SIGMA PLATE HEAT EXCHANGERS

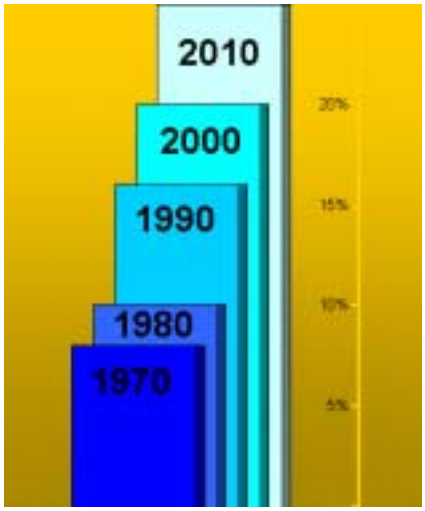
API Schmidt-Bretten

Market Development

A Growth Market for Plate Heat Exchangers

Until the invention of a practical plate heat exchanger tubular heat exchangers (double tube or bundle type) were the only machines for many applications. Originally plate heat exchangers were used mainly in the beverage industries. The low liquid hold-up and high energy recovery capability, made possible by the plate type construction, are still of crucial importance, especially in the pasteurisation process.

The chemical industry, in contrast, requires higher working pressures and long life in corrosive environments. The availability of a large selection of plate and gasket materials has led to steadily increasing success in this sector. Where exotic materials are required plate heat exchangers show distinct advantages over other heat exchangers, especially with regard to cost.



Market segments of plate heat exchangers in important markets of western industrial fields

Plate heat exchangers are also preferred by the shipbuilding and "Offshore" industries where the compact construction coupled with titanium plates is essential.

In heating, ventilating and refrigeration applications the requirements for compact, high efficiency and economical heat exchangers have been met by the plate heat exchanger; a gasketfree version for smaller duties being especially successful.

Whilst remaining dominant in the beverage industry the plate heat exchanger has increased its overall market share, in other industries, to about 15 %.

The overall market share of the plate heat exchanger is showing a disproportionate increase in many industrial sectors as they are increasingly used to replace more and more tubular exchangers.

A precondition is the availability of a large selection of plates of various sizes and characteristics. This flexibility will ensure increasing importance in many thermal processes.

Growth areas of especial importance are the food and environmental industries as well as many industries where energy recovery is important.

SIGMASTAR® evaporator and SIGMA plate heat exchanger

Know - How

Engineering Excellence since 1879

More than a century of production involving over 80,000 heat exchangers for all industries has given SCHMIDT an unparalleled depth of experience.

As early as 1879 the German Patent Office granted Wilhelm Schmidt, the company's founder, Patent No. 7153 for a new highly efficient counter flow surface cooler. Following a brisk demand for the new surface cooler by the brewing and dairy industries both at home and abroad a large number of these units, were manufactured.

Practical experience gained in manufacturing "open" surface coolers for different industrial applications had, by the beginning of 1932, led to design and development of the first "closed" plate type heat exchanger "STANDARD".

This unit was constructed of brass plates milled with spiral channels and chrome plated. Later models utilised stainless steel plates pressed to form corrugated flow channels.

1879

Counter flow external surface cooler

1932

Spiral plate unit

The spiral heat exchanger "STANDARD" provided the first opportunity for separate sections for pasteurisation and heat recovery within a single unit.

1938 saw the development of the "REKORD" horizontal crossflow plate heat exchanger. This unit was available in two sizes. In 1948 the first design of the new generation, the SIGMA series, of plate heat exchangers was completed. The latest development of this type is the X series of high-performance plates with maximised heat transfer coefficients.

2000

SIGMA series 149 plate heat exchanger

Through continuing and systematic development coupled with scientific research SCHMIDT-Bretten has become leader in the field of heat transfer.

A large selection of designs of SIGMA plate heat exchanger plates are available with different surface areas, corrugations, plate materials, plate thicknesses and gasket materials for all applications.

With a qualified staff involved in the design, application and manufacture of SIGMA plate heat exchangers, SIGMASTAR® evaporators and SCHMIDT thermal systems, SCHMIDT-Bretten solves many thermal problems for a wide range of industrial applications. Modern manufacturing techniques utilising the best of modern production and automation engineering form the basis of SCHMIDT's production facility.

SCHMIDT sales activities, supported by domestic sales offices located throughout Germany and internationally by several subsidiary companies, provide close customer support and aftersales service. SCHMIDT-Bretten is also represented in many countries in every continent to provide similar customer support and aftersales service to our overseas customers.

The Market

The food and beverage industries

SIGMA plate heat exchangers
SIGMATHERM plants
SIGMASTAR® evaporators
are available for

- cooling, heating, high temperature short-time heating and concentrating

of fruit and vegetable juices, soft drinks, beer, cider and wines; similar processing is available for milk, milk products, sugar solutions, ice cream, fruit and vegetable pulp, soup, baby foods and other liquid foodstuffs and beverages

Chemical and pharmaceutical industries

SIGMA plate heat exchangers and SIGMASTAR® evaporators provide

- heating, cooling and evaporation of water, acids, alkalies, emulsions, dispersions and other aqueous solutions requiring thermal processing

- cooling of exothermic reactions
- process heat recovery
- condensing of steam and solvent vapours
- environmental protection using closed circuit heating or cooling

Heating and refrigeration engineering

SIGMA plate heat exchangers
for

- distribution stations for industrial and private district heating schemes
- provision of warm water and heating of boilers

- recovery of heat from heat pump systems
- heat recovery from geothermal plants and spa water
- cooling of closed circuits in heat pump and air conditioning plants

Shipbuilding and steel mills

SIGMA plate heat exchangers
for

- shipboard central cooling systems for water and lubricating oil
- heat recovery for energy saving

- cooling of rolling oil emulsions, lubricating and hydraulic oils, process water, quench water or oil
- cooling of ammoniacal liquors and waste water from coking plants

Industrial installations and processing areas

SIGMA plate heat exchangers and SIGMASTAR® evaporators
for

- complete thermal processing plants or individual units for heating and heat recovery

- heating/cooling of lubrication and heat transfer liquids (oils and salt solutions as well as caustic solutions)
- heat recovery from paint systems or other industrial waste heats to reduce the energy consumption
- evaporation of waste water
- separation systems for toxic liquids for environmental protection

Manufacturing Programme

SCHMIDT heat exchanger plates

SIGMA heat exchanger plates are manufactured mainly from stainless steels. The SCHMIDT plate types are produced with a wide range of plate corrugation patterns and depths. These corrugations enhance the thermal performance by increasing the effective surface area and produce turbulence whilst offering low flow resistance.

The range of SIGMA plates enable simple solutions to individual problems even under harsh operating circumstances.

SIGMA X-series high performance plates

Suitable for clean, homogeneous, solidfree liquids; particularly suitable for heat recovery for capacities up to 170 cbm/h and high NTU values.

SIGMA 7 series plates

Suitable for all liquids, even those with fine suspended solids; for industrial and food applications up to a capacity of 2000 cbm/h.

SIGMA heat exchanger plates

SIGMA T series plates for viscous-flows

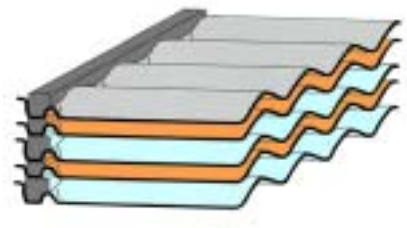
For all liquids, even those containing fibres and pulps, and for condensation of vapours; in all industrial fields and for shipbuilding, suitable for capacities up to 2200 cbm/h and medium NTU values.

SIGMA 2 series pasteurization plates

For all viscous, fibrous or pulpy liquids in the food and beverage industries, e.g for pasteurization of pumpable products with duties up to 250 cbm/h.

SIGMAGAP F series free-flow plates

Suitable for fibrous products with large plates for viscous-flows suspended solids; in all industrial fields, for capacities up to 150 cbm/h.



Sectional view of a F-series plate package

SIGMASTAR® V series evaporator plates

For evaporation, concentration, aroma recovery and condensation of all liquids containing small particles; for the food and beverage and other industries; suitable for flow capacities up to 40 cbm/h and evaporation rates up to 35 cbm/h.

SIGMAWIG welded plates, without gaskets

For clean, non-fouling, homogeneous liquids. Capacities up to 450 cbm/h.

Construction

Principles of Construction

The SIGMA plate heat exchanger, with its compact construction, high thermal performance coupled with low investment and operating costs, is the ideal machine for solving thermal problems in a wide range of applications.

The construction kit assembly principle of the SIGMA heat exchanger contains at its heart, the plate packet. The number of plates, their type and form are selected to suit the application. Each plate is fitted with a gasket to retain the process media within the plate pack whilst separating them from each other.

The plate pack is fitted into a frame and compressed to ensure adequate sealing. The frame consists of a fixed heat plate (1), a moveable cover (8), carrying bars (9 + 11) and a number of tightening bolts. The frame can be painted or clad in stainless steel as appropriate.

Ideally, all connections for the process fluids are situated on the fixed head plate, but connections can also be made to the moveable cover for multipass designs or to meet customer specifications.

Plate heat exchanger SIGMA 114

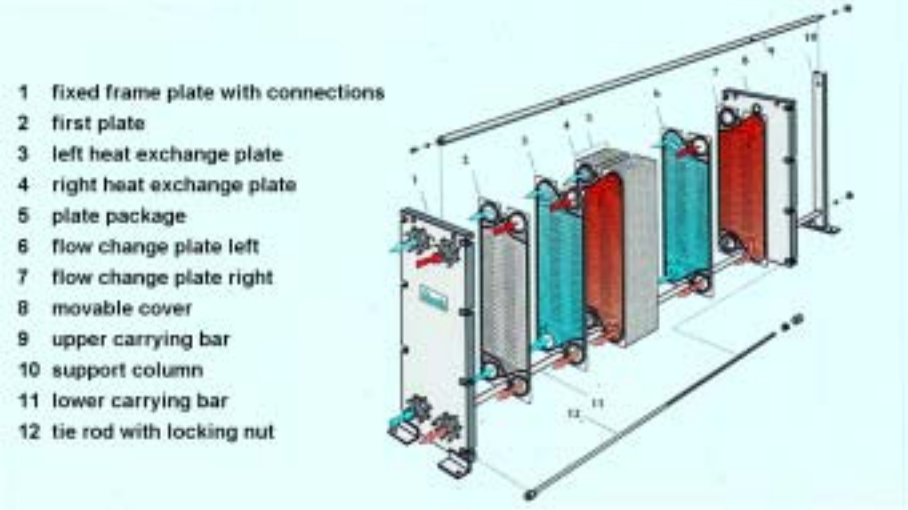
Function

Using the connections on the frame the hot and cold media are conducted into and out of the plate pack. Then fluids pass through the plate pack in the channels between the plates, in counter current or in special cases co-current flow. Heat is exchanged through the plates.

Materials

Stainless steels which are corrosion resistant, non toxic, durable, high strength, smooth and easily cleaned have proved the ideal material for making heat exchanger plates.

Standard materials for SIGMA plates include Stainless Steel 1.4301 (AISI 304), 1.4404 (AISI 316L), Titanium, Titanium-Palladium, Nickel, SMO, Tantalum, Hastelloy, Incolloy and others. The choice is made to match the duty.



Drawing with flow principle

Variable Flow-Gap

The thermal characteristics and pressure loss developed by a fluid flowing in the gap between two plates is determined by the pressed profile of the heat exchanger plates. The plates are, therefore, produced in a number of presspatterns.

It is possible to obtain an optimum match of heat transfer area and pressure drop to the specified duty by combining similar or different plate forms in mixed or block arrangements within the same plate pack.

For viscous fluids or those containing as solid particles wide gap SIGMA plates or "free flow" plates which have an unrestricted flow path, are available.

Gaskets

The gaskets can be fitted into the SIGMA heat exchanger plates either by using adhesives or, for some plates using the SIGMAFIX adhesive free system.

Gasket materials commonly used include nitrile rubber (NBR), ethylene-propylene rubber (EPDM), butyl rubber (IIR), silicon rubber, chloroprene rubber (CR, e.g Neoprene), fluoride rubber (FPM, eg. Viton), chlorosulphonylpolyethylene (CSM, e.g. Hypalon) as well as several hard, fibre based, asbestos free gaskets. Elastomeric gaskets can, depending on type, be used for process temperatures up to 170 °C with the hard gaskets being used up to 250 °C.

Special Features

High heat transfer coefficients

Because SCHMIDT plate heat exchangers develop extremely high heat transfer coefficients (up to 7000 W/m^{2}K) they require low surface areas and have low capital cost.

The continuous in-house development programme coupled to basic research work done in cooperation with universities was and is the basis of the optimised profiles of our SIGMA heat exchanger plates.

Optimised heat recovery

With high heat transfer coefficients and favourable flow characteristics SIGMA plate heat exchangers designed for counter current flow with product temperature differences of less than 1 °C make heat recovery in excess of 96% technically and economically viable.

Low liquids content

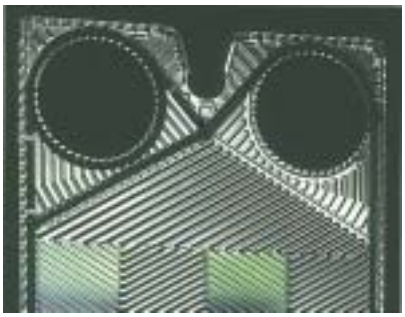
As the gap between two plates is small, a plate heat exchanger contains only low quantities of processed product in comparison to a tubular heat exchanger. The product remains in the plate heat exchanger only for a short time and the process can be easily stopped or the temperature can be changed quickly with minimum damage to the product. The weight of a plate heat exchanger is considerably less than that of a tubular heat exchanger for the same duties.

Compact construction

The concept of the plate heat exchanger and the special compact construction of SCHMIDT units allow the housing of large heat exchanging surface areas in a very compact, space-saving frame. In comparison with a tubular heat exchanger with the same performance considerably less space is required and no additional space is necessary for opening the plate heat exchanger.

No mixing of the product

The sealing system of the SIGMA heat exchanger plates is designed for double sealing of the flow channels. If there are any leakages at the gasket around the plate or the port areas, the leakage is to atmosphere and becomes detectable. This prevents the two process fluids from mixing.



SIGMA-sealing system

Reinforcements

Under the gasket groove the heat exchanger plates are reinforced on both sides. The profile on both sides grants an exact placement of the gaskets and a stability of the plate package, especially for large plate types.

Flexibility

With SCHMiDT plate heat exchangers changes to the processing conditions can be readily accommodated. For this purpose the plate arrangement can be changed, plates can be added or removed.

It is possible for the initial calculations of the unit to provide for future operating conditions. It is also possible to install several sections into one frame and permit flow continuity in processes involving several process steps (e.g pasteurisation). Different products can be processed in different sections within the same unit.

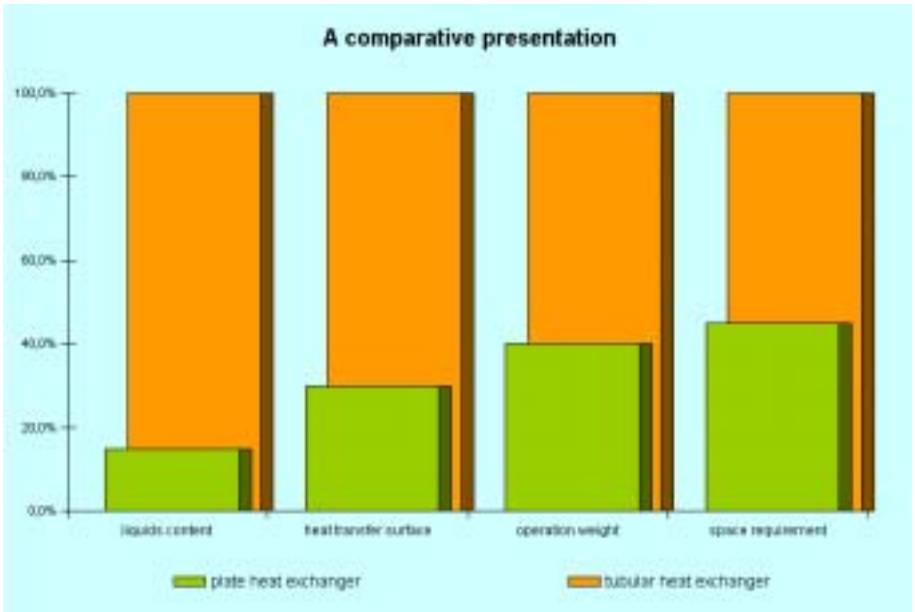
Low fouling

Fouling of the heat transfer surfaces of a SCHMIDT plate heat exchanger is extraordinarily low. This is a result of good product distribution, constant velocity profile and smooth plate surfaces. The high induced turbulence gives a selfcleaning effect which prevents fouling.

Easy maintenance

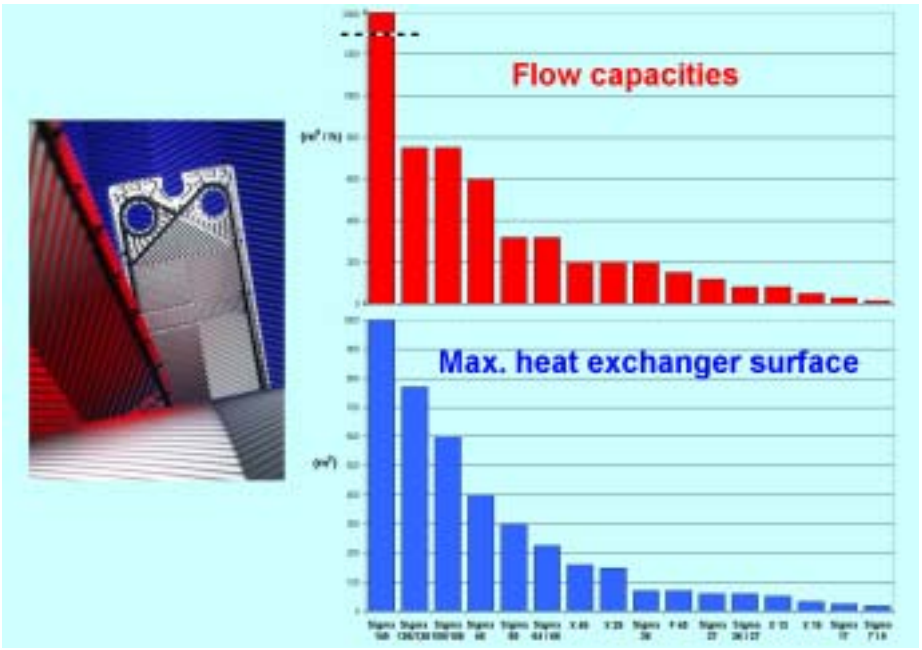
SCHMIDT plate heat exchangers can easily be maintained and cleaned. The unit can be cleaned without dismantling by cleaning-in-place (CIP) systems, by reverse flow cleaning or by addition of suitable cleaning solutions.

It is easy to inspect the plate surfaces, to regasket plates or to clean them mechanically. Removing the closing bolts makes the plate package easily accessible.



Selection Criteria

THE CONDITONS	PROCESS CRITERIA	THE SERIES						
		X	7	T	2	F	V	SW
heat transfer	cooling, heating, heat recovery	■	■	■	■	■	■	■
	pasteurization, sterilization		■	■	■	■		
	condensing		■	■			■	■
	evaporation		■	■			■	■
media physical data	water and water type media	■	■	■	■	■	■	■
	viscous, highly viscous, pasty products		■	■	■		■	
	fibrous and pulpy products		■	■	■	■	■	
	products with solids			■	■	■		
sealing	without gaskets							■
	soft gaskets, mechanically fixed	■	■			■		
	soft gaskets, glued in	■	■	■	■	■	■	
	hard gaskets (asbestos free)		■	■	■			
corrosion	stainless steels	■	■	■	■	■	■	■
	special materials		■	■				■
pressure resistance	up to 10 bars operating pressure	■	■	■	■	■	■	■
	up to 16 bars	■	■	■	■			■
	up to 25 bars	■	■					■
design of the units	standard frames, lacquered finish	■	■	■	■	■		
	special frames, lacquered finish		■		■		■	
	stanless steel clad frames	■	■	■	■	■		



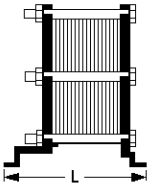
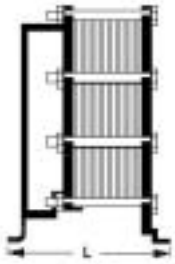
By considering the thermal and hydraulic requirements of a specific application, SCHMIDT, using computer aided design and optimising techniques, will select the optimum plate size and arrangement.

Heat transition coefficient k (water)

X and SW	up to 7.000 W/m^{2}K
7	up to 5.000 W/m^{2}K
2	up to 4.000 W/m^{2}K
F, T and V	special applications

Units Available

Extract of SCHMIDT frames and types

			 free standing frame with closure by means of screws	 frame with closure by means of screws with support
Types	**Standard nozzles DN**	**Distance between port holes A / C (mm)**	**Dimensions B / H (mm) L min / L max (mm)**	**Dimensions B / H (mm) L min / L max (mm)**
SIGMA 7	25 (32)	90 / 480	300 / 750 345 / 545	
SIGMA 17	40	110 / 868	290 / 1020 565/ 865	290 / 1200 780 / 1530
SIGMA X 19	50	165 / 750	365 / 1050 625 / 875	380 / 1150 625 / 1375
SIGMA 26 / 27	65	174 / 980	400 / 1260 635 / 885	400 / 1480 630 / 1630
SIGMA 32	80 (65)	230 / 1055		480 / 1590 735 / 3235
SIGMA 37	80	218 / 1076	460 / 1400 520 / 970	480 / 1590 735 / 3235
SIGMA 38	100	250 / 970		525 / 1440 745 / 2245
SIGMA X 49	100	272 / 945		525 / 1370 635 / 1635
SIGMA 48	200	340 / 1077		750 / 1700 755 / 3755
SIGMA 64 / 66	125 (100)	290 / 1471		850 / 2050 755 / 3505
SIGMA 85	125 (100)	290 / 1928		850 / 2500 1000 / 3750
SIGMASTAR®	40 - 400	755 / 1510		980 / 2700 870 / 2570
SIGMA 106/108/114	200	425 / 1625		1080 / 2400 950 / 3950
SIGMA 136 / 138	200	425 / 2081		1080 / 2750 936 / 2935
SIGMA 149	350	560 / 1835		1200 / 2600 900 / 5000

Specifications

SCHMIDT plate heat exchangers are tested and licenced by several testing authorities including German TÜV and other internationally recognized authorities.

The various SCHMIDT SIGMA series plate heat exchangers cover flow rates ranging between 1 m^3/h – 2000 m^3/h.

The plate capacities, in terms of surface area, cover operating conditions that can range between 0,05 m^2 and 1.100 m^2.

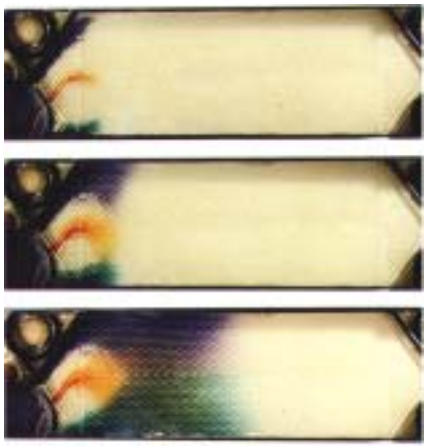
Certain types of SIGMA plate heat exchangers can be supplied for operating pressures up to 25 bar.

Elastomeric gaskets are available for operating temperatures up to 170 °C and hard gaskets up to 250 °C.

Technology

Continuous development of new technologies

SCHMIDT policy has always been the development of new heat exchangers in order to meet with the market requirements. Own product research and applications experience combined with research programmes at several universities and technical institutes enabled SCHMIDT to develop and launch several generations of plate heat exchangers.



Illustrating the mixing behaviour in the flow gap of the X series high performance plate

Modern methods

Modern computer-controlled data acquisition systems are used to record the extensive measurements SCHMIDT makes to assess the performance characteristics of their different heat exchangers. Fully automated equipment is used for durability tests. The items being tested are placed under stress to find the absolute limits of the equipment and its specific material qualities.

With these facilities SCHMIDT also undertakes product trials on material received from customers and provide fully documentated evaluation reports.

SCHMIDT Engineering

In order to optimize the technical and economic performance of SCHMIDT heat exchangers we have developed extensive and efficient computer software programmes that reflect SCHMIDT's extensive practical experience and capability. Aided by large data banks, SCHMIDT engineers can provide, quickly and efficiently, economic tailor-made solutions to our customers‘ problems.

CAD systems

SCHMIDT uses CAD systems extensively for the design of new plates and frames and processing of orders. Modern stock control systems permit relatively low numbers of standardised components to be assembled into a large number of machines for customer specific applications.

Working with CAD systems

Automated manufacturing programme

SCHMIDT has automated almost all production sequences SIGMA plates are produced on a fully automated processing line.

Fully automated plate processing line

High-performance gaskets for SIGMA heat exchanger plates are glued-in by a robot-controlled process which has a variable operational programme for different gasket materials.

Robot controlled gasket gluing assembly

Tool and die manufacture

SCHMIDT-Bretten has a very large investment in tools and dies used in the production of SIGMA heat exchanger plates. The tool and die maker's shop is fitted out with the most modern engineering equipment. This equipment allows great flexibility and speed in the development, design and supply of new plates.

Customer Services

Specific solutions to special problems

The multiplicity of SIGMA heat exchanger types offers the possibility of tailor-made solutions to a wide range of applications in all branches of industry. Decades of experience provide the basis for process oriented concepts and computer software to provide optimised designs. Our professional engineers are available to give advice and assistance during the planning and execution of a project.

Worldwide sales representation

To support the SCHMIDT policy and tradition of customer oriented service we maintain subsidiary companies in the USA, in the Netherlands, France, Spain, Romania and India as well as qualified representatives in many other countries. Being a part of US based API Heat Transfer Group we have access to their sales network as well as to their engineering capabilities.

Worldwide representation

High quality standard

Our strictly controlled quality assurance programme ensures the high standard of product quality and performance From the time of delivery of raw materials to despatch of finished products careful checks are made on quality, compliance with specifications and dimension tolerances. During manufacture the quality assurance process is continuous and systematic, with visual inspection, measurement tests and dye penetrant tests made on a regular basis to the heat exchanger plates. A range of factory tests are carried out on all finished goods for compliance with specifications, dimensions, finish, pressure and sealing. Our product quality control scheme fulfils the requirements of many testing authorities.

Aftersales service

SCHMIDT aftersales service is always available to meet all our customers' needs and requests to provide safe, efficient and economic operation of all SCHMIDT equipment. Specialized SCHMIDT equipment is also available to our customers to carry out their own "in house" maintenance. Qualified service engineers provide immediate on-site assistance.

Commissioning and installation engineers

SCHMIDT-Bretten has experienced commissioning and installation engineers available with specialized skills to take care of plant installation, plant start-up and acceptance tests. These engineers are also available for any aftersales service requirements.

Reliable spare parts service

Replacement gaskets for obsolete plate heat exchangers can still be obtained today.The extensive stocks maintained by SCHMIDT-Bretten ensure the availability of spare plates or new SIGMA heat exchanger plates.

Stock of SIGMA plates

Presentation of new SCHMIDT products

SCHMIDT-Bretten introduces and presents its latest developments, new equipment and processing technology at the most important trade and industry exhibitions in all market sectors. We attend the fairs abroad in association with our representatives and subsidiary companies. Special symposia are held to present the technical and commercial benefits of the new products and processes of our customers.

Booth on the „ACHEMA“ in Frankfurt

API Schmidt-Bretten GmbH & Co. KG

Pforzheimer Straße 46, 0-75015 Bretten, Tel. (0)7252/53-0, Fax (0)7252/53-200
http://www.APISchmidt-Bretten.de -E-Mail: info@apichmidt-bretten.de

The Netherlands: Schmidt-Bretten Ned. B.V., Apolloweg 7 D/E, NL-8938 AT Leeuwarden, Phone (31) 58 - 288 55 80, Fax (31) 58 - 288 50 05
France: S.A.R.L. Schmidt-Bretten France, Z.A.C. de la Croix Prunelle, F-27220 Saint-André-de-l'Eure, Phone (33) 232 - 60 26 80, Fax (33) 232 - 60 28 77
Spain: Schmidt-Bretten Espana S.L., c/ Sant Isidre, 22. Oficina 300, E-08940 Cornella de Llobregat (Barcelona), Phone (34) 93 - 377 84 17, Fax (34) 93 - 474 11 51
Romania: Schmidt-Bretten Romania SRL, Sos. Vergului, Nr. 59, Sect. 2, Bucuresti / Romania, Phone/Fax (40) 1 - 255 21 95, 1 - 255 33 36
India: Schmidt-Bretten (I) Pvt. Ltd., Filtron House, 6-Sitabag Colony, Singhagad Road, Pune-411 030 / India, Phone (91) 20 -433 8642, Fax (91) 20 - 433 7913
USA: API Schmidt-Bretten Inc., 2777 Walden Avenue, Buffalo, N.Y. 14225 / USA, Phone (1) 716684-6700, Fax (1) 716681-2129

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