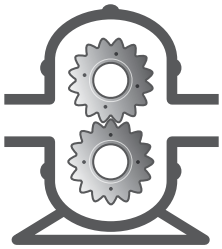
Pump Selection

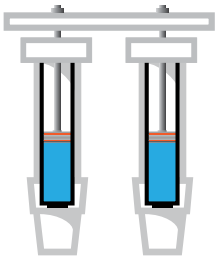
For Spray Foam & Polyurea Applications

There are many things to consider when selecting a pump technology to work with spray foams and polyureas to ensure a successful project. For accurate and reliable results, a pump should meet the following criteria.

Pump Criteria

- Accurate, repeatable dispensing with every stroke or cycle
- Capable of independently maintaining ratio in plural component applications
- Capable of handling a large variability of ambient conditions
- Capable of handling a wide range of material viscosities
- Capable of handling varying triggering patterns and speeds
- Capable of handling the effects of isocyantes (gumming, crystalizing, and hardening)
- The need to hold static pressure when not triggering
- Provide long-term reliability and minimal downtime for the user
- Serviceable at a reasonable cost





Gear Pumps vs Piston Pumps

To better understand how gear pumps and piston pumps compare when working with isocyanates lets review how each pump type measures up to the list of Pump Criteria outlined above.

Check out the chart and information on the back side of this document to see for yourself which type of pump best suits your business's needs.

After reviewing the data it is clear that although gear pumps may be capable of dispensing the materials, there are risks, costs, and other potential issues inherent to using gear pumps with plural component isocyanate chemistries.

Gear Pumps vs Piston Pumps Chart on back side

Gear Pumps vs Piston Pumps

Criteria	Gear Pumps	Piston Pumps
Accurate, repeatable dispensing with every stroke or cycle	Gear Pumps experience “fluid slip”. Fluid slip is the quantity of fluid that leaks from the higher-pressure discharge area to the lower-pressure suction area. It occurs because all gear pumps require some clearance between the rotating elements and the pump housing. This clearance provides a leak path between the discharge and suction sides. Gear pump components will also wear over time, causing an increase in fluid leakage and fluid shear.	Positive displacement piston pumps provide consistent volumetric performance over a large range of temperatures, pressures and viscosities. They are designed to hold stall pressure and can maintain accurate volume per cycle over long periods of use, even with aggressive fluids.
Capable of independently maintaining ratio in plural component applications	Due to fluid slip, gear pumps depend on flow meters to maintain ratio. In this equipment set-up, it is imperative that the flow meters are calibrated often to maintain accuracy. If flow meters are not calibrated, they may drive the system off-ratio by attempting to make ratio corrections and adjustments without knowing the true ratio. This provides a false sense of security because the system is reporting the ratio to be correct when in reality it may be dispensing off-ratio product.	Mechanically linked positive displacement piston pumps are not dependent on flow meters to control volume dispensed or to maintain ratio. By mechanically linking the pumps each time the A pump is cycled, the B pump must also cycle. This results in automatically pumping equal volumes of both A and B materials. Mechanically linked pumps provide consistent ratio in a tight tolerance band.
Capable of handling a large variability of ambient conditions	For high temperature applications, it is important to ensure that the operating temperature range is compatible with the pump specification. Thermal expansion of the casing and gears reduces clearances within a pump, which can lead to increased wear and, in extreme cases, pump failure.	Temperature has little to no effect on the function of piston pumps.
Capable of handling a wide range of material viscosities	Fluid slip is not constant in gear pumps. There are several contributing factors that can change the amount of fluid slip for a given pump. A large variable affecting fluid slippage is material viscosity. Less viscous fluids will have more fluid leakage, and thicker fluids will have less fluid leakage.	Piston pumps are designed to handle a wide range of viscosities. The changing of viscosity throughout the day, or from chemistry to chemistry, has little to no effect on the performance of piston pumps.
Capable of handling varying triggering patterns and speeds	Due to fluid slippage inherent in gear pumps, every time the trigger is released fluid slippage occurs. Once the trigger is pulled again it takes some time for the system to self-adjust and attempt to correct ratio. This effect is exaggerated in periods of rapid triggering and it may be very difficult for the system to maintain an accurate ratio.	Piston pumps are accurate for use in start and stop applications, and are designed to provide repeatable and predictable results. The design of a piston pump utilizes ball checks to maintain stall pressure when not triggering. By maintaining stall pressure, piston pumps maintain consistent ratio.
Capable of handling the effects of isocyantes (gumming, crystalizing, and hardening)	Isocyanates are dilatant liquids, meaning that when they are subjected to high shear and agitation, their viscosity tends to increase. Gear pumps shear more than piston pumps, which makes them more susceptible to causing the ISO to thicken, gum-up and eventually even lock up the pump.	Piston pumps are capable of moving viscous fluids, slurries and abrasives with proper valve design. Piston pumps are regarded as low-shear pumps, as they transfer fluids in and out of a chamber with the help of ball checks.
The need to hold static pressure when not triggering	Due to the fluid slippage inherent in gear pumps, these pumps have trouble holding stall pressure. Being unable to maintain stall pressure leads to ratio overshoots and undershoots as the flow is corrected to compensate for fluid leakage.	The inlet and outlet ball check design of piston pumps allows them to accurately hold stall pressure when not triggering.
Provide long-term reliability and minimal downtime for the user	Gear pumps will wear over time and require maintenance or replacement. Fluid shear, caused by gear pumps, may cause ISO issues that will require pump maintenance. Flow meters will also require field calibration to account for changes in materials, viscosities, flow rates, ambient conditions and equipment wear.	Piston pumps are designed for long-life applications. With very few moving parts, they can run for long periods of time with little to no maintenance and downtime.
Easy to service and at a reasonable cost	Gear pumps may be difficult to service and repair. Many parts need to be inspected; wear between gear teeth and housing, bearing wear, gear wear, shaft wear, chemical deterioration, bulged cover, etc. With replacement of any of these parts, the fluid meters will require recalibration.	Piston pumps used on the Reactor incorporate a quick knock-down design that allows easy service and maintenance. Piston pumps are easy to repair and generally require just a new set of seals.