

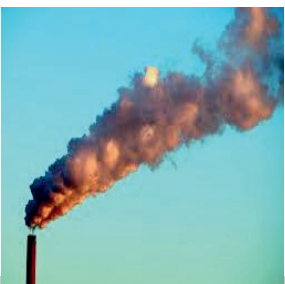


Encon Catalysts



- | | |
|-------------------------|--|
| <i>SP ECO SOTIN</i> | ● <i>All types of coal</i> |
| <i>SP ECO SOTIN – M</i> | ● <i>Heavy oils, masut</i> |
| <i>SP ECO SOTIN – B</i> | ● <i>Biomass fuels</i> |
| <i>SP ECO SOTIN – W</i> | ● <i>Alternative and Waste-Derived Fuels
(RDF/SRF)</i> |

THE PROBLEM



The combustion of solid fuels—including coal, lignite, biomass, waste-derived (substitute) fuels (RDF/SRF), and heavy oils—inevitably **generates residues** that negatively impact the operation of industrial plants. These deposits significantly **reduce operational availability** and overall **energy output**.

In addition to long-established coal and lignite-fired power plants, the use of incinerators for municipal waste, waste-derived fuels (pre-sorted industrial waste), and both recycled and natural wood has increased significantly since the 1970s. These plants often serve as energy suppliers for neighboring production facilities in industries such as food, chemical, paper, and cement. The wood processing industry also utilizes its own waste to generate specialized energy supplies, while local and district heating networks increasingly derive their energy from these sources.

Different fuels produce varying **amounts of combustion residues**, ranging from **approximately 5%** for wood and coal to as much as **30–35%** for various types of lignite, waste, and waste-derived fuels. These residues primarily consist of fine dust particles. These dusts are amorphous mixtures without a single, fixed melting point; instead, they soften and melt across a specific temperature range. Depending on the degree of deformation during heating, three distinct melting temperatures are identified:

T1 – Deformation temperature (IDT): The temperature at which the first signs of rounding or softening of the ash particles occur.

T2 – Softening / Sphere temperature (ST): The temperature at which the ash particle deforms into a spherical shape (the onset of fusion).

T3 – Fluid / Flow temperature (FT): The temperature at which the ash becomes completely liquid and spreads over the surface.

Ash particles become **sticky** once they reach the **T2 (softening)** temperature range, causing them to **adhere** to each other and **accumulate on all heating and boiler surfaces**. Over time, these flue gas-side deposits become more extensive, acting as **thermal insulators** that restrict the flue gas passage and **hinder heat transfer**. Consequently, the temperature level throughout the entire plant increases, leading to significantly **higher dust and NO_x emissions**.

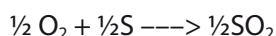
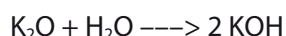
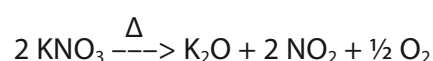
Attempts to prevent these deposits mechanically—using systems such as water, steam, or air soot blowers, rapping devices, and shot cleaning systems—are usually unsatisfactory. This eventually leads to **reduced energy output** and puts an increasing load on auxiliary equipment, such as fans and blowers. As a result, the plant's internal **power consumption rises**, and exhaust **gas temperatures increase significantly**.

As efficiency drops and fuel consumption rises, the system can no longer be operated economically. This ultimately forces a complete shutdown for manual mechanical cleaning.

ENCON CATALYSTS

THE SOLUTION: Chemical and Physical Principles of the SP ECO SOTIN Process

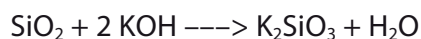
A proven method for preventing the aforementioned deposition processes, derived from inorganic analytical chemistry, involves a specialized **alkali treatment**, primarily utilizing **potassium hydroxide (KOH)**. **Potassium nitrate** is used as a precursor, which undergoes rapid spontaneous decomposition at temperatures above its melting point of 334°C. By adding a stoichiometrically calculated amount of **sulfur** and a precise proportion of **graphite** to ensure stability under normal conditions, this decomposition reaction initiates at temperatures exceeding 180°C. The mixture is prepared using a proprietary specialized blending procedure. The resulting **potassium oxide (K₂O)** reacts immediately with the water vapor—inherent in all combustion processes or present in the fuel—to form **potassium hydroxide (KOH)**



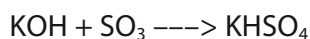
The process occurs within combustion plants at temperatures exceeding 500°C. The decisive factor is the **formation of a KOH aerosol**—consisting of fine, macroscopic liquid suspended particles with a diameter in the micrometer (µm) range. With a melting point of 360°C and a boiling point of 1327°C, these KOH aerosol particles are drawn by the flue gas flow **directly onto the deposits**.

Upon contact, point-by-point physico-chemical reactions occur, **dissolving** the rigid structure of the deposits. In their place, **soft, spongy network structures** are formed, which either **collapse** under their own weight or are easily removed by existing cleaning devices.

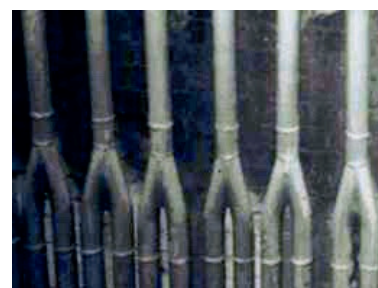
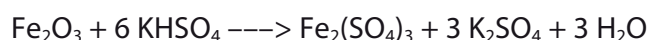
Chemical and physical analyses (including X-ray fluorescence) confirm that flue gas-side deposits contain significant amounts of amorphous and crystalline **silicon dioxide (SiO₂)**. This silica acts as a **cementing agent** through the formation of polymeric modifications. In the melt, it reacts with KOH as follows:



Sulfur dioxide (SO₂) and **sulfur trioxide (SO₃)** are present in virtually every combustion plant and also react with the introduced KOH. This interaction results in the neutralization of acidic sulfur compounds, contributing to the reduction of overall emissions.



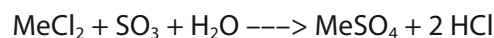
The resulting **potassium hydrogen sulfate (KHSO₄)** then reacts with the **iron(III) oxide (Fe₂O₃)** nearly always present on the boiler surfaces:



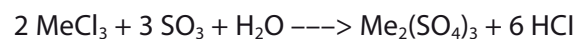


Oxides of aluminum, titanium, zinc, lead, and barium present in the deposits are also **dissolved by KOH**. These processes are analogous to well-established industrial reactions, such as the alkaline digestion of bauxite (Bayer process) for aluminum production, or the ilmenite digestion used to recover titanium dioxide (TiO₂) white pigment. Similar reactions occur with amphoteric zinc and lead salts, as well as other metals. These **digestion-style reactions** are widely utilized in metallurgy for efficient metal recovery.

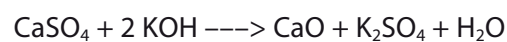
Reactions with **metal halides** within the deposits—particularly **chlorides**—are of significant interest, as these compounds are the **primary cause of corrosion** on heat exchanger tubes. These metal halides react either with the sulfur components integrated into the **SP ECO SOTIN** cleaning agent or with the SO₂ and SO₃ generated during the process:



or



The presence of sulfur, calcium oxide, and sulfates is particularly problematic in lignite-fired plants. This is because sulfates begin to decompose at temperatures as low as **700°C**, releasing reactive compounds into the flue gas. The introduction of **KOH** from **SP ECO SOTIN** initiates a displacement reaction:



These chemical reactions—along with the subsequent processes—are consistently associated with localized volume changes. Consequently, the dense and rigid structure of the accumulated ash particles is converted into a **porous, network-like formation**. These weakened deposits can be **easily removed** by standard **mechanical cleaning** or **often collapse under their own weight**.

DOSAGE

SP ECO SOTIN is administered every **8 hours** at a dosage of **100–300g** per ton of fuel, injected as an aerosol into the boiler's combustion chamber. Dosing is performed using a **compressed-air-operated injector**, typically installed through an **inspection port**, an **unused SNCR opening**, or a **secondary air nozzle** within the system's combustion zone.

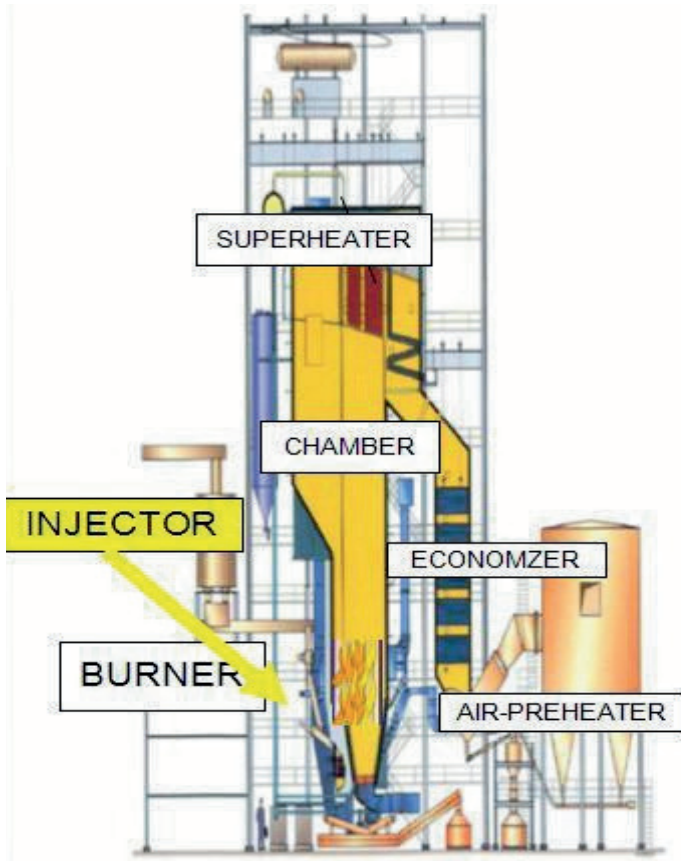
The required air pressure is approximately **6 bar**. The injection pipe is connected directly to the plant's compressed air system. Injector dimensions are calculated and adjusted based on specific local conditions.

The injection duration depends on the required dosage and typically ranges from **30 to 60 seconds**.



DOSAGE IN PULVERIZED (DUST) FUEL-FIRED SYSTEMS

In pulverized (dust) fuel-fired systems, SP ECO SOTIN is injected through boiler openings located at the burner level.



Examples:

125 MW Pulverized (Dust) Fuel-Fired Boiler / Lignite

Fuel consumption: 2,700 t / day

Dosage rate: 100g SP ECO SOTIN / t lignite

Total dosage: 270 kg / day

Injection cycle: 90 kg every 8 hours

70 MW Pulverized (Dust) Fuel-Fired Boiler / Coal

Fuel consumption: 870 t/day

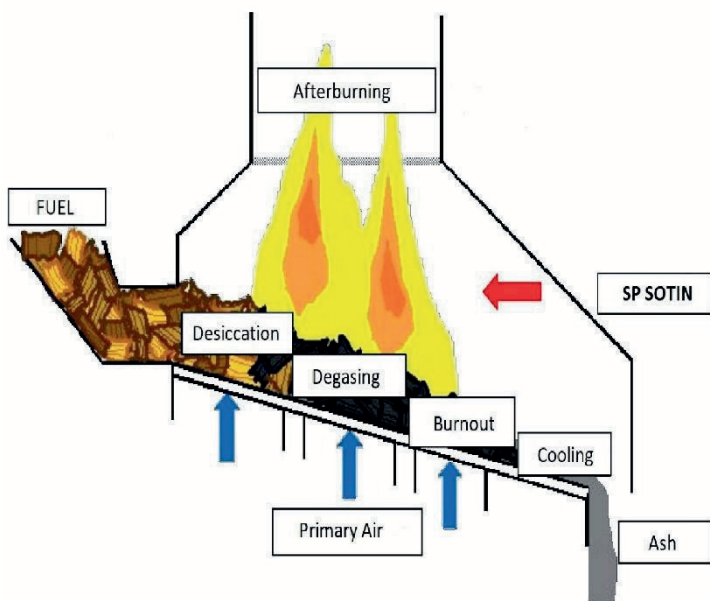
Dosage rate: 100 g SP ECO SOTIN / t coal

Total dosage: 87 kg/day

Injection cycle: 29 kg every 8 hours

DOSAGE IN GRATE-FIRED SYSTEMS

In moving grate systems, SP ECO SOTIN is injected directly into the flame through a boiler opening.



Examples:

50 MW Moving Grate Boiler / Waste-to-Energy

Fuel consumption: 330 t/day

Dosage rate: 100 g SP ECO SOTIN / t waste

Total dosage: 33 kg/day

Injection cycle: 11 kg every 8 hours

45 MW Moving Grate Boiler / Biomass

Fuel consumption: 240 t/day

Dosage rate: 100 g SP ECO SOTIN / t biomass

Total dosage: 24 kg/day

Injection cycle: 8 kg every 8 hours

KEY ADVANTAGES

● Modification of Ash and Slag Melting Points

The application of SP ECO SOTIN **increases the ash melting** point across all boiler segments. By raising this threshold, the ash no longer softens or becomes "sticky," **preventing it from adhering** to heating surfaces. This results in significantly cleaner heating surfaces, leading to improved heat transfer and higher overall energy efficiency for the boiler system.

● Improved Energy Efficiency

The use of SP ECO SOTIN leads to a significant increase in combustion efficiency. These improvements are clearly demonstrated through direct measurements and a measurable **reduction of unburned carbon** in the ash. Furthermore, flue gas temperatures can be reduced by up to **50°C** after the air preheater (LUVU), indicating superior heat recovery.

● Reduction in Fuel Consumption

The application of SP ECO SOTIN increases combustion efficiency, directly resulting in fuel savings of **5–8%**. By maintaining cleaner heat exchange surfaces and optimizing the combustion process, the system requires significantly less fuel to achieve the same thermal output.

● Reduction of Sulfur and Vanadium Corrosion

The use of SP ECO SOTIN leads to a measurable decrease in sulfur trioxide (SO₃) levels within the ash, significantly **reducing low-temperature corrosion**. Simultaneously, the process enables the formation of a protective passivation layer, which **mitigates vanadium-induced corrosion** in the high-temperature range. By minimizing these corrosive processes, the service life of metal surfaces in contact with flue gases is substantially extended.

● Emission Reduction

The application of SP ECO SOTIN significantly reduces environmental impact across multiple parameters. Field data demonstrates **reductions of up to**:

- **35%** for sulfur dioxide (SO₂).
- **18%** for carbon monoxide (CO)
- **33%** for nitrogen oxides (NO_x)
- **35%** for particulate matter (dust).

Furthermore, these optimizations contribute to a substantially improved CO₂ balance for the entire plant.

● Economic Benefits

- Significant Reduction in Fuel Consumption
- Substantially Lower Maintenance and Cleaning Costs
- Increased System Availability through Extended Operating Periods
- Improved CO₂ Footprint and Environmental Compliance
- Extended Service Life of Critical Boiler Components

PRODUCT COMPLIANCE AND APPROVAL

SP ECO SOTIN complies with all applicable European regulations, specifically **REACH** (Regulation (EC) No **1907/2006** concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals) and **CLP** (Regulation (EC) No **1272/2008** on Classification, Labelling and Packaging of substances and mixtures).

PACKAGING

SP ECO SOTIN is supplied in **25 kg** bags. All packaging is secured and stored on industrial pallets for safe transport and efficient handling.



TRANSPORT

SP ECO SOTIN is shrink-wrapped on EUR pallets for secure transit. The product is classified under **ADR Class 5.1** (Oxidizing Substances).



STORAGE

Store **SP ECO SOTIN** in a cool, dry environment. Maximum storage temperature: **65°C**. Keep away from heat, sparks, open flames, and other ignition sources. No smoking.



ABOUT US

Encon has over **30 years of experience** in research, development, and production. Through its subsidiaries and qualified partners, the company supplies solutions to European and Asian markets.

Encon holds **official permits for the trade and supply of the chemicals** used in our online cleaning agents. In accordance with the German Chemicals Prohibition Ordinance (§6,2 ChemVerbotsV), we employ **qualified personnel**, ensuring full compliance with the tightened legal requirements effective since January 2017.

During production, transport, and application, we **strictly adhere to all health and safety regulations**, hazardous substance protocols, and operational safety standards. This is confirmed by a formal hazard assessment conducted with a certified safety specialist (under the Occupational Safety Act).

Accordingly, we provide:

- Safety Data Sheets (SDS) in compliance with Regulation (EU) No. 453/2010.
- Operating Instructions for SP ECO SOTIN in accordance with §14 GefStoffV.

PRODUCTS



CATALYSTS



BELT CLEANERS AND BELT TRACKING IDLERS



AIR CANNON SYSTEMS



METALWORKING

CONTACT



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