

# Flush-Style Plunger Pump System Design Guide



Product Quality, Reliability and Support You Expect

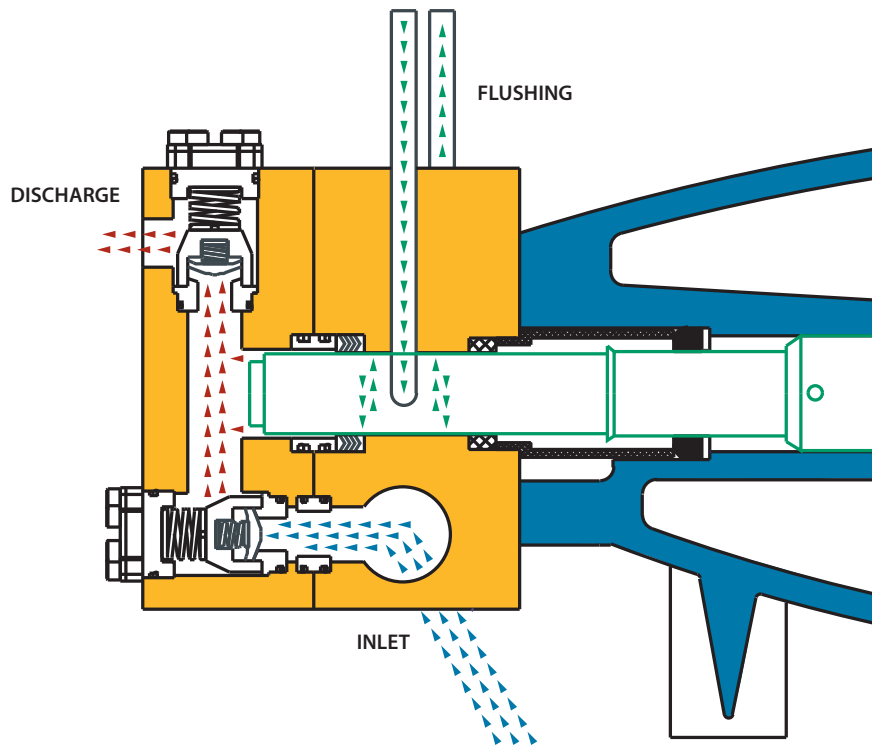
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# Flush-Style Pump Operation

Like all standard plunger pumps, a flush-style pump manifold is configured with an inlet and outlet port. However, on a flush-style pump, the manifold is also designed with an inlet and outlet flushing port to circulate liquid between the high pressure and low pressure seals to extend seal life and reducing ongoing pump maintenance. Cat Pumps offers a broad performance range of flush-style pumps from 3.0 – 240.0 gpm (15 – 908 lpm) and up to 10,000 psi (689 bar).

## Benefits of flushed pumps include:

- Greatly enhanced seal life
- Containment of pumped liquids
- Reduced maintenance
- Safer work environment
- Liquid compatibility



# Standard vs. Flush-Style Plunger Pump Applications

## Deionized Water (DI)

Flush-style pumps are used in DI water applications due to its low lubricity. Tap water is typically used as the flushing liquid.

## Liquids at Elevated Temperatures (Glycol/Boiler Feed Water)

Standard plunger pumps are rated to operate with a maximum fluid temperature between 140° - 180°F / 60°C – 82°C depending on the model. Using a flush style pump can substantially increase seal life. Special seals can be used when pumped liquid is up to 240°F / 115°C. Heated glycol and boiler feed water are two common fluids where a flush-style pump is used. Tap water (applications up to 180°F) and glycol are common flushing liquids for this application.

## Flushing Liquids

Other flushing liquids may be used as long as flushing liquids are chemically compatible with the primary pump wetted components and the primary pump liquid. Flushing liquids should have lubricating properties to enhance seal life.

## Local and State Environmental and Hazardous Waste Regulations

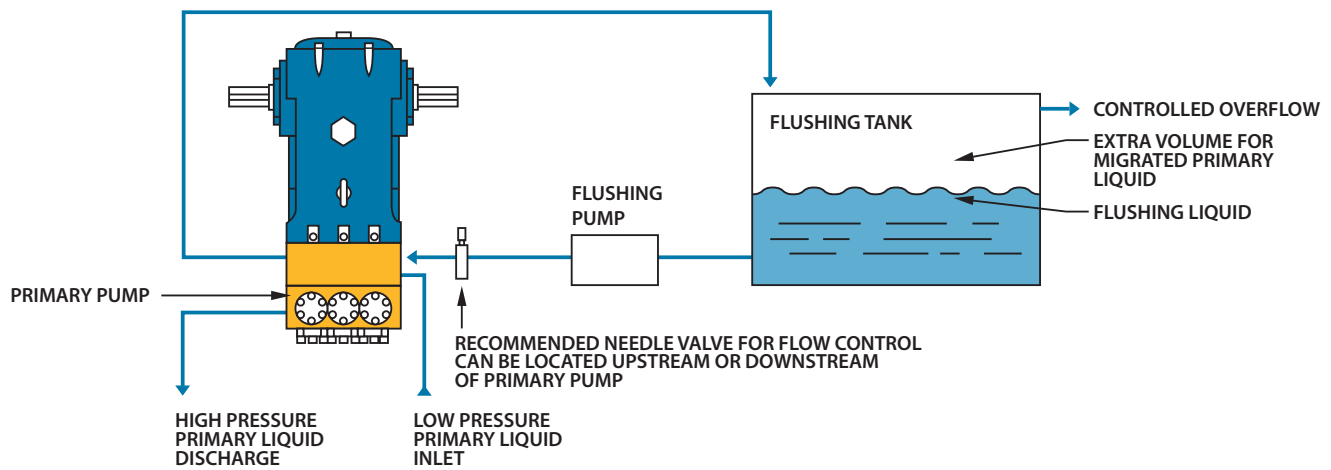
The end user must validate the flushing system design for compliance with all local and state environmental and hazardous waste regulations. Please contact the appropriate authorities.

# Flushing System Design

## System Components (Recirculating Tank)

A recirculating system is one method to control the flushing liquids. Major flushing system components are listed below.

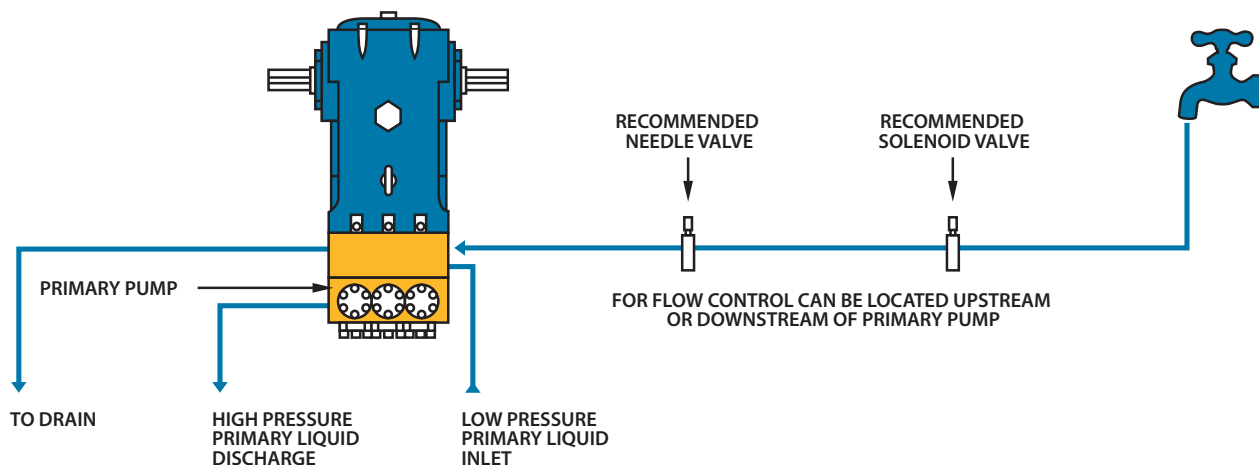
- Primary plunger pump, flush-style
- Flushing pump, minimum flow of 5 gph/18 lph
- Liquid tank, flush system
- Feed and return lines, flush system
- A means to collect and drain (controlled overflow) liquid as it seeps into the flushing side of the system.
- Recommended needle valve either upstream or downstream of primary pump



## System Components (Tap to Drain)

A tap to drain system is another method to control the flushing liquids. Major flushing system components are listed below.

- Primary plunger pump, flush-style
- Feed and return lines, flush system
- Tap water or non-potable water supply of at least 5 gph/18 lph
- Recommended needle valve and solenoid valve either upstream or downstream of primary pump



# Flushing System Guidelines

## Flow and Pressure Control

A low flushing flow, about 5 gph/18.9 lph, and low pressure is typical when flushing at fluids near ambient temperatures. The flushing liquid pressure does not need to be regulated as long as it is less than the system inlet pressure of the primary pump. Only a small amount of pressure is required to move the flushing liquid back to the tank, or to drain.

Flushing flow rates may be higher for liquids being pumped at elevated temperatures. If the flush is being used to cool the pump, there must be sufficient flow to remove enough heat to keep the pump at its specified operating temperature. The maximum operating temperature of the primary pump will vary based on the model selected.

## Fluid Migration

As the system operates, very small amounts of the primary liquid will migrate past the pump seals and into the flushing liquid. The tank should only be partially filled with the flushing liquid allowing space in the tank for the extra volume that will mix with the flush liquid over time.

This extra tank capacity will increase the time interval for maintaining the quality of the flushing liquid and the tank level. Monitoring flush inlet flow and comparing it to flush discharge flow can also give an indication of high pressure seal leakage if the discharge volume is greater than the inlet volume.

If the primary pump is shut-down, DO NOT run the flush pump, as trace amounts of the flushing liquid can migrate past the primary pumps high pressure seals contaminating the primary liquid.

## Controls and Sensors:

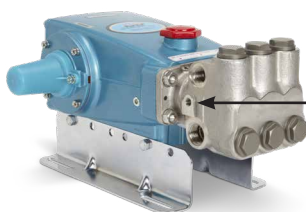
The flushing system can be manually or automatically controlled based on customer preference. Automated controls might include a PLC interface with various sensors and programming to monitor and control the flushing system.

**IMPORTANT: THE FLUSHING SYSTEM MUST BE OPERATING WHEN THE PRIMARY PUMP IS OPERATING OTHERWISE THE PRIMARY PUMP SEALS WILL FAIL PREMATURELY.**

## Filtration

Filtering the flushing liquid is not required unless contamination ingress is possible in the application environment.

## Flush Pump Styles



Model numbers ending with "C"  
are cast manifold flush pumps

Flushing Port  
(Each Side)



Model numbers ending with "K"  
are block manifold flush pumps



### CAT PUMPS

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