



Guidelines for use in processes utilising CIP (Clean In Place) systems

The following recommendations offer advice on how to maximise the CIP (Clean In Place) efficiency of the SSP Series S and X rotary lobe pumps. These guidelines incorporate references to internationally recognised cleaning detergents, velocities, temperatures and pressures used to clean other types of flow equipment, such as valves and fittings, but have been specifically prepared to maximise the CIP effectiveness of our rotary lobe pumps.

The perception of the word clean will vary from customer to customer and process to process. The four most common interpretations of 'Clean' are given below:

- 1. Physical Cleanliness.**
This is the removal of all visible dirt or contamination from a surface. This level of cleanliness is verified by a visual test only.
- 2. Chemical Cleanliness.**
This is defined as the removal of all visible dirt or contamination as well as microscopic residues, which are detectable by either taste or smell but not by the naked eye.
- 3. Bacteriological Cleanliness.**
This can only be achieved with the use of a disinfectant that will kill all pathogenic bacteria and the majority of other bacteria.
- 4. Sterility.**
Quite simply this is the destruction of all known micro-organisms.

The recommendations given in this document for CIP will address the first three definitions.

In most installations it is important to ensure the maximum recovery of pumped product residues from the production line at the end of each production run. Where this is a requirement, consideration should be given to mounting pumps with ports in the vertical plane to maximise their drainability. This will minimise any product loss, ease the cleaning of the system and reduce the requirement to dispose of or recycle the wash from the initial cleaning cycles. By maximising the recovery of product from the system both the efficiency of the production and cleaning processes will be increased.

Rotary lobe pumps are rarely used as the supply pump for CIP fluids. Centrifugal pumps are generally used during CIP for each phase of the cleaning cycle. For the majority of CIP cycles it is recommended that a differential pressure of 2 - 3 bar (30 - 45 psi) be created across the rotary lobe pump to promote efficient cleaning, whilst it is rotating at its normal operating speed. In many cases a valve is employed in the discharge line of the system to create the differential pressure across the pump and a by-pass loop installed around the pump to divert any excess of CIP liquid that the rotary lobe pump is unable to transfer. The valve(s) setting may be fluctuated during the CIP cycle to promote pressure/flow variations that may enhance the cleaning process.

During the CIP cycle there must always be sufficient flow of cleaning fluid being delivered by the CIP pump to make sure that the rotary lobe pump is neither starved of liquid at its inlet due to its own flow capability, or overpressurised at its inlet due to its tendency to act as a restriction if it is unable to transfer the full flow of the fluid being delivered to it.

Represented By:

KGO Group Ltd.
www.kgogroup.com

1200 Speers Rd., #52
Oakville, ON
Canada L6L 2X4

The information contained herein is correct at the time of issue, but may be subject to change without prior notice



Internationally accepted protocol for CIP suggests that during all phases of the CIP cycle a pipeline velocity of 1.5 - 3.0 m/s (5 - 10 ft/s) is required. Velocities within this range have proven to provide effective cleaning of our rotary lobe pumps although as a general rule the higher the velocity the greater the cleaning effect.

Generally the most effective cleaning processes incorporate five stages:

- 1) An initial rinse of clean, cold water.
- 2) Rinsing with an alkaline detergent.
- 3) Intermediate rinse with cold water.
- 4) Rinsing with an acidic disinfectant.
- 5) Final rinse with clean cold water.

The cycle times, temperatures, cleaning mediums and concentrations of the detergents used will all influence the effectiveness of the cleaning cycle and care must be taken when defining these to ensure they are suitable for use with the pumped media. Of equal importance is the chemical compatibility between the cleaning detergents and the pumped media wetted materials in the pumphead, and ensuring the pump is fitted with the correct temperature clearance rotors for the CIP cycle. Consideration should also be given to the disposal or recycling of used cleaning liquids and the potential requirement for handling concentrated detergents. Specialist's suppliers should make the final selection of cleaning detergents/disinfectants.

Within these guidelines a typical cleaning cycle for our pump ranges would be as follows:

1. Rinse with clean water at ambient temperature to remove any remaining residue. 10 to 15 minutes are usually sufficient for this part of the cycle but this will depend on the condition and volume of the residue to be removed.
2. Rinse with an alkaline detergent, typically a 2.5% solution of Caustic Soda (NaOH) at between 70 to 95°C (158°F to 203°F) for a period of 20 to 30 minutes. It is also common to add a wetting agent (surfactant) to lower the surface tension of the detergent and hence aid its cleansing ability. This phase of the cleaning cycle should dissolve and remove organic matter such as fats and proteins.
3. Intermediate rinse with clean water at ambient temperature for a period of 5 to 10 minutes. This phase should remove any residual detergents.
4. Rinse with an acidic disinfectant, typically a 2.5% solution of Nitric Acid (HNO₃) at ambient temperature for a period of 10 to 15 minutes. This phase of the cleaning cycle should remove proteins, mineral salts, lime and other deposits.
5. Final rinse with clean water at ambient temperature for a period of 10 to 15 minutes or until all traces of the cleaning fluid have been removed.

During the CIP cycles it is important that the required concentration of cleaning detergents is maintained consistently. A significant increase in concentration could cause damage to the pump and other components in the system. A significant decrease in concentration could affect the detergents cleaning efficiency. A facility for monitoring and adjusting the detergent concentration should be considered.



Cautionary Notes:

1. Rotary lobe pumps and other equipment installed in CIP systems have components within them that will expand and contract at different rates. Care should be taken not to subject them to rapid temperature cycling.
2. Pumped media containing particulate such as fibre, seeds or soft fleshy matter have to be evaluated carefully and on an individual basis, as the nature of these will provide an increased cleaning challenge. These types of product may typically require increased cleaning cycle times and/or increased velocities and pressures during the cleaning cycle.
3. CIP detergent liquids and the elevated temperatures typically used for CIP processes can cause a potential health risk. Always adhere to site Health and Safety regulations. If you are in any doubt over the safety aspect of applying CIP to our rotary lobe pumps, please consult further with Alfa Laval Pumps Ltd.
4. Always store and dispose of cleaning agents in accordance with site Health and Safety regulations.

After CIP cleaning an additional sterilisation in place process (SIP) may be required when highly sensitive pumped media is handled, inactivating any micro-organisms, which might be still present in the pump. The sterilisation can be carried out by means of chemicals, hot water or steam. For example, in the dairy industry the sterilisation temperature is approximately 145°C (293°F).