Sulfuric Acid

Sulfuric acid is a highly corrosive mineral acid with the molecular formula H₂SO₄. Sulfuric acid is the most widely produced/consumed chemical at over 200 million tonnes per year. It is used as a reactant, catalyst, drying agent or for pH adjustment in the production of fertilizer and various other chemicals, as well as for petrochemical refining, metals processing, pulp and paper manufacturing and in many other applications and industries.

Acid waste streams are often simply neutralized prior to transfer to waste water treatment facilities. Rising operating costs in difficult economical times creates the need to recover the sulfuric acid for further use.

Stricter environmental regulations globally also mandate recovery of sulfuric acid rather than waste treatment.

Pfaudler has the most experience and expertise in the industry, dating back to 1884, for the selection, design and manufacture of high performance corrosion resistant components and systems for the safe production, transportation and storage of corrosive, and hazardous chemicals such as sulfuric acid.
Pfaudler Sulfuric Acid Recovery (SAC) Systems

Pfaudler’s SAC System Features

**Designs for** concentration up to 96%wt. and capacities up to 1200 MTPD.

**Pfaudler’s extensive experience** in corrosion resistant equipment and system design:
- invented glass-lined steel in 1884;
- first to fabricate with Zirconium in 1938 and Tantalum in 1946;
- pioneered use of fluoropolymers for process systems in 1964.

**Heat recovery systems** integrated into design for substantial operational cost savings.

**Gravity flow** integrated into design to minimize rotating equipment, operating costs, and maintenance costs and to increase system on-line time.

**Efficient designs** allow for compact system designs which provide capital cost savings, reduce required plant space and minimize operational acid volumes to maximize protection of personnel, property and the environment.

**Multiple system designs** including forced circulation, thermosiphon and multi-effect for energy conservation.

**Pilot test facility** allows for proof of concept/performance, optimization of design and data collection for commercial-scale system design.

**Emission control systems** provided as an option to control organics, NOx and emissions when plant pollution control systems do not exist or are not designed for the additional load.

**Utility systems** designed and provided for plants were existing utilities are insufficient to service the SAC System.

**Control systems** are included to provide for safe, reliable operation.

**Single-source responsibility:**
- process design;
- engineering design;
- construction;
- performance guarantee;
- installation services;
- maintenance services;
- spare/replacement parts.
Corrosion Resistance

The selection, design and manufacture of the proper high performance corrosion resistant materials of construction is critical for the safe production and storage of corrosive and hazardous chemicals like sulfuric acid. Pfaudler has many years of experience and expertise with corrosion resistance as we invented Glasteel® in 1884, pioneered the use of fluoropolymer technologies for process applications with our Edlon division in 1964 and were the first to fabricate process equipment from Zirconium in 1938 and Tantalum in 1946.

Pfaudler has the largest number of customer installations of glass-lined and fluoropolymer-lined equipment for corrosive applications in the Chemicals Industry. The high alloys necessary for sulfuric acid processing are very costly and while these high alloys are required for heat exchangers for heating, evaporating, condensing or cooling sulfuric acid, Pfaudler’s Glasteel® and Fluoropolymer technologies are much more economical choices for storage and processing tanks and transfer piping.

We have a wide range of glass linings for our clients’ corrosive process requirements, a few of which include our standard WWG, which has a wide range of application, Pharma Glass for ultra-pure applications, Poly Glass for its anti-stick properties, ARG for abrasion resistance and ASG for its anti-static properties.

For corrosive applications we utilize our Pfaudler Glasteel® and Edlon fluoropolymer technologies and Pfaudler reactive metal technologies.

Our knowledge and expertise of the unique properties of fluoropolymers combined with the Edlon brand technologies enables us to meet the most complex geometric challenges for vessel and piping accessories for any corrosive application utilizing fluoropolymers such as PTFE, PFA, ECTFE, ETFE, and PVDF.

Besides high alloys such as Tantalum and Zirconium, Pfaudler also manufactures heat exchangers with Glasteel® and silicon carbide materials of construction.
Pfaudler has fabrication facilities located in seven (7) countries to serve our global clientele and we design equipment per all major global pressure vessel design codes including: ASME, DIN, PED, TUV, GB150, Chinese Certification “SELO”, AD Merkblatter 2000, KGS, TEMA.

We size, design and 3D model pressure vessels utilizing internationally recognized software programs such as PVElite, Aspentech, HTRI, Solidworks, and Autodesk AutoCAD.

Pfaudler designs and fabricates standard and custom glass-lined and fluoropolymer-lined tanks and processing vessels up to 4 m (13 ft) in diameter with capacities to 120 m³ (32,000 gallons) and with design temperatures up to 343°C (650°F) and design pressures of full vacuum up to 20 bar (300 psig).

We also design and fabricate standard and custom reactive metal heat exchangers up to 1,400 m² (15,000 ft²) and silicon carbide heat exchangers up to 73 m² (788 ft²).

Computational Fluid Dynamic (CFD) and Finite Element Analysis (FEA) are completed for critical applications.
Process Engineering

**Pfaudler’s Engineered Solutions Group** is comprised of experienced engineers, representing all disciplines of turnkey plant design.

At the heart of this group are chemical engineers, with vast experience and expertise in all chemical operations, including: Evaporation, Distillation, Mass Transfer, Reaction, Mixing, Heat Transfer, Filtration, Fluid Flow, Drying, and more.

Pfaudler’s Engineered Solutions Group completes process designs utilizing process simulations with Aspen Hysys® and/or by processing our clients’ materials in our Pilot Process Test Facility.

We design sulfuric acid recovery systems for any feed whether it be simply removing water or designing for removal of organic or inorganic impurities.

Our complete system design can also include designs for vent gas scrubber or absorbers for NOx removal or the design of utility supply systems.

Using the simulation output and/or pilot test data, Pfaudler’s engineering team develops an optimized design for an efficient, safe, and economical commercial production facility.
Pilot Testing

Before chemical production begins, or construction starts, and before engineers design the facility, an optimal chemical process must be developed, and proven. At Pfaudler’s world-class Process Test Facility, our experienced chemical process engineers develop & optimize your process, and collect the data required to design your commercial-scale facility.

Typical purposes for testing at Pfaudler’s Process Test Facility include new process development, yield and purity improvement, process optimization for cost-reduction and increased profit, and VOC reduction to meet environmental regulations.

Pfaudler’s Process Test Facility, can be configured for a variety of evaporation operations. Multiple utility systems provide a wide range of operating conditions, including: a high-capacity multi-stage vacuum system, for vacuum down to less than 0.01 millibar, hot thermal oil up to 345°C, steam to 180°C and water systems from -12° to 140°C.

Our Process Test Facility is designed to process flammable and corrosive chemicals, in volumes ranging from lab samples, to tote quantities.

Pilot testing concludes with a comprehensive report that includes the scope, objectives, and sample analytical results, accompanied by conclusions, and recommendations.
Complete Process System Design

- Design Basis
- Process IP
- P&IDs / PFDs
- Equipment Specifications/Design
- Equipment Fabrication
- Instrument Specifications/Design
- PLC Control System
- Piping Specifications
- Corrosion Resistant
- Materials Selection
- System Layout
- Structural Steel Design
- Piping Drawings
- Bills of Materials
- Procurement
- Construction
- Commissioning
- Documentation
- Installation Instructions
- Operating Instructions
- Maintenance Instructions
- Performance Guarantee
- Installation
- Maintenance/Service
- Spare/Replacement parts
Pfaudler’s Engineered Solutions Group designs, fabricates and commissions complete process systems with Pfaudler’s SAC Technology at the core.

These complete systems include the acid concentrator/evaporator plus all ancillary equipment, instrumentation and piping completely assembled on structural steel modules or field fabricated.

Each system is designed specifically for our clients’ process. The layout is custom designed to ensure proper system functionality and to ensure all equipment, instruments and valves are arranged for ease of operation and maintenance.

This single source responsibility ensures the design of every component is integrated into a complete system design to ensure proper system performance.

Our modular design provides:
• Reduced costs
• Shorter schedule
• High quality construction