GMM Pfaudler Systems

Acid Recovery

GMM Pfaudler Systems

Our capabilities are not limited to the individual technologies themselves. Utilizing vast chemical processing expertise, our skilled engineers combine Technologies with all other required ancillary equipment, piping, instrumentation and controls into complete, fully integrated and efficiently operating process systems.

GMM Pfaudler supplies turn-key systems from lab scale systems through full industrial scale plants, for all chemical processes. The layout is custom designed for proper system functionality and also to ensure that all equipment, instruments and valves are arranged for ease of operation and maintenance.

This single source responsibility ensures that the design of every component is integrated into a complete system design that provides optimum system performance, reduced costs, shorter schedules and high quality construction.

PROCESS SYSTEMS PACKAGES

- Engineering & Design
- Reaction Systems
- Evaporation & Distillation Systems
- Acid Recovery
- Filtration & Drying Systems
- Absorption Systems
- Extraction Systems


Meet your Sustainability goals with our Acid Recovery processes
Concentrate
Recycle
Reuse
Reduce Waste

Acid Recovery

The Chemical industry produces thousands of tons of diluted inorganic waste acids containing inorganic and organic impurities. These acid waste streams are often neutralized prior to transfer to wastewater treatment facilities. However, rising operating costs in difficult economic times create the need to recover the acid for further use. Stricter environmental regulations globally also mandate recovery of acid rather than waste treatment.

materials such as glass-lined steel (Glasteel®), fluoropolymer-lined steel and reactive metals (Zirconium and Tantalum) technologies that help in the safe containment and processing for acid recovery.

Our capabilities expand across the globe, designing and engineering plants for the following Acid recovery processes:

Pfaudler's Acid Recovery Capabilities

We offers Acid Concentration plants with process technology and a complete range of Engineering services provided by **GMM Pfaudler Systems Group**, active in the field of acid treatment and all related services for decades. Our highly experienced team of Process Developers, Project Managers and Experts from all related disciplines evaluate the most appropriate process technology for the given application.
The offered plant is based on the latest state of technical knowledge and all plant units are optimized with respect to investment costs and operability of the plant. The scope of supply is proven to be suitable in regards to safety and operability.

As Acid is highly corrosive ranging from low to high concentrations, Pfaudler offers corrosion-resistant

GMM Pfaudler Systems

- Nitric Acid
- Spent Acids
- Sulfuric Acid
- Formic Acid
- Acetic Acid
- Waste Water
- Hydro-Chloric Acid

Our Acid Concentration System Features

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.

Laboratory 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.

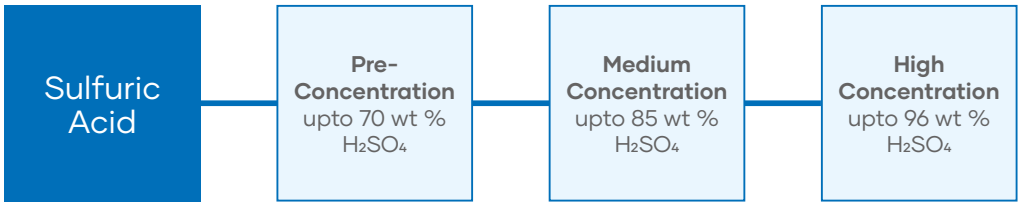
Utility systems designed and provided for plants were existing utilities are insufficient to service the Acid Concentration System Control systems are included to provide for safe, reliable operation.

Single-source responsibility:

- process design
- engineering design
- construction
- performance guarantee
- installation supervision
- maintenance services
- spare/replacement parts

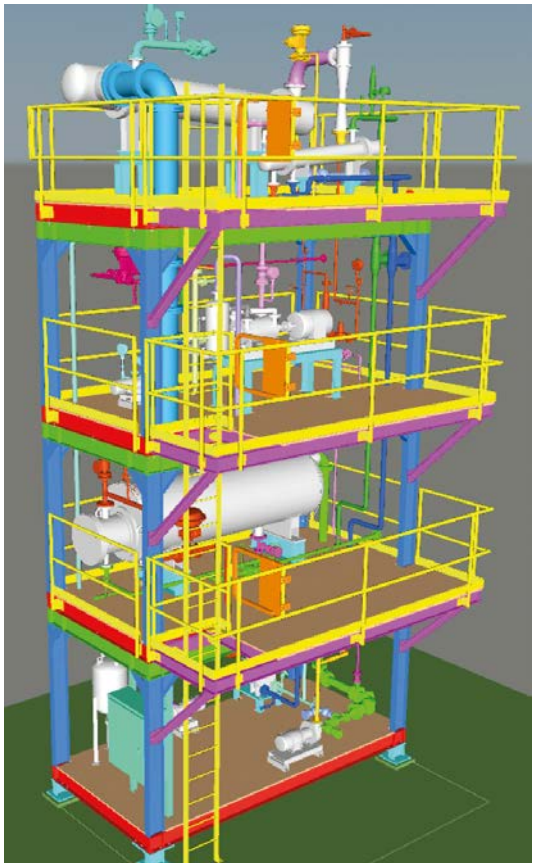
Our Processes in Acid Recovery

Sulfuric Acid Recovery



Concentration of Sulfuric Acid can be divided into 3 different fields of process technology. The differences are the potential operating conditions, the necessity of a water vapor purification and the applicable materials of construction (MoC).

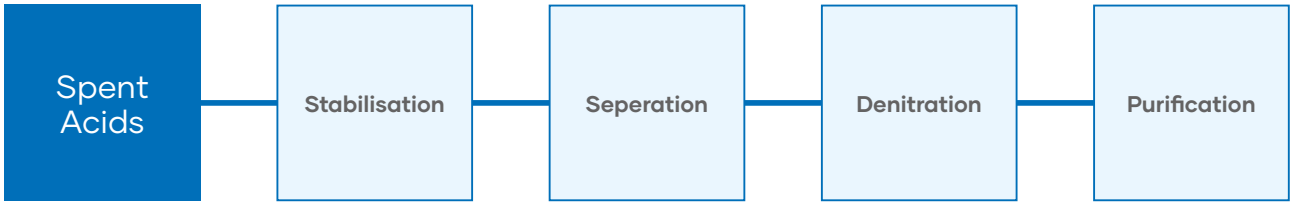
Sulfuric Acid Pre-Concentration up to 70 wt% H2SO4 – PoSA (Pre-Concentration of Sulfuric Acid)
The PoSA process can be operated under vacuum or atmospheric conditions. Even at atmosphere the boiling temperature of Sulfuric Acid of 70 wt% H2SO4 is about 166°C. This allows the use of "normal" steam for evaporation. Also heaters, evaporators and piping can be made out of high-alloys or lined FRP. Due to the vapor pressure of H2SO4 an additonal vapor treatment is normally not necessary.



Sulfuric Acid Medium Concentration up to 85 wt% H2SO4 – MoSA (Medium-Concentration of Sulfuric Acid)
The concentration of Sulfuric Acid up to 85 wt% can be operated under vacuum or atmospheric conditions, depending on available heating media and necessary treatment steps. No additional water vapour might be needed, as the vapour pressure of H2SO4 is in the range of 1 wt%.
Due to the strong corrosive behaviour of Sulfuric Acid at the elevated temperature and concentration level, corrosion resistant materials like glass, glass-lined steel and Tantalum have to be used. The final selection of process conditions is made in accordance with the client's site conditions and requirements for product quality and effluents.

Sulfuric Acid High Concentration up to 96 wt% H2SO4 – HoSA® (High-Concentration of Sulfuric Acid)
For concentrating Sulfuric Acid up to 96 wt% either high temperature or high vacuum condition is required.
High vacuum process allows the use of high-pressure steam and a Tantalum heater, however, a vacuum of about 10 to 20 mbar has to be maintained and the use of chilled water is mandatory for reaching a final concentration above 93 wt% H2SO4. Also the lifetime of the materials is limited at these concentrations and operating conditions. The high-temperature process based on the Pfaudler HTX (High Temperature Heat-Exchanger) allows the use of a moderate vacuum of about 80 to 100 mbar, most often the same vacuum if the overall process consists of several concentration steps. This allows the use of standard cooling water but makes Thermal oil as heating media necessary. In combination with an oxidative agent, very pure product qualities can be achieved.
Pfaudler can offer the most suitable process, depending on the available utilities or the requested purity of the end product.

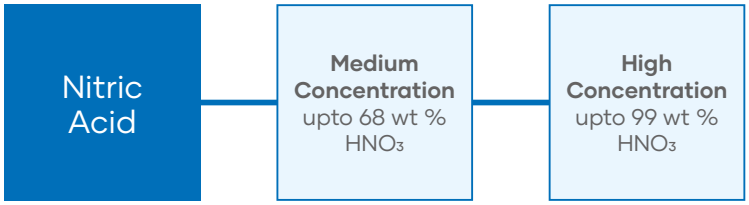
Spent Acids Recovery



Spent Acid, which is normally a mixture of Sulfuric Acid, Nitric Acid, water and the related organic compound is generated mainly by nitration processes.
This Spent Acid, depending on the production process needs several treatment steps:

- Stabilisation, to secure safe storage and destroy unstable organic components.
- Separation of Nitric Acid and Sulfuric Acid.
- Denitration of the Sulfuric Acid.
- Purification, which is a thermo-chemical pre-treatment under atmospheric conditions.

Nitric Acid High Concentration - HoN



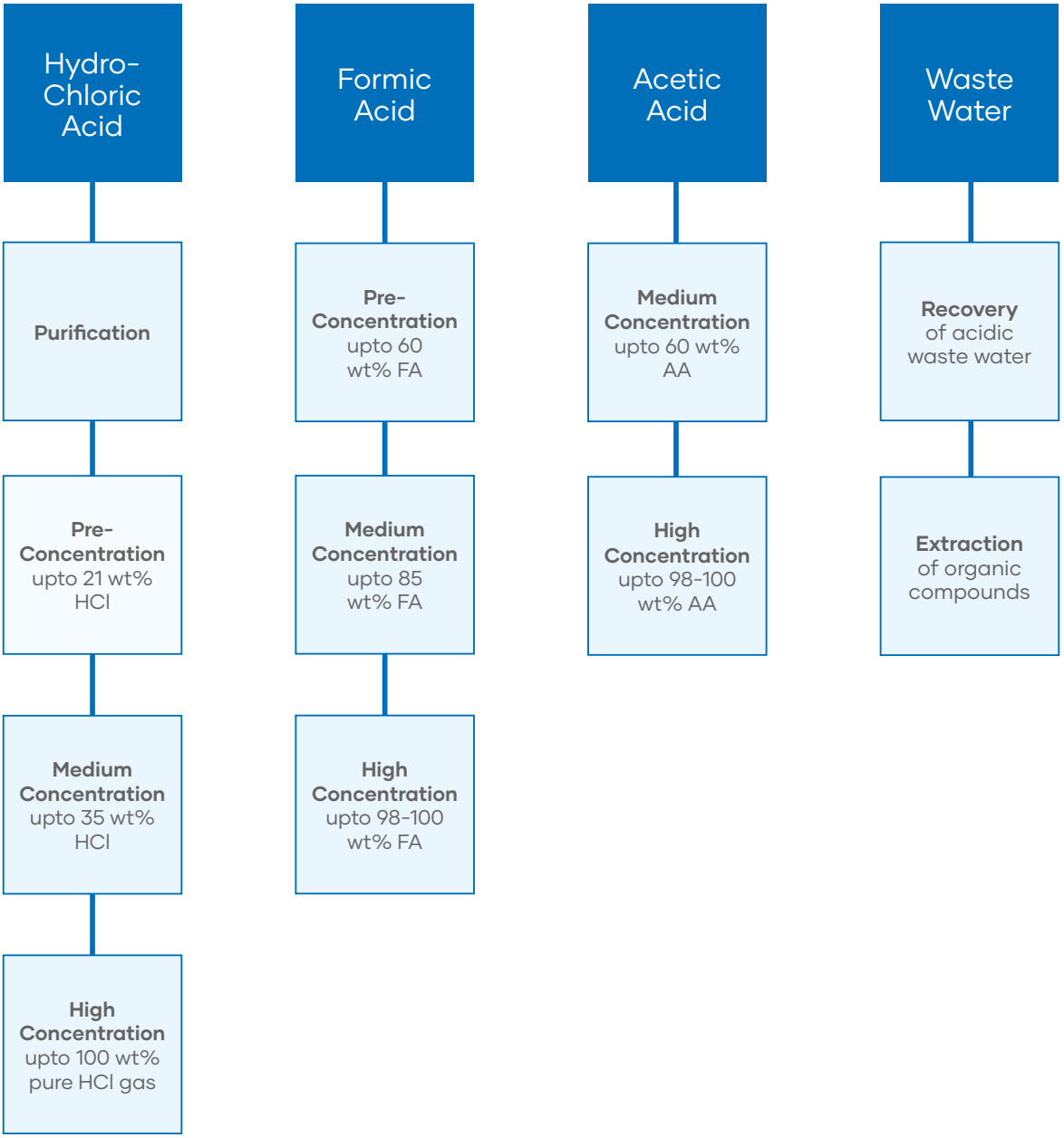
To break the azeotropic point for achieving concentrations up to 99 wt% Nitric Acid (HNO3), an extractive rectification is necessary.
Pfaudler offers two different processes for carrying out the rectification.

- Sulfuric Acid (H2SO4) route. (HoN-SA® – process).
- Magnesium Nitrate (Mg(NO3)2) route. (HoN-MA® – process).

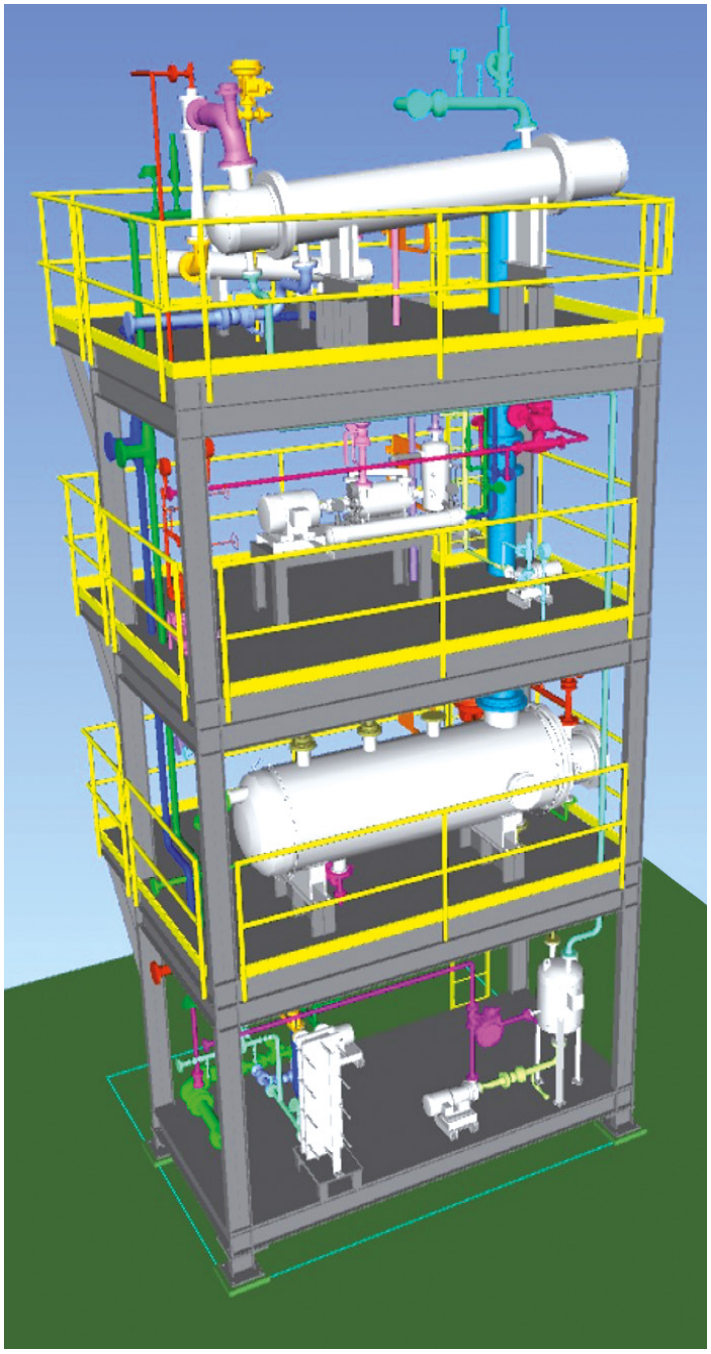
Within both the processes, the extractive agent is re-concentrated and fed back to the HNO3 concentration column. This allows a closed loop without consumption of the agent.
In both process technologies, an additional off-gas treatment is a part of the overall process design which helps in achieving a yield of more than 99.5% Nitric Acid.

Acid Recovery and Concentration for other Acids

Pfaudler also offers acid recovery and concentration plants for the following acids:



Complete Process System Design



- Design Basis
- Process IP
- P&IDs / PFDs
- Equipment Specifications/Design
- Equipment Fabrication
- Instrument Specifications/Design
- PLC or DCS Systems
- 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

PROJECT
MANAGEMENT

SINGLE SOURCE
RESPONSABILITY

FAST TRACK
SCHEDULE

Complete Process System Design

Pfaudler's Engineered Systems Group designs, fabricates and commissions complete process systems with Pfaudler's Acid Concentration 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

PLC
CONTROLS

MODULAR
CONSTRUCTION

FOOTPRINT

Pilot Testing

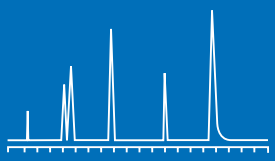
Before chemical production begins, or construction starts, and before engineers design the facility, an optimal chemical process must be developed, and proven. At Pfaudler's world-class Process Test Facility, our experienced chemical process engineers develop & optimize your process, and collect the 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 IBC(Intermediate Bulk Containers) tank quantities.

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



ANALYTICAL
DATA

HIGH QUALITY
COMPONENTS

Worldwide Presence

GMM Pfaudler

GMM Pfaudler is a global leader in corrosion-resistant technologies, systems, and services for the chemical, pharmaceutical, food and energy industry.

Our Branded Product Lines that include PFAUDLER, NORMAG, MAVAG, MIXION, INTERSEAL, EQUILLOY, EDLON and HYDROAIR showcase our strength as a group, our capabilities, and our pursuit for constant innovation. With an end-to-end solutions-oriented approach, a global footprint, and a perfectly integrated offering system we are able to meet complex industry demands worldwide.

GMM Pfaudler is driven by 1800+ individuals across 4 continents and 15 global manufacturing facilities around the world. The Group's targeted investments in strategic markets, innovation and competitiveness paves the way forward for GMM Pfaudler's continued legacy.

80+
Countries

1800+
Employees

04
Continents

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Manufacturing Facilities Sales & Services Organization

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