

# Clean in Place (CIP) Cleaning and Elastomer Seal Selection

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Clean in Place (CIP) is an industrial process or method used to clean the interior surfaces of process vessels, reactors, piping, and process machinery without dismantling the equipment. CIP is used in such industries as dairy, brewing, pharmaceutical, food & beverage, and cosmetics who's processes requires frequent sanitation and cleaning.

CIP cleaning offers special challenges for elastomer (rubber) seal selection. A typical CIP process might include flushing with water, alkali circulation, intermediate water rinse, acid circulation, draining, final rinse, and disinfection. In each CIP step the elastomer seal is subjected to very different chemical species and high temperatures. An elastomer is often selected on the basis of the fluid it is sealing for the manufacturing process, however the CIP process chemistry is often more aggressive toward the elastomer seals than the manufacturing process chemistry. It is very important that the elastomer seals are compatible with both the manufacturing process fluids and the CIP process.

## Process Sealing Considerations for Elastomer Selection

- Solvents: Polar / Nonpolar
- Oil, Fat, Grease, Water, Alcohol
- pH: Acidic or Alkaline
- Mineral Acids, Organic Acids, Amines
- Temperature: high and low
- Regulations: FDA, 3A, USP class VI
- Metal Detection of the seal
- Hygienic seal design

## CIP Sealing Considerations for Elastomer Selection

- Hot Water / Steam
- Alkaline Rinse Compatibility: NaOH or Soda
- Acid Rinse: Nitric Acid ( $\text{HNO}_3$ ), Phosphoric Acid ( $\text{H}_2\text{PO}_4$ )
- Tolerance for extractables from elastomer and polymer components
- Disinfectants and their effect on the elastomer

The preceding bullet points list a number of considerations that a process engineer and equipment manufacturer must consider when selecting a seal. The risk to contaminating the process and the final product can be very high. With the large number of sealing materials, seal designs, and sources for sealing products it is important that sealing experts be consulted.

For more information please contact [S W Jagels Materials & Technology, LLC](http://www.swjagels.com) on the web at <http://www.swjagels.com>.