

10 Eagles Court
Cartersville, Georgia
30120
(770) 386-7855 (Voice)
(770) 386-8350 (Fax)

Ameridex Plate Exchangers

This instruction manual covers your new

AMERIDEX

Plate Heat Exchanger. If you contact Ameridex about this heat exchanger please refer to the type and serial number mentioned below.

Type: _____
Serial # _____

Contents:

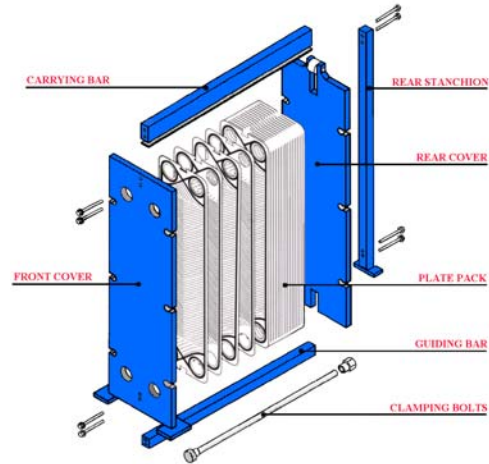
	<i>Page</i>		<i>Page</i>
Type Description.....	1	Start-Up & Operation.....	8
Construction & Function.....	2	Opening & Assembling.....	9
Plate Construction.....	3	Cleaning.....	10
Drawings & Name Plate.....	4-5	Fault Locations.....	11
Gasket Construction.....	6	Rebuilding & Spare Parts.....	12
Installation of the PHE.....	7		

The Design and Function Of Ameridex Plate Heat Exchangers

As the name indicates, your plate and frame heat exchanger utilizes a frame to hold and compress a varying number of heat transfer plates. The individual parts of the frame are as follow:

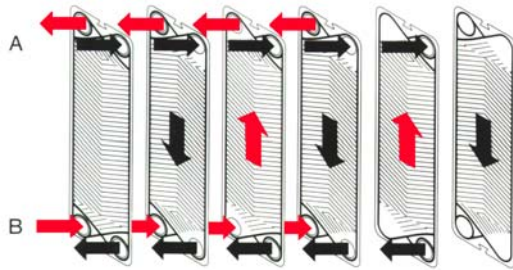
Front Cover
Rear Cover
Stanchion
Carrying Bar
Guiding Bar
Clamping Bolts

Fig.1



Each heat transfer plate is supplied with a gasket affixed, so that the plates form a closed system of parallel flow channels. It is through these channels which the medias flow alternating at every second interval. (Fig.1)

Fig.2



The Plate Pack

The gaskets are affixed to the plates either through the utilization of adhesive or the “Ameri-Snap” snap in gasket system. These gaskets provide isolation of the medias from the atmosphere. In order to separate the medias the plates are double gasketed around the interior of the inlet portholes with intermediate drain areas designed into the gaskets.

Every second plate in the pack must be turned 180 Deg. so that the plates form a closed system of parallel flow channels through which the medias flow alternately at every second interval. (Fig. 2)

Intermediate Frames

If the plate heat exchanger works with several medias at the same time, it can be necessary to insert intermediate frames. The intermediate frames are equipped with corner blocks which form connections between the different sections. Two connections can be placed in the same corner block which will connect to two different sections in the plate heat exchanger.

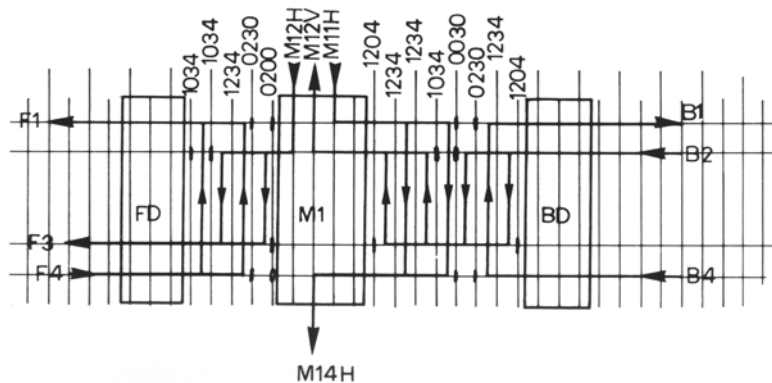


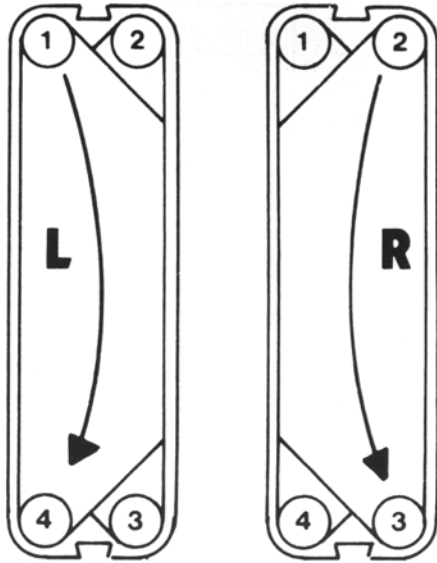
Fig. 3

The Plates

Ameridex heat transfer plates are designed in such a manner that they may be utilized as either right or left plates simply by turning the plate 180 Deg.

On a right plate the flow runs from porthole #2 to porthole #3 or reverse from porthole #3 to porthole #2. On a left plate the flow runs from porthole #1 to porthole #4 or reverse from porthole #4 to porthole #1. (Fig.4)

Heat Transfer Plate Portholes



Depending upon the desired liquid flow within the plate heat exchanger, the four corner portholes must be opened. These portholes are numbered 1,2,3,4 beginning with the upper left hand side of the plate and run in clockwise order as seen on the gasketed side of the plate. (Fig.4)

The portholes are opened as you can see on the diagram drawings, which describe the liquid flow in the plate exchanger. (Fig.3)

Code is used to describe which portholes are open and which are closed. For example, code 1234 means that all corner portholes are open while code 0204 means that porthole 2 and porthole 4 are open, while porthole 1 and porthole 3 are closed.

Fig.



Changing Plates

The changing and mounting of new plates may be done after disconnection of the plate heat exchanger from the media source(s) and removal of the clamping bolts. Before mounting spare plates be sure to check that the plates are identical to those which you want changed. A reduction of the number of plates can be made, but the plates must be removed two by two so that the plate pack, after reduction, is still mounted by plates which turn right and left. The plates which are removed must have all four portholes open. It is necessary to correct the minimum tightening dimension after either an increase or a reduction in the number of plates.**

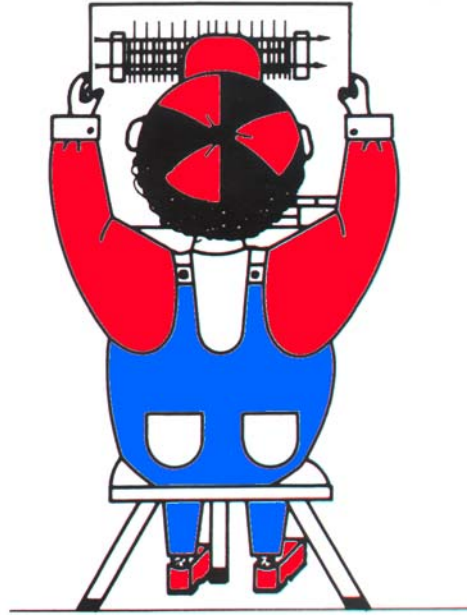
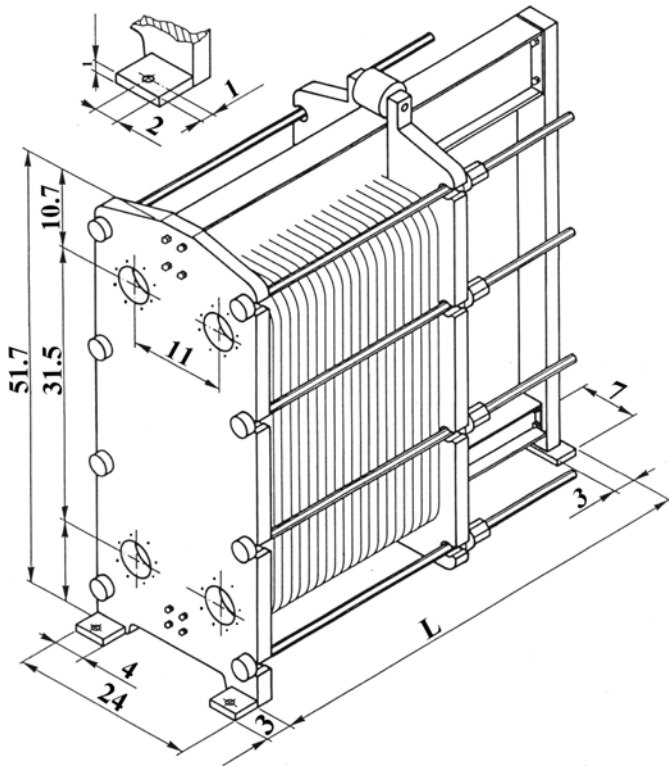
***Note: A reduction in the number of plates means that the transmission area of the plate heat exchanger is reduced corresponding to the plates being removed. A removal of plates will cause a rise of the pressure drop over the plate heat exchanger.*

Drawing, Diagram, & Name Plate

Assembly Drawing

The assembly drawing indicates various dimensions of the plate heat exchanger. This includes, but is not limited to, height, width, length, and connections. (Fig.5) (Please note that the connection types are indicated on the upper right hand side of the drawing and may differ from the connection type specifically shown on the illustration.)

Fig. 5

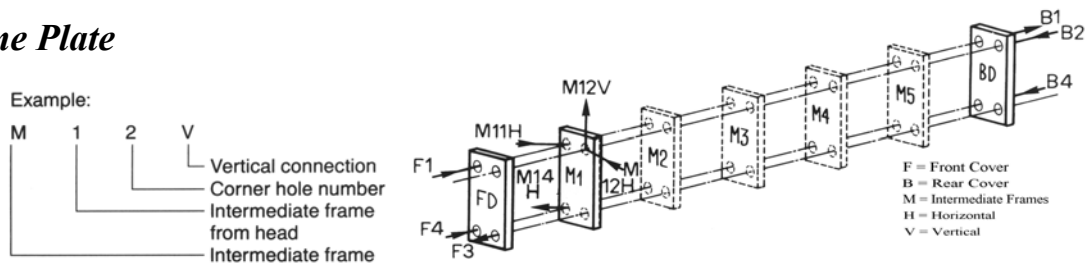


Placing of Connections

On the symmetrical drawing under the flow diagram, the placing of the connections is shown (Fig.6). The dot and dash intermediate frames are drawn up according to the number of intermediate frames in the plate heat exchanger. The connections are marked with a code which consists of letters and numbers.

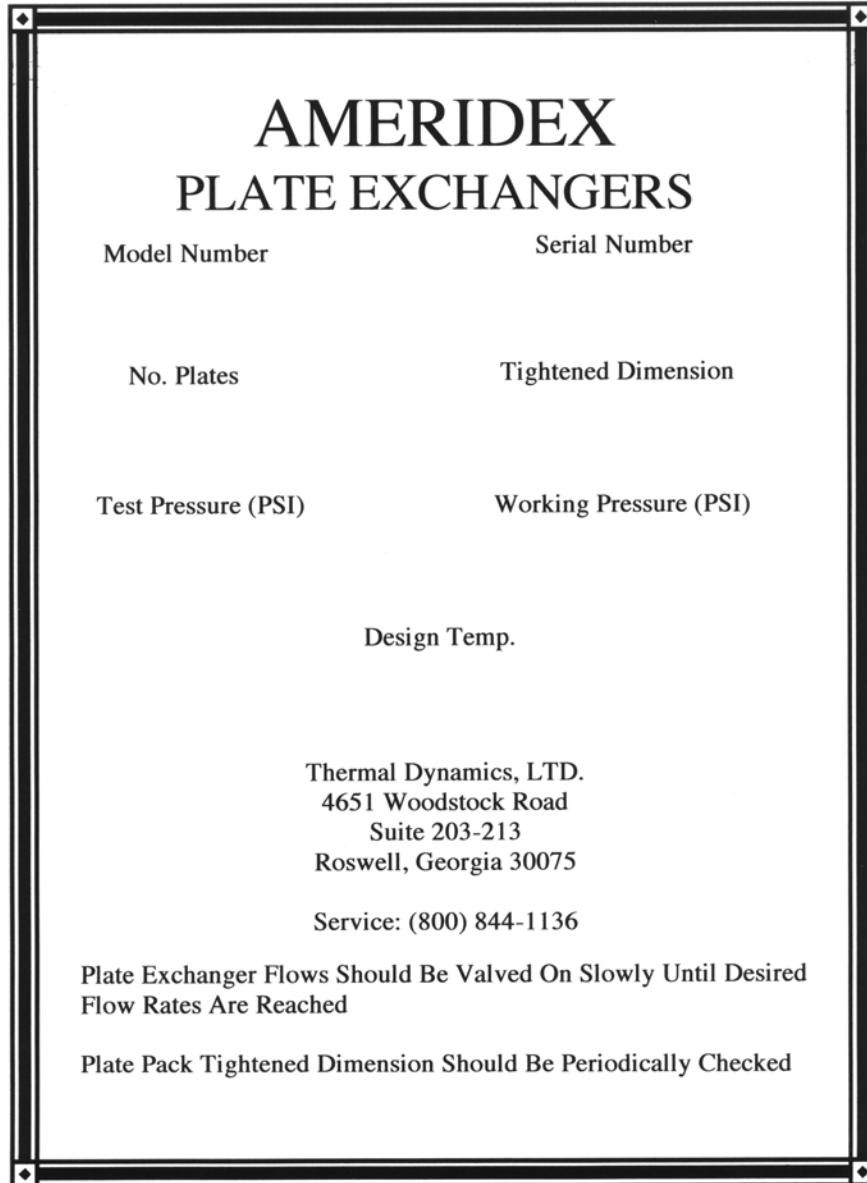
Fig. 6

Name Plate



A name plate is located on the front cover of the plate heat exchanger. The name plate is stamped with important information concerning the PHE. *(Actual name plate on unit may vary from the example shown below.) Certain model plate heat exchangers feature smaller nameplates which show only the unit serial number. For these models it is important to contact Ameridex directly for tightening information, etc.*

Fig. 7



Your plate heat exchanger contains two types of gaskets (Fig.8).The plate which initially follows the front cover (and the intermediate cover, if applicable) is called a “start plate” and contains a “start gasket”. All other plates in your plate heat exchanger contain “flow gaskets”. A start gasket is made by taking two port ringed sections from two flow gaskets and combining them. Therefore, should re-gasketing become necessary for your heat exchanger, make sure to note the gasket lay-out on the plate before removing it for replacement.



Adhesive

Fig. 8

Scotchgrip 1099 elastomeric is a nitrile rubber adhesive on a soluble basis (25% solid materials). It is partly thermoplastic to allow the old gaskets to be removed from the plates by heating them in boiling water.

Detergent

ACETONE should be used for the cleaning and degreasing of new gaskets and the gasket grooves on the plates to which the gaskets will be applied. It is very important that every detergent is evaporated before applying the adhesive.

*****Caution! Solvents are dangerous to inhale!*****

Applying Adhesive

The first step in applying adhesive is to prepare the surfaces which will come into contact with the adhesive. It is critical that the area to which the adhesive will be applied is clean and free of fingerprints, etc. To accomplish this wipe both the gaskets and the gasket grooves with a cloth which has been moistened with degreasing substance. A brush should be used to apply a thin coat of adhesive to the back of each gasket. The gaskets are then placed in a clean, moisture free area to allow drying to occur. The gasket grooves are applied with a thin coat of glue, after which the gaskets are pressed down in the groove using equal amounts of pressure to insure stability.

For best results, this process should take place upon a solid table, and the adhesive should at first be applied on the curved edges of the plate grooves and continue along the straight edges. After the gaskets have been pressed into the gasket grooves the plates should then be carefully stacked, assuring that the pressure be equally distributed around each area of the plates. Allow plenty of time for glue to dry (see chart below).

Upon completion the plates are once again hung into the frame and the plate heat exchanger is closed (see Opening and Assembling).

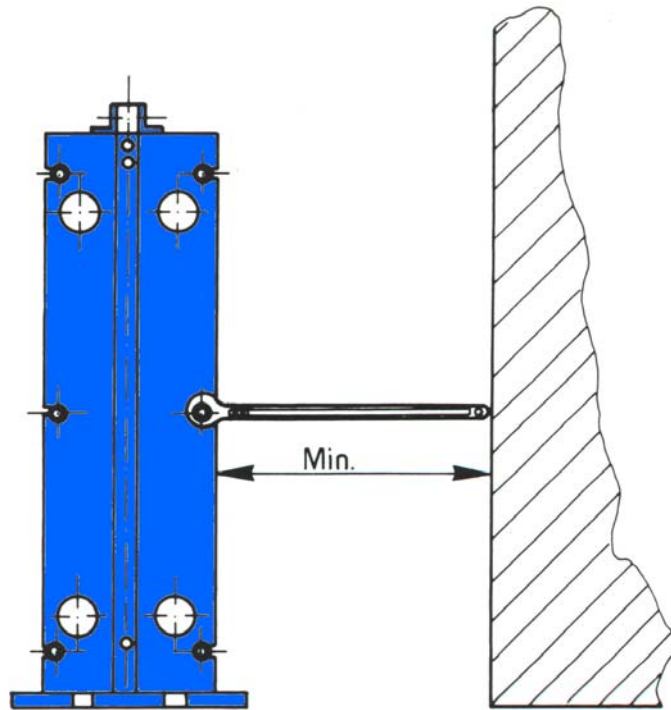
Approximate Drying Time:

194 - 212 Deg. F. (80-100 Deg. C): 2 Hours

104 Deg. F. (40 - 50 Deg. C.): 24 Hours

Normal Room Temperature: 48 Hours





Installation Of The Plate Heat Exchanger

There are three important points to take into consideration when planning to install a plate heat exchanger:

Fig. 9

1) Space Requirements - The plate heat exchanger requires enough space so that it may be opened for inspection or repairs without problems (Fig. 9). It is necessary for the plates and the clamping bolts to have enough space so that they may be opened and closed without problems. The rear cover must be pulled back to the stanchion before opening for service can be easily completed (Fig. 10).

2) Pipe Installation - In order to make the plate heat exchanger yield the specified duty the pipe installation must be mounted according to the attached diagram. The pipe installation must be configured so that the rubber liners, if used in the studded ports, may be removed. Also, the connection must be mounted in a way which prevents the plate heat exchanger from being overloaded and it must be flexible enough so that extra tightening of the plate heat exchanger is possible.

3) Tightening - Your plate heat exchanger should be checked for loosening of the clamping bolts before being operated. During shipment, slight loosening of the bolts may occur as the plates and gaskets take a set position. *It is very important that all bolts are securely in place before initial operation of the heat exchanger, and that the unit(s) be routinely checked for any loosening of the bolts during the initial months of operation.*

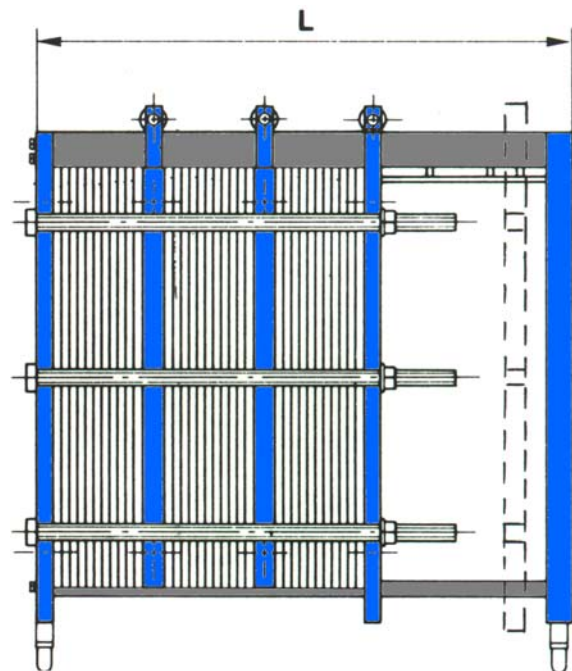


Fig. 10

Start-Up & Operation Instructions

When starting up your plate and frame heat

exchanger the following key points must be observed:

- *Working Pressure*
- *Pump Activation*
- *Pressure Pulsation and Vibrations*
- *Leakage During Start-Up*
- *Airing*
- *Pressure Rise and Change Of Temperature*
- *Leakage During Operation*
- *Longer Working Pauses*

Working Pressure

The maximum working pressure of your plate heat exchanger is included in the design parameters data sheet. In most cases it will also be included on the name plate (see pg. 5). This pressure must not be exceeded.



Pump Activation

When starting the pumps, the valves to the plate heat exchanger must be closed. After the pump has started, maneuvering of the valves must take place slowly and carefully in order to avoid both liquid and/or pressure shock.

Pressure Pulsations And Vibrations

No pressure pulsations and vibrations must be transferred from pumps or other equipment. If these are transferred to the plate heat exchanger then fatigue fractures can arise in the plates.

Leakage During Start-Up

Leakage during start-up can arise. This stops when both the gaskets and the plates have obtained running temperature and when the pressure has been distributed equally throughout the entire plate heat exchanger.

Airing

Air in the plate heat exchanger reduces the heat transmission and increases the pressure drop. Therefore the plate heat exchanger must be vented to remove any excess air.

Pressure Rise and Change Of Temperature

During operation both the pressure and the temperature have to be controlled continuously. A rising pressure drop and/or a falling heat transmission indicates that some scaling has deposited on the plates. This scaling must be removed (see pg. 10 which deals with the cleaning of the plate heat exchanger).

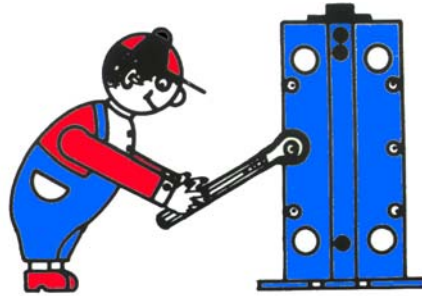
Leakage During Operation

See fault location on pg. 11.

Opening And Assembling

When opening and assembling the plate heat exchanger it is important to carefully observe the following items:

- There must be no pressure and the exchanger must be cool
- Opening and Dismounting
- Mounting and Assembling



Without Pressure & Cooled

Before opening your plate heat exchanger be sure that there is no pressure in it and that the temperature is cooled down to 90 Degrees F. (35 Deg. C). If the plate heat exchanger is opened at a temperature which is greater than 90 Deg. F., the gaskets may come loose from the plates.

Opening & Dismounting

When opening your plate heat exchanger all bolts must be loosened equally. After that, the rear cover is pulled back towards the stanchion. *If the plate heat exchanger is installed onboard a ship the rear cover must be fastened to the stanchion.*

Mounting & Assembling

The plates and gaskets should be checked carefully before mounting. The plates should be clean and the gaskets must be free of fatty substances and other uncleanness. A grain of sand on a gasket has the potential to cause leaks during operation and may also cause damage to the gaskets.

The plates should be replaced in exactly the opposite sequence as removal, beginning with the start plate. For a standard pass plate heat exchanger, the gaskets must always be turned towards the front cover of the plate heat exchanger. (If your heat exchanger is a dual section model, you should contact Ameridex for assistance before proceeding.) If the gaskets have been changed or the plate heat exchanger has just been delivered then the plate heat exchanger is assembled according to the measure stated on the name plate +/- 0.1mm per plate.

During assembly the front cover and the rear cover must be parallel. It is therefore necessary to measure the assembling dimensions on both sides of the heat exchanger at the top, middle and bottom to assure this occurrence. (Fig. 12)

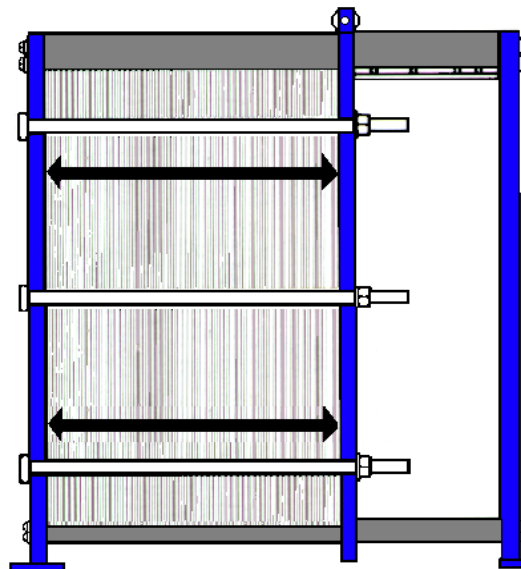


Fig. 12
Cleaning

Both the capacity and the corrosion resistance of the plate heat exchanger depend upon the level of cleanliness. To combat factors which would hinder the performance of the plate heat exchanger certain measures can be taken:

- *Manual Cleaning*
- *Cleaning In Place (CIP Cleaning)*
- *Cleaning Materials*
- *Control Of Cleaning*

Manual Cleaning

Open the plate heat exchanger according to the instructions described on page 9. The plates are then separated and carefully pulled apart. Use a soft brush and a quality, well-qualified cleaning material for cleaning the plates.

Never use a wire brush, sandpaper, metal scraper, etc. Neither the plates nor the gaskets can bear heavy-handed or robust treatments.

A high pressure cleaner can be utilized but it is imperative that absolute care be taken. Also, be sure to never add abrasives.



CIP Cleaning

For CIP cleaning (Cleaning In Place) to occur, the scaling on the plates must be soluble. All materials in the circulation system must, however, be resistant to the cleaning material.

The cleaning can also occur without circulation. This is done by filling the plate heat exchanger with a qualified cleaning material. After a period of time the cleaning material is washed out of the PHE with clean water.

An example of CIP cleaning:

- Cooling and heating liquids are drawn out and the PHE is at rest
- Rinse with cold or tepid water
- Warm cleaning fluid circulates
- Rinse again with cold or tepid water
- Rinse with water combined with cleaning material
- Rinse with cold or tepid water one final time

Cleaning Materials

A qualified cleaning material is one which removes scaling on the plates without damaging plates and gaskets. Stainless steel has a passivated (protecting) film. This film must not be destroyed, as it assists in preserving the resistance of the stainless steel.

Suitable Cleaning Materials:

- Oil and grease are removed with a water emulsifying oil solvent, i.e. BP system cleaner.
- Organic and grease fouling are removed with sodium hydroxide (NaOH) solution:
 - concentration = 5.00 ltr. 30% NaOH per 100 ltr. water (Max. Temp. = 180 Deg. F)

- Carbonates and limestone are removed with nitric acid (HNO) solution**:
 - concentration = 2.4 ltr. 62% (HNO) per 100 ltr. water (Max. Temp. = 140 Deg. F)

**Note: Nitric acid also has an effective build up effect on the passivation film of stainless steel.

Reasons For Insufficient Cleaning

- Low circulation quality
- Improper (short) cleaning period
- Improper mix of cleaning chemicals for the amount of scaling (fouling) on the plates.
- Lack of cleaning control (not cleaned often enough)

Fault Locations

- Reduced Capacity
- External Leakage
- Internal Leakage

Reduced Capacity

If a reduction of the heat transmission and/or a rising pressure drop is maintained, the plate heat exchanger needs to be cleaned (see Cleaning Pg. 10).



External Leakage

There are a number of different possibilities to explain why external leakage may occur:

- The plate heat exchanger is working at a higher operating pressure than is mentioned on the name plate. If this is the case then the pressure must be reduced immediately to the amount stated on the name plate.
- The plate heat exchanger is not tightened to the minimum measure which is mentioned on the name plate. It must be tightened down to this measurement. (See Pg. 9)
- The plate heat exchanger is suffering from scaling or fouling on internal components. Open the plate heat exchanger and check the plates. They must be free of scaling and without deformity. Next, check the gaskets. They must be elastic, without deformity, and clean.

Make sure that all parts are clean because even something as small as a grain of sand on the surface of a gasket can cause leakage to occur.

If after all the aforementioned items have been checked a leak still occurs, the gaskets may have to be changed. If a leak occurs through the weepholes of the gaskets, the reason may be either a defective gasket or a corroded plate in the area of the drainage zone.

Internal Leakage

Internal leakage leads to the fluids inside of the plate heat exchanger becoming mixed. Leakage of this type may only be repaired by changing the defective plates. Suspected leakage can be located in one of the following ways:

- Remove one of the bottom pipe connections and then put the opposite side under pressure. After the pressure has stabilized no liquid should be coming from the removed pipe connection. If leakage does occur then there is a leak in one or more of the plates. The plate heat exchanger must be opened and each plate examined carefully as a leak may be as small as a pinhole.

- Open the plate heat exchanger and remove the plates. After allowing time for the plates to dry, the plates are then hung back in the PHE once more and it is re-assembled. Circulate the liquid on only one side (every second interval). After a few minutes stop the circulation and open the PHE carefully so that no water is sprayed on the dry sides of the plates. Examine the plates carefully, searching for wet areas on the dry sides. By detecting water on the sides which should be dry, you should be able to pinpoint the area of the leak and find the hole through which the leak is occurring.

Rebuild

Due to the fact that the plate and frame heat exchanger is composed of separate modules it is very flexible in regards to being able to handle both enlargements and reductions in capacity. This in turn allows for a vast array of possibilities when a change in capacity is being planned. Ameridex keeps files containing detailed information on all delivered plate heat exchangers. We will gladly forward suggestions and/or quotations concerning a rebuild of an existing PHE. In order to accommodate these types of inquiries, Ameridex will need to know the serial number of the unit (stamped on the name plate) and the modifications which are desired. Ameridex then delivers, with the necessary parts for a rebuild, a complete description of the steps taken in rebuilding the PHE. After the task is completed Ameridex will update all files relating to the project so that the information will be available for future reference.

Spare Parts

When ordering spare parts the plate heat exchanger type and serial number should be mentioned. This will help to prevent delivery of improper and unnecessary parts.

- When ordering plates it is important to mention the correct pattern code and if the plates are right or left turning (See page 3)
- When ordering a complete set of new gaskets, glue, and cleaning fluid the serial number should be made available.
- When ordering single gaskets it is important to mention the correct type.
- When ordering clamping bolts it is important to measure the old clamping bolts to insure delivery of the proper size replacements.

Parts & Service:

Telephone - (770) 386-7855

Fax - (770) 386-8350

