

# Spray Drying Absorption

The economic solution for  
Flue Gas Desulphurisation



# SDA: economical, efficient, ecological

## Balancing interests

Climate change – and in particular, air pollution – has never been higher on the global agenda. An inherently international issue, policed by multilateral agreements, legislation is constantly tightening.

For power plant operators this is nothing new – it's long made good political sense to curtail harmful emissions. What is new, however, is the expanding role environmental technologies can play in enhancing plant performance. With a considerable portion of a modern plant's costs linked to pollution control, the right technologies not only cushion environmental impact, but fertilise competitive advantage.

When it comes to flue gas desulphurisation (FGD), GEA Niro's spray drying absorption (SDA) process can give you an edge. By enhancing efficiency and limiting costs, SDA lets you comfortably balance regulatory and financial ambitions.

## Empowering the power producers

First conceived by GEA Niro in the 1970s, SDA has been quickly adopted by fossil fuel based power plants around the world because of its numerous demonstrable benefits.

SDA removes acid gases and particulates from flue gases – at rates well above legislative targets – and converts them into a light, free-flowing powder. However, it's in the sheer simplicity of SDA that its true merits lie. Using a minimum of equipment and raw materials, SDA requires far less capital expenditure upfront and lower running costs than many rival technologies. (Compared to wet scrubbers, SDA offers huge savings on energy, water consumption, and operating and maintenance costs.) The process' uncomplicated basis also makes it remarkably robust (the first SDA systems, installed in 1980, are still running today) and easy to operate. The system can handle a broad fuel range, and simply adjusts itself to follow changes in boiler load and flue gas composition.

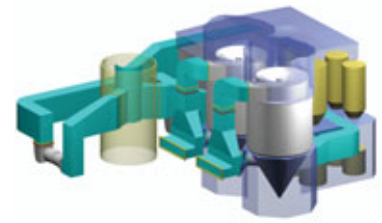
All of this means you can meet your commitment to regulators without neglecting your obligation to shareholders. Dependable, economical, verifiable – SDA literally puts the power back in your hands.



*Absorber penthouse  
with absorbent supply  
arrangement and  
spare rotary atomizer.*

Large SDA's clean the flue gas from a 550 MW<sub>e</sub> coal fired power plant in the USA.

GEA Niro can generate basic designs for new or retrofit SDA projects.



Two parallel absorber modules treat the flue gas from 8 lignite fired boilers installed in the Czech Rep.

530 MW<sub>e</sub> lignite fired power plant in the Czech Rep.



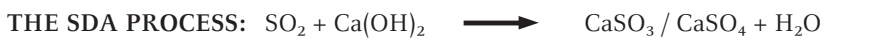
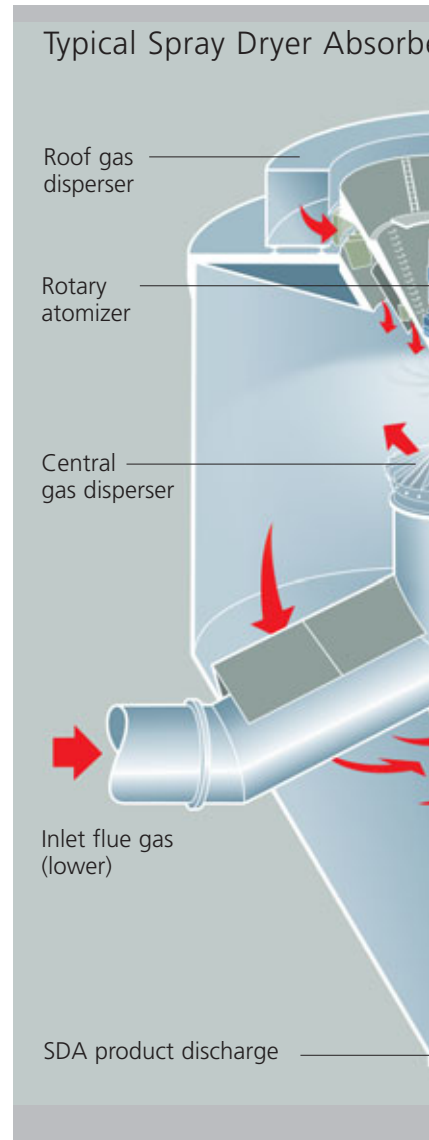
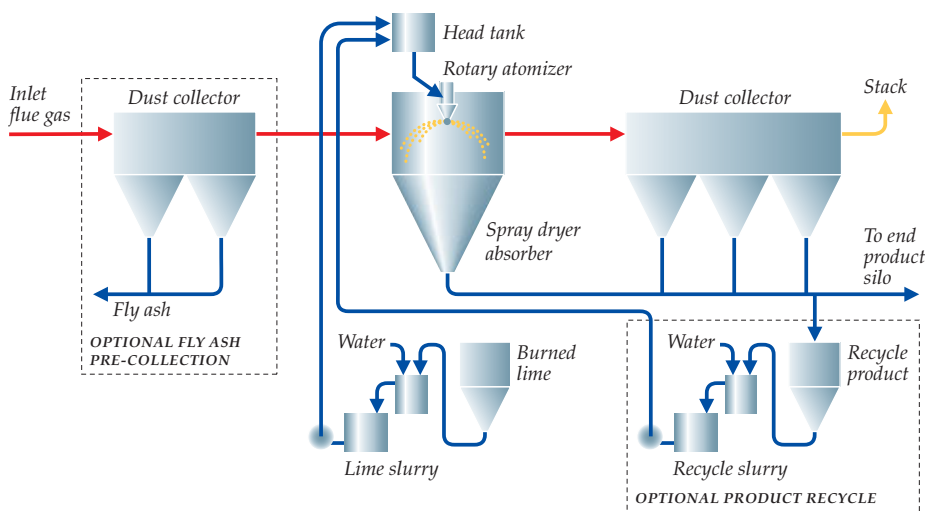
#### Key Benefits

- SO<sub>2</sub> removal efficiencies well above 98%
- Superior SO<sub>3</sub> capture rate
- Superior micro-pollutant capture rates
- Patented process for mercury removal
- Low capital expenditure
- Low water consumption
- Low auxiliary power consumption
- Low operating and maintenance costs
- High availability
- Highly flexible: adjusts to variations in boiler load and flue gas
- No need to reheat flue gas
- Absorbers made of mild steel – no high alloy materials
- Can use low quality water, incl. waste water or sea water
- No lining required
- No waste water generated
- No sludge treatment equipment
- Fly-ash pre-collection optional

A rotary atomizer disperses the absorbent slurry into billions of tiny droplets.

# A simple, precise process

SDA is based on a simple concept, honed over the years into a precise, effective system. Hot, untreated flue gas is fed into a spray drying absorption chamber and comes immediately into contact with a fine spray of alkaline slurry (usually slaked lime). Virtually all the acidic components in the flue gas are absorbed into the alkaline droplets, while the water is evaporated simultaneously. Precise control of the gas distribution, slurry flow rate and droplet size ensures droplets are converted into a fine powder. Some fly ash and reaction products drop to the bottom of the absorber and are discharged. The treated flue gas continues on to a dust collector, where any remaining suspended solids are removed. The cleaned outlet gases are then expelled through the stack. Meanwhile the dry powder from the bottom of the absorber and dust collector is conveyed to a silo. The SDA process can optionally include a partial recycling of the reaction products to the feed slurry to improve absorption and drying performance.



## Effective and adaptable

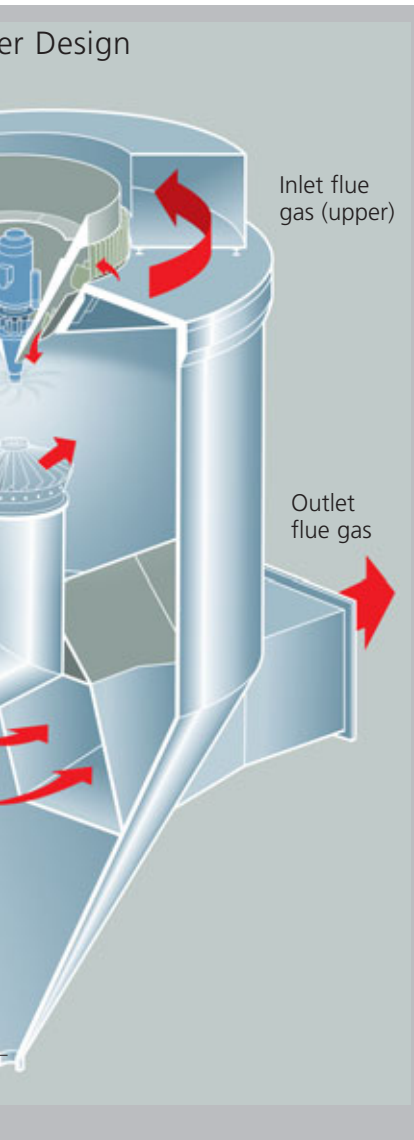
GEA Niro's unique SDA process offers many advantages.  $\text{SO}_2$  removal rates are freely adjustable up to 98% or more. In addition, micro-pollutants, such as  $\text{SO}_3$ , Hg, HCl and HF, are also effectively removed during the process. A highly tolerant system, SDA is self-adapting to changes in flue gas flow rate, temperature and composition. On a practical level, SDA is suitable for power plants of all sizes, requiring only a single absorber and a single rotary atomizer per 450  $\text{MW}_e$ . And absorption chambers are made entirely of mild steel and often produced locally. Finally, the process can utilise low-grade water and generates no waste water.





Left: A 2 x 130 MW<sub>e</sub> coal fired power plant in Finland.

Right: The dry free-flowing product from the SDA process can easily be handled in a pneumatic transport system.



### The Rotary Atomizer and Gas Dispenser

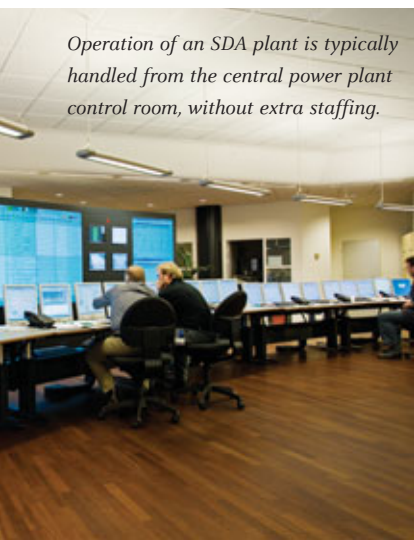
Central to GEA Niro's SDA process is the concept of using a spray dryer as both an absorber and dryer simultaneously. Achieving this hinges on two crucial pieces of equipment – the GEA Niro rotary atomizer and gas dispenser. The former atomises feed slurry into billions of droplets, while the latter ensures the correct gas dispersion to optimise drying and reaction conditions.

Years of development and refinement have resulted in an atomizer that is extremely reliable, able to operate continuously for more than 4,000 hours and requires little maintenance. Other key advantages of the GEA Niro atomizer include:

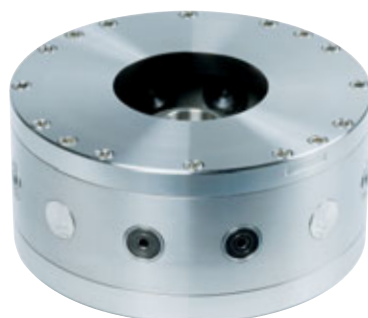
- High capacity – one atomizer per 450 MW<sub>e</sub>
- Low maintenance
- Patented wear-resistant design (WEARSERT™)
- High availability
- Durable – lifespan over 30 years
- Broad turn down range
- Proprietary feed distributor design (VOLUTE™)



A single rotary atomizer can treat the flue gas from a 450 MW<sub>e</sub> unit.



Operation of an SDA plant is typically handled from the central power plant control room, without extra staffing.



The abrasion-resistant atomizer wheel and insert design ensures reliable continuous operation, with a minimum of maintenance.



GEA Niro patented rotary atomizer wheel insert.

# A pioneer of SDA

In the mid-1970s, GEA Niro began testing the idea of using spray dryers to absorb acid compounds and trace metals in combustion gases, with considerable success. By 1980 the process was patented and made commercially available. SDA's operational and economical advantages mean it has been eagerly adopted by incinerator operators throughout Europe, the USA and Asia.

## **Bringing expertise to bear**

GEA Niro remains the world authority on SDA applications for flue gas cleaning, offering an unprecedented range of experience, process know-how and equipment. To date we have fitted over 450 rotary atomizers at more than 160 installations around the world. More importantly, we ensure this knowledge translates into tangible benefits for our customers. A familiarity with incinerator design and legislative demands enables GEA Niro to quickly and professionally generate basic engineering designs for new SDA installations. And, whenever possible, we personally oversee the implementation and start-up phase of all projects to satisfy customers (and ourselves) that the process and equipment perform as expected.

## **A lasting commitment**

Investing in an SDA system is really just the first step in a relationship that we hope is as durable and enduring as our technology itself.

GEA Niro is a world leader in industrial drying applications and has operations in more than 50 countries. Our global after-sales division is dedicated solely to serving customers with routine maintenance checks, original GEA Niro spare parts and emergency technical support. Of course, our SDA-specialist engineers are also at hand for more complex repairs or process inquiries. Finally, our after-sales division can provide training on both operation and maintenance issues, helping customers help themselves.

With GEA Niro you can be confident you're never far away from local support of a world-class standard. That's because when you invest in an SDA system from GEA Niro, you also gain the commitment of 4,000 employees, devoted to keeping your business performing optimally at all times.

*Adjacent SDA's at two parallel coal fired units in the USA.*



*Bottom of SDA with flue gas inlet and outlet duct and product discharge.*

Left: Erection of an SDA plant in Denmark.



Right: GEA Niro SDA-specialists are at hand for process enquiries.

Most SDA units have a spare atomizer, which can be brought into service within 30 minutes.



Large SDA module at a lignite coal fired power plant in the Czech Rep.



Left: A coal fired power plant in Denmark, 2 x 350 MWe.



Right: A coal fired power plant in USA, 275 MWe.

Above: Upper deck of fabric filter downstream of SDA.



Right: A coal fired power plant in Denmark, 350 MWe.



## Experience

GEA Niro has contracted and installed more than 10,000 plants worldwide

GEA Niro is a world leader in industrial drying, with spray drying, spray cooling/congealing, flash drying, freeze drying, granulation and fluid bed processing as core technologies. Having installed more than 10,000 plants around the globe, GEA Niro is known for delivering solutions that meet customers' exact requirements. The GEA Niro companies are part of GEA Process Engineering.



GEA Process Engineering

### **GEA Niro**

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