HUGO PETERSEN
Verfahrenstechnischer Anlagenbau

PETERSEN-IRRIGATION-SYSTEMS
When Gas meets Acid

www.hugo-petersen.de

The company

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

Initially, using the expertise gained in the classical production of sulphuric acid, from off-gases generated in the refining of metallurgical ores, the company HUGO PETERSEN specialized in the field of manufacture of sulphuric acid, hydrochloric acid and gas cleaning.

Figure 1:
Hugo Petersen 1906

HUGO PETERSEN has more than 110 years of experience in the design and operation of sulphuric acid plants and their equipment. Today, HUGO PETERSEN offers a vast range of technology to this 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. This, together with its 50 years know-how in the design and operation of gas cleaning equipment and plants processes, offers further advantages through the experience from both worlds.

The initial sulphuric acid tower technology invented by Mr. Hugo Petersen required since these days systems for irrigation of acids in the towers. Thus, from the very beginning the company was designing its own irrigation distributors.

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.

Accurate Planning - the basis for our work

The scope of the tender, for a custom designed plant, is solely defined by the task, operating requirements and the requirements of our customer.

The thorough evaluation of the ecological and economic factors ensures the best plant specific solution. Proven technology, combined with HUGO PETERSEN´s site specific developments, leads to the construction of a plant suitable for the respective application.

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

Every plant is unique and all plant components have to be finely adjusted. Hence, it is of great advantage when a single company designs all components.

Irrigation Distributors by HUGO PETERSEN

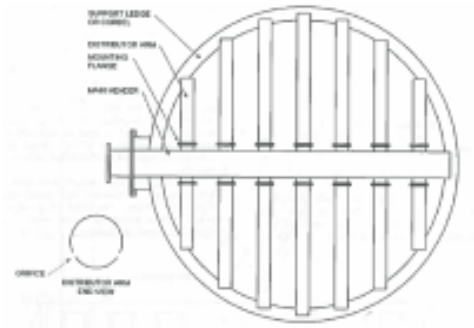
Trouble free operation guaranteed

In the beginning the irrigation systems were very simple made cast-iron distributors. The cast iron as material remained up to the 1980s. At that time the first high corrosion resistant austenitic steels appeared and the possibilities of the distributors were influenced significantly. The trough-design (Open channels were still possible in cast iron. Pipe distributors achieving a high precision of distribution occurring. The HP-Design was widely used and in several demands it showed it perfect performance.

Some disadvantages of the pipe distributors and some other distributors in the market showed some significant negative issues. This was the initial start to develop a system that take a superior place in the system the HP-FaFi-System.

To understand the difference between the distribution systems a comparison of some well-known distributors should be allowed.

Pipe-Distributor

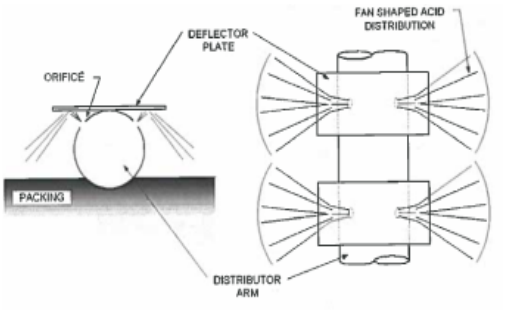


Let's start with the already discussed HP-pipe distribution system.

Acid is feed by a header and the acid flows out under pressure. The system can be designed in a flat design saving some tower height, but that is mostly not achievable as the height between packing and mist elimination is defined by human accessibility.

Figure 2: HP-Pipe-Distributor

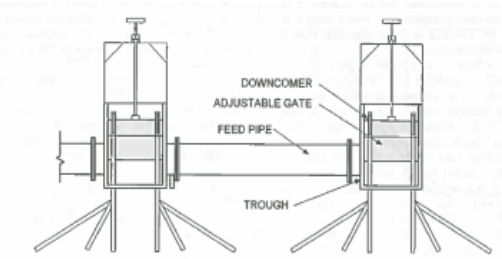
An advantage the distributor can be covered with additional packing to reduce spillage.



Deflection-Plate Distributor

A modification of the pipe distributor is the deflection plate distributor, where the acid is leaving at the upper part of the tubes and sprays against a deflector plates. Obviously that creates a lot of spills as the distributor has to be installed above the packing.

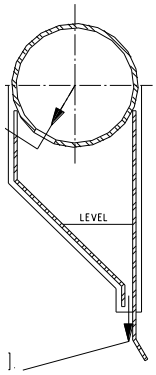
Trough-Distributor



A well-known design is the trough-design that was reminiscence from the cast-iron age. With the new stainless steel materials like SX, or other silicon-containing-austenites, the design could be made in a precision that allowed a very homogeneous distribution. The principle is that the acid is free-flowing in channels and flowing out by down–comers into the packing. The design finished in an over design of up to more than 40 down-comers per square meter. They are expensive and high maintenance requesting.

A design, which is not required for best absorption acid towers, as acid irrigation is mostly not the key!

Film-Distributor

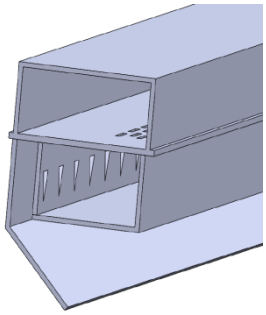


An up-to-date design is the film distributor, as it is adapted to high-gas-velocity –towers. The acid is homogeneously distributed inside the distributor over a slotted tube and out-flowing acid flows along a guiding plate into the packing.

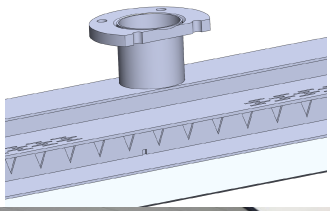
The system needs a relatively low pressure-drop to achieve a good distribution, no spillages and a homogeneous distribution along the irrigation channels. The narrow opening of the here presented distributor will create some problems due to blockages of the slots at the out-flow in the packing

The discussion of the above mentioned distributors concludes some possibility for improvement.

The result is the **HUGO PETERSEN Fall-Film-Distributor**!



The basis is a film-distributor with internal distribution of acid in a channel via slotted plates into a lower channel with triangular outlets, where the acid flows towards a guiding plate forcing the acid to flow along the said one into the packing.



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The spillage-free / blockage-free design in combination with a homogeneous distribution is the innovation in liquid distribution.

The distributor specially made for today's generation of drying- and absorption towers.

Figure 3: HP-FaFi-Distributor

The following table will demonstrate the achievements reached with the new design.

Features	Remarks	Results
Distribution	equal irrigation along irrigation arm by liquid chamber – transverse distribution ~ 300 to 500 mm	✓
Acid Inlet Velocity	lowest velocity of all known systems due to force by gravity	✓
Creation of Droplets	also small droplets are avoided	✓
Free Gas Flow Area	65 – 80 % → depending on irrigation rate	✓
Risk of Blockages	no risk because smallest gap is: more than 50 % larger than open screen size and max 50% of width of outlet-triangle and splash out of larger particles	✓

Table 1: Advantages of HP-FaFi-Distributor

Finally the FaFi-Distributor combines the advantages of film distributor by avoiding the blockages by particles.

A comparison of the before mentioned systems are shown in the following table:

Type of System	Distribution	Acid Inlet Velocity	Creation of Droplets	Risk of Blockages	Free Gas Flow Area	Ranking
HP Fall Film Distributor	+ +	+ +	+ +	+ +	+ +	1
Film Distributor	+ +	+ +	+ +	-	+ +	2
Trough System	+ +	+ +	+ +	-	-	3
Pipe Distributor	+	o	o	-	+ +	4
Deflection Plate System	+ +	o	- -	-	- -	5

Table 2: Comparison of Distributors

The before mentioned facts demonstrate again the first class design of HUGO PETERSEN's Technology.

The Detail makes the Difference!

Selected References:

Figure 4: 200 tpd Mh Sulphur Burning Plant

Figure 5: 200 tpd Mh $FeSO_4$-Roasting

Figure 6: 1,500 tpd Mh Sulphur Burning Plant

Figure 7: 2,200 tpd Mh Sulphur-Burning Plant

Figure 8: 600 tpd Mh Sulphur-Burning Plant

Figure 9: 400 tpd Mh Roasting Plant

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