

The Case Against The Bladder Pump

Bladder pumps have historically been used for sampling at many contaminated sites across the US. Bladder pumps, I believe, had their purpose at one time. As far as submersible pumps, prior to the development of 2" centrifugal pumps (e.g. the 110-volt 2" Grundfos) and especially the 12-volt centrifugal pump, they were pretty much the only option other than a bailer. However, in my opinion, bladder pumps are old technology and there are numerous draw backs to using bladder pumps for low flow sampling. These draw backs are as follows:

- The surging action of bladder pumps causes increased turbidity within the well thus slowing the overall sampling process.
- The surging action of bladder pumps increases the difficulty in staying within required maximum draw down (4 inches or less) outlined by the USEPA Low Flow method. This can affect the technical quality of the data.
- The intermittent surging of a bladder pumps makes filling 40mil VOAs without aeration more difficult, again potentially affecting the quality of the data.
- Decontamination of a bladder pump is more difficult and time consuming because of the plastic construction of the bladder itself and the intermittent pulsing.
- Because of the intermittent flow, determining an accurate flow rate (millimeters per minute) is much more difficult using a bladder pump especially for wells requiring below average flow rates. Knowing an accurate flow rate is critical in determining/verifying the frequency of readings used to determine field parameter stability. Readings taken too frequently can give the illusion of stability when in actuality the operator is taking readings from the same water (or mostly the same water) over and over.
- The pause in flow between surges while using a bladder pump during the winter allows lines to freeze more easily, delaying the sampling process.
- The compressors used with bladder pumps tend to freeze in the winter also.
- Bladder pumps require 2 tubes (air line and water line), increasing costs.
- Bladder pumps themselves are significantly more expensive to operate, rent, and own.

What Do I Prefer And Why.

I recommend centrifugal pumps. Specifically, I like an all stainless steel centrifugal 12-volt pumps, such as the Proactive Hurricane. I am not affiliated with this company and have no reason other than the fact that I like their pumps to publish their web site. The benefits of an all Stainless Steel centrifugal 12-volt pump are as follows:

- The slower and smoother, continuous flow from a centrifugal pump minimizes turbidity within the well during sampling, increasing the quality of the data and the sampling process.

- The slower and smoother continuous flow from a centrifugal pump increases the ability to stay within required maximum draw down (4 inches or less) outlined by the USEPA Low Flow method.
- The slower and smoother continuous flow from a centrifugal pump makes filling 40mil VOAs easier, minimizing aeration of the water.
- Decontamination of an all Stainless Steel centrifugal pump is substantially more effective and significantly less time consuming than a plastic bladder pump.
- The slower and smoother continuous flow from a centrifugal pump allows for the use of "direct read" flow meters. Flow rate determination is precise and allows the operator to quickly and easily determine/verify the frequency of readings use to determine field parameter stability.
- The continuous flow from a centrifugal pump allows water to keep moving and minimizes the opportunity for water to freeze in the lines in the winter and delay the sampling process
- Centrifugal pumps don't have compressors to freeze in the winter.
- Centrifugal pumps only require 1 tube/line, versus 2 tubes/lines (air line and water line) with a bladder pump. This saves on material costs.
- Centrifugal pumps are about ½ the cost to operate, rent and purchase.

Stainless Steel Centrifugal pumps are approved and allowed by the USEPA and nearly every state for water sampling for nearly all chemical parameters. I am not aware of any reason or scientific basis why a sample from a centrifugal pump would be any less valid or accurate than a sample collected using a bladder pump. On the contrary, for the reasons listed above, a sample collected properly using a centrifugal pump will increase the quality of the sample and the data collected during the sampling while simultaneously saving material costs and sample time.

I've "heard" people mention two reason or issues with collecting samples using a centrifugal pump. One reason they mention is temperature. The claim is that water passing through the pump increases in temperature which could potentially affect the results. The second reason I've heard is that the centrifugal action (spinning turbines in the pump) can "shear" molecules affecting the results.

Regarding the temperature issue: I suggest that if your pump is heating up while sampling your using the wrong size pump/tubing combination. A pump that is deadheaded or near deadheaded can heat up, but a pump working within its design range and flow range does not heat up in any significant manner. I've run pumps at full speed for 10 - 15 minutes while deconing after sampling and have never felt a warm pump, the pump usually feels about the same temperature as the water. So, if you're using the right pump for the job, temperature should be unaffected.

Regarding the shearing of molecules: although I've heard this a few times, I've never seen any studies or documentation of the effect. Similar to the scenario described above, if you are deadheading or nearly deadheading your pump I can see how maybe there might be some shearing or degradation of a molecule, but a pump working within its design range and flow range and properly matched to the proper size tubing should not have any significant molecular "shearing". If anyone knows of any studies related to this I would be interested in seeing

them. I've "Googled", "Binged" and "Yahooed" the topic numerous times and have yet to find any studies or documentation.

If you have an opinion different than mine and can give valid reasons why, I would appreciate hearing from you regarding the topic.

PG

President