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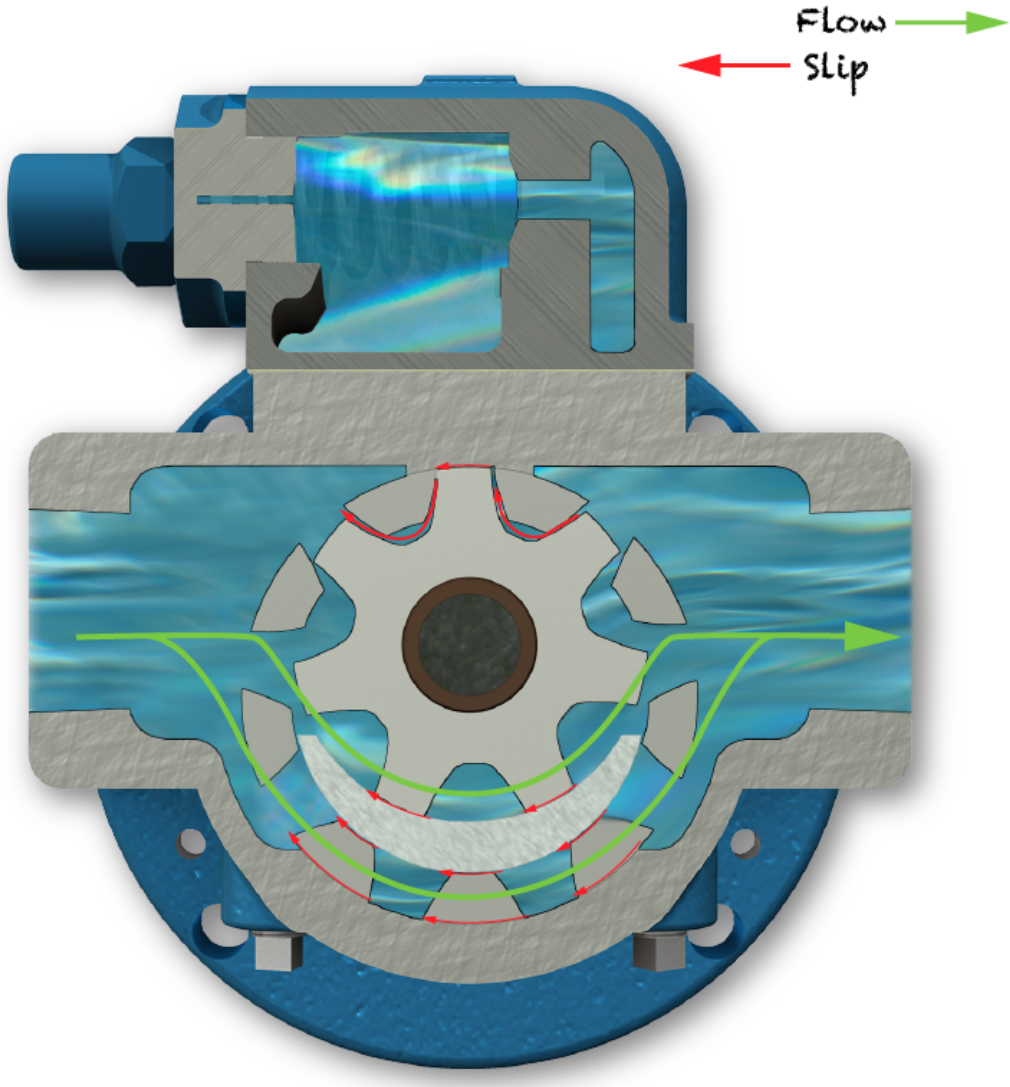
SUMMIT™

SIXTY SECONDS WITH SUMMIT PUMP : VOL 1-25

What is *slip*? How does it affect
Positive Displacement Pump performance?

Is Your Pump Slipping?

Fluid slip is a common term used to describe reverse fluid flow inside a pump or other turbomachinery. Slip is affected by internal clearances of the parts, temperature, pressure and viscosity.

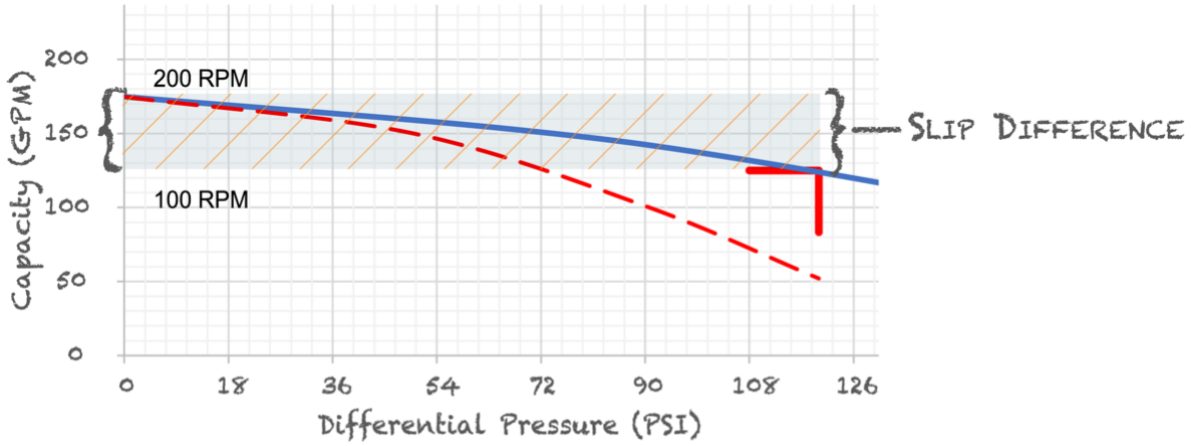


Click for Summit positive displacement pumps

In a positive displacement pump, slip can be easily calculated just by looking at the flow being produced while in operation and subtracted from the nominal flow rate of the pump per one revolution.

$$\text{Slip} = \left(\frac{\text{Gallons}}{\text{1 Revolution}}\right) \text{RPM} - \text{Measured Flow Rate}$$

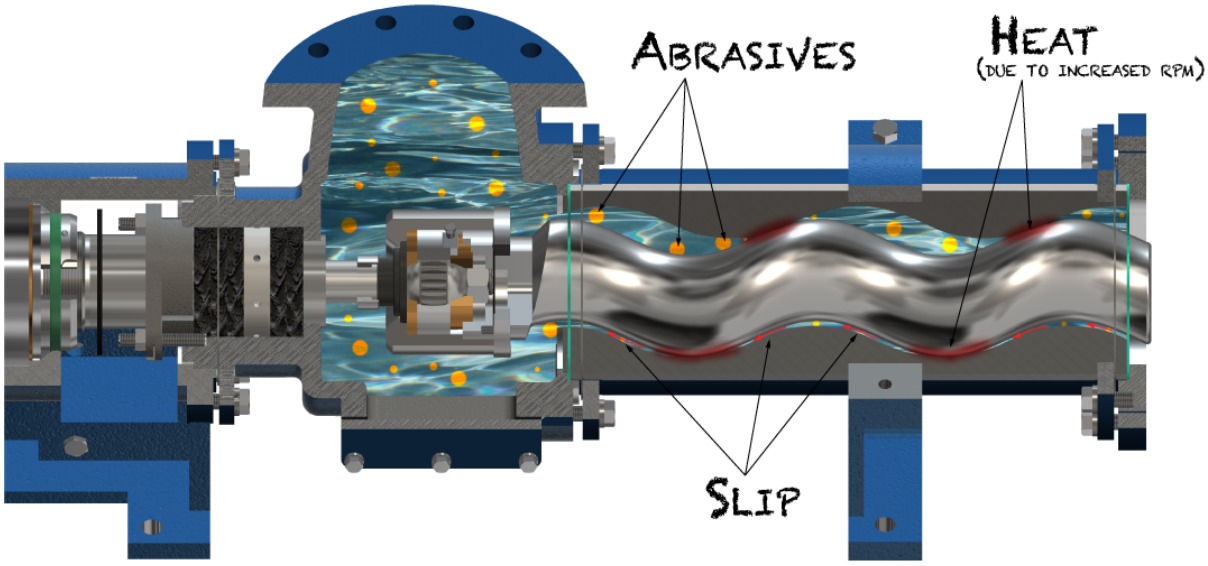
Another way to determine the amount of slip is looking at the pump curve. At 0 psi, the pump is producing its nominal flow at the RPM. Notice as the pressure increases running at the same RPM, the flow will decrease. The difference between the operating pressure and 0 psi is the amount of fluid slip the pump is experiencing. This method is more of an approximation whereas the above measured flow minus the nominal flow per revolution is more accurate.



Why Should we Care About Slip?

Most importantly, too much slip can increase wear and decrease pump life, especially if the fluid is abrasive or has solids. Abrasive fluid passing through the clearances of the internal parts has the same effect of sand blasting. This opens up the clearances even more, amplifying the issue.

Next, too much slip can increase the cost of operation and loss of efficiency. In a positive displacement pump, if you are not getting the desired flow rate the first thing you do is turn up the speed, but doing this also increases the required power needed to meet same flow and pressure.



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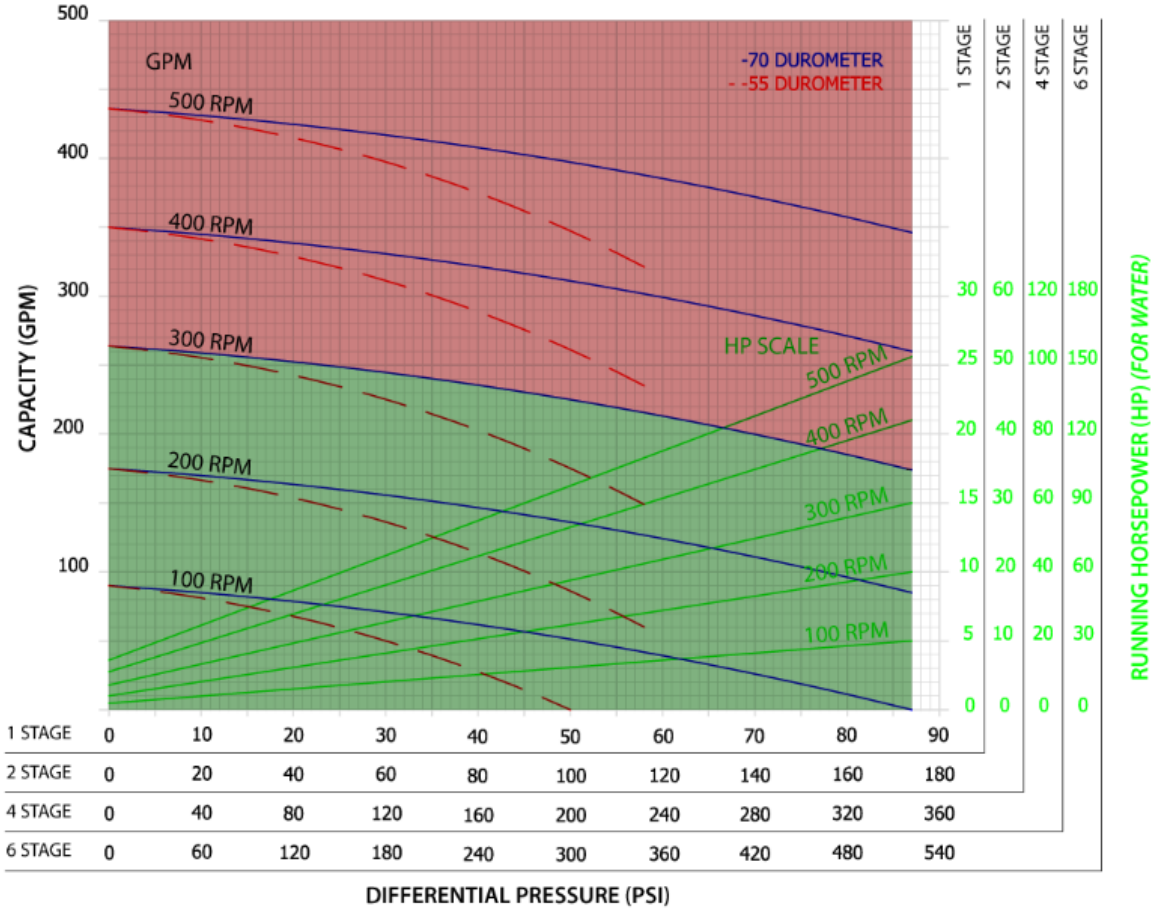
Excessive amounts of slip will introduce heat into the pump. This is critical in both the Progressive Cavity and Internal Gear Pump lines. Elastomers in the Progressive Cavity's stator, or any rubber, has a set life limit based on how much heat it can absorb. The more heat it absorbs, the shorter its life.

The clearances in the Internal Gear Pump are extremely tight and with extra heat introduced can cause the rotor and idler to expand and potentially lock up against the head or casing. As a side note, if the safety relief valve is being used as a flow throttling mechanism, it can also cause the rotor and idler to expand as well.

How do you Decrease Slip?

When sizing positive displacement pumps, our guidelines is to **keep slip under 15% of the desired flow rate**. One option to achieve this is to choose a smaller pump, but keep in mind RPM restrictions. When sizing Progressive Cavity pumps, our guideline is nothing faster than 300 RPM, to minimize the amount of heat generated to maximize stator elastomer life.

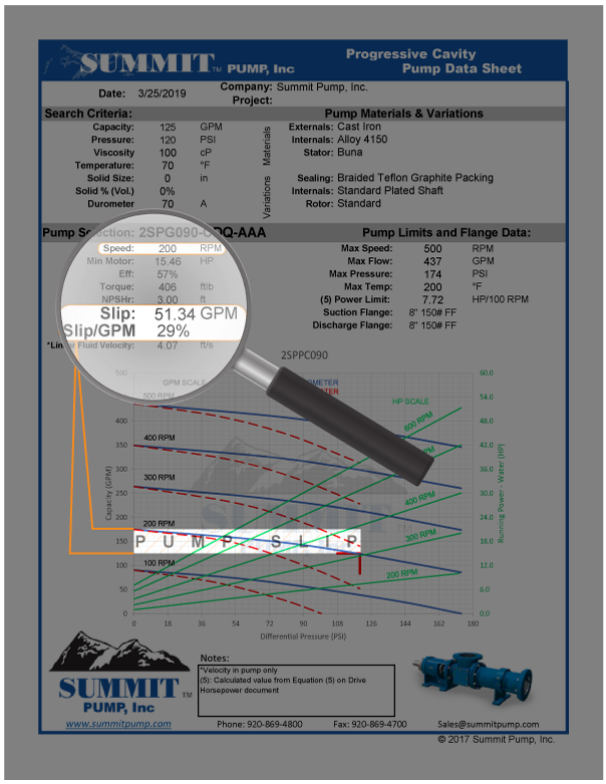


"Summit Pump Man,
I don't want to change my existing pump size, what else can I do to minimize slip?"

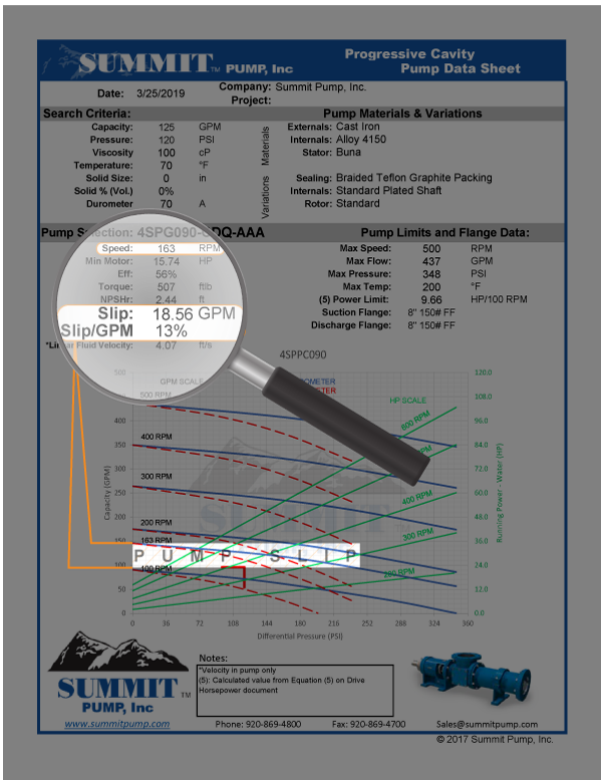
Reduce the pressure of the system. Reduce the all unnecessary fittings, increase pipe diameter, operate at a lower flow rate, ensure all filters and pipe runs are clean of debris, shorten the distance the fluid has to run.

A convenient feature of the Progressive Cavity pump is the ability to simply **change the stage of the pump**. For example, increasing a 2-stage rotor and stator to a 4-stage will reduce the amount of pressure per stage the pump experiences. Ultimately, reducing the amount of slip by a factor of the stage change. As with everything, there is always a tradeoff, torque and power required will increase and resulting factors need to be examined, such as motor size, pump frame size and location space available.

Two Stage Pump



Four Stage Pump



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