AIR OPERATED DIAPHRAGM PUMPS

TECHNICAL GUIDE & ACCESSORIES

CHEMICAL RESISTANCE

There are many inquiries concerning the pumping of paint, ink or adhesive. You need to ask —

1. Is the fluid solvent or water based?
2. What is the viscosity?
3. What is the temperature?

If the customer does not know if the fluid is solvent or water based, ask what they use to clean up the product. This is usually a primary component of the fluid.

If the fluid is solvent based, then Nylon / TFE models usually are appropriate unless the solvent is a chlorinated solvent, such as trichlorethylene or trichlor . . . or perchlor . . . anything, then the PVDF / TFE model must be used. (Sometimes acetal can be used, not often though.) *No matter what is generally acceptable, you must check resistance charts to make sure that a compatible material is used.* Use the PP / Geolast models in water based inks, adhesives and paints.

A common term for sodium hydroxide is caustic soda — use PP / TFE models.

When checking for material compatibility always ask the percentage and temperature of the fluid. Resistance is often associated with strength and temperature. Never advise that anything other than '' rated materials be used. Check several charts for the right combination. If the rating fluctuates radically from chart to chart, go with the most conservative rating. The end user should be informed of the fluctuation and should consult with a chemist or the manufacturer of the product for the correct material.

If you can't find a particular chemical on any of the charts, it is probably a proprietary product name. Someone must contact the manufacturer listed on the MSDS sheet and have the manufacturer recommend a material based on available models.

Bleach or sodium hypochlorite (the major component of bleach) should be pumped with the PVDF / TFE model only. Bleach will embrittle polypropylene no matter what compatibility charts say.

Watch sulfuric acid. When the concentration starts to exceed 50%, it is recommended that a switch from the PP / TFE model to the PVDF / TFE model even though charts indicate otherwise. Also, the strength of the acid may increase and the end user is not aware that polypropylene is no longer compatible. It is safer to select PVDF / TFE models.

Remember: Although the charts say that hydrofluoric acid is O. K. with polypropylene, if the flow rate dictates 1" or larger pump, PVDF must be used since HF eats the glass filling in the poloypropylene 1" and larger pumps. The ½" models are not glass reinforced, so the ½" PP / TFE model is appropriate.

The PVDF models are the only models recommended for food applications. The PVDF and TFE used in the pumps have the FDA, 3A dairy class rating (we have the specifications available). The pump is not a true sanitary pump, but the materials are pure. The polypropylene and nylon used in the ½" models are pure materials, but not considered sanitary although they are used in some food processes at the request of the end user. The 1" and larger models in nylon and polypropylene (PP / TFE and Nylon / TFE models) are fiberglass reinforced, and they are not recommended for food applications because the glass filling can leach into the fluid.

Another help in selecting compatible materials is to have the customer list other materials in use in the system. Are polypropylene, PVDF or nylon valves and fittings used elsewhere with the product?

Pumps can be tracked by serial number, however if the pump label is missing, the pumps are color coded for easy identification:

COLOR CODE

PP / Geolast - white muffler plate, black intermediate
PP / TFE - black muffler plate, black intermediate
PVDF / TFE - blue muffler plate, black intermediate
Nylon / TFE - red muffler plate, red intermediate

DIAPHRAGM MATERIAL

The diaphragms listed as Buna-N are not a true nitrile. They are called Geolast and are a blend of nitrile and polypropylene. Due to the limited chemical resistance information on this compound, and the fact that they meet and exceed the chemical resistance of nitrile, we list them as Buna-N (the trade name for nitrile). Santoprene®, which is used in the PP / TFE, Nylon / TFE and PVDF / TFE models (behind the TFE overlay) is a blend of EPDM and poly-propylene. This diaphragm meets and exceeds the chemical resistance of EPDM and is used in the EPDM option. Again, due to limited resistance data, EPDM listings can be used. Santoprene and Geolast diaphragms have incredible cycle life and are relatively resistant to abrasion.

Although the diaphragms are quite stiff (40 durometer), the pumps have no difficulty pumping. This is the recommended durometer for maximum cycle life and chemical resistance.

Optional elastomers include Viton® and EPDM. Viton is not available for the 2" or ¼" pumps.

TEMPERATURE

Polypropylene gets brittle under 32°F. PVDF can be used at temperatures down to 0°. PVDF models are rated to 200°F; all other models are rated at 150°F. Maximum pressures, temperatures and solid particle size are in the pump specifications on Bulletin P-605. Know the pump specifications.

PRESSURE

Generally, start-up pressure of the pump is around

20 - 25 PSI, not mentioned in any literature. If the pumps are operated at higher than 100 PSI they will leak at the band clamps. This is a design feature for pressure relief, *the pump will not explode.*

DUAL MANIFOLDS

The ½" models are shipped with (2) double manifolds. If the customer requests a pump built with double manifolds, it can be done. If the customer does not want the double manifolds, there is no refund on this item.

The 1" models have the double manifold capability built into the elbows. The manifold is discarded and the elbows are rotated 180°. There is a female thread within the elbow for connection. Connection is made through the side of the pump. See the diagram in the 1" operating instructions.

The ¼" models have an optional dual manifold feature and request for the dual manifold must be indicated at the time of order. The factory has to configure the pump for dual manifold applications because machining operations must be done to certain internal parts.

The 2" models do not have the double manifold capability because they have flanged connections.

NOTE: When using the double manifold, the pump cannot have one side of the discharge closed and expect the pump to operate. The pump will not pump with one side closed. Instead use a 'Y' or 'T' fitting on a single manifold. One side or the other may be closed with no problem.

REGULATING THE FLOW RATE

The pump's capacity can be regulated with a valve on the discharge of the pump, with air pressure (do not reduce less than 20 PSI) if high discharge pressure is not needed, or by using a valve on the discharge of the pump. *Very important: The pump is not harmed if the air pressure is constant to the air valve and the fluid discharge valve is closed. This is a common way of operating the pump. Avoid valves on the fluid suction line.*

AIR LINE LUBRICATION

Each pump has a sticker applied that says "do not use air line lubrication". If the air line is centrally lubricated, it is best to filter out the oil. We do not recommend the use of an air line lubricator. There have been cases where the user has added an inappropriate lubrication which caused swelling to occur in the nitrile lip seals which effectively locked up the air valve. Of course, the failure was blamed on the pump.

VISCOSITY

SSU = Saybolt seconds
cps = centipoise

Both are measurements of viscosity. See viscosity curve for loss of capacity within a pump. The pump curves are derived from water based tests with no fittings, etc. Flow rate may vary significantly with higher specific gravity, multiple fittings, suction lift, etc.

Specific gravity (referred to as the S. G. of the fluid) is a measurement of the weight of a fluid. Water has a specific gravity of 1. Full strength sulfuric acid has a specific gravity of 1.75. It is almost twice as heavy as water. Most acids are heavier than water. Oil is lighter than water. Although a substance may be viscous, it may not necessarily have a high S. G, e. g. face cream. It is light weight, but highly viscous. It is best to be extremely conservative when discussing capacity. It is impossible to tesxt and provide charts for every type of application.

When pumping viscous fluids NOTE:
1. Use large suction lines (up to 1½ times the size of the fluid inlet), dual suction can also be used.
2. Position the pump as close to the level of the fluid as possible or below the level of the fluid (known as a flooded suction)
3. Start the pump slowly using the air flow control.

Use these guide lines and the application will be successful.

SUCTION LIFT AND VISCOSITY

Suction lift is measured vertically from the level of the fluid to the pump. As viscosity increases, suction lift decreases. When you have a highly viscous substance, such as waste oil, the pump should be placed at the level of the fluid or below, if possible. For example, when pumping a highly visous substance from a drum, the pump should be placed right on the top of the drum, not three feet higher.

UV EXPOSURE

The PVDF / TFE models are the only plastic pumps which have UV stabilized plastic. Polypropylene and other plastic models should be shrouded from UV rays if installed in a permanent outdoor application.

FLAMMABLE FLUIDS

Flammable fluids are generally non-conductive. When non-conductive fluids are pumped in plastic, non-conductive pumps, a static charge may occur. Use the conductive models available or make sure the pump is grounded through metal fittings at the suction and discharge. The end user should always be reminded to ground the pump.

SUBMERGED APPLICATIONS

When submerging the pump, the exhaust must be piped above the level of the fluid. Also, the metallic fasteners must be compatible with the fluid.

TROUBLE SHOOTING

Prior to giving technical assistance the following information must be known:
1. Find out the serial number, model and date of installation.
2. Find out the fluid, temperature and other parameters of the application.

PRIMING

When someone says the pump is not priming they mean it is not pulling the fluid into the pump. The pump may be cycling, but

no fluid transfer is taking place. Several factors could be affecting the pump.

1. Sludge or particles may have been sucked up into the pump and may be preventing the check valve from making a positive seal between ball and seat.
   Solution: Flush the pump, clean the check valves.
2. There may be a suction leak on one of the suction line fittings. This will also be indicated by poor flow rate mixed with lots of air in the discharge.
   Solution : Check all fittings with a soapy solution for any bubbling. Use Teflon® tape to seal fittings.
3. The suction lift specifications may be exceeded.
   Solution: Pump must be closer to the fluid. Wetting the valve seats by pouring some fluid in through the discharge will improve the suction lift. This may work if the application is continuous and the pump is not required to go through a dry lift process on a regular basis.
4. The fluid is highly viscous and the suction lines are the same size or smaller than the size of the manifold of the pump.
   Solution: Increase the size of the line (use a reducing fitting into the manifold) and start the pump slowly using the air flow control valve.

LEAKAGE

1. Make sure all nuts are secured to the proper torque. A torque wrench must be used.
2. If Teflon "O"-rings within the pump were not replaced during service, they may need to be replaced in order to make a more perfect seal.

LOW FLOW RATE

1. Check for obstructions in either fluid line. Line size should be the same size or larger than suction port.
2. Check for obstruction in air line.
3. Confirm air pressure at the air valve. Due to the friction and air usage elsewhere, line pressure can fluctuate widely between air compressor and pump.

PUMP WILL NOT CYCLE

1. Check for obstructions in the air line and fluid lines.
2. Air pressure must be at least 20 PSI. If there is discharge line pressure, the air pressure differential must be not only sufficient to start the pump, but must be great enough to produce the desired flow rate.

PREMATURE DESTRUCTION OF WETTED COMPONENTS

1. Inquire about runaway tow motors.
2. If there are small lines in the plastic coupled with actual cracking at the weld line, this is typical of chemical attack. Temperature and strength of fluid need to be re-examined.
3. If there is severe abrasion of the valve seats and premature rupture of diaphragms, the fluid is abrasive. Slow down the velocity of the fluid and abrasion will be minimized.
4. Premature failure of diaphragms is generally due to sharp objects in the fluid. Filtration of the suction line may be needed.

INSTALLATION AND PERIODIC MAINTENANCE

Each diaphragm pump is provided with torque requirements for all fasteners. Due to the flow of plastic, all fasteners should be retorqued prior to installation and periodically as part of a regular maintenance program. Diaphragms should also be checked to avoid rupture of the fluid. Diaphragms get approximately 6 - 7 million cycles of life. This means that if the pump is pumping at 100 PSI, 24 hours a day, 7 days a week, the diaphragms should be checked in about 3 - 4 months for fatigue.

ACCESSORIES

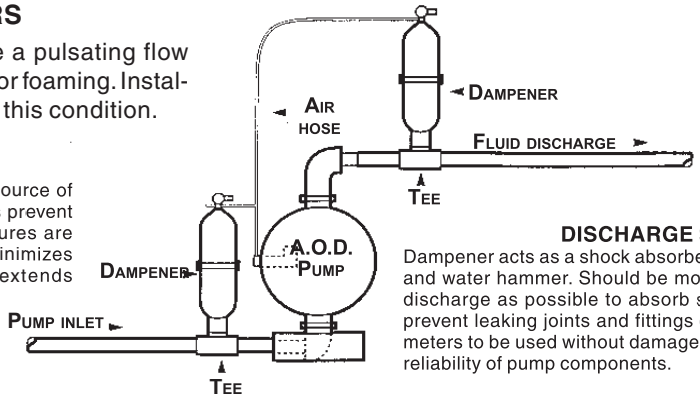
PULSATION DAMPENERS

Air operated diaphragm pumps provide a pulsating flow which may cause pressure spikes, splashing or foaming. Installation of a pulsation dampener will minimize this condition.

TYPICAL INSTALLATION

SUCTION SIDE

Dampener acts as an accumulator to provide a close source of product when pump inlet check balls are opened. Helps prevent cavitation. Acts as a dampener when high inlet pressures are generated as pump's inlet check valves are closed. Minimizes stress and shock on pipes, fittings, manifolds and extends diaphragm life.



DISCHARGE SIDE

Dampener acts as a shock absorber to minimize pulsations and water hammer. Should be mounted as close to pump discharge as possible to absorb shock at its source. Will prevent leaking joints and fittings due to pulsation. Allows meters to be used without damage and extends the life and reliability of pump components.

AIR PRESSURE REGULATOR VALVE

Air operated diaphragm pumps may develop fluid pressure beyond the ratings of hose and fittings (particularly at elevated temperatures). Installation of an air pressure regulator is recommended to ensure safe systems operation.

AIR OPERATED DIAPHRAGM PUMP ACCESSORIES

PULSATION DAMPENERS

1" MANUAL MODEL

Designed to eliminate pressure surges and pulsations

- **Non metallic solution contact**
  Polypropylene to 125 psig @ 175° F
  PVDF to 125 psig @ 225° F
  Nylon to 125 psig @ 175° F
- **Manual or automatic adjusting models.**
- **For pump sizes - ½", 1" or 2"**
- **Improve accuracy and life of pumps and meters.**
- **Stainless steel clamp band design for easy maintenance.**
- **One-way air inlet valve prevents product backflow if bladder is ruptured.**
- **Eliminates costly pipe system vibration and leakage.**

Pulsation Dampeners are uniquely designed to eliminate 97% of all types of fluid flow pressure spikes. The unwanted result of these pressure spikes is hydraulic shock, material foaming or material splashing.

Pulsation Dampeners reliably protect diaphragm pumps, pipes, fittings and equipment from vibration and fatigue. Pumps and filter chambers last longer and are more reliable when they are not exposed to harmful fluid shock waves. Installation is easy. Connect to fluid line via tee and supply compressed air or nitrogen to charge the dampener.

The highly efficient dampening provided by these devices makes them ideal for use as a suction stabilizer on all types of pumps or after valves to also protect downstream equipment.

Pulsation Dampeners come in two models and three sizes. Manual adjustment for continuous dampening requirements. Automatic adjusting for variable pump discharge pressures.

TO ORDER

SIZE NPT	MODEL	PRICE CODE NO.	MATERIAL	ADD TO MODEL NO.	ADD TO PRICE CODE NO.	ADJUSTMENT	ADD TO MODEL NO.	ADD TO PRICE CODE NO.	BLADDER MATERIAL	ADD TO MODEL NO.	ADD TO PRICE CODE NO.
½"	Dampener-½	55-73	Polypropylene	PP	0	Manual	M	0	EPDM	B	-B
1"	Dampener-1	55-74	(Glass fiber) Nylon	N	1			1	Viton	L	-L
2"	Dampener-2	55-75	PVDF	K	2	Automatic	A	Buna N	TFE	V	-V
										T	-T

AIR PRESSURE REGULATORS

Designed for applications where controlled pressure must be held. Adjustments are made with a special key, which can then be easily removbed to prevent tampering.

In the event of line surges, an integral stop in the bonet prevents diaphragm rupture by limiting diaphragm plate travel. Maximum operating inlet pressure is 250 PSIG. Outlet pressure ranbe is 5 to 125 PSIG. Regulators are furnished without gauge, which is listed below as an option????

TO ORDER

AIR INLET SIZE FNPT	CFM @ 100 PSI	PRICE CODE NO.
¼"	20	79-0305
½"	50	79-0306
¾"	120	79-0307
1"	150	79-0308

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