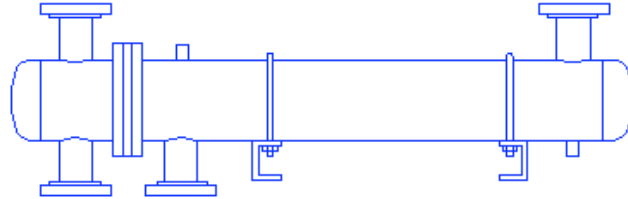


OPERATION AND MAINTENANCE OF INDUSTRIAL HEAT EXCHANGERS



DESIGN AND OPERATING CONDITIONS

Do not operate heat exchangers under conditions that exceed those specified on the Yula Corporation Nameplate and Data Sheet.

INSTALLATION

Care should be taken to assure that the heat exchanger is installed correctly. Also, while inlet and outlet nozzles are sometimes interchangeable, Yula Corporation should be notified before any directions of flow are reversed.

START-UP PROCEDURE

When putting a heat exchanger in operation, open the vent connections and slowly start to circulate the cold medium only. Be sure that the entire cold side of the exchanger is completely flooded before closing its vents. The hot medium should then be gradually introduced until all passages are filled with fluid. Then close the hot side vents and slowly bring the unit up to its operating temperature.

TEMPERATURE SHOCKS

Start all operations gradually. Do not introduce hot fluid suddenly when heat exchanger is empty or cold, or shock unit with cold fluid when hot.

PULSATIONS

Fluids should flow smoothly into heat exchanger with a minimal amount of pulsations. Pulsations can cause vibrations and straining which could result in leaks.

SHUTDOWN PROCEDURE

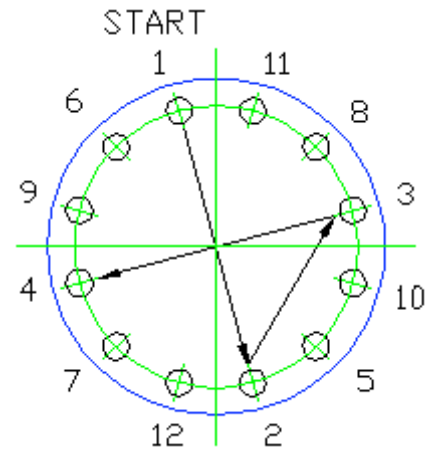
When heat exchanger is required to be shutdown, the hot fluid should be turned off first. If it is necessary to stop the circulation of the cold fluid, the hot medium should also be stopped by by-passing the heat exchanger.

BOLTING AND GASKETS

All body flanges were hydrostatically tested per the ASME Code at Yula Corporation prior to shipment. During shipment and handling during installation, it is possible that the bolting might be loosened. Therefore, all gasketed joints should be snugged up prior to start-up and after unit has been heated to prevent leaks and blown out gaskets. It is important that all bolted joints be tightened uniformly and in a diametrically staggered pattern as illustrated below.

NORMAL TORQUE VALUES

STUD SIZE	TORQUE (FTxLBS)
1/2"	30-40
5/8"	60-80
3/4"	100-120



GASKETS

It is recommended that when a heat exchanger is dismantled, it should be reassembled using new gaskets. Care should be taken to assure that gaskets are properly seated prior to tightening the bolts. Also, gasket surfaces should be clean and smooth prior to reinstalling tube bundle. Yula Corporation maintains an extensive inventory of replacement gaskets. When ordering gaskets, identify the heat exchanger by the Yula Model Number and Serial Number which can be found on the ASME Nameplate.

DRAINING HEAT EXCHANGER

Drain all fluids when totally shutting down unit to eliminate the possibility of freezing or corrosion. Also, to guard against water hammer or condensate flashing back to steam, condensate should be drained into properly sized traps during all stages of operation.

INSPECTION

Heat exchangers should be checked for fouling at regular intervals. Observe the interior and exterior condition of tubes and keep them clean to achieve maximum heat transfer surface.

ACCESS TO TUBES

U-tube construction: Remove heads after disconnecting piping.

Floating head construction: Remove channel cover, shell cover, and floating head. Do not remove channel.

When removing the tube bundle from the heat exchanger, care should be exercised to assure that it is not damaged by improper handling. Do not insert objects into tubes, or handle tube bundles with hooks or other tools which might dent or scratch the tubes. Bundles should be moved about on skids or cradles.

TUBESIDE STEAM CLEANING

In the event that the tubeside of the heat exchanger is to be steam cleaned, it is important that the shellside remains in operation or flooded and equipped with a relief valve. This will prevent shell liquid from evaporating and possibly increasing chloride concentration to a unsafe level and cause stress corrosion cracking of the tubes. Also, if the shell fluid is heated, it is possible for the pressure to rise above design conditions and cause leaks.

CLEANING

Provide convenient means for frequently cleaning heat exchangers as suggested below.

- 1) Circulate chloride free cleaning solution through the shell at a good velocity to remove sludge or other soft deposits.
- 2) Some soft deposits may be removed by circulating hot fresh water through the shell.
- 3) For hard scale, coke and other hard deposits, mechanical means may be used.