

## Cleaning Plate Heat Exchangers

Depending upon the nature of the fluids involved and the application, the heat exchanger's performance level may decline over a period of time.

This deterioration in performance is typically due to the buildup of scale, sediment and/or biological mass on the plates.

Fouling of the heat exchanger manifests itself as a decrease in thermal performance, an increase in pressure drop across the exchanger and/or a reduction in the flow through the exchanger.

Three Methods are currently available for cleaning the exchangers:

**1-removing the plates** from the exchanger for mechanical or chemical cleaning.

**2-back flushing** the exchanger by crossover piping

**3-Chemical cleaning** of the plates while still installed in the exchanger.

The first method can be performed either on site by or under the guidance of qualified field service personnel or off-site in a qualified PHE service centre.

The second method is normally conducted by the reverse flow of the liquids in a pre installed pipe arrangement.

However the method will only back flush a certain percentage of the deposited material and eventual opening of the unit would be required.

The main advantage is to extend the time between full plate cleaning.

Method one is the only procedure requiring the plates to be removed from the exchanger and cleaned either on site or offsite.

The third method which offers an alternative to external cleaning is chemical cleaning of the plates while installed in the exchanger.

Cleaning-in-place (CIP) is an economical method of maintaining the exchanger at peak performance and extending its operating life.

It is recommended that regular CIP cleaning be included in the preventive maintenance program to maximise exchanger performance and minimise the system's operating costs and overall maintenance costs.

CIP cleaning cannot be used for removal of fibrous deposits, such as paper pulp and hair. Neither can it be used for macro deposits, such as stones, plastic bags and shell fish.

### Caution

Under no circumstances should hydrochloric acid be used to clean stainless steel plates, nor should hydrofluoric acid be used to clean titanium plates.

If these acids are used on these types of plates, they will corrode and need replacement.

Cleaning agents containing ammonia or oxidizing acids such as nitric acid must not be used to clean plates in nickel, Monel and Hastelloy B heat exchangers.

These agents will result in corrosion of the plates and ultimate failure of the exchanger.

High quality fresh water should be used in preparing all cleaning agents.

Water with a chloride content exceeding 300 ppm should not be used.

In all cases, care must be taken to properly dispose of all materials used in the cleaning process.

This can sometimes complicate on-site cleaning.

### On- site cleaning

Non-metallic brushes, high-pressure washing and various cleaning agents can be used to clean the plates on-site.

The combination used will depend on the nature and degree of fouling.

Plates should be cleaned as soon as possible to prevent scale drying.

Common cleaning agents for encrusted scale and sedimentation include:

Hot water Nitric, Sulphuric, Sulphamic, Citric or Phosphoric acid

### Complexing agents

such as EDTA or NIA Sodium polyphosphates.

It is generally recommended that the concentration of these agents should not exceed 4 % and that a temperature of 60°C to 80 °C be used.

Plates should be regularly checked while in the cleaning tank for signs of deposit removal and possible corrosion.

After removal from the tank the plates should be rinsed with clean water.

Manufacturers' recommendations may exceed these limits under special circumstances.

For biological growth and slime, alkaline cleaning agents such as sodium hydroxide and sodium carbonate are usually effective.

The recommended maximum concentration and temperature for these agents are, respectively, 4% and 80°C.

Cleaning can sometimes be enhanced by the addition of small quantities of complex forming agents or surfactants.

High-pressure water can usually be used to partially remove any growth immediately after opening the plate heat exchanger.

## Cleaning in place (CIP)

CIP as part of a routine maintenance procedure prolongs the time between opening a plate heat exchanger for manual cleaning, reducing plant down time and improving gasket life.

A typical CIP set up is shown below.

### Procedure

Isolate the exchanger from the process plant.

Connect the CIP unit to the heat exchanger, the flow should be the opposite to normal operation.

Mix the cleaning agent to required concentration with water in the tank and heat to the required temperature.

The solution should be recirculated at a rate of 10-20% above normal process flow or as per the process rate.

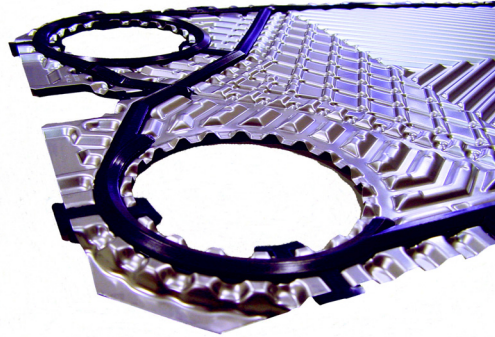
Circulate the cleaning solution a 4-6 hours

Drain and rinse with fresh water

Disconnect the CIP unit

The heat exchanger can be checked for cleaning performance by putting the unit back on line and rechecking the pressure drops, compared to the pre clean results. For future cleaning the comparison will indicate any required changes to the cleaning regime.

Dispose of used chemicals responsibly.



Typical CIP system.

