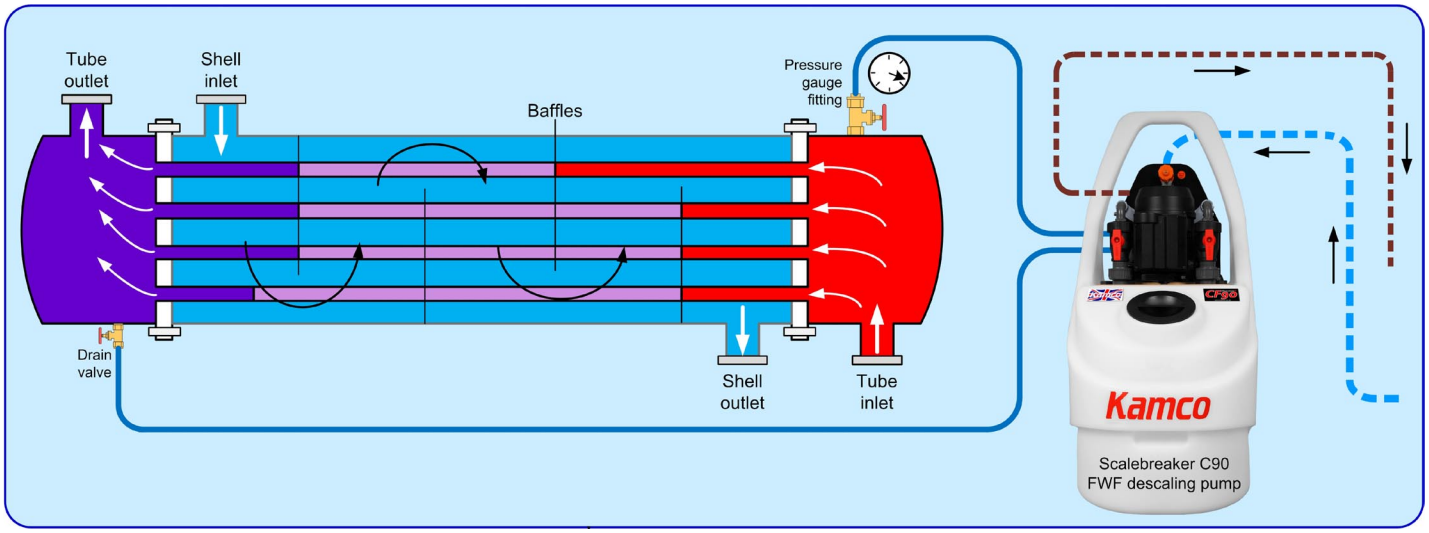
Kamco
Solutions to Scale

Guidance notes on descaling shell and tube type heat exchangers



CHOICE OF DESCALING CHEMICAL AND QUANTITY REQUIRED:

If the heat exchanger utilises any stainless steel in the construction, either SCALEBREAKER SR or SCALEBREAKER FX should be used, dependent on the type of fouling. SCALEBREAKER HD should not be used, although it may be used with mild steel, copper, brass and bronze.

1. Check the volume / capacity of the section to be descaled (if it is an oil cooler type heat exchanger being descaled, estimate the volume of the water-side), and calculate the amount of descaling chemical required.

2. As a guide, for a 100 litre capacity heat exchanger, use 10 litres of descaling chemical (ie. a 10% solution by volume). A weaker solution may be used, but will take longer to remove a given amount of scale.

3. In the above example, a C20 descaling pump, with 20 litre tank capacity, will allow all the descaling chemical to be placed directly in the pump tank, without first draining out a corresponding volume of water from the heat exchanger. For plate heat exchangers with larger volumes, and larger quantities of plates, consider a descaling pump with larger pump and pressure output.

4. A descaling pump with a smaller tank would require some water to be run out of the heat exchanger before commencing, and the tank of the pump would need to be filled with descaling chemical two or more times, each time operating the pump briefly to transfer the chemical into the heat exchanger before commencing normal circulation. The chemical will rapidly dilute to the working strength on commencing circulation.

NB. When descaling with any acid, there is the possibility of hydrogen being evolved. Hydrogen is a flammable gas, and the working area should be well ventilated. Avoid smoking nearby, or any other means of ignition.

PROCEDURE

1. Ensure an adequate water supply to dilute or neutralise any chemical leaks, or the spent descaling chemical, so that disposal does not contravene local regulations.

2. Isolate water inlet and outlet pipework, by valve, or blanking plates if necessary.

3. Couple flow and return hoses from descaling pump to the water inlet and outlet of the heat exchanger to be descaled.

4. If it is anticipated that descaling is to be a routine maintenance procedure, consider installing valved tee-pieces in the standard flow and return pipework to the heat exchanger, terminating in 1/2" or 3/4" BSP male threads. This will enable immediate coupling of the descaling pump across the heat exchanger whenever descaling is required.

5. The pump connection to the lower point of the heat exchanger should always be through a valve, as a precaution. Failing this, power failure to the pump would result in the head of water in a larger heat exchanger overflowing the pump tank, unless prevented by closing the valve. (Scalebreaker FWF models have integral valves suitable for this.)

6. Connections should be made so that there is a closed circuit between the pump output hose, through the plate heat exchanger to the return hose.

7. Venting of the carbon dioxide gas evolved is achieved through the pump tank filler cap aperture. The cap should be screwed on by no more than one quarter of a turn. This is sufficient to vent the gas, but

at the same time reduces fumes and prevents splashes.

8. Connect the pump to a suitable earthed power supply. As the pump will be used in a damp location, a residual current circuit breaker plug should be used.

9. The flow reverser handle points in the direction of flow of the liquid. Turn the handle so that it initially points towards the hose going to the lower heat exchanger connection. The hose from the top of the heat exchanger will then be the return to the pump tank.

10. Prior to adding descaling chemical to pump tank, first 'prove' the circuit with fresh water alone. Add water to pump tank to approx. 4" (10cm) above minimum liquid level, switch on pump, and immediately open the valve detailed in point 5 above, to allow circulation to commence. If water level drops initially, add more water to pump tank, and check that all connections are tight.

11. To commence descaling, slowly add descaling chemical into pump tank. Wait until liquid is returning into the descaling pump tank from the heat exchanger, and check to see if there is a build up of foam on top of the liquid in the pump. If so, carefully add FOAMBREAKER to the tank. This may happen when there is a large amount of limescale in the heat exchanger.

12. As circulation commences, bubbles and foaming will be seen in the return hose to the pump, indicating that limescale is being dissolved. If foam formation is excessive, carefully remove descaling pump tank cap, and add FOAMBREAKER to the descaling pump tank to stop the foaming.

13. Reverse the direction of flow periodically, checking all connections for tightness and absence of leaks.

14. Scale removal can be considered complete when bubbles are no longer seen in the return pipe, and yet the descaling solution is still sufficiently strong to remove hard water deposits.

SCALEBREAKER descaling chemicals contain a built-in colour change to monitor strength. An alternative simple check may be made by dropping a sample of limescale into the solution, and observing if there is any effervescence.

15. Alternatively, a pH meter, or pH indicator paper, may be used to check the pH of the descaling solution. Once the pH has risen to 3.5 to 4, its ability to dissolve limescale and corrosion deposits is effectively spent, and more descaling chemical or a fresh solution will be required.

16. After draining off the spent descaling chemical, flush the heat exchanger with fresh water. Many natural waters are slightly alkaline, and water flushing may be all that is required. Alternatively, circulate a 0.5 to 1% solution of NEUTRALISING CRYSTALS through the heat exchanger for 15 minutes, drain, and then flush with clean water.

17. Operators may prefer to neutralise the spent descaling solution "in situ" whilst the liquid is still circulating, by carefully adding neutralising crystals to the solution until the pH is brought up to a value of 7, and then flushing to drain. If foaming is excessive, carefully add a little FOAMBREAKER to the descaling pump tank.

If you have a Scalebreaker C40 or C90 FWF descaling pump, this has an integral fresh water flushing facility: When descaling is complete, the spent descaling solution may be pumped to waste along the dump hose as follows:

If the flow reverser lever is to the left, twist the right-hand dump valve through 180° to show the word 'dump', ensuring that the left-hand valve remains in the 'circulation' position.

(If the flow reverser lever is to the right, twist the left-hand dump valve through 180° to show the word 'dump', ensuring that the right-hand valve remains in the 'circulation' position.)

When 'dumping', the water level in the pump tank will fall by the same volume as is being dumped. Open the mains water supply valve and adjust to allow fresh water to enter the tank at the same rate as water is exiting the dump hose. Make sure that the tank water level remains at least 10 cm (4") above the minimum mark.

Continue dumping until fresh water is leaving the end of the dump hose.

Turn the valve which is in 'dump' mode through 180° to restore full circulation through the pump and the system. Close the water supply inlet valve once the level in the reservoir has stabilised between minimum and maximum markers.

Allow fresh water to circulate through the descaled equipment for ten minutes.

IMPORTANT: When working with acidic descaling chemicals, always wear suitable protective clothing and goggles. Refer to instructions on labels of descaling chemicals, and refer to Material Safety Data Sheets.

Caps should be kept securely on all chemical containers whilst not in use. To avoid splashes, operators should not stand directly over the open neck of either chemical containers or the filling neck of the descaling pump whilst pouring or adding chemicals.

Legal disclaimer: It is stressed that these are guidance notes only, and the above information is based on the present state of our knowledge of tubular heat exchangers in general. It is given in good faith, but due to the diverse and varied nature of such equipment, the user must satisfy himself that the above procedure is viable in the prevailing situation.