



Better Boilers

**T SERIES
HEAT EXCHANGER
USER MANUAL**

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I OPERATING PRINCIPLES

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.

The IBC T Series of heat exchangers are designed to perform at high fluid velocities with low pressure drops. It has a helical coiled tube design that makes it distinctive from other shell and tube heat exchangers on the market today. This unique design enables efficient heat transfer performance, and allows for diversity in its applications.

Typical Applications:

- swimming pools, spas, hot tubs (for high chlorine applications, use titanium version)
- in floor heating
- driveway snowmelt
- oil coolers
- transmission and engine coolers
- boiler sample coolers
- waste water heat recovery
- marine/ saltwater applications (titanium version)

To maximize the performance of the T Series heat exchangers, the product should be installed in a counter-current flow method, as shown below in Figure 1. The hot, or heating, fluid flows through the tube side. The cold, or heated, fluid flows through the shell side.

Example: for swimming pool applications, the pool water is to flow through the shell side, and the boiler water is to flow through the tube side.

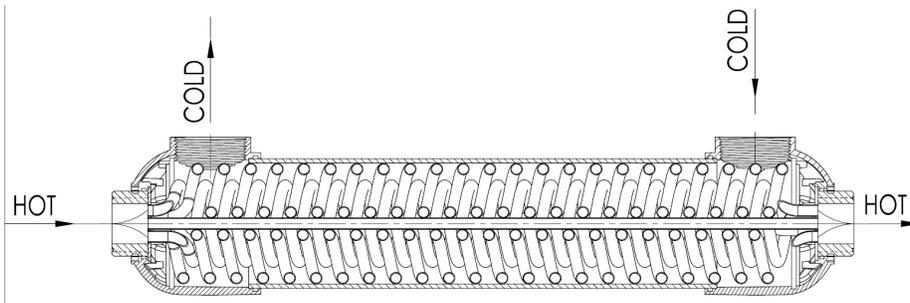


Fig.1 Typical Flow Diagram

Under no circumstances should there be pulsating of fluids in the system, 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.

II DESIGN PARAMETERS

Shell Side Pressure: 35 PSI

Shell Side Temperature: 120 F

Tube Side Pressure: 145 PSI

Tube Side Temperature: 200 F

**** WARNINGS****

DO NOT exceed these design parameters! Failure to adhere to these parameters may result in equipment damage and/or personal injuries.

HOT SURFACE

Contact surface may be extremely hot during operation. Do not touch! Use extreme caution while in close proximity. Failure to do so may result in personal injuries.

III MATERIALS OF CONSTRUCTION

Heat Transfer Surface:

1. Commercial Pure Titanium (CP Ti) exhibits exceptional resistance to a vast range of chemical environments and conditions, due to a thin, invisible, but extremely protective, surface oxide film (primarily TiO₂). Ti is especially known for its elevated resistance to localized attack and stress corrosion in aqueous chlorides (e.g., brines, seawater) and other halides and wet halogens (e.g., wet Cl₂ or Cl₂-sat, brines), and to hot, highly-oxidizing, acidic solutions (e.g., FeCl₃ and nitric acid solutions). Ti is also recognized for its superior resistance to erosion, erosion-corrosion, cavitation, and impingement in flowing, turbulent fluids.

2. The low ("L" .03 max) carbon versions of stainless steel (SS) 316 in wrought and cast compositions is used for welded applications. The thin chromium oxide film to which SS owes its corrosion resistance forms almost instantly in air, water, or other media containing oxygen. Dissolved oxygen is the principal constituent of water that affects the corrosion behaviour of SS and the effect is highly beneficial. The agitation, turbulence, and high velocity of water that are so troublesome to carbon steel, cast and ductile iron, are highly beneficial to the durability and performance of SS.

Head:

Polyphthalamide, 40% filled with glass fiber is a thermoplastic construction material based on a semi-crystalline, partially aromatic polyamide - PA6T/X. In comparison to other well-known polyamides it is characterised by its very high performance profile at high temperatures, owing it to a specially heat stabilised injection molding process. It is particularly suitable and approved for parts in house-hold appliances in contact with food and drinking water. The main distinguishing feature of polyphthalamide, when compared to other polyamides, is its good performance values at high temperatures providing parts which are stiffer, stronger and have better heat distortion stability and chemical resistance.

Shell:

Unplasticized Polyvinyl Chloride (PVCU) is a widely used construction resin, commonly used as a material for producing pipes. Good mechanical properties in terms of creep, viscoelasticity, and fatigue are very important and are maintained over prolonged periods of time (products are evaluated for creep, and data are extrapolated up to 100 years when necessary with high safety coefficient) The visco-elasticity of the material permits an exceptional behavior concerning the interactions between the shell of a heat exchanger and the coil bundle inside. PVC is inert to a lot of materials, including disinfectants used in the treatment of potable water.

**** IMPORTANT NOTE ****

It is the purchaser's responsibility to ensure that all fluids in contact with the product are compatible with the construction material of the product. This includes operational fluids and cleaning fluids. Corrosive environments are often a combination of chemical levels, flow rates, and temperatures. Failure to ensure this will result in damages to the product.

The helical tube bundles are available in both titanium and stainless steel materials. Stainless steel tube bundles should not be used in applications that involve high chloride levels or sea/saltwater. The titanium tube bundles are recommended in these cases.

IV INSTALLATION / HOOK-UP

The heat exchanger can be mounted in either the vertical or horizontal position. All pipes connected to the heat exchanger are recommended to be equipped with shut-off valves so that the heat exchanger can be removed for maintenance purposes, or be isolated (using bypass line) if required.

Couplings that are threaded into the head of the heat exchanger (e.g. pool water lines) should be made of plastic material. Pipes connected to the unit should be mounted so that any stresses or strains in the system (e.g. caused by thermal expansions) would not translate to the heat exchanger.

**** CAUTION ****

DO NOT OVER TORQUE CONNECTIONS DURING INSTALLATION, AS IT MAY DAMAGE THE UNIT. ON SHELL SIDE, USE PLASTIC CONNECTIONS ONLY.

**USE ONLY WITH THREAD SEALANT (eg. LOCTITE 55 OR EQUIVALENT).
DO NOT USE TEFLON TAPE!**

Figure 2 is an example of a typical installation. *The heat exchanger should have safety relief valves installed on both sides of the product. Install unit **before** chlorination device.*

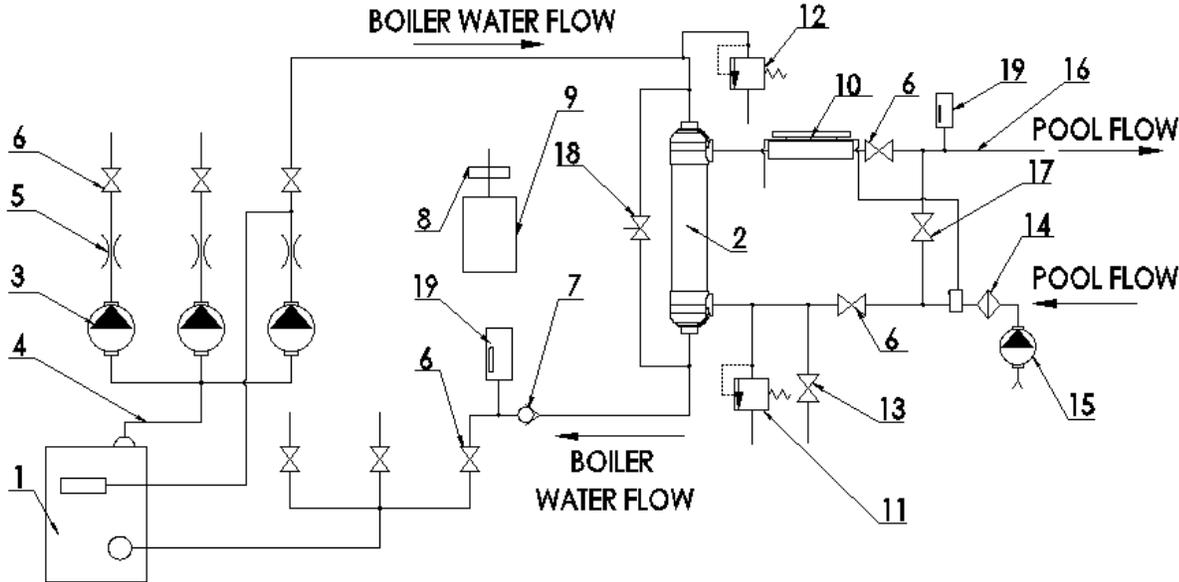


Fig. 2 Typical Pool Installation

1 Boiler - 2 Heat exchanger - 3 Circulation pumps - 4 Boiler water circuit - 5 Flow control valve - 6 Gate valve - 7 Check valve - 8 ON/OFF switch - 9 Relay - 10 Flow switch - 11 Safety relief valve - 12 Safety relief valve - 13 Drain valve - 14 Filtration - 15 Pump - 16 Water supply - 17 Bypass valve - 18 Bypass control valve - 19 Thermometer

V START-UP / SHUT-DOWN

Inspect the equipment prior to startup. Ensure that the system is clean of debris before starting operation to prevent clogging of tube and shell side passages. Open vent connections before starting up.

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 cold (heated) fluid should first enter into the system.
- The hot (heating) fluid, water or steam, should be gradually brought into the system.
- Check all connections for leaks.

Shut-Down:

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

Prevent any of the fluids from dropping below their freezing point. Drain all fluids when shutting down to prevent possible freezing and corrosion.

During off-seasons, or long periods of non activity between uses, ensure that the heat exchanger is thoroughly drained and flushed well. Failure to do so may result in buildup and corrosion, which will cause premature product failure.

VI MAINTENANCE

It is important to have a regular maintenance regime to ensure the longevity, and the effectiveness, of the product.

Clean heat exchangers 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.

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

The cleaning solutions are readily accessible 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 (stainless steel, titanium, pvc, 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 for stainless steel tube bundles

- **Hydrochloric acid up to 0.1% concentration**
- **Solutions that contain MCl**
- **Chlorides (MgCl₂, NaCl between 0.01-1%, CuCl up to 1%, CaCl₂ from 5% to saturation)**
- **Any fluid that will deposit alkaline residue or phosphorous**

LEAK DETECTION:

External leaks are easily visible.

To assess if a unit has an internal leak:

- disconnect the tube side connections, and drain it of all fluid or moisture
- pressurize the shell side (with water, in most cases), and observe the tube side for signs of the test fluid

VII TRANSPORTATION / STORAGE

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 IBC sales office immediately in the event that such 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.

VIII TROUBLESHOOTING

In many cases, issues with the system may not involve, or be related to, the heat exchanger itself. Below are a few common, system-related issues.

Problem	Possible causes
No performance (heat)	The heat exchanger is not completely filled with water in both circuits.
	The heat exchanger is not deaerated properly.
	Insufficient flow at heating circuit.
	Strainer clogged on Boiler or Pool side (circuit).
	Wrong setting of thermostat or of automatic controls, if any.
	Defective sensor on self-acting thermostat

IX WARRANTY STATEMENT**IBC Technologies****LIMITED WARRANTY INFORMATION**

IBC warranty obligations are limited to the terms set forth below:

IBC 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 IBC's original invoice, whichever expires first. The original purchase date as used herein shall mean the date stated in the vendor's original invoice.

IBC 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 IBC chooses, at its discretion, to replace any product for which there is a valid warranty claim, IBC shall replace the product with the same model or, if such model is not available, with a model which is, in IBC'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 IBC. 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.

IBC shall not be liable for any direct, special, incidental, or consequential damages caused by the use, misuse, or inability to use this product. IBC 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 IBC for warranty service, the purchaser must complete the Warranty Claims Form (attached) and fax it to IBC at **(920) 783-8340**. Upon preliminary assessment of the claim, IBC 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 IBC 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 labour for disassembly, removal, shipment, reassembly or reinstallation; the purchaser will be responsible for such costs.

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

X WARRANTY CLAIMS FORM

IBC WARRANTY CLAIMS FORM

IBC 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 IBC'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 IBC during the warranty period, IBC 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:

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

Comments:
 (indicate source/symptoms of defect)

Product Operating Conditions:

	Tube Side	Shell Side
Temperature In <input type="checkbox"/> °C <input type="checkbox"/> °F		
Temperature Out <input type="checkbox"/> °C <input type="checkbox"/> °F		
Flow <input type="checkbox"/> kg/s <input type="checkbox"/> USGPM		
Operating Fluids		

For pool use, please complete the following table:

<i>Chemical</i>	<i>Levels</i>
Free Chlorine	
pH	
Calcium Hardness	
Alkalinity	
Total dissolved solids	
Bromine	
Copper	
Chloride	
Other (specify)	

Thank you for your assistance. Please fax this form back to IBC. You will be contacted once the information has been reviewed.

IBC FAX NUMBER
(920) 783-8339

XI SALES & SERVICE

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

IBC

**4203 Industrial Court
Sheboygan, WI 53083
USA**

**TEL: (856) 887-0544 (Tech Support Ext. 4)
FAX: (920) 783-8339**