SA AND WA TYPE HEAT EXCHANGERS

USER MANUAL

INDEX

I. APPLICATION

Sec Heat Exchangers **SA** and **WA** model U-tube heat exchangers are designed for a wide range of liquid to liquid (**WA**-model) and steam to liquid (**SA**-model) applications. We offer products of the highest quality and reliability to satisfy your most rigorous demands.

Typical Applications:

- Domestic Hot Water
- Oil Temperature Cooling
- Liquid & Gas Cooling

II. OPERATING PRINCIPLE

A heat exchanger is a device in which heat is transferred from one flowing fluid to another. Thermal energy is transferred through the tube walls and the total heat load is dependent on the flow parameters of the fluid. Shell and tube heat exchangers are the most common type of heat exchangers for liquid/liquid service, although many applications also involve steam and certain gases.

SEC's **WA** line of heat exchangers is designed for liquid to liquid applications, and our **SA** line of heat exchangers is designed for steam to liquid applications. Normally, the heating medium (e.g. hot water, steam) flows through the shell side, and the heated medium through the tube side.

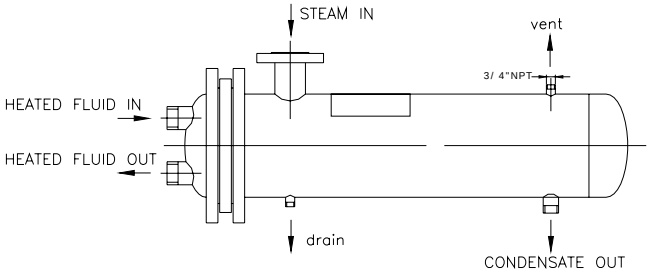


Figure 1. Flow Distribution in SA-model

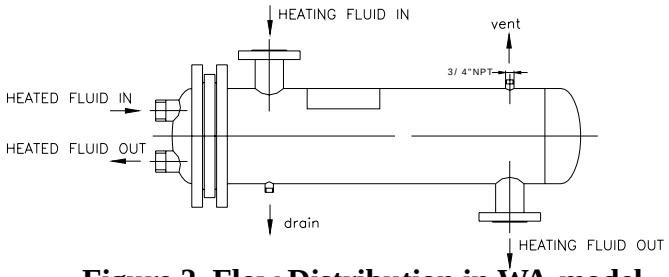
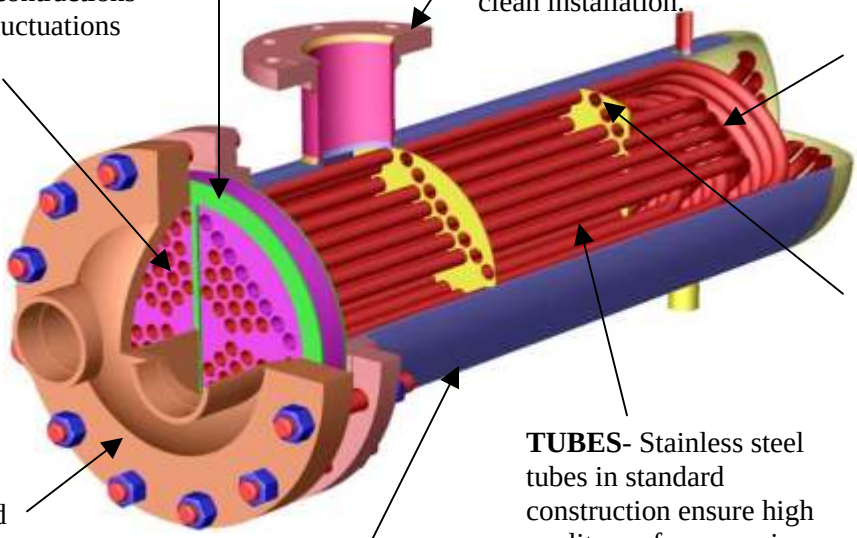


Figure 2. Flow Distribution in WA-model

III. CONSTRUCTION

FEATURES

Available in 2 or 4 pass construction, our products are enhanced with stainless steel tubes in the standard construction, rugged cast iron heads, and unique coil and baffle arrangements to optimize the thermal performance of the heat exchangers.



GASKETS- high quality compressed fibers (reusable)

CONNECTIONS- standardized sizes for easy assembly. Additional threads and surface protection for clean installation.

TUBESHEET- U-bend tubes expanded into tubesheet allow for tube expansions and contractions due to thermal fluctuations

TUBE BUNDLE- unique tube bundle layout minimizes buildup problems at the edges and optimizes media flow in the units.

BAFFLES- punched baffles with minimum clearances between tubes assure correct fluid flow and minimized bypass.

TUBES- Stainless steel tubes in standard construction ensure high quality performance in a broad range of applications.

HEAD- standard cast-iron head for heavy-duty services.

MOUNTING- saddles attached with standard units for quick & easy mounting.

MATERIAL

SA and **WA** model heat exchangers are manufactured according to the following table, although optional materials of construction are available to suit specific customer requirements.

Materials of Construction		
Sections	**Standard Construction**	**Optional**
Shell	Steel	SS304; SS316L
Head	Cast Iron	SS304; SS316L
Tubes	Stainless Steel (304)	Copper; SS316L
Tube sheet	Steel	SS304; SS316L
Connections	Steel	SS304; SS316L
Baffle	Steel	SS304; SS316L
Nuts & Bolts	Steel	-
Gasket	Non-asbestos/pressed fiber	-

IV. OPERATING PARAMETERS & SELECTION OF HEAT EXCHANGERS

Standard maximum working parameters of the heat exchangers are as follows:
(Units designed to different parameters are available. Please consult the SEC sales office for details.)

Standard Design Parameters		
	Pressure (PSI)	**Temperature (°F)**
Shell	150	375
Tube	150	375

Regardless of the application, proper sizing of a heat exchanger is extremely important in obtaining the desired thermal performance from the unit. In order for SEC to select the most appropriate product for an application, a customer should specify the following information:

- type of operating medium/fluids
- required heat load
- required inlet/outlet temperatures of the heating medium
- required inlet/outlet temperatures of the heated medium

Selection is made through a computer software program developed by SEC Heat Exchangers.

V. INSTALLATION

Before installing the heat exchanger into the system, ensure that all the proper piping and safety gauges are in place:

1. Allow enough space around the heat exchanger to provide sufficient clearance to permit the removal of the tube bundle from the shell (for maintenance or inspection purposes).
2. Provide valves and bypasses in the piping system so that both the shell side and tube side may be bypassed to permit isolation of the heat exchanger for inspection, cleaning, and repairs.
3. Provide thermometer wells and pressure gauge pipe taps in all piping to and from the heat exchanger, as close as possible to the unit to detect operating performance of the unit.
4. Provide necessary air vent valves for the heat exchanger so that it can be purged to prevent or relieve vapor or gas binding on both the shell and tube side.
5. Install proper liquid level controls and relieve valves and liquid level and temperature alarms, etc.
6. Install a surge drum upstream from the heat exchanger to guard against pulsation of fluids caused by pumps, compressors, or other equipment.

The **SA** and **WA** models are designed for horizontal installation. If space is a constraint and vertical installation is required, please inform the SEC sales office.

- Before piping up, inspect all openings in the heat exchanger for foreign material. Remove all plugs and shipping covers immediately prior to installation. Do not expose the interior passages of the heat exchanger to the atmosphere as moisture and contaminants may enter the unit and cause damage to the system.
- Mounting saddles are attached to the standard unit for quick and easy installation.
- When installing, set heat exchanger level to the ground to ensure no excess force is required to connect to the system. Install the heat exchanger in a manner where it will not be exposed to mechanical stresses or moments.

VI. STARTUP/SHUTDOWN

In all startup and shutdown operations, fluid flows should be gradual and regulated to avoid thermal shocking the unit, and every effort should be made to prevent subjecting the heat exchanger to overpressure or hydraulic hammers, as these conditions may impose stresses on the unit that could result in structural damages.

Start-Up:

- Valves should be opened gradually in order to achieve a steady increase in flow and pressure into the unit. The pressure increase/decrease should not exceed 72 psi/min (0.5 MPa/min).
- The cold fluid should first enter into the system, through the tube side.
- The hot fluid, water or steam, should be gradually brought into the system, from the shell side.
- Check all connections for leaks.

Shut-Down:

- Shut down hot fluid side first, then the cold fluid side.

VII. OPERATION

Heat exchangers should be used according to the specifications given to SEC, and within pressure and temperature ranges not exceeding the limits set forth in the section **“Operating Parameters & Selection of Heat Exchangers”.**

1. Ensure that the system is clean of debris before starting operation to prevent clogging of tube and shell side passages.
2. Open vent connections before starting up.
3. Follow the instructions in the section **“Startup/Shutdown”**.
4. After the system is completely filled with the operating fluid, close all manual vent connections.
5. Do not operate the heat exchanger under pressure and temperature conditions exceeding the maximum allowable limit (as specified on the nameplate).
6. Prevent any of the fluids form dropping below their freezing point.
7. Drain all fluids when shutting down to prevent possible freezing and corrosion.

Under no circumstances should there be pulsating of fluids, as this causes vibrations that could damage the structural integrity of the heat exchanger. The system should be designed to prevent the unit from encountering pressure shocks and rapid temperature changes.

VIII. MAINTENANCE

CLEANING

Heat exchangers are subject to fouling (scale buildup, sludge deposits, hard water deposits, tarnishes, etc.) periodically, depending on operating conditions. Fouling in the unit can result in increased pressure drops, low temperature differential in the heated medium, or a higher exit temperature on the heating medium side.

To clean or inspect the tubes, it may be necessary to remove the tube bundle from the shell. When removing the tube bundle, ensure that there is no damage due to improper handling:

- The weight of the tube bundle should not be supported by individual tubes, but should be carried by the tube sheet support or baffle plates.
- Do not handle the tube bundle with hooks or other tools that can damage the tubes.
- To withdraw the tube bundle, pass rods through two or more of the tubes and take the load on the tube sheet, or alternatively, thread a steel cable through one tube and return through another tube.
- Lift tube bundles horizontally by means of a cradle formed by bending a light-gauge plate into a u-shape.
- Do not drag the bundles, as this may cause damage to the tubes and baffles.

Cleansing of the heat exchanger can be done without removing the tube bundles or the unit from the system, although extra connections and bypasses would be required.

The cleaning solutions are readily assessable at businesses carrying chemical cleaning agents for heat exchangers or tubing and piping applications. As a guideline to purchasing the cleaning solutions, check for the following product data:

- compatibility with the material of construction (steel, stainless steel, copper, etc.)
- acceptable for use in food processing industries (if applicable)
- effectively removes scale, slag, tarnishes, and hard water deposits
- easily rinsed out of the system
- no objectionable or corrosive fumes

The following fluids are prohibited for use as a flushing agent!!

- **Hydrochloric acid up to 0.1% concentration**
- **Solutions that contain MCl**
- **Chlorides ($MgCl_2$, NaCl between 0.01-1%, CuCl up to 1%, $CaCl_2$ from 5% to saturation)**
- **Any fluid that will deposit alkaline residue or phosphorous**

LEAKS

To locate ruptured or corroded tubes or leaking joints between the tubes and tube sheet, the following procedure is recommended:

- Drain the heat exchanger completely of any fluid or moisture.
- Pressurize the shell side of the unit with fluid (e.g. water, glycol, etc.)
- Observe the tube joints and tube ends for indication of test fluid leakage.

IX. STORAGE & TRANSPORTATION

During transportation of the heat exchangers, ensure that they are not exposed to mechanical damages. Upon receipt of the heat exchanger, inspect the unit for shipping damages. Notify the carrier or the SEC sales office immediately in the event damages do occur.

Heat exchangers should be stored in a clean, dry, low humidity area away from corrosive environments or weather elements (e.g. rain, snow, blowing dust). If the unit is not to be placed in immediate service, take precautions to prevent rusting or contamination. Heat exchangers that are out of service for extended periods of time should be protected against corrosion.

X. WARRANTY TERMS

SEC HEAT EXCHANGERS
LIMITED WARRANTY INFORMATION

SEC's warranty obligations are limited to the terms set forth below:

SEC HEAT EXCHANGERS. ("SEC") warrants to the original purchaser that this product will be free of manufacturing defects in material and workmanship for a period of one (1) year from the original purchase date, or eighteen (18) months from SEC's original invoice, whichever expires first. The original purchase date as used herein shall mean the date stated in the vendor's original invoice.

SEC will, at its option, repair or replace this product without charge if it is found to be defective during the limited warranty period specified above. If SEC chooses, at its discretion, to replace any product for which there is a valid warranty claim, SEC shall replace the product with the same model or, if such model is not available, with a model which is, in SEC's reasonable judgment, the nearest compatible model available at the time of replacement. Note that each purchaser is limited to one (1) product replacement during the warranty period of the original claim.

NOT UNDER COVERAGE BY THIS WARRANTY

This limited warranty covers defects encountered in normal use of the product while operating according to the specifications set forth by SEC. The warranty is void and shall not apply to the following, including, but not limited to:

1. The failure or malfunction results from improper or negligent operation, abuse, misuse or maintenance or unauthorized alteration.
2. Malfunctions resulting from, or repairs necessitated by, uses of the product for purposes other than that for which it was designed, or resulting from flood, fire, wind, lightning, freezing, or any other natural disaster, an act of God, an act of destruction, theft, or accident.
3. Damages to the product that occur during shipment.
4. Damages caused by improper or faulty installation.
5. Products exposed to corrosive elements harmful to the structural integrity and durability of the product.
6. Products installed outside of Canada and the United States.

SEC shall not be liable for any direct, special, incidental, or consequential damages caused by the use, misuse, or inability to use this product. SEC is under no legal obligations to rectify, including but not limited to, lost profits, downtime, goodwill, damages to or replacement of equipment and property. Purchaser assumes all risk and liability for loss, damage or injury to purchaser and purchaser's property and to others and their property arising out of the use, misuse or inability to use this product. This limited warranty shall not extend to anyone other than the original purchaser of the product.

MAKING A WARRANTY CLAIM

To file a claim under this warranty, the purchaser must do the following during the warranty period:

Before returning the product to SEC for warranty service, the purchaser must complete the Warranty Claims Form (attached) and fax it to SEC at **(902) 569-2800**. Upon preliminary assessment of the claim, SEC will send the purchaser a Request for Inspection Form, along with an Inspection Tag and a Return Merchandise Authorization (RMA) number. The Inspection Tag and RMA number must be clearly displayed and attached to the product on its return to SEC before it can be processed. Proper packing of the product in the original container, or equivalent, is the responsibility of the purchaser. This warranty does not cover expenses or labor for disassembly, removal, shipment, reassembly or reinstallation; the purchaser will be responsible for such costs.

SEC RESERVES THE RIGHT TO CHANGE SPECIFICATIONS OR DISCONTINUE MODELS WITHOUT NOTICE.

XI. WARRANTY CLAIMS FORM

SEC WARRANTY CLAIMS FORM

SEC warrants this product against defects in materials and workmanship for a period of one (1) year from the original purchase date, or eighteen (18) months from SEC's original invoice, whichever expires first. The original purchase date as used herein shall mean the date stated in the vendor's original invoice. Should the product fail to perform according to the specifications set forth by SEC during the warranty period, SEC will repair or replace, free of charge, the products that it finds defective.
If you wish to make a warranty claim, please complete this form. Incomplete forms will not be processed. To make multiple claims, please fill out one form for each individual unit.

Name: _____
Company: _____
Address: _____
Telephone: _____ Fax: _____

Product Information: **Comments:**

Model Name: _____
Serial Number: _____
Purchased From: _____
Vendor Invoice # : _____
Vendor Invoice Date: _____
SEC's Quotation # : _____ (if applicable)

(indicate source/symptoms of defect)

Product Operating Conditions:

	Tube Side	Shell Side
☐ °C ☐ °F		
Temperature Out ☐ °C ☐ °F		
Flow ☐ kg/s ☐ USGPM		

For pool use, please complete the following table:

Chemical	*Levels*
Free Chlorine	
pH	
Calcium Hardness	
Alkalinity	
Total dissolved solids	
Bromine	
Copper	
Chloride	
Other (specify)	

Thank you for your assistance. Please fax this form to SEC **(902) 659-2800**
You will be contacted once the information has been reviewed.

XII. SALES & SERVICE

SEC HEAT EXCHANGERS serves its customers through a network of distributors. For application assistance, performance specifications, pricing, or name of the nearest Authorized Distributor, contact us at:

SEC HEAT EXCHANGERS
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www.sec-oilcoolers.com