

Metso:Outotec

Sulfuric Acid technology

Benefits

- Sustainable proprietary technology developed through continuous R&D
- Capabilities ranging from modular solutions to lump sum turnkey plant (LSTK) delivery
- In-house process chain expertise associated with upstream metallurgical processes (smelting or roasting)
- Complete lifecycle solutions covering design, operation, maintenance, and modernization



Our sulfuric acid technology is based on more than 90 years' experience in a diverse range of projects around the world. We have delivered more than 650 complete plants with daily capacities ranging from 100 to 5,000 tons. Our plant solutions are fully customizable and designed to maximize operational efficiency, sustainability, and safety. We also offer a comprehensive range of service solutions to support you throughout your plant's lifecycle.

Customized, sustainable solutions from a global industry leader

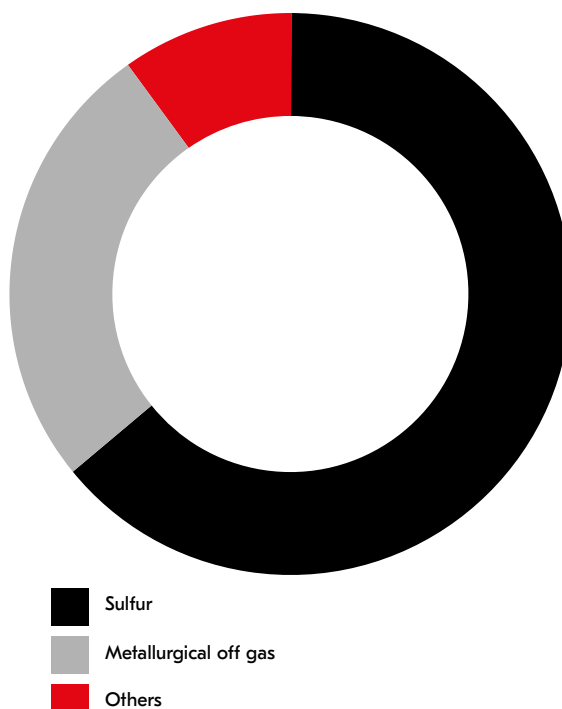
Metso Outotec is a world leader in sulfuric acid plant design and implementation, with a successful track record stretching back over 90 years. Our portfolio includes plants based on elemental sulfur combustion and metallurgical off-gas handling, as well as plants for special processes such as the thermal decomposition of iron sulfate and spent sulfuric acid. These are complemented by processes for the production of liquid SO_2 and SO_3 , various concentrations of oleum, and special high-grade sulfuric acid.

Our broad service portfolio covers the entire plant lifecycle, encompassing everything from audit and feasibility studies and debottlenecking projects, to greenfield turnkey installations, as well as comprehensive technical support. Our solutions for sulfuric acid plants combine high quality engineering, professional implementation, and local market expertise.

Since the introduction of the Bayer AG double absorption process in 1964, Metso Outotec has continuously developed the most sustainable process solutions for the acid industry. Safety, efficiency, and facilitating the sustainable use of Earth's natural resources are at the heart of everything we do.



Feedstock for sulfuric Acid production



Milestones in Metso Outotec's sulfuric Acid experience

1912	First sulfuric acid plant completed by Deutsche Metallgesellschaft
1936	First single absorption plant based on contact process completed by LURGI Metallurgie
1964	First double absorption plant completed by LURGI Metallurgie
1989	First Metso Outotec HEROS heat recovery installation completed
2001	Acquisition of LURGI Metallurgie
2003	First LUREC (LURGI recirculation contact) installation completed
2008	Acquisition of Auburn, a service company
2010	Acquisition of Edmeston



Metallurgical OFF-GAS treatment

Whether you are facing declining ore grades or stricter environmental restrictions, we analyze the complete process chain, beginning from the upstream metallurgical process, when designing your acid plant solution. From hot and wet gas cleaning to the sulfuric acid plant and acid production, we use our proven expertise to develop the most technologically efficient and economically sustainable solution for your application.

Benefits

- Unique process chain expertise from ore to metal
- Solutions capable of handling very high levels of impurities such as arsenic, mercury, and fluorides
- Optimization of process and equipment to minimize power and water consumption
- Easy operation and maintenance



Gas cleaning equipment and technologies

Our portfolio includes proven technology and proprietary equipment for wet gas cleaning. Our capabilities cover both new plants and the modernization and debottlenecking of existing facilities.

Portfolio

- Quenching and scrubbing (Metso Outotec OtoVent, Metso Outotec Conturi, high-efficiency scrubber)
- Gas cooling tower
- Fine dust and mist elimination (stainless steel and plastic wet electrostatic precipitators)
- Fabric filters
- Fluoride removal
- Mercury removal (including Boliden-Norzinc process, selenium filter)
- Arsenic removal
- Tail-gas treatment (peracidox scrubber)



Sulfuric Acid production

In a pyrometallurgical process, gas from the gas-cleaning section enters the sulfuric acid plant via the drying tower, where most of the humidity is removed in order to minimize the potential for corrosion inside the plant. Before entering the stainless steel converter, the gas temperature must be increased to accommodate the operating temperature of the catalyst. Sulfur dioxide is converted into sulfur trioxide, and the process gas is sent to the first absorption step where sulfur trioxide is removed and forms sulfuric acid. After further conversion, the gas is routed to the stack via the final absorber.

Sulfur dioxide feedstock for the plant can also be produced by sulfur burning. Our portfolio covers the full process chain from sulfur handling and sulfur burning through to sulfuric acid production. Our technology delivers optimum energy recovery in both high and low pressure steam. The project scope can include electrical co-generation facilities as well as full utility concepts and associated infrastructure.



Benefits

- Design focused on safety and reliability
- Proprietary design of primary sulfuric acid equipment
- Energy-efficient, low-emission technologies
- Process-specific solutions:
 - Metso Outotec HEROS heat-recovery system for steam generation
 - Metso Outotec LUREC strong SO_2 gas handling technology
 - NO_x removal solutions
 - Minimized water consumption
- Equipment designed using advanced CFD analytics
- Solutions for the full range of plant capacities, from modular, low-capacity up to mega-capacity

Portfolio

- Metso Outotec Edmeston SX® System equipment manufactured from proprietary acid-resistant stainless steel
- Acid distributors
- Drying and absorption towers up to 12 m in diameter
- CORD gas-gas heat exchangers with exceptional operational lifetime and straightforward maintenance
- Fully welded stainless steel converters up to 20 m diameter with up to three integrated gas-gas heat exchangers

Sulfur burning technology

At the heart of the sulfur combustion process is the Metso Outotec LURO sulfur burner system. With more than 150 units installed worldwide since its introduction in 1964, we have refined the system to ensure that it provides reliable performance and low maintenance requirements for modern plant environments.

Metso Outotec Edmeston SX stainless steel

Our proprietary acid-resistant steel is the benchmark alloy in sulfuric acid plants. An austenitic stainless steel with high silicon content, it has excellent corrosion resistance over a wide concentration range at high temperatures, in both static and dynamic conditions. Metso Outotec Edmeston SX® has been used for decades in a variety of applications such as piping, acid coolers, drying and absorption towers, acid distributors, pump tanks, valves, wire mesh, and other internal tower components.

Benefits

- Wide operational range (15 to 110% of sulfur load)
- Industry's smallest furnace configuration enabled by excellent atomization and compact combustion characteristics
- Highest single-burner capacity on the market (up to 35 t/h of liquid sulfur)
- Fast and easy burner removal
- Minimized risk of steam leaks

Benefits

- Excellent corrosion resistance (over 20-year service life)
- Proven material with more than 500 references
- Rapid delivery of partly or fully finished equipment and components

Portfolio

- Acid piping
- Acid distributors
- Direct and indirect acid coolers
- Absorption towers
- Pump tanks
- Strainers

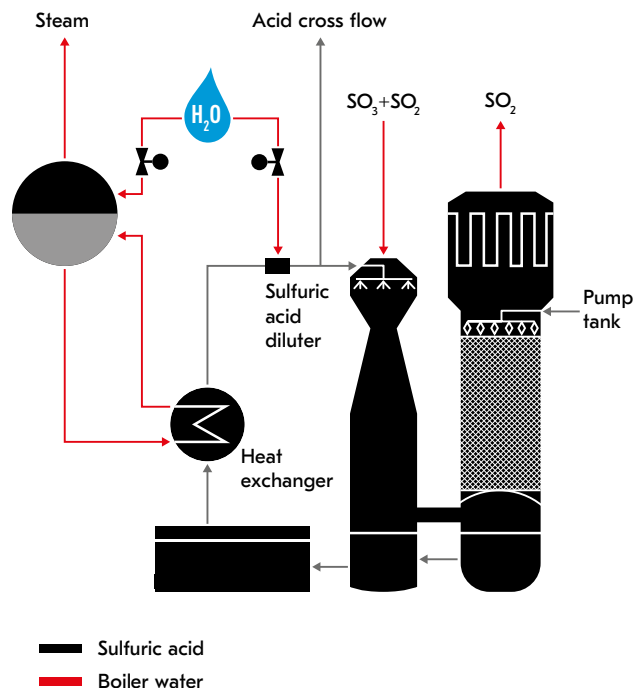


Effective heat recovery for improved efficiency and sustainability

Sulfuric acid production from elemental sulfur generates a significant amount of waste heat. Modern plants of this type typically generate electrical power via a turbine-generator set. This can also apply to production from metallurgical off-gases. We have developed the Metso Outotec LUREC™ process for strong feed gases, and have modernized metallurgical plants with boiler elements to enable steam production.

Metso Outotec HEROS heat-recovery system

To ensure that we can offer you the most sustainable solution possible, a key focus of our R&D work has been on acid cooling as the main contributor to waste heat production. The Metso Outotec HEROS heat recovery system generates steam using waste heat from the acid cooling process. It is designed as a peripheral system that can be taken in and out of service without impacting plant operation. Acid-resistant brick lining and stainless steel ensure the maximum possible reliability and widest possible operational window. The system reduces cooling water consumption, and the steam can be used for heating purposes or for electricity production on site.



Metso Outotec HEROS system

Benefits

- Improved energy efficiency through steam production from waste heat
- Complete independence from acid plant production means HEROS shutdown does not affect plant availability
- Improved plant availability enabled by digital monitoring system (PORS)
- Safe and reliable heat recovery
- Wide operational window due to acid-resistant materials

Portfolio

- High-pressure steam production from process gas waste heat
- Metso Outotec HEROS process for heat recovery from hot acid/acid cooling
- Metso Outotec LUREC process for strong metallurgical off-gases
- Retrofit solutions for metallurgical and sulfur-burning acid plants





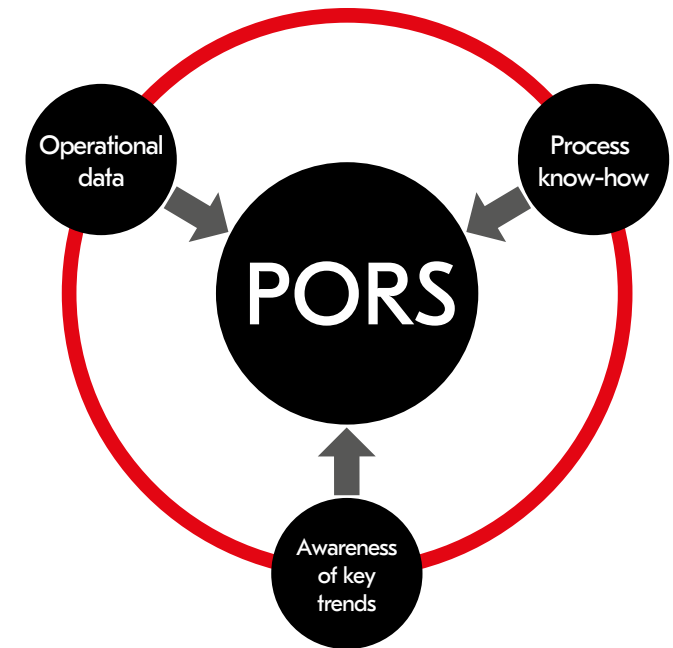
Digital tools to improve safety, efficiency, and productivity

The driving forces behind and benefits of digitalization are common across all industries: improved efficiency and productivity, predictive analytics capability for equipment failure prevention, and improvements in environmental compliance. Typically, large amounts of data are collected and made available through existing plant instrumentation, but operators lack tools that enable them to fully analyze the data in order to identify potentially hazardous situations.

Adequate training is key to safe and efficient plant operation. Our dynamic and static plant simulators are used to improve and speed up training of plant operators and provide them with a deeper understanding of processes.

Metso Outotec PORS

We can support operators by sharing our process know-how to help them more easily identify and prevent such situations through the Metso Outotec PORS (Plant Operability Reliability and Safety) system.



Benefits

- Compare theoretical versus actual KPIs
- 24/7 online monitoring and analysis of actual KPIs
- Identify potential causes of process disruptions and any potentially hazardous situations
- Increase plant operators' awareness of potentially hazardous situations
- Simple, intuitive system

Lifecycle service solutions

Our sustainable and reliable lifecycle solutions are tailored for your specific application and help to ensure that you get the best return on your investment. You benefit from unparalleled expertise that you can rely on to maximize equipment performance, environmental efficiency, reliability, and safety. Our goal is to help you optimize total cost of ownership, minimize equipment downtime, and maximize production efficiency.

We offer a comprehensive range of services that can be combined into a tailored solution to meet your precise requirements and asset needs, including spare and wear solutions, maintenance and operational services, shutdown project services, modernizations, and a wide range of off-the-shelf and customized training services.

Catalyst screening

We carry out catalyst screening using proprietary technology designed specifically for sulfuric acid plants. The technology allows quick, safe screening that minimizes plant downtime and reduces losses related to catalyst handling compared to manual screening. After screening, the catalyst is reloaded pneumatically into the converter from the ground. As well as being quick and safe, this method also minimizes dust generation and the risk of damage to the catalyst.



Benefits

- Minimal manpower required
- Fast screening minimizes plant downtime
- Dust is completely controlled
- Minimized risk of catalyst damage
- Removal, screening, and bagging done in one non-stop operation