



rotork[®]

Keeping the World Flowing
for Future Generations

Application Focus:
Flue Gas Desulphurisation

Flue Gas Desulphurisation Processes

Flue Gas Desulphurisation (FGD) is the process of removing sulphur dioxide (SO₂) from the exhaust flue gases of fossil-fuel power plants and other sulphur oxide emitting processes such as waste incineration.

FGD is normally the final treatment process for flue gas once particulates and nitrogen oxide have been removed using an Electrostatic Precipitator (or bag house) and a Selective Catalytic Reducer. There are numerous system designs for FGD but the most common in large power station applications is a wet scrubber which can remove ~95% of SO₂ in the flue gas.

The wet scrubber uses an alkaline slurry to absorb and neutralise the acidic sulphur dioxide from the flue gas. Various alkaline substances (limestone, hydrated lime or magnesium hydroxide) can be used for the slurry, each producing different output materials.

Components within the FGD absorber tower requiring flow control:

Treated flue gas inlet – Cooled and scrubbed flue gas flows through ducting to the absorber tower inlet.

Compressed air injection – Oxidises the alkaline solution for improved chemical reaction with the SO₂ flue gas.

Circulation pumps – Cycle alkaline solution from the effluent holding tank to the spray headers.

Discharge outlet – Pass solid calcium sulphate crystals (Gypsum) out of the absorber tower for further processing.

Spray headers – Disperse the alkaline solution as a fine mist to maximise interaction with the flue gas flow.

Flue gas outlet – Treated flue gas leaves the absorber tower for further capture or venting to the atmosphere.

Ancillary processes and components requiring flow control:

Pre-scrubbed flue gas inlet – Hot flue gases from the power plant flow through ducting to the dust scrubber.

Dust remover outlet – Controlling the release of particulates removed from the incoming flue gas.

Heat exchanger – Hot incoming flue gas is used to re-heat outgoing treated flue gas before it enters the stack.

Process water – Used in the demister to condense and remove any remaining alkaline particles.

Limestone and slurry inlet – Metering limestone input to the slurry pond and controlling flow of slurry into the tower.

Compressed air inlet – Regulating flow of air in to the absorption slurry to control calcium sulphate production.

➤ Rotork deliver reliable high performance flow control for all FGD processes

➤ Products designed with safety, integrity and industry leading lifespans

➤ Water-tight, dust-tight and suitable for use in volatile and high temperature environments

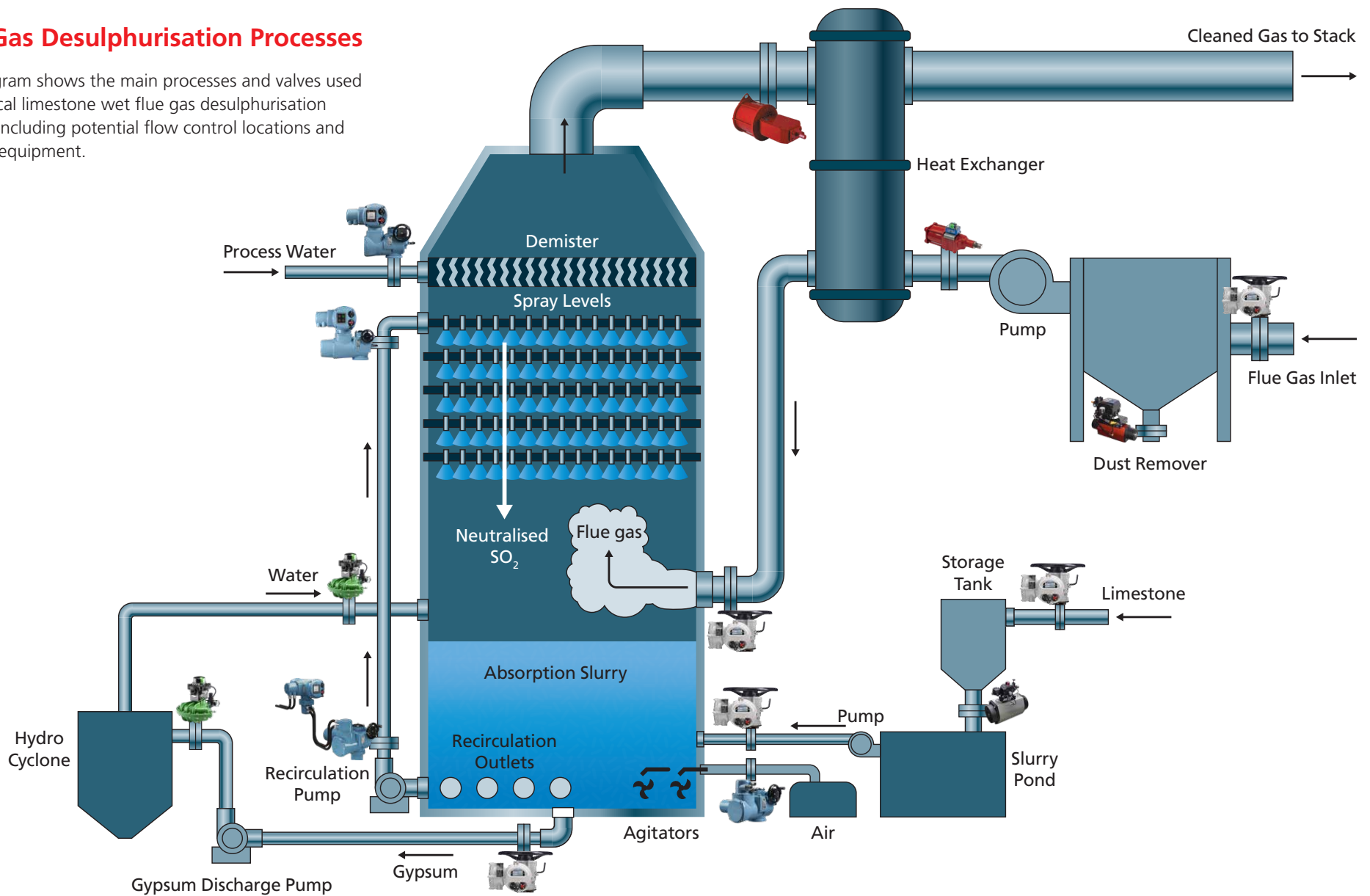
➤ Rotork reliability reduces maintenance, improves efficiency and increases productivity

In this document we identify the main challenges where modern, reliable equipment provides solutions for the design and operation of flue gas desulphurisation systems.

Coal Power Station Flue Gas Desulphurisation

Flue Gas Desulphurisation Processes

This diagram shows the main processes and valves used in a typical limestone wet flue gas desulphurisation system, including potential flow control locations and suitable equipment.



Design Challenges for FGD Systems

Challenge: Fluctuating temperature and vibration

FGD processes expose flow control equipment to environments where ambient temperature and vibration levels can be elevated, requiring robust design and manufacturing.

Solution

Isolation and flow control valves in the dust remover and heat exchanger systems are exposed to fluctuating and elevated temperatures and vibration levels. Valve control must be reliably maintained in these areas and safety shutdown systems may be used to guarantee the safety of staff and to save equipment in the event of process failure.

Reliability is critical for the actuation of these valves. If the valves fail to operate correctly, the flue gases may back up, causing potential damage to the plant.

Rotork use detailed computational analysis to ensure material selections work together in these environments to maintain product integrity and process operation.

Rotork CP and GP pneumatic actuators have been designed for these applications and provide reliable fail close / fail open, on / off and modulating duties.

Rotork CK range actuators with remote mount controls are suitable for use in hard-to-reach locations and in environments with high levels of vibration.

Challenge: Corrosive atmospheres

Acidic and alkaline process fluids and gases including the flue gases, slurry and neutralised SO₂ create corrosive environments where FGD equipment must operate safely and reliably.

Solution

The chemical makeup of FGD process media means that flow control equipment comes in to contact with both acidic and alkaline corrosive atmospheres.

The standard finish of Rotork actuators is resilient to harsh atmospheres and is tested and certified for use within industrial applications throughout the world. Optional C51 paint finish is available for highly corrosive atmospheres.

Rotork products provide highly reliable operation in all environments and deliver reduced cost of ownership over their extended lifetimes. We regularly see actuators that were installed more than 60 years ago and are still operating within their original design parameters.

Rotork IQ range actuators are designed to the highest safety standards for safe and reliable long term valve operation without any need for human input. Intelligent on-board systems provide asset management data including accurate control, monitoring, alarm signalling and diagnostics.

Rotork IW gearboxes are combined with IQ actuators to operate ball, plug and butterfly valves as well as power and process dampers.

Challenge: Dust contamination

High volumes of dust can be corrosive, get mixed with lubricants, be damaging to metals and form cement like deposits, all of which can lead to excess wear and increase equipment failures.

Solution

Isolation valves used throughout FGD systems are medium to large size butterfly valves with special coatings and seals. They suffer from corrosion and often stick due to the high levels of suspended particles in the flue gases and lime slurry emulsion. Actuators are also exposed to these atmospheres and the corrosive nature of the dust.

Rotork products are tested and qualified to the highest levels in the industry, with high IP ratings proving they are resilient to dust ingress in FGD systems and remain fully operational throughout their lifetimes.

Rotork GT and RC pneumatic actuators are certified suitable for use at SIL3 as a single device. They deliver highly reliable operation in double-acting and spring-return configurations for use throughout FGD systems.

Rotork K-TORK pneumatic vane actuators deliver highly accurate modulating valve control in ATEX and NEMA certified compact enclosures.

Rotork valve positioners work with our pneumatic actuators to accurately control valves of all sizes. Available in pneumatic, electro-pneumatic and SMART configurations with HART®, Profibus® and Foundation Fieldbus® connectivity.

IQ Range Multi-Turn, Part-turn and Linear Electric Actuators



Robust on/off and modulating valve control and diagnostics

Reliability and Diagnostics

- Certified water-tight and dust-tight to IP66 / 68
- Corrosion resistant paint finishes including C5I
- Multi-turn, part-turn, linear and modulating duties
- Linear up to 1 m stroke with 25 KN thrust
- Accurate, reliable actuation of multiple valve types
- Robust and reliable isolation duty
- Compact, minimal weight to power ratio
- Data logger monitoring of valve performance, preventing unplanned shutdowns
- SIL 2/3 compliant for use in SIS to IEC 61508

CK Range Multi-Turn and Part-Turn Modular Electric Actuators

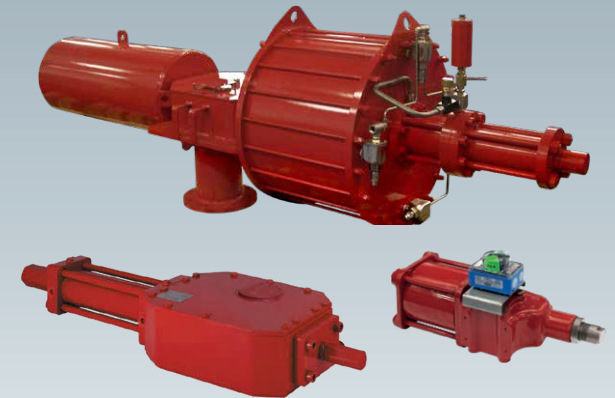


Water-tight and dust-tight valve control and diagnostics

Modular Flexibility

- Remote mounting control option provides 2G vibration resistant valve actuation
- Certified water-tight and dust-tight to IP68
- Corrosion resistant paint finishes including C5I
- Modular design provides choice of control options and ability to operate in hard-to-reach spaces
- Compact, minimal weight to power ratio
- Data logger monitoring of valve performance, preventing unplanned shutdowns

GP/GH Range and CP Range Part-turn Pneumatic and Hydraulic Actuators



Robust actuation of large and medium diameter pipeline and gate valve applications

Reliable and Robust

- Spring-return configurations provide automatic closure on air pressure loss or ESD event to protect plant equipment and personnel
- Pneumatic and hydraulic double-acting and spring-return configurations, fail close / fail open
- Compact sizes with high torque output up to 600,000 Nm (442,537 lbf.ft)
- SIL3 compliant for use in SIS to IEC 61508
- We can provide package solutions to save you time and reduce maintenance by combining actuator, limit switch, solenoid valve and filter regulators

RC200 Range and GT Range Rotary Compact Pneumatic Actuators



Multi-purpose FGD pipeline valve control

Compact and Corrosion Resistant

- Aluminium or stainless steel bodies designed for operation in corrosive environments
- Fast and easy on-site assembly
- Reliable double-acting and spring-return operation in fail close / fail open configurations
- Compact size with high torque output
- SIL3 compliant for use in SIS to IEC 61508
- High quality manufacturing
- We can provide package solutions to save you time and reduce maintenance by combining actuator, limit switch, solenoid valve and filter regulators

K-TORK Range Quarter-Turn/Rotary Pneumatic Vane Actuators



Accurate and reliable quarter-turn / rotary operation of valves and dampers

Compact and Highly Accurate

- Modulating accuracy of 0.25% or better
- Capable of millions of operations at fast cycle times
- Pneumatic double-acting and spring-return configurations
- Compact no-sideload, constant-torque design with output to 18,300 Nm (13,497 lbf.ft)
- Spring-return option for added security
- We can provide package solutions to save you time and reduce maintenance by combining actuator, limit switch, solenoid valve and filter regulators

IW Part-Turn Gearboxes



Motorised or manual operation of multiple valve types

Lightweight and Compact

- Can be deployed in conjunction with the IQ range or stand-alone for manual actuation
- Control various types of valves including ball, butterfly and plug
- Built to meet the most demanding process requirements
- Robust and compact
- Increase torque requirement without compromising on space and weight

Valve Positioners



Accurate and intelligent control of pneumatically operated valves

Safety and ESD Shutdown Capabilities

- Compact and reliable precision valve positioners for linear and quarter-turn rotary actuators
- Single- and double-acting configurations with low air consumption levels
- Explosionproof, flameproof, high vibration resistant, dust-tight and water-tight enclosures
- Fail freeze and fail safe options
- Auto calibration and clear LCD displays
- SMART positioners provide enhanced diagnostics and network control via HART®, Profibus® and Foundation Fieldbus® networks

Control and Communication



Network valve control and monitoring

Reliable Network Control with Reduced Cabling Complexity

- Multiple options available for control and communication between the PLC and actuators
- From simple, effective hard-wired digital control, to variable 4-20 mA and high-end digital networks with options including Profibus®, Modbus®, Foundation Fieldbus® and Rotork's proprietary Pakscan™ network
- Network options reduce the need for multiple cable runs
- Minimised cabling costs
- Maintained integrity

Service and Aftermarket Solutions



All plant operations

Lifetime Management

A complete solution to the risks associated with the life cycle of your equipment

Intelligent Asset Management

Advanced analytics to improve reliability and availability of key assets

Spares

Comprehensive OEM spares available worldwide

Life Cycle Management

Controlled strategies for managing the risks of ageing equipment



A full listing of our worldwide sales and service network is available on our website

www.rotork.com

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