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OXYSULF sulfuric acid recovery

OXYSULF MET metallurgical processes

OXYSULF SCU H_2SO_4 / SO_2 production

OXYSULF SAR spent acid regeneration

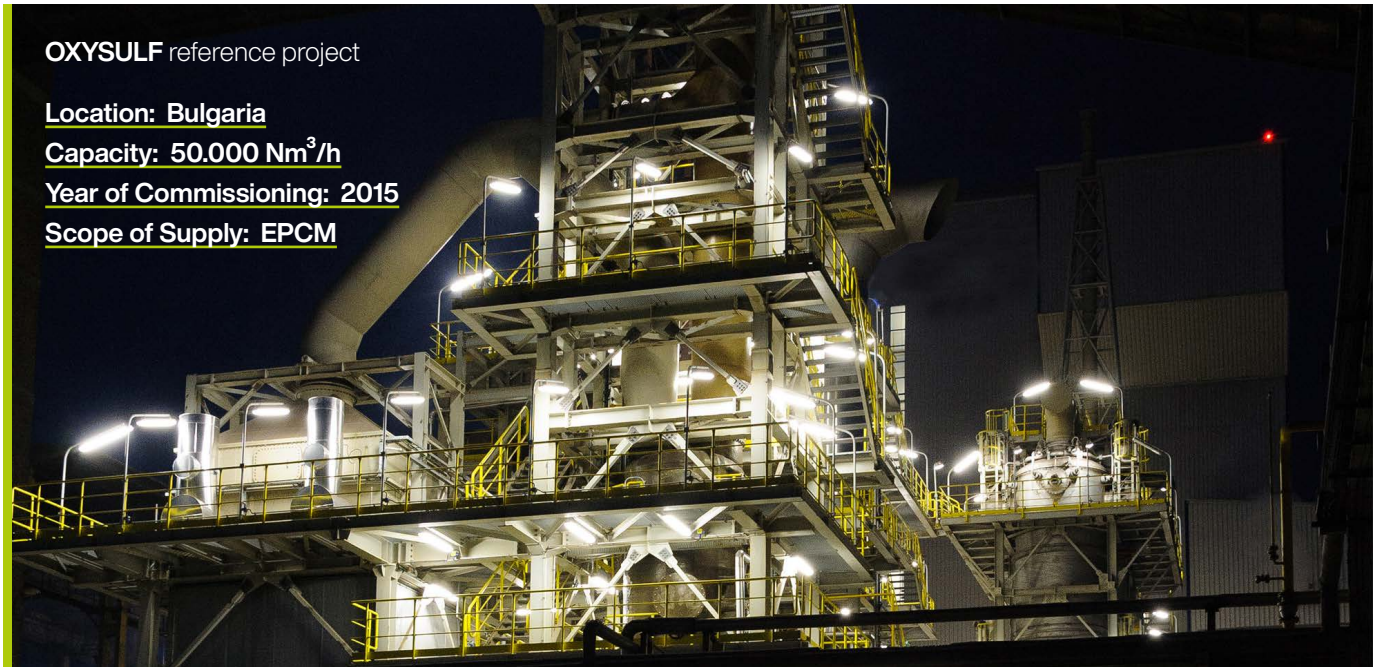
renewable feedstocks.
closed loops.
clean emissions.

OXYSULF

The OXYSULF process is a customized highly energy-efficient technology used for the cleaning of wet waste gases containing sulfur compounds and for the production of sulfuric acid.

Application	Separation of sulfur bearing-compounds from wet process streams to produce concentrated sulfuric acid
Typical Process Gas Flow	10.000 - 500.000 Nm^3/h
Sulfur Compounds	SO_2, H_2S, COS, CS_2, Mercaptanes concentration in gas stream: 2-200 g/Nm^3
Final Product	(H_2SO_4) 96-98 %/w
Sulfur Recovery	up to 99,98%
SO_2 Emissions	<50mg/Nm^3
Application Field	Refineries & petrochemical industry Coal based fertilizer and chemical industry Cokes manufacturing Non ferro metallurgical industry (Mo, Pb...) Power industry Viscose industry Natural gas processing

The process is based on the catalytic or the combination of thermal and catalytic oxidation of sulfur–bearing compounds by forming sulfuric acid. It is able to handle contaminants such as SO_2, H_2S, COS or CS_2 at a wide concentration range. Sustainability and guaranteed low emissions go together with the economical benefit.



Your Advantages at a Glance

Customized Modular Plant Configuration
The acid condensation column is based on a new KVT proprietary design which ensures reliability, high on-stream time and low maintenance costs. The column is made of a lined stainless steel concept which ensures the required corrosion resistance.

High Sulfur Oxidation Efficiency
A special designed KVT catalyst ensures the maximun oxidation efficiency. The KVT vanadium catalyst is designed for the conversion of SO_2 for wet application. The KVT noble metal based catalyst TARDIGRAD is designed for low concentration, able to work at a wide temperature range (250-600 °C) at low pressure drop .

Highly Efficient Heat Recovery System
The heat recovery system uses a heat transfer fluid in order to achieve the maximum efficiency. Due to the exclusive design, the excess heat is recoverd and used efficiently in the process and for external purpose.

Guaranteed low SO_2 and Acid Mist Emissions
The Wet Electrostatic Precipitator (WESP) removes the sulfuric acid aerosols formed during the condensation in the condensation column. When required, an additional tail gas reactor can ensure sulfur oxidation efficiency up to 99,98%.

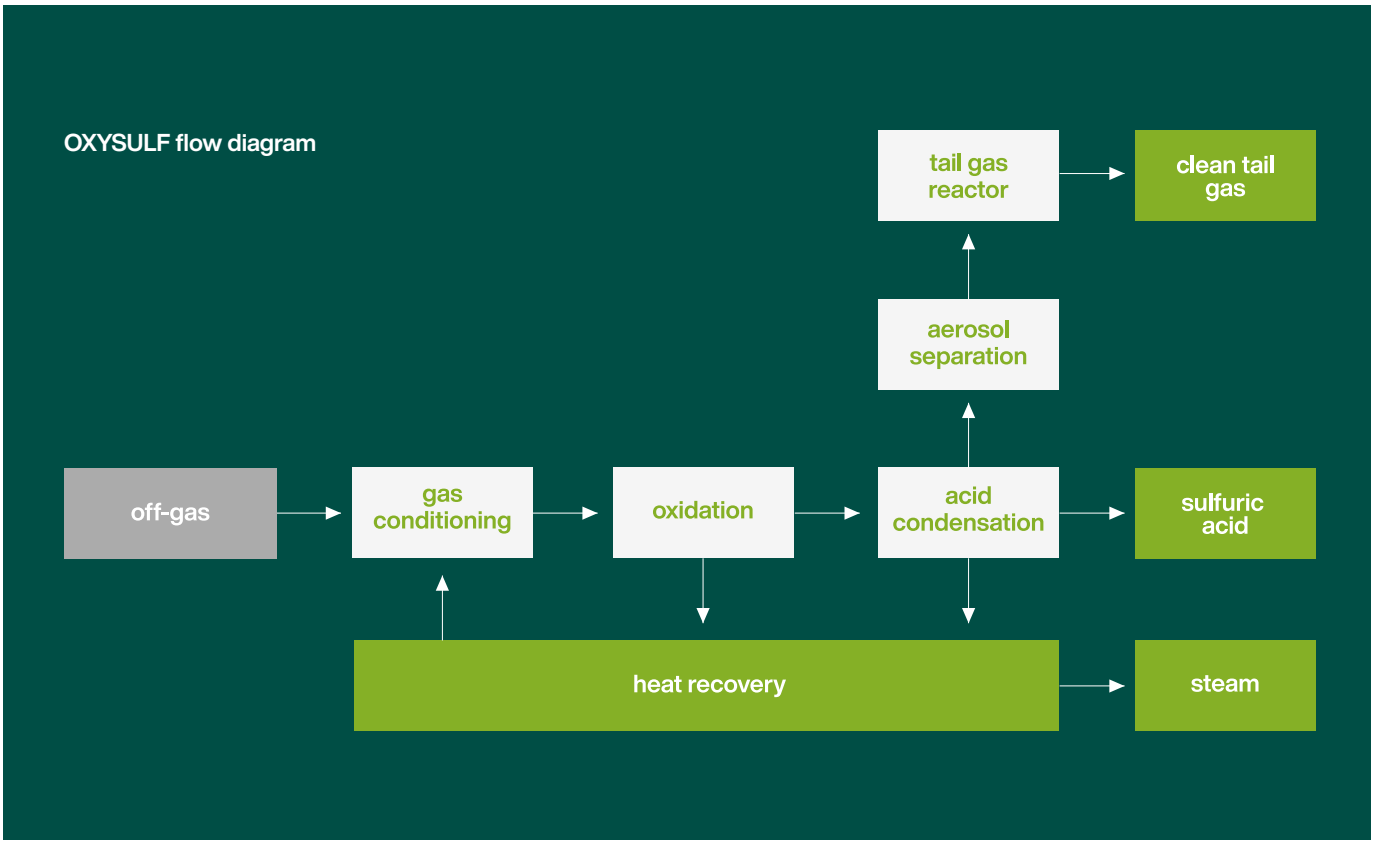
Simple Automated Operation
OXYSULF plants are highly automated in order to reduce operator and maintenance time to a minimum.

Compact, Modular Concept OXYSULF
Plants have a compact design which allows easy installation and integration into existing industrial plants.

OXYSULF reference project

Location: Tunisia
Capacity: 100.000 Nm^3/h
Year of Commissioning: 2008
Scope of Supply: EPC

OXYSULF



Process Description:

1. The off-gas passes the gas conditioning system which may consist of a combustion chamber, a prefilter, a scrubber, Dry-Fil hot gas filter (KVT exclusive) or a preheater depending on the Wet Gas Clean Plant.

2. The gas passes over the multibed reactor where the catalytic oxidation of sulfur compounds takes place and gaseous sulfuric acid is formed. The heat of the exothermic reaction and the heat of the process gas cooling is used within the Heat Recovery System.

3. The Heat Recovery System is indivudally designed as per process and client requirements. Several options are available such as heat transfer fluid systems or a waste heat boiler for steam generation.

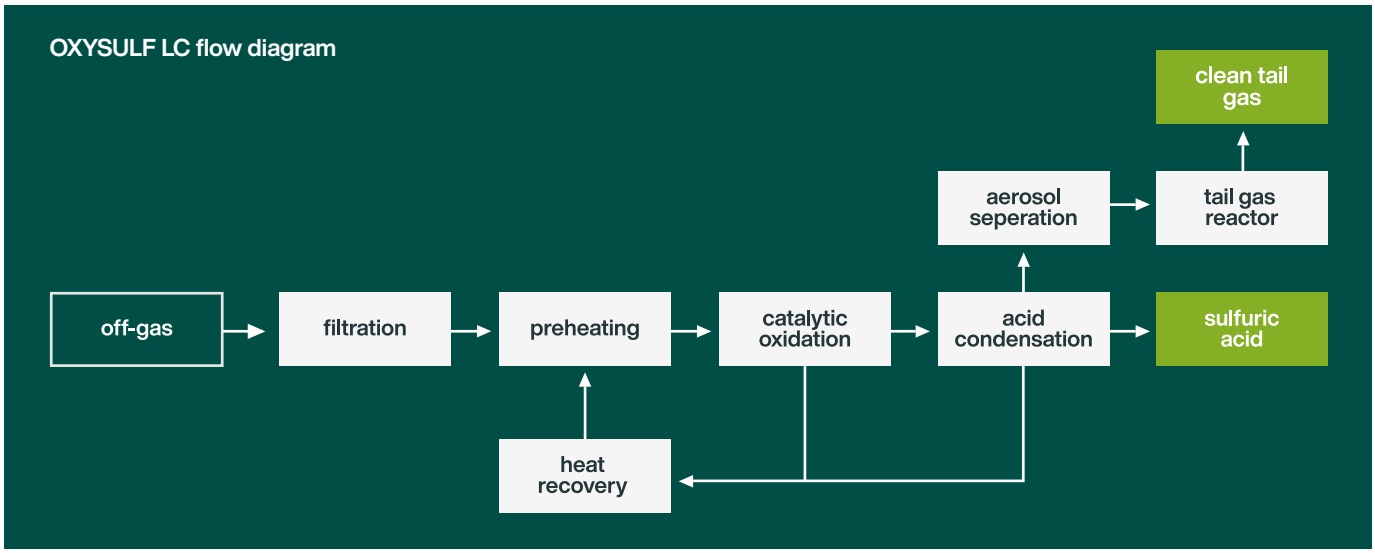
4. In the acid condensation column the sulfuric acid is condensed with up to 98%w concentrated acid. The hot acid is cooled within acid coolers and stored at the sulfuric acid tank.

5. The gas downstream of the condensation column is routed to the Wet Electrostatic Precipitator (WESP) where the sulfuric acid aerosols are precipitated. An optional tail gas reactor stage increases the sulfur oxidation efficiency to meet most stringent emission requirements.

The OXYSULF technology can be classified into the following five main types:

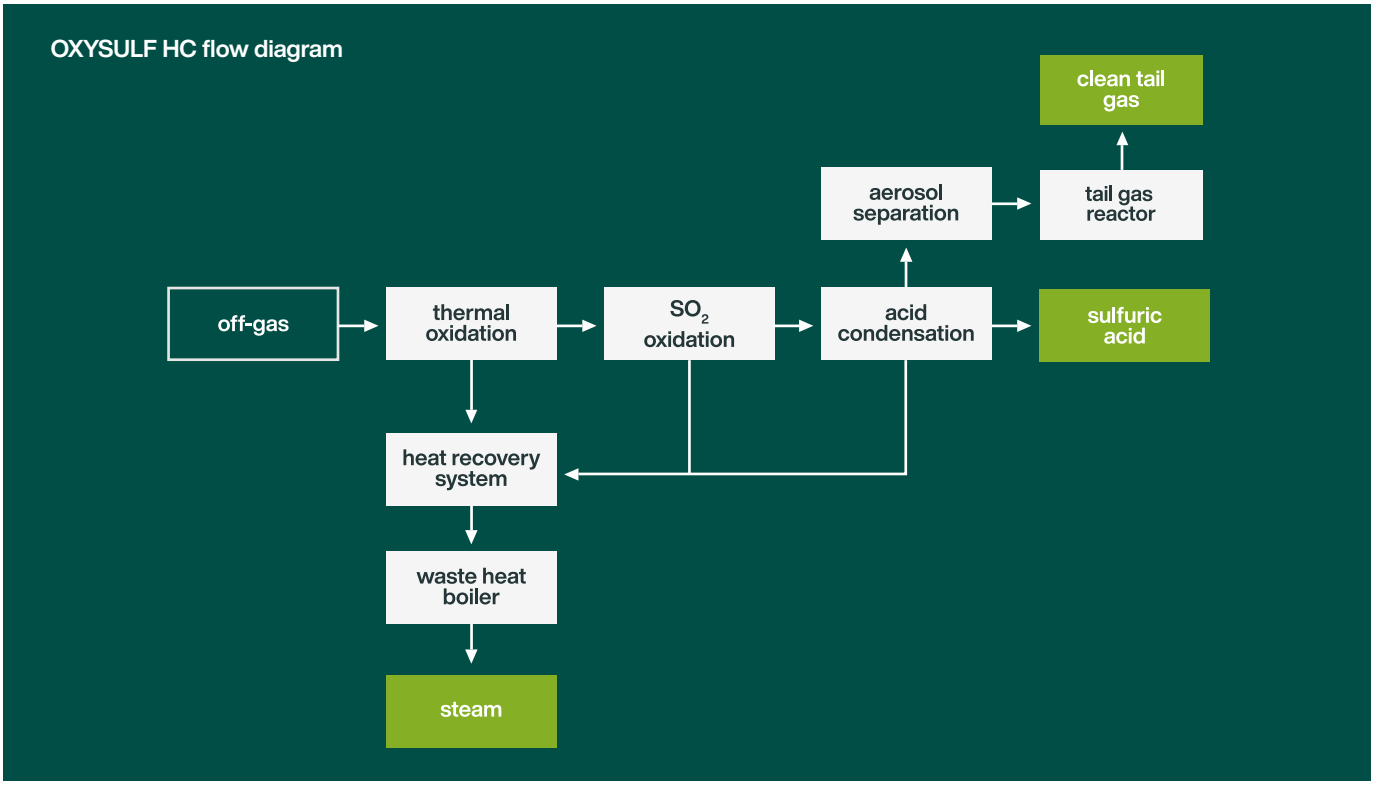
- **OXYSULF LC** for low concentrations
- **OXYSULF HC** for high concentrations
- **OXYSULF MET** following metallurgical processes
- **OXYSULF SCU** for H_2SO_4 and or SO_2 production
- **OXYSULF SAR** for spent acid regeneration

OXYSULF LC



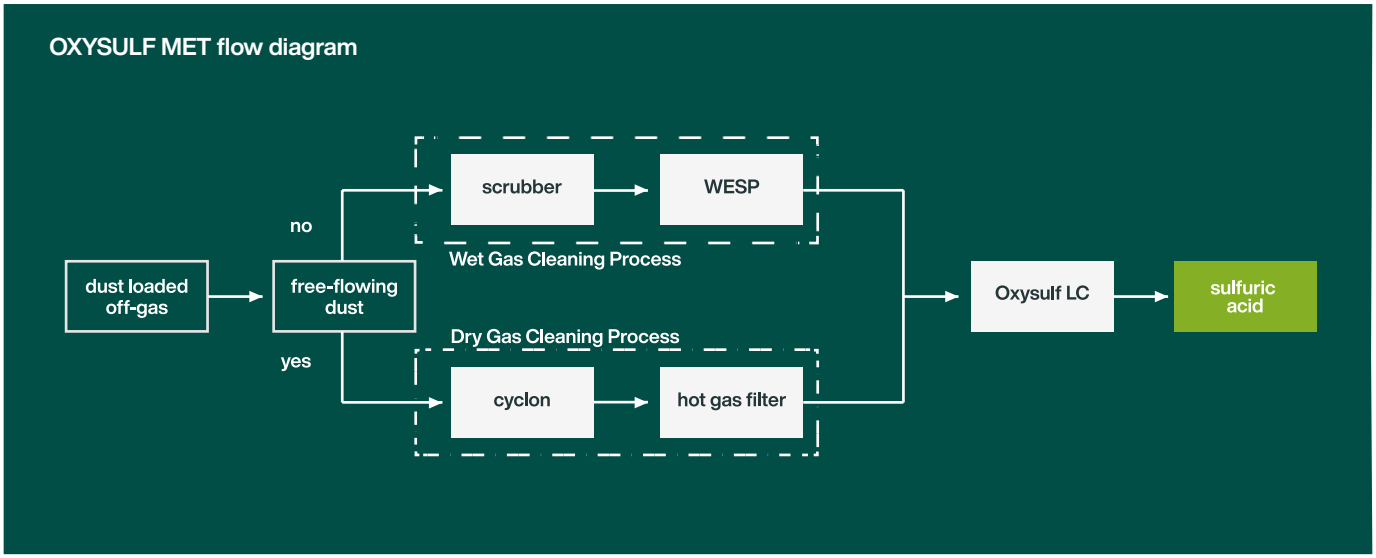
The **OXYSULF LC** technology is used for lean H_2S and SO_2 off gas feed streams. In the reactor the H_2S and SO_2 is converted to SO_2 by the proprietary Tardigrad catalyst. For concentrations below the autothermal condition, an additional raw gas preheating is required. With an optional Tail Gas Reactor, SO_2 required emission limits are achieved. Typical OXYSULF LC application are in viscose industry, natural gas processing, power and metallurgical industry.

OXYSULF HC



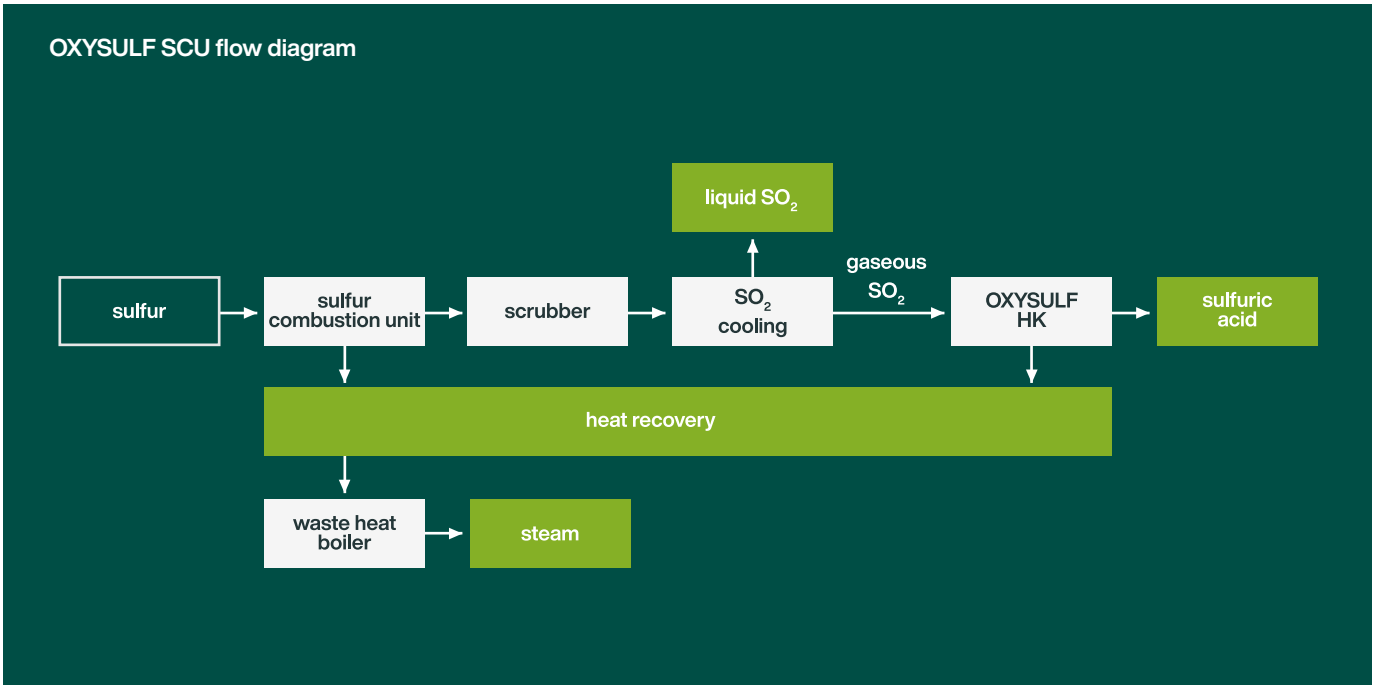
The **OXYSULF HC** technology is used for concentrated H_2S off gas feed streams. The process includes a combustion chamber for the thermal oxidation of sulfur compounds. To raise the sulfuric acid output, additional sulfur can be burnt in the combustion chamber. A Waste Heat Boiler is part of the Heat Recovery System to recover the excess heat after the combustion chamber and from the reactor. With an optional Tail Gas Reactor the maximum conversion rate can be achieved. Typical OXYSULF HC applications are in the oil, gas, steel and power industry.

OXYSULF MET



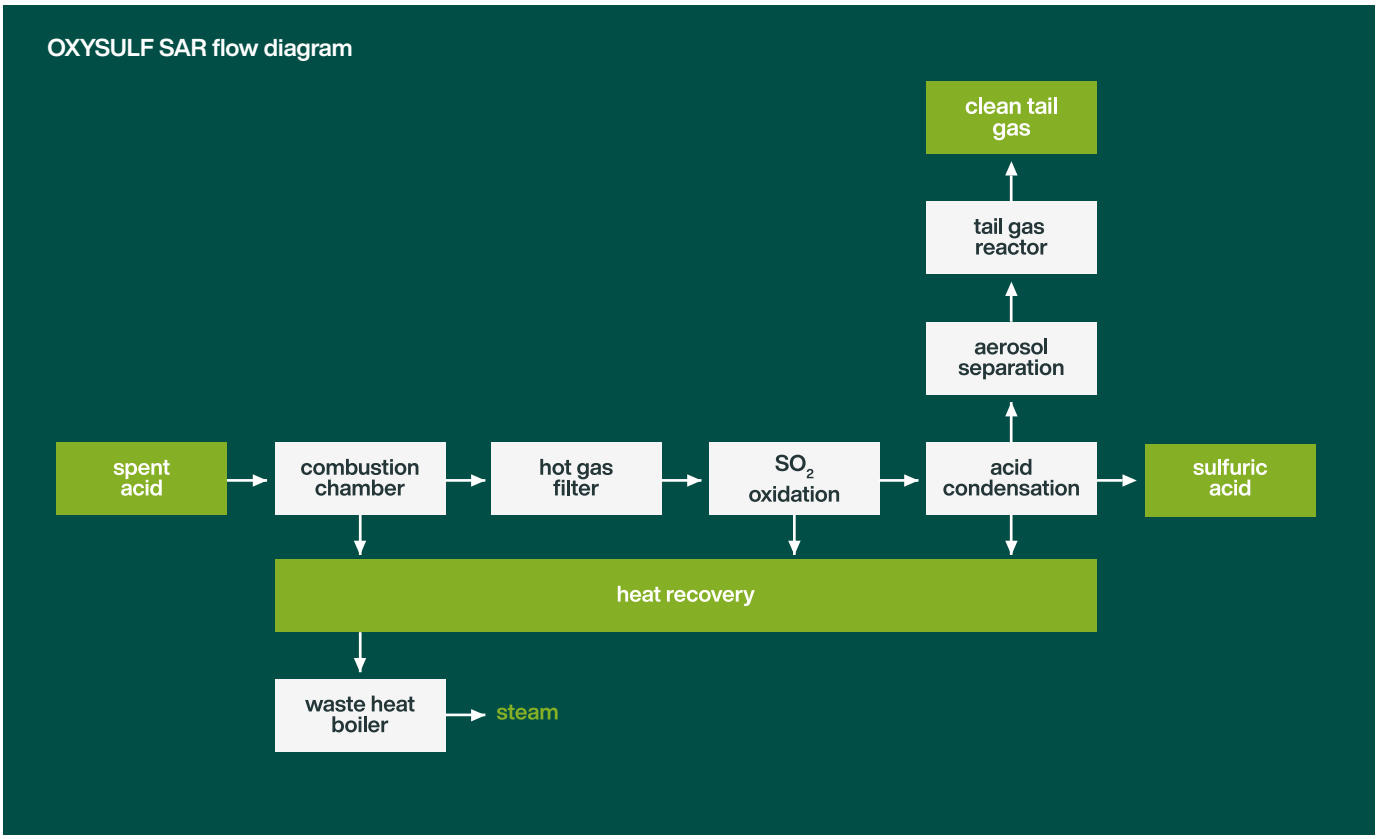
The **OXYSULF MET** has been developed to meet the requirements of the metallurgical industry where dust loaded roast gases with dust concentration up to 180g/Nm^3 have to be treated. The roast gas from the furnace is cooled down to the operation temperature of the downstream cleaning process. The physical properties of the dust dictate the cleaning technology to be used: for “free-flowing dust” the gas stream is treated with a Dry Gas Ceaning Process. The cooled gas passes over a cyclone where large particulate are settled, followed by a proprietary Dry-Fil Hot Gas Filter for further filtration; for “not free-flowing dust” the gas stream is treated with a wet process. Here the cooled gas passes over a scrubber followed by a proprietary Wet Electrostatic Precipitator (WESP) for gas cleaning. After the gas cleaning system, the off-gas is treated with the OXYSULF LC process.

OXYSULF SCU



OXYSULF SCU is applied when SO_2 and H_2SO_4 production is required. Liquid sulfur is fed into a specially designed combustion chamber to form SO_2. The resulting process gas is fed into the scrubber to absorb the small quantity of potentially formed SO_3. After the scrubber, part of the SO_2 is cooled and condensed. The remaining SO_2 is sent to the OXYSULF HK plant where the conversion of SO_2 to SO_3 and then the hydrolysis to sulfuric acid takes place.

OXYSULF SAR



For the spent acid and sulfate regeneration the **OXYSULF SAR** is used.
The spent acid with the fuel gas is fed into a special designed combustion chamber to form SO_2. The acid together with fuel gas is fed into the burner through compressed air and ultrasonic atomizing. For special applications there is the possibility to use H_2S gas or S feed instead of fuel gas to reduce energy cost. Depending on the acid composition and possible impurities a hot gas filter after the combustion chamber maybe required to remove the solid impurities from the SO_2 gas stream.
After the hot gas filter, the gas stream is treated with an OXYSULF HC plant where the conversion of SO_2 to SO_3 and then the hydrolysis to sulfuric acid takes place. The clean gas is discharged to the atmosphere through the main stack.

about kvt

Development. Creation. Execution. Support.

kvt is a global process engineering company offering a full range of services from the initial concept to turnkey industry plant solution. We work in close cooperation with our customers, consistently delivering innovative and customised solutions.
As engineers we have the responsibility to develop advanced technologies in harmony with the efficient use of our natures resources under consideration of the protection of its air, water and soil.

learn more at www.kvt.technology

We believe in a sustainable future for chemicals based on renewable feedstocks, closed loops, and clean emissions.

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