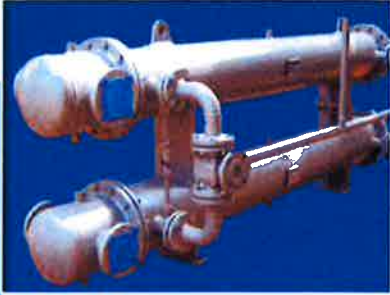
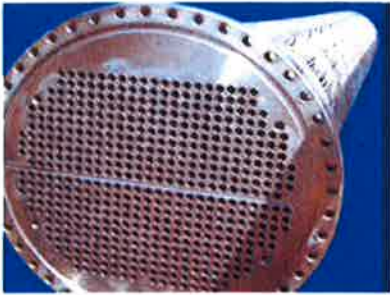


Shell & Tube Heat Exchangers



SONDEX



SONDEX A/S is specialized in development, production and marketing of Heat Exchangers for oil & gas, food and dairy, district cooling / heating, industrial and marine applications.

Since the very start in 1984, headquartered in Denmark, we have expanded our activities, which now include nearly all European countries, USA, Asia, Far East and Middle East, and today our market share of the total market for heat exchangers amounts to approximately 9-10%.

We are having our office and service centre in Dubai, U.A.E. and in Damman, Kingdom of Saudi Arabia to cater to the requirements of our customers from the Middle East. We also have a sufficient stock of spares available at our warehouse in Jebel Ali Free Zone to enable us to serve our customers better.

Besides our traditional Plate Heat exchanger with gaskets, we also have Brazed, Spiral, Semi Welded, All Welded, Shell & Tube, Shell & Plate, Free Flow to Double Walled heat exchangers, Wastewater and Submersible Pumps and freshwater generators.

We have a very wide range of plates for various applications. Apart from us providing solutions in the field of heat transfer technology, we also provide efficient and effective energy saving services.



**Shell &
SONDEX Tube Heat Exchangers**

**We are certified as per EN ISO 9001: 2008
and we are approved to Fabricate & certify units
as per ASME Section VIII Div. 1 ('U' Stamp)**

OUR CERTIFICATIONS:

EN ISO 9001-2008

EN ISO 14001-2004

BS OHSAS 18001-2007

ASME "U" stamp

AHRI Standards 400-2001

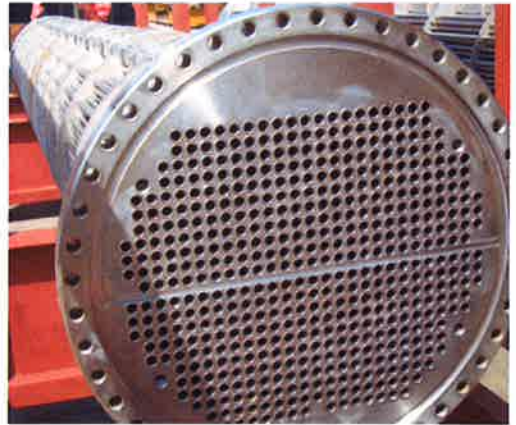
Pressure Equipment Directive
97/23/EC (PED)

EN 13445

Shell & Tube Heat Exchangers

Shell and tube heat exchangers are known as the workhorse of the chemical process industry and represent the most widely used vehicle for transfer of heat in industrial applications. In essence, a shell and tube exchanger is a pressure vessel with many tubes inside of it. One process fluid flows through the tubes of the exchanger while the other fluid flows outside of the tubes within the shell. The tube side and shell side fluids are separated by a tube sheet.

Shell and tube exchangers can be configured for liquid-liquid, gas-liquid, condensing, or vaporizing heat transfer. They have the ability to transfer large amounts of heat in relatively low cost, serviceable designs. They can provide large amounts of effective heat transfer surface while minimizing the requirements of floor space, liquid volume and weight. We offer a wide range of sizes and configurations.



SONDEX ADVANTAGES

- ▶ Designed as per TEMA class R, C, B
- ▶ Relatively inexpensive
- ▶ Easy to clean
- ▶ Available in many sizes
- ▶ Compact design
- ▶ Available in many different materials
- ▶ Can be designed for high pressures without excessive cost
- ▶ Design principles well known

TOP QUALITY WELDING, OUR TRADEMARK

Our main aim is to deliver top quality customised solutions, always complying with the PED 97/23 EC directive.

We use our own 3D software for the calculation and design of our systems, according to the requirements of several design codes, such as ASME "U" stamp, EN 13445. Subsequently, our qualified welders, with years of experience, assemble the shell & tube heat exchanger.

We look after each small detail and can guarantee for the highest quality welding connections. When designing, we always start from the specific needs of our client. We understand your requirements like application, processes, thermal exchange agents (steam, oil, water, solvents, etc.), material (stainless steel, steel, alloy, titanium, copper nickel, 90/10 or 70/30 CuNi, etc.), shell & tube requirement (straight type, U-tube type), etc.

Based on every customer's requirement, we can customize a 3D design with the aid of our in-house developed software. Our experienced welders and technicians ensure an expert assembly and installation compliant with the quality standards.



SONDEX

COMPONENTS OF SHELL & TUBE HEAT EXCHANGER

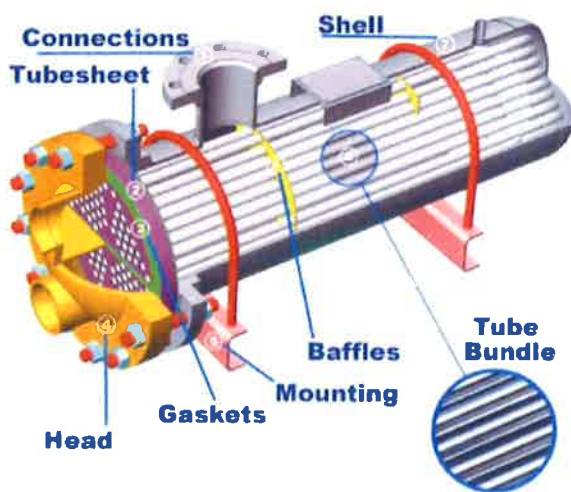
TUBES

The tubes are the basic component of a shell and tube heat exchanger, providing the heat transfer surface between the fluid flowing through the inside of the tubes and the other fluid flowing across the outside of the tubes. We offer tubes in a variety of diameters, wall thicknesses, lengths and materials of construction.

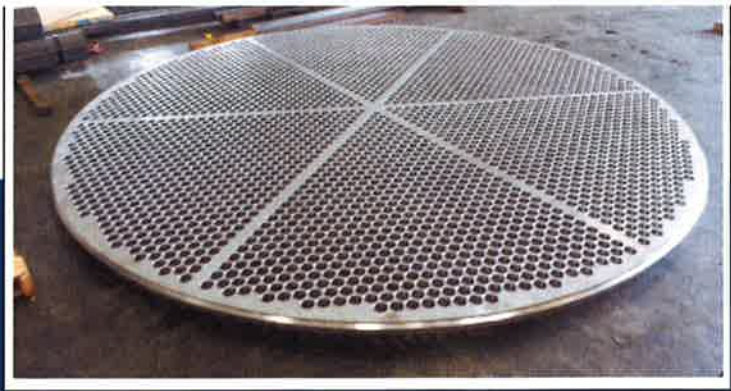
TUBESHEETS

Tubesheets are the plates that support the ends of the tubes. The tube to tubesheet joint must be mechanically strong enough to resist the forces that would tend to separate the tube from the tubesheet during operation and it must be leak tight. Typically tubes are “rolled” or mechanically expanded into grooves that have been cut inside the tube holes. Often, tubes are also “seal welded” at the face of the tubesheet to prevent leakage. Sometimes, a deeper penetration “strength weld” is specified to provide additional mechanical integrity.

The tubesheet is normally a single round plate drilled in the appropriate pattern to accept the tubes, tie-rods, spacers and gaskets. The tube sheet, in addition to its mechanical requirements must (like the tubes) be capable of withstanding corrosive attack by both fluids in the heat exchanger. Sometimes, to save costs, tube sheets are fabricated with carbon steel and then faced with a more expensive material.



Freshly Machined
Tubesheet



Tubesheet Face Showing
Grooved & Rolled Tubes



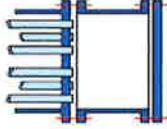


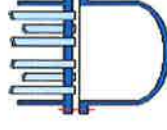
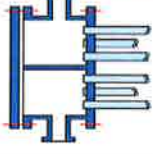

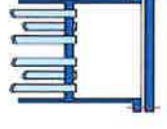
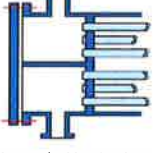
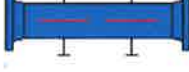
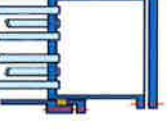
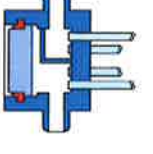

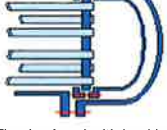

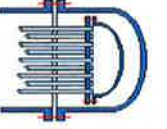





APPLICATIONS:

- ▶ OIL & GAS
- ▶ POWER GENERATION
- ▶ PETROCHEMICAL AND PHARMACEUTICAL
- ▶ HVAC
- ▶ STEAM CONDENSERS AND EVAPORATORS
- ▶ WATER PREHEATERS
- ▶ OIL PREHEATERS / SUCTION HEATERS
- ▶ EXHAUST GAS HEAT EXCHANGERS (BIO AND NATURAL GAS)
- ▶ JUICE AND C MASCUIE HEATERS FOR SUGAR INDUSTRIES
- ▶ BLACK LIQUOR AND WHITE WATER FOR PAPER INDUSTRIES
- ▶ ENGINE JACKET WATER COOLERS
- ▶ REFRIGERATION CONDENSERS

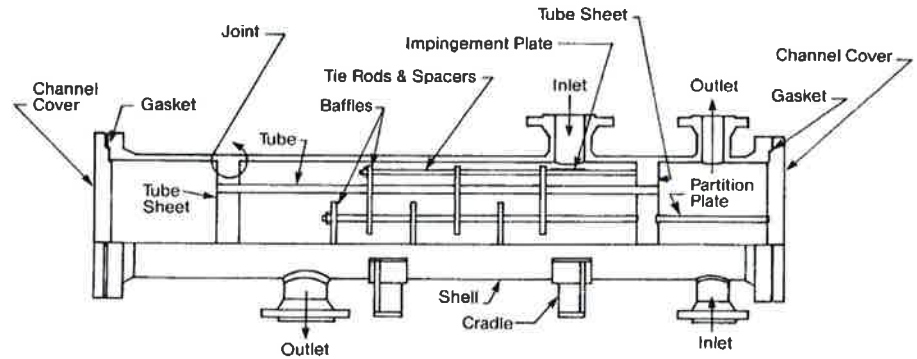


DESIGNATIONS OF SHELL & TUBE HEAT EXCHANGERS

	Stationary Head Types	Shell Types	Rear Head Types
A	 Channel & Removable Cover	 One Pass Shell	 Fixed tubesheet like 'A' stationary head
B	 Bonnet (Integral Cover)	 Two Pass Shell with longitudinal baffle	 Fixed tubesheet like 'B' stationary head
C	 Channel integral with tubesheet and removable cover	 Split flow	 Fixed tubesheet like 'C' stationary head
N	 Channel integral with tubesheet and removable cover	 Double Split flow	 Outside packed floating head
D	 Special High pressure closure	 Divided flow	 Floating head with backing device (Split Ring)
		 Kettle type Reboiler	 Pull Through floating head
		 Cross Flow	 U-tube bundle
			 Packed floating tube sheet with lantern ring

TYPES OF SHELL & TUBE HEAT EXCHANGER:

▶ STRAIGHT TUBE FIXED TUBESHEET



Advantages:

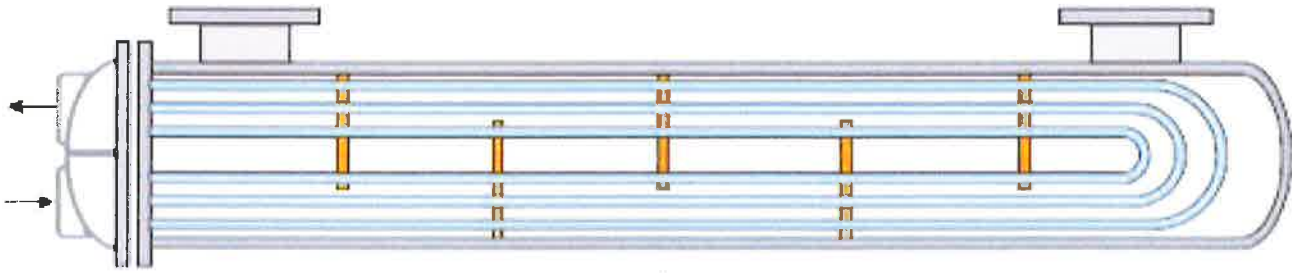
- ▶ The fixed tubesheet design cost about 20% less therefore it is less costly than removable bundle exchangers.
- ▶ Less operating problems
- ▶ Provides maximum heat transfer surface area per given shell and tube size.
- ▶ Easily interchangeable with designs of various manufacturers.
- ▶ Flanged lip baffles ensure close tolerance, high efficiency and additional tube support.
- ▶ Enlarged bundle entrance area of hub/tubesheet design lowers entrance velocity and pressure loss.
- ▶ Tube side can be steam or mechanically cleaned.
- ▶ Only tube side fluids exposed to gaskets.
- ▶ No packed joints.
- ▶ Easily interchangeable with designs of various manufacturers.



Shell	Brass or Stainless Steel 316
Tubes	Tubes Copper with option for 90/10 or 70/30 CuNi Tube Diameter Options: 1/4", 3/8", and 5/8" or Stainless Steel 316 with option for Copper, 90/10 or 70/30 CuNi, Titanium, SS304 Tube Diameter Options: 1/4", 3/8", 5/8", etc
Hubs	Brass with optional SAE four bolts connections or Stainless Steel 316, Titanium, CuNi 70/30
Bonnets	Carbon steel with option for Bronze or Stainless Steel 316 with Carbon (rolled type), CuNi 70/30 rolled, SS316, SS304 (rolled type)
Feet & Bolting	Carbon Steel or Carbon Steel with Stainless steel option & Stainless steel
Design Pressure	Tube Side = 75 - 450 psi; 517- 3,102 kPa Shell Side = 75 - 300 psi; 517- 2,068 kPa
Design Temperature	Tube Side = -20- 650° F; -29- 343° C Shell side = -20- 650° F; -29- 343° C



▶ U-TUBE
REMOVABLE FLOATING BUNDLE



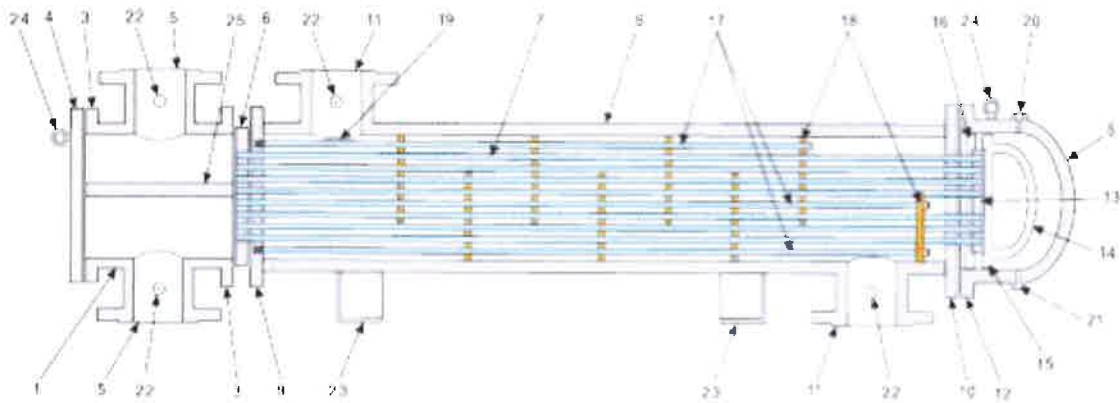
Advantages:

- ▶ The U-tube bundle can be configured both in a fixed tubesheet and as a removable bundle as illustrated above. The use of a U-tube bundle eliminates one of the tubesheets making this arrangement about 10% less expensive than the fixed tubesheet design.
- ▶ Allows for differential thermal expansion between shell and tubes as well as between individual tubes.
- ▶ Capable of withstanding thermal shock.
- ▶ All welded rugged carbon steel shell side construction provides maximum durability.
- ▶ Provides maximum heat transfer surface area per given shell and tube size.
- ▶ Easily interchangeable with designs of various manufacturers.



Shell	Fabricated Carbon Steel with Stainless options
Tube sheets	Fabricated Carbon Steel with Stainless, 90/10 CuNi and Brass options
Tubes	Copper with option for Stainless Steel, 90/10 or 70/30 CuNi
Bonnets	Carbon steel with option for Bronze or Stainless Steel 316 with Carbon (rolled type), CuNi 70/30 rolled, SS316, SS304 (rolled type)
Feet & Bolting	Carbon Steel or Carbon Steel with Stainless steel option & Stainless steel
Design Pressure	Tube Side = 75 - 450 psi; 517- 3,102 kPa Shell Side = 75 - 300 psi; 517- 2,068 kPa
Design Temperature	Tube Side = -20- 650° F; -29- 343° C Shell side = -20- 650° F; -29- 343° C

▶ SHELL & TUBE HEAT EXCHANGER WITH FLOATING HEAD



Part names:

1. Stationary Head-Channel
2. Stationary Head-Bonnet
3. Stationary Head Flange - Channel or Bonnet
4. Channel Cover
5. Stationary Head Nozzle
6. Stationary Tubesheet
7. Tubes
8. Shell
9. Shell Flange - Stationary Head End
10. Shell Flange - Rear Head End
11. Shell Nozzle
12. Shell Cover Flange
13. Floating Tubesheet
14. Floating Head Cover
15. Floating Head Cover Flange
16. Floating.
17. Transverse Baffles or Support Plates
18. Impingement Plate
19. Vent Connection
20. Drain Connection
21. Instrument Connection
22. Support Saddle
23. Lifting Lug
24. Pass Partition

Advantages:

- ▶ These are often used in high temperature and high-pressure services and services where you wish to avoid leakage problems at gasketed joints.
- ▶ More cost effective than removable bundle designs.
- ▶ Chemical, mechanical, and water blast cleaning of the tubes is possible. Generally, it can be used in the situation where the dirt is very heavy and the tube side is easy to be corrosive.

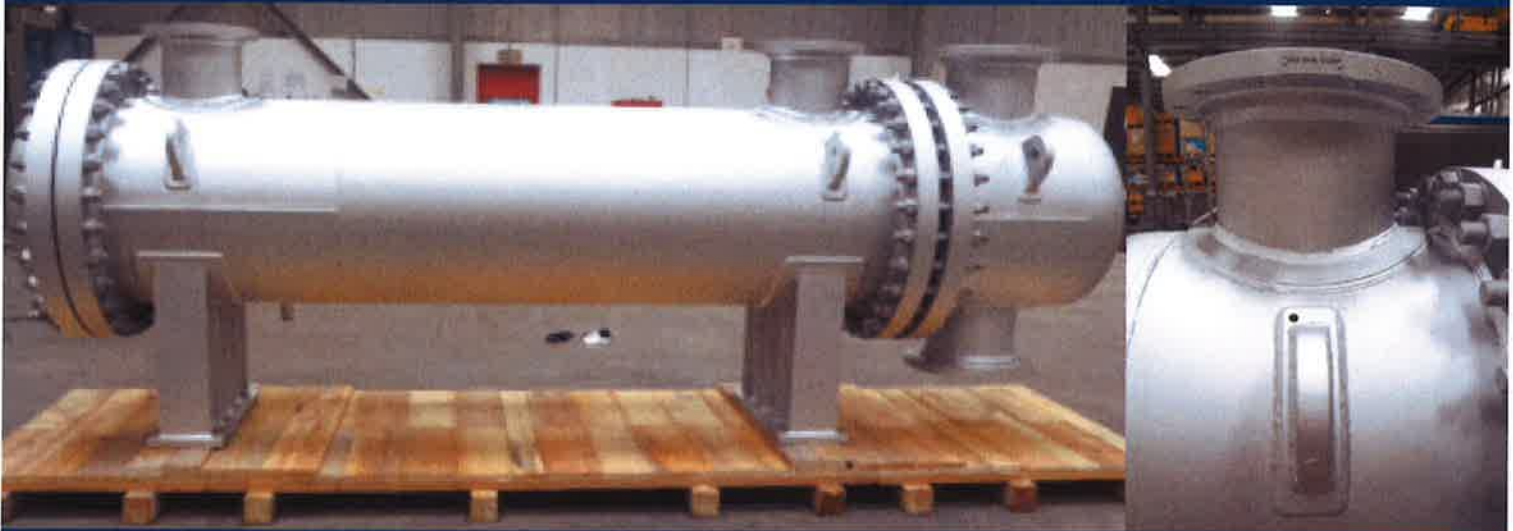
Materials:

Shell	Carbon Steel – SA516GR70
Tube sheets	Forged Carbon Steel - SA105
Tubes	Stainless Steel Tubes - SA213TP316L
Bonnets	Carbon steel - SA516GR70
Feet & Bolting	Carbon Alloy Steel - SA193B7
Design Pressure	Tube Side = 75 - 450 psi; 517- 3,102 kPa Shell Side = 75 - 300 psi; 517- 2,068 kPa
Design Temperature	Tube Side = -20- 650° F; -29- 343° C Shell side = -20- 650° F; -29- 343° C

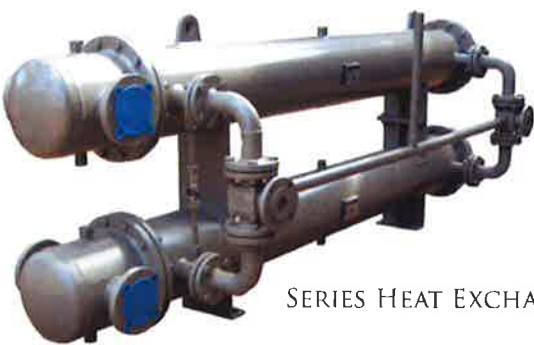


REFERENCES:

CUSTOMER : AL KOUT INDUSTRIAL PROJECTS CO., KUWAIT



CUSTOMER : LUSAIL, QATAR



SERIES HEAT EXCHANGER



TANK MOUNTED HEAT EXCHANGER



HEAT EXCHANGER FOR MARINE APPLICATION



REPLACEMENT TUBE BUNDLES

Shell & Tube Heat Exchangers



SONDEX