



HUGO PETERSEN
Verfahrenstechnischer Anlagenbau

TECHNOLOGY AND PROCESS OVERVIEW
Expertise and Know-how for our Clients

www.hugo-petersen.de

The company

Experience and in Detail

HUGO PETERSEN GmbH located in Wiesbaden, origins from the renowned company Hugo Petersen, founded in 1906, in Berlin. HUGO PETERSEN is part Chemieanlagenbau Chemnitz (CAC) group and as such can provide full for the development and implementation of small to large scale

Initially using the expertise gained in the classical production of sulphuric acid generated in the refining of metallurgical ores, the company HUGO specialized in the field of manufacture of sulphuric acid, hydrochloric acid



Pic. 1:
Hugo Petersen 1906

engineering
of the
support and security
installations.

acid, from off-gases
PETERSEN
and gas cleaning.

Efficiency First

Not only do the things right, but also, do the right things



Pic. 2: Patent 'Kammerregulator' 1905

The founder, Hugo Petersen was, from the beginning, ambitious to improve operations to reduce emissions, through his invention of the patented "Kammerregulator" for the classical lead-chamber process. The unit improved the control of the performance of the lead-chamber and hence the emission of noxious gases.

In 1923, he replaced the lead-chambers by irrigated towers, achieving a 6-fold increase in performance versus the original design.

Nowadays, sulphuric acid is produced by the well-known double contact process, which is based on the oxidation of SO₂ to SO₃ using a vanadium pentoxide catalyst, introduced by BAYER AG in 1964. Since then, the



Pic. 3: Tower Plant 1923

conversion efficiency has increased from 97.5% to 99.5%

HUGO PETERSEN supplies plants and equipment which ensure conversion rates of more than 99.92% and with its vast experience in gas cleaning it is possible to attain SO₂-free gases.

HUGO PETERSEN with its more than 110 years of experience in the design and operation of sulphuric acid plants and their equipment offers today a vast range of technology to the industry. The design, whilst incorporating HUGO PETERSEN's extensive experience, has been developed and optimised through a comprehensive research program, conducted using HUGO PETERSEN'S own pilot plant facilities.

The engineering company has evolved from HUGO PETERSEN - consulting engineers, to an operating entity with a worldwide network of representatives and subsidiary companies.

In the field of Manufacture of Sulphuric Acid, the focus is on planning, designing and supplying plants which use raw materials like elemental sulphur, metallurgical sulphides and the decomposition of spent acid. This also includes the efficient and intensive use of off-gases from metallurgical plants as well the effective energy recovery from sulphur burning plants.

HUGO PETERSEN is world-wide one of two companies that have the complete in-house-developed technology for metallurgical acid plants.

About 50 well trained process technologists and engineers contribute their knowledge and expertise in the fields of mechanical and electronic engineering, as well as material science, to their design work.

Since more than 25 years HUGO PETERSEN is doing site-surveys, plant-audits, operational and maintenance-consultancy.

Accurate Planning - the basis for our work

HUGO PETERSEN has installed more than 400 turnkey plants and plant components for the manufacture of sulphuric acid, oleum and SO_2/SO_3 .gaseous or liquefied

Technology and Process Overview

HUGO PETERSEN Sulphuric Acid Technology

HUGO PETERSEN set new standards at the beginning of the 20th century with the PETERSEN tower plant process for the manufacture of sulphuric acid and thereby replaced the outdated lead chamber process.

For more than 100 years HUGO PETERSEN has been building sulphuric acid plants meeting the highest standards. Over the decades, optimal concepts for our clients have been developed.

Thanks to its knowledge of metallurgical and chemical processes, HUGO PETERSEN can offer its customers customized solutions.

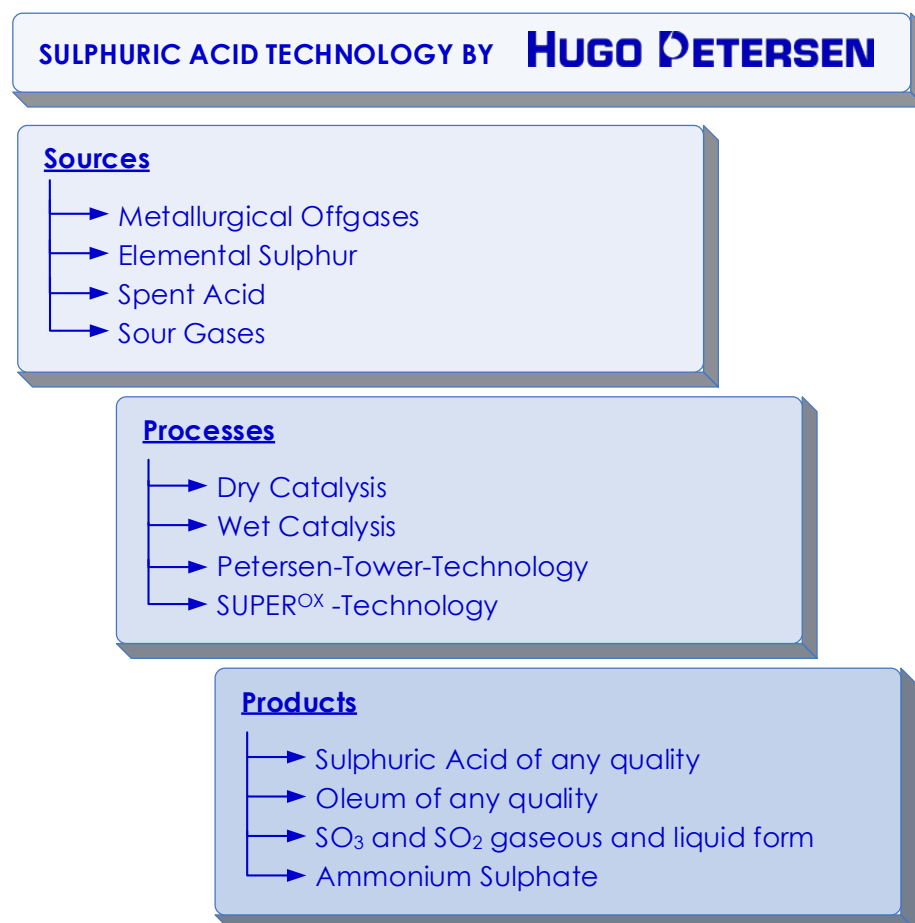


Fig.1: Process Overview: Sulphuric Acid

In the above overview the key processes are shown. At the same time, more specific methods have been developed by HUGO PETERSEN, such as:

Special Processes

Special Processes here are those that afford a special efficiency in separation and meet specific requirements, but which also target energy recovery.

- $\text{SO}_2^{\text{RICH}}$
- $\text{SULF}^{\text{ALTA}}$
- SUPER^{OX}
- SUPER^{CO}
- $\text{MERCURY}^{\text{EX}}$ (B-GON)
- ENER^{REC}
- PINC

$\text{SO}_2^{\text{RICH}}$	a process that generates from weak SO_2 -containing gases an SO_2 -rich gas, which can be further, converted to liquid SO_2 or any other sulphur-based product.
$\text{SULF}^{\text{ALTA}}$	a group of methods for the treatment of SO_2 -containing gases with more than a 12 vol.%. In this case, gases can be treated with gases of more than 30 vol.%.
SUPER^{OX}	highly efficient SO_2 -separation process based on sulphuric acid and H_2O_2 .
SUPER^{CO}	An optimized A-coal process for the production of sulphuric acid from low conc. SO_2 gas.
$\text{MERCURY}^{\text{EX}}$	Mercury separation for the highest grades of sulphuric acid.
ENER^{REC}	Energy recovery and utilization from sulphuric acid plants.
PINC	Process Integration Network Consulting for industrial Plants

Equipment Development

HUGO PETERSEN technology is also characterized by a variety of in-house developments in sulphuric acid technology.

Here are a few representative ones:

- | | |
|---|--------------------------------|
| ■ Petersen Turbulence Scrubber | Scrubbing |
| ■ PJET Petersen Jet Scrubber | Jet scrubbing |
| ■ PES Petersen Electro-Stat | Wet Electrostatic Precipitator |
| ■ Intenso Smelter to melt sulphur | |
| ■ DynSon-Injector® for sulphur combustion | |
| ■ OXY-Reactor® for sulphur combustion | |
| ■ Homogeneous flow heat exchanger, like MBRF® | |
| ■ Stainless steel converter | |
| ■ Anodic-protected acid coolers | |
| ■ Liquid distributor, like FaFi® | |

HUGO PETERSEN-Gas Cleaning

Overview

HUGO PETERSEN GmbH has been operating for over 70 years in the field of industrial gas treatment and cleaning. In the early days the driving engine was gas cleaning for SO₂-containing exhaust gas for the production of sulphuric acid by the contact process.

In the early 1960s of the 20th century, gas cleaning became a field of manufacturing activity for HUGO PETERSEN in addition to sulphuric acid manufacturing.

Again, in the first phase, gas cleaning technology was the godfather of sulphuric acid manufacturing.

In addition to the separation of acidic components from exhaust gases, aerosol separation was and remains a key technology component of the HP portfolio.

GAS CLEANING TECHNOLOGY BY **HUGO PETERSEN**

Type

- Wet Gas Cleaning
- Dry Gas Cleaning
- Catalytic Gas Cleaning
- Aerosol Separation

Kind

- Absorptive
- Adsorptive
- Catalytic
- Mechanical

Produkts

- Sulphuric Acid and Oleum
- SO₃ and SO₂ in gaseous and liquid form
- CaSO₄, Na-Sulfites, Na₂SO₄, (NH₄)₂SO₄
- HCl and others

HP technology was initially divided into these main groups

- Wet gas cleaning
- Dry gas cleaning
- Catalytic Gas Cleaning
- Aerosol separation

The stated goal of a gas cleaning concept is also the optimal combination of individual technologies.

Here, some objectives are:

- Resource recovery
- Energy savings
- Energy utilization

The following lists are intended to provide an overview, but do not claim to be exhaustive.

Wet Gas Cleaning

Absorptive separation of gas components in an alkaline as well as partially in an acidic medium

Acid gas components

- SO₂
- SO₃
- HCl
- HF
- HBr
- HI
- H₂S
- and other acid gas components

Heavy metals such as

- As
- Hg
- Se
- Cd and others

Adsorptive separation of gas components and particulate constituents

Acid gas components

- SO₂
- SO₃
- HCl
- HF
- HBr
- HI
- H₂S
- NO_x
- N₂O
- and other acid gas components

Heavy metals such as

- As
- Hg
- Se
- Cd and others

Organic components

- Dioxins
- Furans
- PCBs
- HCB and others

Catalytic decomposition or Implementation of

- SO₂
- NO_x
- N₂O
- Dioxins
- Furans
- PCBs
- HCB and others
- CO

Separation of Aerosol and Superfine Dust

- Acidic liquid aerosols
- Organic aerosols
- Particulate matter

by means of:

- static centrifugal separators
- dynamic/rotating centrifugal separators
- electrostatic separators

Resource Recovery

Other materials are also produced from the separated components among, such as:

- FGD gypsum for use
 - in the construction industry
 - as an aggregate for the preparation of ceramics and cement,
 - etc.
- Sodium sulphite solutions for use in the beverage industry
- Mg-sulphite solutions
- Ammonium sulphate
- Hydrochloric acid
- Sulphuric acid
- Oleum
- SO₂-rich gases
- SO₂ liquid
- SO₃ gas
- SO₃ liquid

Here as well HUGO PETERSEN sulphuric acid technology is used.

Special Processes

Specific methods here are those that have special separation efficiency and produce reusable materials, but which also target energy recovery.

- SO₂^{RICH}
- SULF^{ALTA}
- SUPER^{OX}
- SUPER^{CO}
- MERCURY^{EX} (B-GON)
- ENER^{REC}

Equipment Development

HUGO PETERSEN technology is also characterized by a variety of in-house developments in separation technology.

Here are a few representative ones:

■	PJET	Petersen Jet Scrubber	Jet scrubbing
■	PTA	Petersen Turbo Agglomerator	Aerosol separation and gas extraction
■	PSA	Petersen spray absorber	HE-jet scrubbing
■	PTB	Petersen Turbo Accelerator	Aerosol
■	PZA	Petersen centrifugal separator	Aerosol
■	DSA	Petersen pressure jump separator	Aerosol
■	PMV	Petersen Multi Venturi	Aerosol
■	PES	Petersen Electro-Stat	Wet Electrostatic Precipitator

Our specialists handle every customer's request individually. The engineering company, HUGO PETERSEN, is free to select processes and measures to be taken for each application, as we have the full range of technology, in-house.

Our Services for You



References

Wet gas cleaning for metallurgical sources

Turbulence Scrubber, Wet-Electro-Static-Precipitator



Pic. 4: Cleaning off gases by means of absorption and aerosol removal downstream of pyro-metallurgical processes in non-ferrous industries.



Pic. 5:

Gas Cleaning in a Regen Plant The high-performance PES - wet electrostatic precipitator is used for the removal of aerosols and dusts.



Pic. 6: Complex multistage wet scrubbing unit installed at a metallurgical plant.

Contact Plants



Pic. 7: 2,000 tpd Sulphuric Acid DC-Plant based on sulphur burning with ENER^{REC}



Pic. 8: World's Largest Oleum Plant with a capacity of 1,500 tpd



Pic. 9: Complete revamped Sulphuric Acid DC-Plant (600 tpd)



Pic. 10: Revamp of S-based from 1,500 tpd to 2,200 tpd



Pic. 11: Cu-smelting based metallurgical DC-plant original 900 tpd and lately revamped to 1,500 tpd



Pic. 12: Pyrothine roasting/S-based combi plant of 1,500 tpd



Pic. 13: Wet-Gas-Cleaning Plant down a Mo-roasting plant



Pic. 14: MBRF-Heat-Exchanger for Sulphur-Burning-Plant



Pic. 15: Stainless-Steel-Absorption-Towers



Pic. 16: Anodic-Protected-Acid-Coolers



Pic. 17: Stainless-Steel-Converter



Pic. 18: New Gas-/Gas-Heat exchanger Modification at Converter (Turkey)

Special Processes

Tail-Gas Scrubbing



Pic. 18: SUPER^{OX}-Processes downstream sulphuric acid plants



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