

## CIP CLEANING

Any reduction in heat exchange capacity or increase in fluid pressure losses may be due to a build-up of fouling deposits in one or both of the fluid circuits. These must be removed by CIP or mechanical cleaning to return the unit to its design capacity and to prevent possible long term corrosion damage. HRS heat exchangers are designed to be CIP cleaned but if mechanical cleaning is required the unit must be removed to a suitable workshop area for the cleaning operations.

Before cleaning operations commence it is important to ensure that the fluid circuit (service fluid) is fully drained and open to the atmosphere in order to prevent pressurisation of the CIP cleaning operations.

### Cleaning operations

After completion of the production cycle the heat exchanger system should be cleaned as necessary using alkaline and/or acid washes combined with fresh water flushes. The flow rate used for the CIP cleaning cycles should be at least the level of the product circulation rate but a minimum velocity of 1.5 m/s through the product circuit is recommended. If in doubt as to the type of cleaning fluids or cycles necessary, the user should contact a specialist cleaning company for advice.

### CIP fluids for MATERIALS OF CONSTRUCTION ANSI 316 and 316L

The following fluids are typically used during CIP cleaning operations:

- NaOH: A 1% solution (w/w) of caustic soda in water circulated at a temperature of 70°C.
- HNO<sub>3</sub>: A 0.5% solution (w/w) of nitric acid circulated at a temperature of 70°C.

**Note:** In severe fouling applications it may be necessary to exceed the concentration levels given above but advice from a specialist cleaning company should be sought before taking this step.

- Detergents: There are various proprietary detergents available which contain wetting and cleansing agents and if these are used the manufacturer's instructions must be followed while still observing the solution strength limits given above.

**Note:** Water used to make up the solutions for CIP cleaning or for subsequent flushing operations must be clean fresh softened and free from chlorides.

- Operators must have appropriate experience and training in handling and working with CIP fluids as they can be hazardous in their liquid or vapour form.

Appropriate safety equipment such as overalls, gloves and safety goggles must be provided. If there are any doubts on the part of the operator on how to handle and use the fluids you must seek specialist advice.

- Disposal of the various solutions after final use must take into account the nature of the substances used and must always be in accordance with environmental legislation in force in the country of use.

## **CIP cleaning flowrate**

### **FLOW VELOCITY**

BCJAD Heat Exchangers should always be cleaned under turbulent flow conditions. For this reason, flow velocities in the region of 1.5 to 2.1 m/s should be applied. The use of a high velocity also improves cleaning efficiency in small dead legs.

It has been generally considered that flow velocities in excess of 2.1 m/s are not beneficial, but recent work indicates that the application of even higher flow velocities can enable a beneficial reduction in cleaning chemicals.

### **Sterilisation**

The sterilisation procedures required for specific applications must be determined by the process and system designers. In general terms the process will involve heating the unit using hot water or steam to a temperature which is considered high enough to sterilize the surfaces and holding the units at that temperature until all of the components forming the heat exchanger reach that temperature.

For most high pH applications, a temperature of 90°C will be sufficient but for systems involving low pH products 140°C may be required.

- Before sterilisation operations commence it is important to ensure that the shell side fluid circuit (service fluid) is fully drained and open to the atmosphere in order to prevent pressurisation of the shell during the CIP cleaning operations.

This is particularly important when a refrigerant fluid is being used as the pressure increase could exceed the safe working pressure and damage the equipment.

## The CIP Cleaning Cycle

