Shell and Tube Heat Exchanger

Technical Guide & Product Specification Brochure

A shell and tube heat exchanger is an industrial pressure vessel engineered to transfer heat between two fluids without letting them mix. A cylindrical outer shell houses a bundle of parallel tubes; one fluid flows through the tubes while the second flows around them inside the shell, transferring heat through the tube walls.

Core Construction Components

Shell	Outer cylindrical pressure vessel housing the tube bundle and shell-side fluid.
Tubes	Primary heat transfer surface; tube-side fluid passes through the inner bore.
Tube Sheets	Precision-drilled plates that hold and seal tubes at both ends of the bundle.
Baffles	Internal supports that guide shell-side fluid in a zigzag path, boosting turbulence and heat transfer.
Front / Rear End Heads	Distribute and collect tube-side fluid at inlet and outlet.
Nozzles, Flanges & Gaskets	Provide leak-free connection points and allow safe access for servicing.

Types of Shell and Tube Heat Exchangers

Type	Best Suited For	Trade-off
Fixed Tube Sheet	Clean shell-side fluids, moderate temperature differe	No mechanical cleaning of shell side; thermal stress risk
U-Tube	High-pressure, high-temperature clean fluid service	Difficult to clean U-bends; even tube passes only
Floating Head	High fouling, high-pressure critical applications	Higher cost and mechanical complexity

Recommended Materials by Service

- Carbon steel — cost-effective for non-corrosive utility services (steam, cooling water)
- Stainless steel 304/316 — chemical, pharmaceutical, and food processing duties
- Titanium Grade 2 — seawater and aggressive acid environments
- Copper alloys — high thermal conductivity for HVAC and refrigeration
- Duplex stainless steel — combined mechanical stress and chemical attack, offshore use
- Hastelloy / Inconel — extreme high-temperature, chemically aggressive service

TEMA Class Selection

Class	Recommended Use
TEMA R	Severe refinery and high-pressure service

TEMA B	Chemical process industries
TEMA C	General commercial and HVAC utility service

Maintenance Checklist

- High-pressure water jetting — removes soft scale and biological deposits
- Mechanical rodding — clears hard mineral deposits from accessible straight tubes
- Chemical circulation cleaning — dissolves scale inside U-tube bundles
- Eddy current testing — detects wall thinning without dismantling
- Bundle pull and full inspection — complete visual and dimensional checks
- Hydrostatic pressure testing — verifies pressure integrity after servicing

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Custom shell and tube heat exchangers built to TEMA R, B & C and ASME standards, delivering 20–30 years of dependable service.
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