Sulphuric Acid Manufacturing

Plate heat exchanger application

Sulphuric acid is one of the most reactive acid as a chemical compound, yet a little bit tricky to recycle the waste heat due to few anti-corrosion materials could be found or too costly. Hofmann has been committed to studying varies materials on plate heat exchangers to adapt different manufacturing processes in a range of industries, which could be of contributing on energy efficiency.

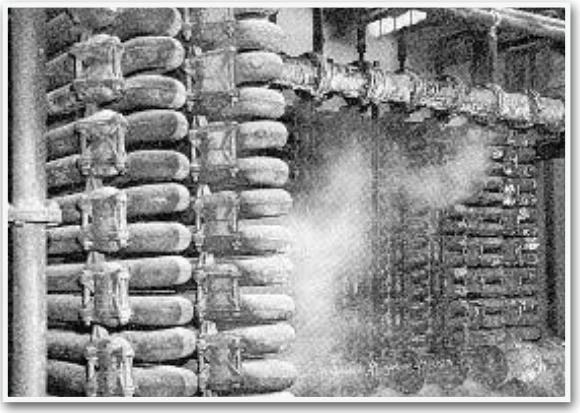
HFM Industry

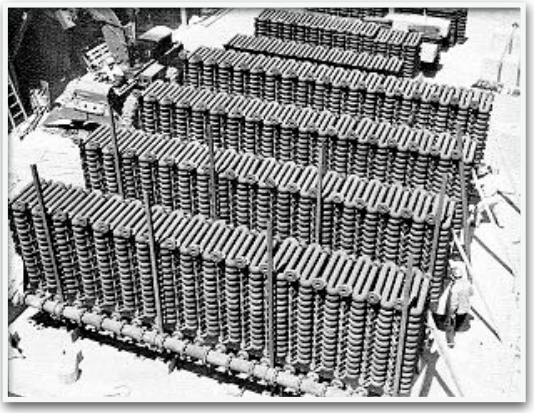


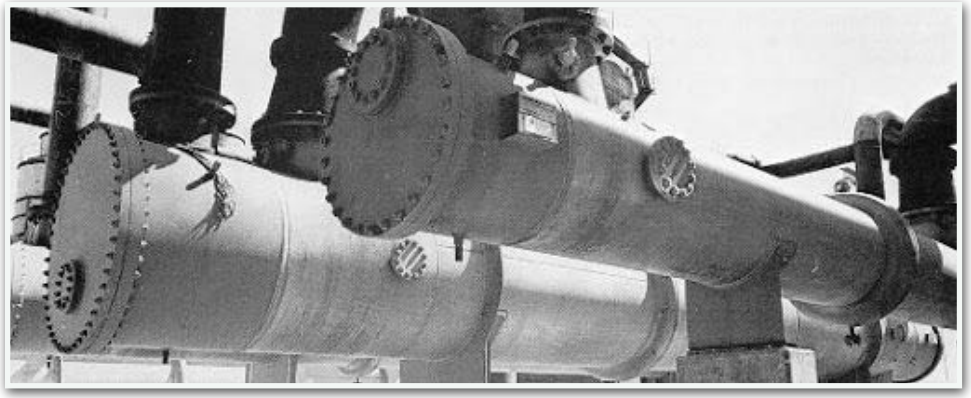


Sulphuric acid is widely use in fertilizer, water treatment, metallurgical, petrochemical, chemical, pulp-paper industries etc.
The modern common source for producing sulfuric acid are pyrite, sulfur, smelting flue gas. At present, most of the sulfuric acid is produced by the contact process.

The main process flow of preparing sulfuric acid from pyrite includes roasting of pyrite, purification of furnace gas, drying of gas, conversion of sulfur dioxide and absorption of sulfur trioxide.







The last generation sulphuric acid chillers like cast iron “serpentine” coolers and anodically protected shell and tube stainless steel acid cooler were the most commonly used sulphuric acid coolers globally, whereas the former demanded too much land and is lag in technology.

The latter is comparably more compact, its all-welded structure ensures no leakage, and the most pioneering improvement is it allows higher operation temperature, which contributes in smaller surface areas, reduction in the number of fans, lower operating horsepower and higher operating efficiencies.

Main sulphuric acid formula in manufacturing

Roasting: $S + O_2 \rightarrow SO_2$

Conversion: $2\ SO_2 + O_2 \rightleftharpoons 2\ SO_3$ (vanadium oxide catalyst)

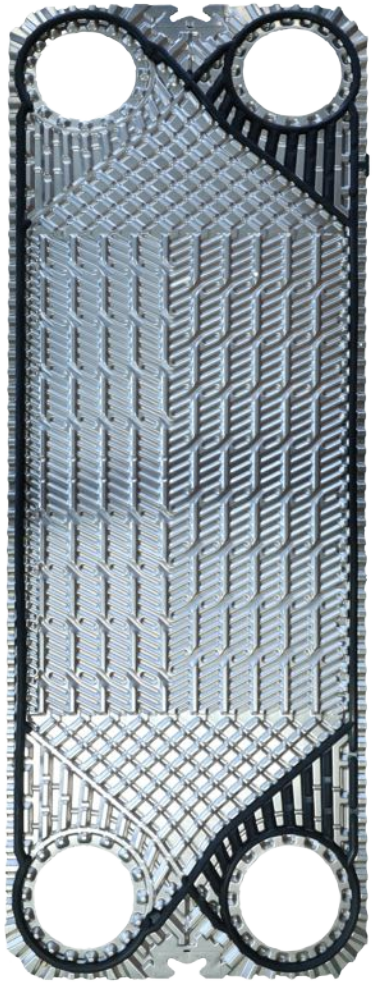
Absorption: $H_2SO_4 + SO_3 \rightarrow H_2S_2O_7$

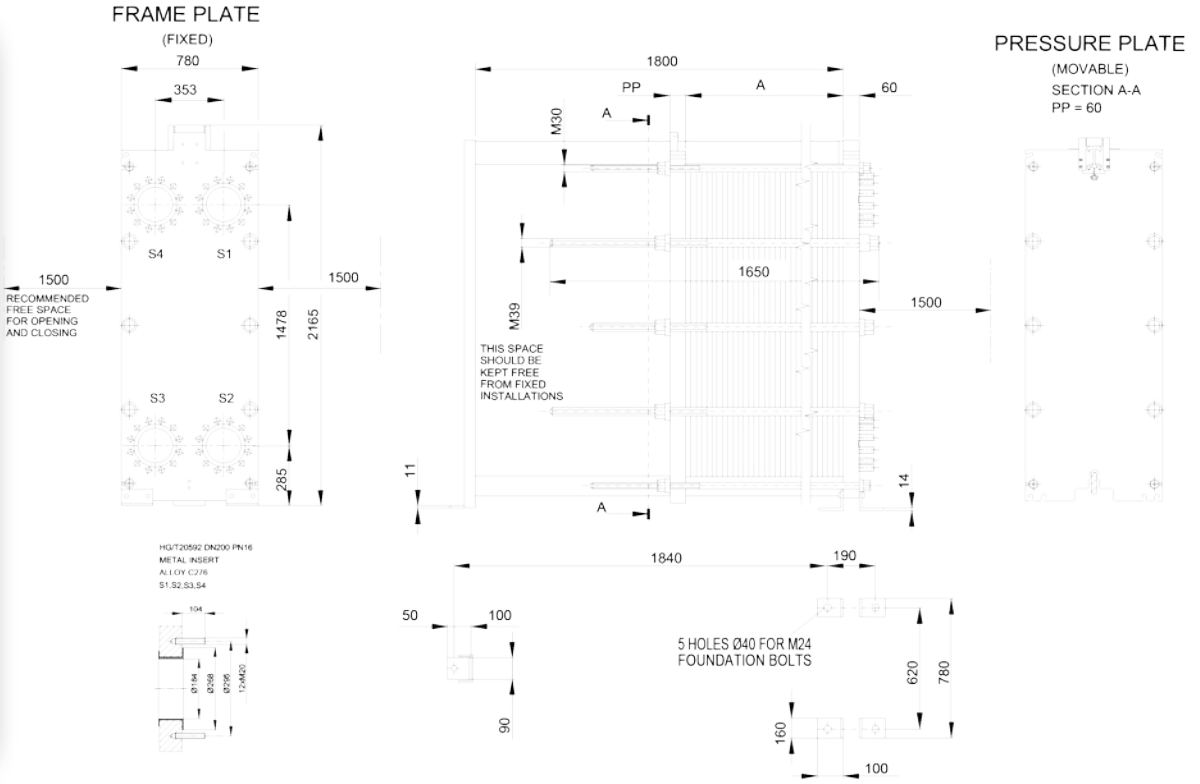
$H_2S_2O_7 + H_2O \rightarrow 2\ H_2SO_4$


Vanadium oxide catalyst

However, the problem with the design is the difficulty in anodically protecting the tube side of a heat exchanger. For the system to protect the material the current must be able to reach down the entire length of the tubes and this is very difficult to achieve on the tube side of an exchanger.

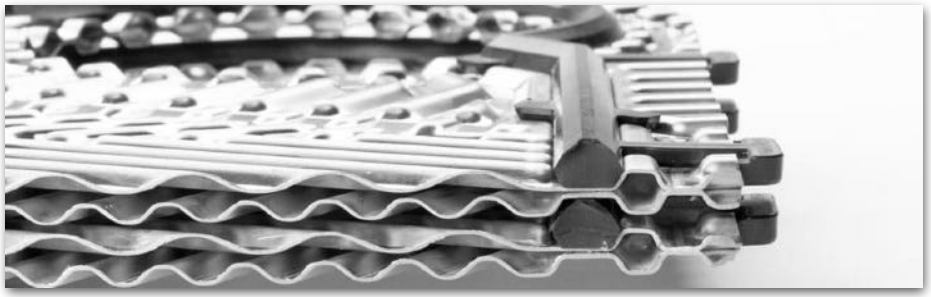
Plate heat exchanger demands even smaller plot areas compare to those two above under the same heat transfer area, plates' distribution area force fluid spread all over the corrugated surface where turbulence is more likely to occur, thus, heat transfer coefficient is much more higher. Aside from the frames, bolts, guiding bars and all the other small pieces, plates and sealing gasket are the only components contact with the sulphuric acid directly, which means there is no need to consider acid resistance upon most of the parts. And thanks to its compact size and optimized thin plate design, the consumption of corrosion resistance material is minimal.





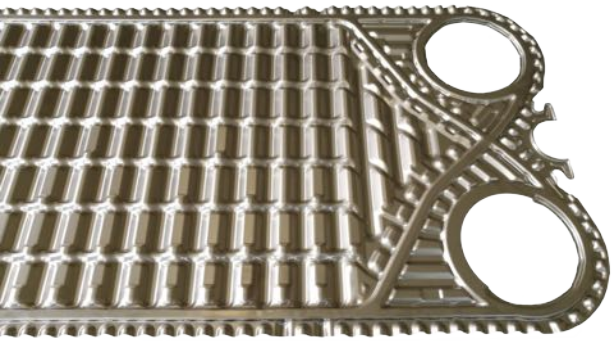
	92.5% Sulphuric acid / Hot	Water/ Cold
Actual volume flow m³/h	250	250
Design pressure MPa	1.0	1.0
Temperature inlet/ outlet °C	90/ 45	28/ 60
Pipe diameter DN	200	
Heat transfer area	151	

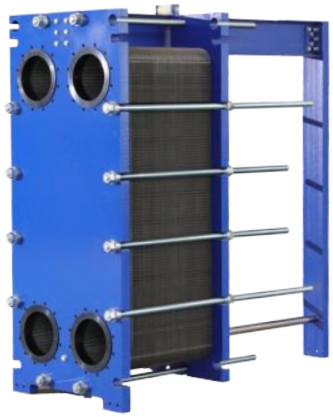
This is a sulphuric acid semi-welded PHE chiller for the first absorber tower, the sulphur trioxide is absorbed by sulfuric acid to concentrated to 92.5% in absorber tower, then, the 90 degrees H_2SO_4 goes through 180 pieces heat transfer plates and cooled down to 45 degrees.
During the sulphuric acid thermal transferring, there is no contact with any gasket, cause it only runs across the welded path. On the other cooling water side, there is no need to use welding, just EPDM gasket.



Our products for sulphuric acid manufacturing

We know better on thermal transfer solution





The Gasket plate heat exchanger is expandable and easy servicing. However, in terms of high concentrated sulphuric acid, gasket we only recommend Viton-G, and as show on the left, the sulphuric acid has to below 100 degrees celsius.
Whereas, it is still recommended due to its flexibility and low maintenance cost.

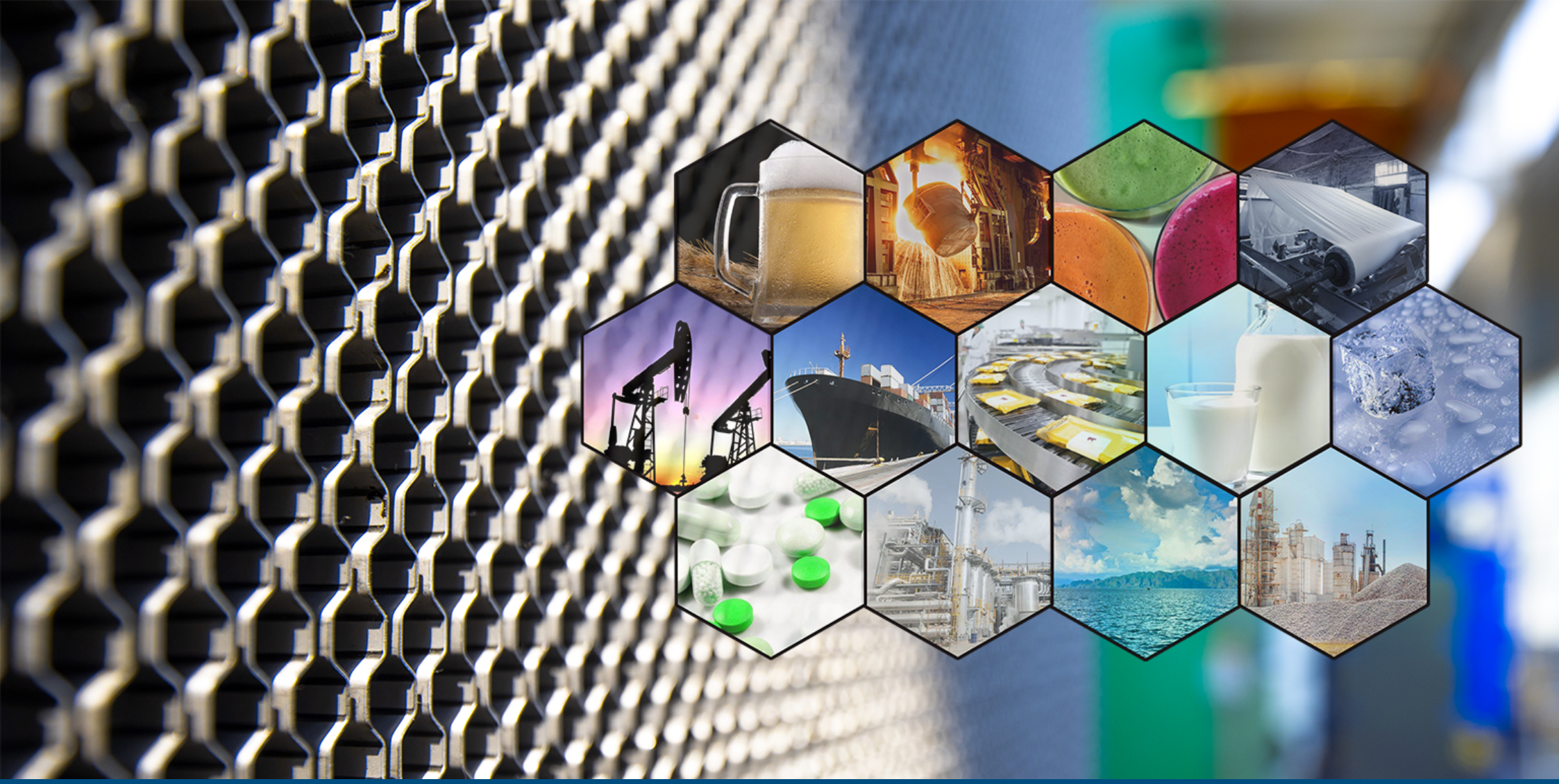
	Gasket plate heat exchanger	semi-welded plate heat exchangers
Max connection diameter/DN	500	200
Max. volume flow m³/h	4000	650
Max. Heat transfer surface/m²	1520	320
Designed Pressure rate MPa	2.5	2.5
Temperature °C (for high concentrated sulphuric acid)	-40-100	-40～180
Plate material	SS 316, Avesta 254 SMO, Hastelloy C276,	
Frame material	Carbon Steel, 304 SS, 316 SS	Carbon Steel

The Semi-Welded Plate Heat Exchanger, one side is sealed by laser welding, and the other side is sealed by gaskets. This increases maintainability, but allows the use of aggressive medium and higher pressure than the completely inflated model.

Our service is better than you expected

HFM offers rich experience in Sulphuric Acid manufacturing. We have multiple global warehouses and service teams around the world, the delivery time and freight are reduced to the largest extent, and spare parts can be delivered at the fastest speed. Manufacturing is merely one part of our business, knowing our customers requirements and acknowledge various kinds of working conditions is our daily life.

1, Inventory management
In order to ensuring delivery effectiveness, based on the acknowledge of PHE market and supply chain management, HFM has distributed the warehouses around the world.
2, Spares replacement
HFM has the full range of plate heat exchanger spares, our service engineers could either travel to the scene or remote guid your team to replace.
3, Cleaning service
HFM can provide both CIP(cleaning in place) and disassembling cleaning services depending on your circumstances.



Professional design solution:

Our technical department dealt with various application year after year, the accumulative experience forged a special team with exploring spirit and critical spirit. The gasket plate heat exchanger is our core business, thousands of units have been in services for many years in different fields.

Service is our cornerstone：

We consider customer as our priority, understanding customers' real needs and rapid feedback are the basics.
We and customers are bound to each other for learning and developing, sharing knowledge keeps us growing, which makes accomplishing projects easier and faster.

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