concepts that offer the best possible solution serving environmental requirements and economical necessity simultaneously.

OUR SOLUTION

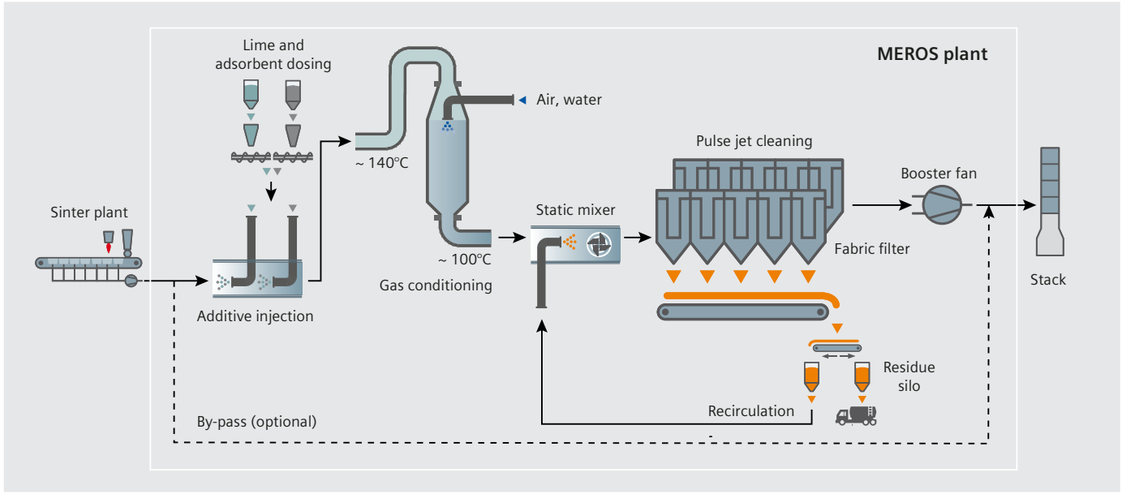
A fully satisfactory, environmentally compatible solution for the treatment of the offgas arising during the sintering process has not existed for a long time. In response to this challenge, Primetals Technologies developed the MEROS® process which stands for Maximized Emission Reduction Of Sintering. In a series of successive treatment steps the dust and harmful metallic and organic components present in the sinter offgas are removed to levels previously unattained with conventional gas-treatment techniques. Process operations and operating parameters were confirmed during two years of performance of the MEROS® demonstration plant. This was followed by the construction of the world's first MEROS® industrial plant which started up at the sinter plant of voestalpine Stahl, Linz/Austria.

MEROS® – a dry-type offgas cleaning process to reduce harmful emissions from sinter plants

ADVANTAGES OF MEROS®:

- Highest removal efficiency for heavy metals, acid gases, dioxin and other VOCs due to countercurrent flow injection of additives
- Minimized quantity of recirculation dust, therefore fewer filter pulse-cleaning cycles and less compressed air required
- Minimized mechanical stress on filter bags by using low-pressure pulse cleaning
- Avoidance of system sticking due to dry dust recirculation
- Controlled and constant process temperature as the basis for efficient desulfurization with hydrated lime
- Flexible gas desulfurization with hydrated lime - $Ca(OH)_2$ or sodium bicarbonate - $NaHCO_3$ as alternative process solution

MEROS®
GAS CLEANING WITH HYDRATED LIME (VARIANTE A)



MEROS® process - Gas cleaning with hydrated lime

Pulse Jet Filter

PROCESS DESCRIPTION

In the first step, adsorbents such as specially prepared lignite coke and hydrated lime for desulfurization are injected into the sinter offgas stream in the counter-current flow direction.In the second step, the gas stream passes to a conditioning reactor where the gas is moisturized and cooled to a temperature of about 90-100°C by means of an injected fine mist using dual flow nozzles (water and air).

This accelerates the chemical reactions required for binding and removing SO_2 and other acidic gas components.In the third step, the offgas stream passes through a pulse jet filter equipped with special high-performance fabrics where the dust and the trapped pollutants are removed. In order to enhance the gas cleaning efficiency and to reduce additive costs, the main portion of the dust is recycled to the offgas stream after the conditioning reactor. The dust removed from the system is conveyed to intermediate storage silos for subsequent disposal or further treatment.

INJECTION OF ADDITIVES

The injection of additives has two different objectives. Objective one is the desulfurization of the offgas ($DeSO_x$) by injection of specific desulfurization powders. Objective two is the reduction of heavy metals, PCDD/F (dioxins/furanes) and other toxic organic compounds VOC (volatile organic compounds).

MAIN BENEFITS

- Perfect distribution of additives by several injection lances
- Highest removal efficiency due to countercurrent flow injection of additives at a high relative velocity

Beside a perfect distribution of the additives, a high relative velocity of the injected particles against the gas flow is needed. A combined injection of the two powders is realized in counter current direction to the gas flow at a relative velocity far above 30 m/s. To ensure excellent distribution, several injection lances are positioned inside the gas duct.

GAS CONDITIONING

Special importance has to be addressed to the gas conditioning reactor. On the one hand temperature peaks are eliminated to protect the fabric filter bags and on the other hand the gas is conditioned at a desired process temperature (usually around 90-100°C) for improved desulfurization.

MAIN BENEFITS

- Special design of reactor inlet and outlet section to prevent clogging, settling and separation of particulates
- Special designed dual-flow nozzles to generate fine mist
- Set point temperature can be adjusted individually from the dust recirculation rate
- Permanently controlled and constant process temperature ensures reliable desulphurization of off-gas

PULSE JET FILTER

Main task of the fabric filter is the separation of the particulate matter transported with the offgas. This dust consists of primary dust, additives and reaction products. The dust particles remain on the outside surface of the filter cloth and the filter cake is built up at the surface of the membrane. When reaching a certain pressure drop over the filter, a compressed air pulse is activated and the filter cake falls off the cloth surface into the dust hopper.

MAIN BENEFITS

- Highest separation efficiency
- Persistent and temperature resistant filter bags suitable upto 250°C
- Low compressed air demand
- Minimized mechanical stress on filter bags using low pressure pulse cleaning
- Minimum filter area demand due to 8 or 10 meter length of filter bags

Additive dosing/injection

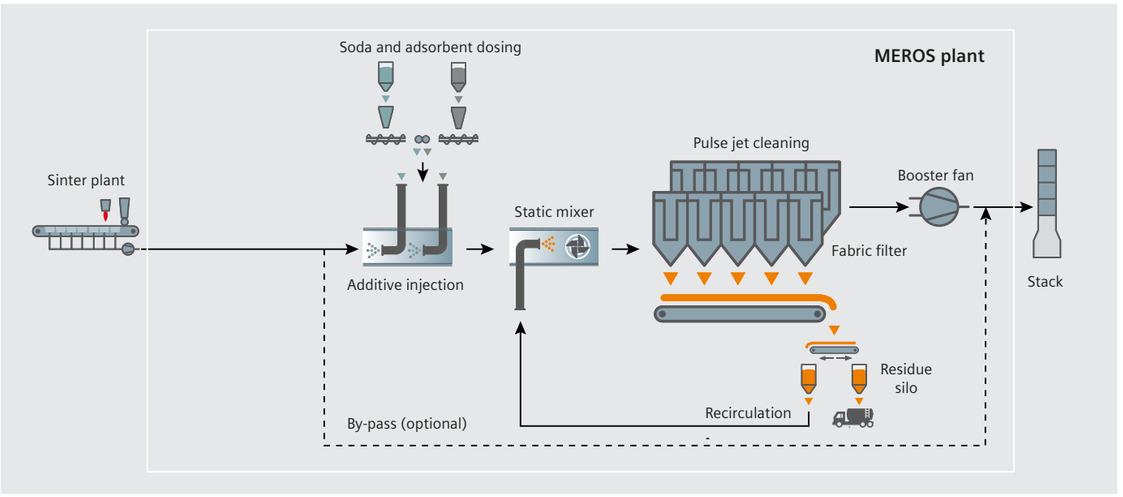
RECIRCULATION OF DUST

Most of the dust separated by the pulse jet filter is recirculated to the gas stream just behind the gas conditioning reactor. Doing so, the unreacted parts of additives are once again contacted with the offgas and the effective usage rate is increased which results in an optimized operation cost figure.

ADDITIVE AND RESIDUE STORAGE

The additives are delivered by tank trucks and pneumatically fed to the additive storage silos. From there the material is fed to the intermediate gravimetric dosage bins for further treatment and injection into the raw gas duct.Parts of the dust separated in the filter hoppers is not recirculated and conveyed to the residual storage silo. The residue is transported by a tank truck for external utilisation.

MEROS®
GAS CLEANING WITH SODIUM BICARBONATE (VARIANTE B)



MEROS® process - Gas cleaning with hydrated lime

PROCESS DESCRIPTION

Depending on the local requirements and conditions, also sodium bicarbonate can be used as desulphurization agent. The use of sodium bicarbonate is preferred if highest $DeSO_x$ degrees are required, if a $DeNO_x$ plant is necessary (or expected in future) or where land-filling costs are high.

ADVANTAGES OF USING SODIUM BICARBONATE

- Desulphurization efficiency more than 95%
- Excellent stochiometry close to 1 and decreased amount of residue
- Possibility to elutriate the Na_2SO_4 out of the residuals and discharge the water into the see
- Higher reaction temperature, in case of a $DeNO_x$ plant less energy for reheating is required
- No water consumption – no cooling is required
- Simple process – low investment costs
- Less consumption of compressed air

SUMMERIZING, SODIUM BICARBONATE IS FAVOURABLE IF

- Highest $DeSO_x$ degrees are required
- $DeNO_x$ plant need to be installed either immediately or in the future
- Landfilling costs are high

COMPARISON OF SODIUM BICARBONATE AND HYDRATED LIME FOR USE AS DESULPHURIZATION AGENTS

	Sodium bicarbonate (SBC)	Hydrated lime (HL)
$DeSO_x$ degree	> 95%	< 85–90%*
Stochiometric factor	1.1	1.7–2.0*
Residual amount	~ 70%	100%
Aditive costs	~ 180–200%	100%
Temperature after $DeSO_x$	sinter raw gas temperature (no cooling)	~ 90–100°C
Coke gas consumption for $DeNO_x$ (if required)	60-70% saves considerably reheating gas!	100%

*depending on additive quality, sinter gas temperature, conditioning temperature

THE WORLD‘S FIRST MEROS® PLANT
SINTER PLANT LINZ/AUSTRIA

MEROS® at voestalpine, Linz/Austria

A fully satisfactory, environmentally compatible solution for the treatment of the offgas arising during the sintering process has not existed up until now. In response to this challenge, Primetals Technologies recently developed the MEROS® process. In a series of successive treatment steps the dust and harmful metallic and organic components present in the sinter offgas are removed to levels previously unattained with conventional gas treatment techniques. After two years of excellent performance of the MEROS® demonstration plant, the world‘s first MEROS® industrial plant is now in operation since 2007 at the sinter plant of voestalpine Stahl, Linz/Austria.

PLANT DATA

Gas flow	650,000 Nm^3/h
Raw-gas temperature ~	130°C (120–160°C)
Filter area	~ 19,000 m^2
Cooling-water flow	8-30 m^3/h
Sinter gas cooling bys	2-50°C
Additives:	
Hydrated lime(original process design)	~ 330 kg/h
Sodium bicarbonate (current operation practica)	~ 500 kg/h
Lignite	~ 60 kg/h
Dust recirculation	~ 10 t/h

Gas conditioning tower

MEROS® at voestalpine, Linz/Austria

EMISSION REMOVAL

SO_2 removal	> 50% (current operation practice)*
Clean-gas dust content	< 5 mg/Nm^3
NO_x (as NO_2)	< 150mg/Nm^3
Heavy-metal removal efficiency	
Hg	> 97%
Pb	> 99%
Removal efficiency of acidic gases	
HCl	> 92%
HF	> 92%
Organic components	
Dioxin (PCDD/F) emissions	< 0.1 ng TEQ/Nm^3
VOC (condensable)	> 99%

* Technically up to 98% SO_2 removal is possible

PROJECT SCHEDULE AND FURTHER IMPLEMENTATION STEPS

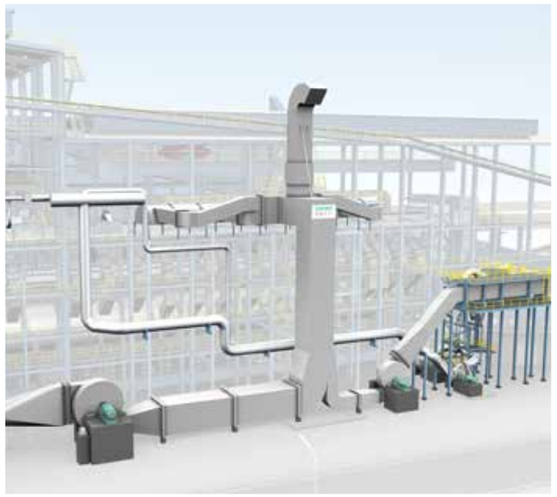
- Award of contract: March 2006
- Start of erection: October 2006
- Start-up: August 2007
- Conversion to sodium bicarbonate process: 2011
- Installation of SCR - $DeNO_x$ plant: 2012

SCOPE OF SUPPLY & SERVICES – PROCESS TURNKEY

- Project management
- Basic and detail engineering
- Procurement of all equipment
- Process control and automation level 1
- Erection execution of plant
- Supervision of erection and commissioning

SELECTIVE WASTE GAS RECIRCULATION
ENERGY EFFICIENCY FOR SINTER

Waste-gas recirculation hood



Selective waste-gas recirculation system

In order to save CAPEX and OPEX for the MEROS® Plant Primetals Technologies recommends to combine the advanced gas cleaning investment with the Selective Waste Gas Cleaning system wherever technically possible.

SELECTIVE WASTE-GAS RECIRCULATION SYSTEM

Primetals Technologies has developed and implemented a new technology that enable environmental emissions from sinter production to be reduced. This has been achieved with the introduction of a selective waste-gas recirculation system in which the offgas from selected zones of the sinter machine is mixed with hot cooler off-air and is then recirculated to the sinter strand.

The selective waste gas recirculation system enables emission reductions in sinter production to previously unattained levels. Thanks to the advanced technology, the offgas from selected zones of the sinter machine is mixed with cooler off-air and/or ambient air and re-circulated to the sinter machine. The result is a significant reduction of the specific offgas volume by up to 50%.

Specific investment and operating costs for gas-cleaning facilities can therefore be kept at acceptable levels. The selective waste gas recirculation system from Primetals Technologies can be installed in existing or greenfield plants.

MAIN BENEFITS

- Waste gas volume by up to 50%
- Specific solid fuel consumption decreased by up to 10%
- Decreased investment and operational costs for waste-gas-cleaning plant
- Lower CO_2 emissions (reduction by up to 10%)
- Lower emissions freight of SO_x, NO_x, PCDD/PCDF and heavy metals
- Extended battery service life

BAG FILTER CONTROL
SMART BAG FILTER CLEANING FOR ENVIRONMENTAL PLANTS IN THE METALS INDUSTRY

FUNCTION

Cost-efficient production in accordance with environmental requirements forms the basis for competitive steelmaking. Thanks to intelligent, fast and robust electronic modules, the bag filter control unit optimizes bag filter operation, featuring a significantly reduced cleaning air consumption as well as the detection of defective cleaning valves. This stand-alone self-monitoring package can be easily implemented in existing plants, thereby ensuring completely automatic operation. A standard bag filter operates without any energy optimization, based on fixed cleaning cycles where the cleaning valves purge compressed air into the filter bags. A malfunction of a cleaning valve can only be detected manually through acoustic checks, which are both time consuming and cost intensive. Most of the cost-intensive compressed air is wasted, because the cycle time is not adjustable in the system.

FIELD OF APPLICATION

All kind of dedusting systems with bag filter cleaning

OUR SOLUTION

An optimized bag filter control is the major precondition for cost reductions. Using a differential pressure measurement between bag filter inlet and outlet, and the actual volume gas flow, an optimal cleaning cycle mode is automatically selected by the bag filter control unit. A fast and reliability electronic module with MOS-FET technology, which additionally features self-monitoring functions, controls the cleaning valves. The duration of the open time for each cleaning valve can be adjusted, thereby reducing the compressed air consumption to a minimum.

MAIN BENEFITS

- Automatic control of the entire bag filter features high efficiency of the bag filter cleaning process
- Pre-tested technological package including HMI, software and hardware
- Powerful electronics replace conventional relays
- Short implementation and commissioning time in new or existing bag filters
- Short amortization time and high return of investment
- Energy savings due to reduced cleaning air consumption
- Reduction of maintenance costs

PULSE JET FILTERS
CLEAN SOLUTIONS FOR DUST HANDLING

Hoppers with steep inclination avoid dust deposits

Pulse jet valve arrangement with noise cover

THE ENVIRONMENTAL PLANTS INSTALLED BY PRIMETALS TECHNOLOGIES COMPRISE

- Pulse jet bag filter units and reverse air bag houses
- EAF dedusting comprised of watercooled ducts, drop-out boxes, quenching towers, forced draught coolers, cyclones, canopy hoods, mixing chambers, filters, fans and stacks
- AOD dedusting comprised of watercooled stacks, forced draught coolers, canopy hoods, filters, fans and stacks
- Noise reduction, dog and elephant houses
- DeS dedusting comprised of moveable hoods, cyclones, filters, fans and stacks
- Dedusting systems for the glass and ceramic industry

As a state-of-the-art system integrator for EAF dedusting equipment, Primetals Technologies offers comprehensive in-house solutions for primary and secondary off-gas treatment in the field of EAF steelmaking.

THESE PROVEN PRIMETALS TECHNOLOGIES DEDUSTING SOLUTIONS ARE CHARACTERIZED BY

- Advanced simulation tools
- Modular design pulse jet filters
- Proven water-cooled duct design
- Proven quenching tower design
- Proven forced draught cooler design
- Custom-made solutions
- “Fit-for-use” applications
- Highest flexibility

OUR PULSE JET FILTERS ARE CHARACTERIZED BY

- Standard filters designed for low and easy maintenance in a steel shop environment
- Modular filter design, which permits future extensions with add-on components
- Dramatic reductions in installation times due to the modular design of prefabricated panels, hoppers and filter heads
- Accurate blowpipe positioning with centering on the venturis, which ensures long bag life
- CFD-modelled filter casing for heavy particle separation and optimized flow distribution through bags
- Low energy consumption due to the cast-aluminum classic venturi situated on top of the bags, which provide an efficient secondary air in-draught
- Low energy consumption using straight blowpipes, which eliminates elbow losses
- Low energy consumption and pressure loss through the filter casing, due to an optimized gas flow, large venturi diameters and maximized damper dimensions
- Fully automatic filter cleaning with no moving parts on the inside of the filter
- Filter cleaning operation in either online or offline mode
- Filter cages, which are designed to protect the bags and allow them to be walked on after installation
- Fully standardized service interchangeable parts, which are commercially available worldwide for the entire filter range

Carinox, Belgium, 2005

Venturi valve hall

REFERENCE PLANT
MAANSHAN IRON AND STEEL COMPANY, P.R. CHINA

MEROS® at Maanshan Iron and Steel Company, P.R. China

After two years of operation of the MEROS® demonstration plant and one year of exellent performance of MEROS® commercial plant at voestalpne Stahl, Linz/Austria, the world's second MEROS® industrial plant was awarded by Maanshan Iron and Steel Company, P.R. China in the year 2008.

PLANT DATA

Gas flow	520,000 Nm^3/h
Raw-gas temperature ~	~ 140°C (120–160°C)
Filter area	~ 16,400 m^2
Cooling-water flow	8-30 m^3/h
Sinter gas cooling by	20-50°C
Additives:	
Hydrated lime	~ 1,000 kg/h
Lignite	~ 60 kg/h
Dust recirculation	~ 8 t/h

EMISSION LIMITS

SO_2 removal	> 80% / < 200 mg/Nm^3
Clean-gas dust content	< 5 mg/Nm^3

PROJECT SCHEDULE

- Award of contract March 2008
- Start of erection Spring 2009
- Start-up Summer 2009

SCOPE OF SUPPLY & SERVICES

- Project management
- Basic engineering of entire plant
- Supply of mechanical and electrical key-equipment
- Process control and automation level 1
- Supervision of erection and commissioning

LIFE CYCLE SERVICES FOR YOUR PLANT

OPERATIONAL SUPPORT

BENEFIT FROM OVER 50 YEARS OF EXPERIENCE

Comprehensive services for metallurgical plants, from supply of original manufacturer components, spare and wear parts to consulting, technical assistance and training.

PLANT UPGRADES

LOW INVESTMENTS FOR STATE-OF-THE-ART TECHNOLOGY

Decades of experience worldwide in design, manufacturing, and com-missioning as well as consulting of metallurgical plants ensure each client with innovative modernizations and mechatronic solutions for its processing chain.

MAINTENANCE SERVICES

ON-AND OFFLINE MAINTENANCE AND REPAIR SERVICES

With wide-ranging international network of customer support experts and worldwide repair and maintenance workshops, Primetals Technologies is your ideal single source partner for maintenance services.

With a portfolio consisting of operational support, plant upgrades, and maintenance services you can focus on your core business while Primetals Technologies assures your plant's optimum performance.

Fast, reliable, and experienced service and support for the metallurgical industry Primetals Technologies strives to be a long-term lifecycle partner dedicated to your success. We offer a full range of services across the entire lifecycle of your plant, including consulting and technical assistance, directly from a single provider. Our service portfolio ranges from a spare parts service available at just the right time to advanced staff training and technical support, upgrades of components and plants to be technical up to date; also from repair service of key components for a longer lifecycle, to online and offline maintenance. Our services reduce cost, increase productivity, improve product quality, and ensure safety.

Primetals Technologies Austria GmbH
A joint venture of Mitsubishi Heavy Industries and partners

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Brochure No.: T01-2-N081-L4-P-V2-EN
Printed in Austria