



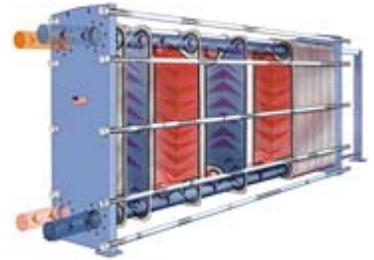
## Maintaining a Plate Heat Exchanger

*By Joe Bell, Tranter, Inc.*

**Both reactive or proactive approaches to maintenance have advantages and disadvantages. It is up to you to decide which method is best suited to your operation.**

Maintaining a plate heat exchanger and its related cost is not just a good idea - it is a necessity for any successful business strategy concerned with its continued manufacturing productivity. It is safe to say that it would be rare to find someone in this industry that does not believe in having a plate heat exchanger maintenance strategy. The key is its scope and effectiveness. When thinking of establishing a maintenance strategy, the tough questions that affect budgets come quickly to mind:

- Is it better to eliminate equipment problems after they arise or prevent them from happening?
- Equipment failure must happen sometime. Is it better to deal with it in-house or through certified off-site cleaning facilities with original equipment manufactured (OEM) diagnostics, parts and repairs?
- Are there real gains or drawbacks to using non-OEM parts?



This exploded view of a plate heat exchanger shows the intricacies of the device and how maintaining it can be costly and time consuming if you wait for the reactive approach.

The challenge comes from knowing when to spend on maintenance efforts with a look toward a reasonable return on that investment and when maintenance can be effective through lower-cost methods. This is not necessarily an either/or proposition: It is more of a good balancing act with a look toward the best methods of maintenance to garner the greatest equipment productivity. It is not just spending money on maintenance that leads to effective productivity; it is spending money wisely.

The hard questions come down to a simple strategy choice: Is your business not just reactive but proactive in its response to maintenance issues? A reactive approach is the most popular method that most manufacturing businesses use to save money short-term; a proactive approach is forward-looking and prepares the business for eventual equipment failure and solving errors before they can affect production downtime or cash flow.

The purpose of this article is to look closely at the methods for maintaining a plate heat exchanger - sometimes referred to as a plate-and-frame heat exchanger or PHE - so that it runs as efficiently as possible for as long as possible. Just what is a plate heat exchanger and why, when and how does one provide maintenance for it?

A plate heat exchanger is a pack of thin, corrugated metal plates made from any stainless steel or exotic metals with ports for the passage of two fluids between which the heat transfer will occur. The plate pack is assembled between two pressure-retaining frames compressed with tightening bolts.



## Why Provide Maintenance?

There are many reasons to schedule regular maintenance. The plate heat exchanger must be allowed to maximize its efficiency as it originally was designed for either heating or cooling at specified pressure drops. Unscheduled production stops are costly and annoying. While heating will cause the most stress on a plate heat exchanger, it is not necessarily true that heating will require more or less maintenance than a cooling system. Furthermore, if it is necessary to restore a unit to the original as-built design parameters or redesign based on new criteria, maintenance could be needed.

It does not take a process heating professional to recognize when maintenance is required on a plate heat exchanger. Failures can be detected easily by anyone through visible leaks from gaskets to the atmosphere or cross-contamination between fluids through cracks in the plates in a regular check of the equipment. Visual checks tell when fouling or plugging occurs on the plate surfaces or when gaskets fail due to temperature excursions or compression set.



Plate heat exchangers must be maintained if your company is concerned with its continued manufacturing productivity.

Providing maintenance at the point where such obvious errors occur is a far-too-common practice among industries that use plate heat exchangers. Relying on a systematic check alone for leaks and damage is reactive in nature and can limit the effectiveness of a maintenance strategy. The owner of a plate heat exchanger need not wait for these visible signs of disrepair and failure before scheduling maintenance for a unit.

When pressure drop rises and exceeds original design or when loss of heat transfer occurs and the unit does not cool or heat as designed or specified, maintenance may be required. Monitoring equipment in the form of pressure and temperature gauges used to detect wear and stress on the unit can help to plan maintenance on all affected units. Investment in this type of monitoring equipment may be restricted due to budgetary constraints or not be considered in an effort to cut cost. But is this really creating a cost-efficient maintenance system?

## Proactive Maintenance

Reconditioning intervals depend on fluids, pressures, temperatures and the age of the equipment. Monitoring equipment in the form of temperature and pressure gauges helps to identify if a unit is operating at or near maximum limits. Failure detection can be associated with unexpected temperature and pressure changes. The net effect allows for regular scheduling of reconditioning so that time and money are not wasted in unexpected breakdowns and prolonged downtimes.

Proactive maintenance is the concept of investing in monitoring equipment such as pressure and temperature gauges, filters and back-flush valves so that errors in unit efficiency can be noted, analyzed and used to establish a schedule of maintenance. Because the methods of providing maintenance to plate heat exchangers are no different in either a reactive or proactive maintenance mindset, it is important to remember that it becomes, then, a choice to combat a current problem as it occurs or as an expected part of the scheduled work cycle.



The above image depicts a worn-out gasket on the left and its healthy, maintained counterpart.



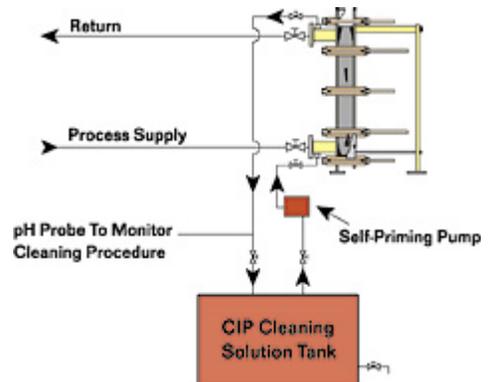
No system is perfect; no equipment will run without eventual breakdown; and not even the best gauges and meters made can detect every problem before it happens. So, while proactive maintenance is the best method of dealing with unit malfunction, it is not the end-all-and-be-all of maintenance approach. Some surprises will arise, and obviously, reactive maintenance procedures will need to be followed. A hybrid of the two systems is the most realistic course, ensuring the least downtime and least expense in repairs and lost production.

### How to Provide

Plate heat exchanger maintenance is provided through two distinct methods:

- Clean in place (CIP) on-site maintenance.
- Authorized cleaning facilities off-site maintenance.

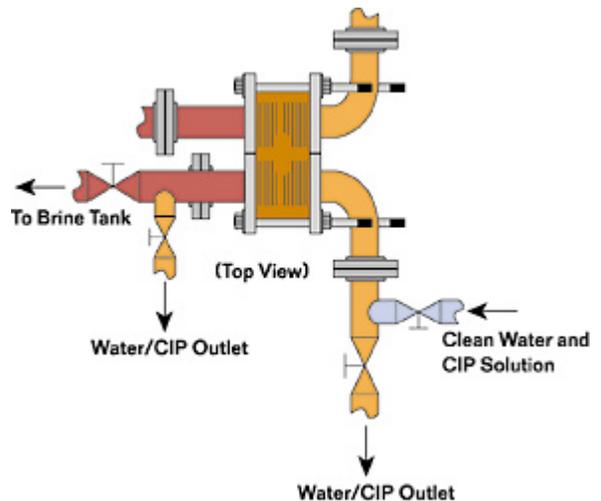
The basic difference between these two methods is not how, but where and who performs the maintenance. CIP is performed in the manufacturing plant for quick recovery and continued equipment use, and it usually is performed by the person in charge of maintenance. Utilizing an authorized cleaning facility requires removing the equipment and shipping it to a facility outside the plant where certified maintenance personnel service the plate heat exchanger. A closer look at each method will help shed light on which is best.



Because they can provide quick turnaround in a maintenance cycle, clean-in-place (CIP) systems are an attractive maintenance method and the preferred cleaning method when especially corrosive liquids are being processed. The schematics above and below depict flow diagrams of typical CIP systems.

**CIP Maintenance.** Because of the advantages of quick turnarounds in a maintenance cycle, CIP is an attractive maintenance method. It is faster, more convenient and simple. It is also a preferred cleaning method when especially corrosive liquids are being processed. Typically, a CIP operation would be as follows:

- The plate heat exchanger unit is turned off.
- All fluids are drained from the unit. Single-pass units are self-draining. Multi-pass units may require special drain holes.
- The preselected cleaning solution is circulated through the unit in a bottom-to-top flow to totally flood the unit and prevent channeling. When it is determined that the solution is no longer reacting with the substances inside the unit, the cleaning is complete.
- The unit is drained of the cleaning solution and, if necessary, rinsed with water and put back online.





For all its advantages, be careful when making CIP the exclusive method for maintenance of a plate heat exchanger. CIP has its place, but the drawbacks can be costly. The person performing CIP may not be certified to maintain the equipment. If replacement of gaskets and other parts is deemed necessary, the maintenance staff may not be qualified to do it. The temptation to order non-OEM replacement parts when CIP is used exclusively is further testament to getting into a false sense of cost cutting for effectiveness. Non-OEM parts are rarely a good idea. Lack of technical and operational support and warranties of replacement parts can be a recipe for continued failures, lost production time and high labor cost. Typical plate heat exchanger original equipment replacement parts are:

- OEM gaskets.
- Plates.
- Nozzles.
- Guide bars.
- Tie bolt assemblies.
- Frames.

All replacement components are based on original "as built" prints or those that will be compatible with process fluids, pressures and temperatures. Caution is the best guideline to use when deciding on a CIP method on any maintenance need that arises.

**Authorized Cleaning Facilities.** The disadvantages of the authorized cleaning facilities tend to be measured by the up-front cost and rarely for the real advantages achieved.

At an authorized cleaning facility, each plate is logged and visually inspected to determine if it merits reconditioning. The client is informed if any plate is unserviceable and why. The facility cross-checks its database to confirm the plate heat exchanger's original specifications and then conducts a close visual inspection of gaskets and contact points on the remaining plates to determine if there is any erosion or apparent change from the original specification. Then the precise cleaning and treatment process required is determined.

Plates are pressure-washed, rinsed and subjected to either hot caustic stripping and/or a manual procedure for gasket and scale removal. They are subjected to immersion in a variety of acids compatible with the plate material to remove the balance of any foulants. Cleaned plates are fully visually inspected and a 10 percent sampling of plates are dye-penetrant tested. Each tested plate is sprayed with dye and inspected under ultraviolet light to locate any pin-hole leaks or cracks. Following this procedure, plates again are pressure-washed and rinsed to remove all traces of the dye.

Plates are then re-gasketed with an OEM-spec gasket adhesive that eases field repair should it be required. Plates receive a thorough inspection before being packed and shipped. Units are hydrostatically tested prior to shipment.



Authorized cleaning facilities include OEM gasket replacement, thorough inspection of all parts and cleaning by certified experts in plate heat exchanger maintenance.





A properly maintained plate heat exchanger can provide many trouble-free years of operation. No piece of equipment is perfect, however; every unit will eventually have problems, and if costly downtime and product loss are to be minimized, a maintenance program is one solution.

## Sidebar: Hot Sheet

### KEY BENEFIT

Like every other piece of equipment, plate heat exchangers require maintenance. How you provide that maintenance - proactively before a problem develops or reactively after production has been disrupted - makes a difference.

### EQUIPMENT COVERED

Plate heat exchangers

### INDUSTRIES SERVED

Chemicals/petrochemicals, electronics, finishing, food, packaging, pulp/paper, pharmaceuticals, plastics, textiles



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## Related Websites

- Tranter, Inc. [www.tranterservice.com](http://www.tranterservice.com)
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