



Mud Drilling and Pump Selection, and a Notable Innovation

When choosing a size and type of mud pump for your drilling project, there are several factors to consider. These would include not only cost and size of pump that best fits your drilling rig, but also the diameter, depth and hole conditions you are drilling through. I know that this sounds like a lot to consider, but if you are set up the right way before the job starts, you will thank me later.

Recommended practice is to maintain a minimum of 100 to 150 feet per minute of uphole velocity for drill cuttings. Larger diameter wells for irrigation, agriculture or municipalities may violate this rule, because it may not be economically feasible to pump this much mud for the job. Uphole velocity is determined by the flow rate of the mud system, diameter of the borehole and the diameter of the drill pipe. There are many tools, including handbooks, rule of thumb, slide rule calculators and now apps on your handheld device, to calculate velocity. It is always good to remember the time it takes to get the cuttings off the bottom of the well. If you are drilling at 200 feet, then a 100-foot-per-minute velocity means that it would take two minutes to get the cuttings out of the hole. This is always a good reminder of what you are drilling through and how long ago it was that you drilled it. Ground conditions and rock formations are ever changing as you go deeper. Wouldn't it be nice if they all remained the same?

THE TRUE INNOVATION WAS PROVIDING THE WELL DRILLER A SOLUTION FOR THEIR MUD PUMP REQUIREMENTS THAT WAS THE RIGHT SIZE AND WEIGHT TO INTEGRATE INTO BOTH EXISTING AND NEW DRILLING RIGS.

Centrifugal-style mud pumps are very popular in our industry due to their size and weight, as well as flow rate capacity for an affordable price. There are many models and brands out there, and most of them are very good value. How does a centrifugal mud pump work? The rotation of the impeller accelerates the fluid into the volute or diffuser chamber. The added energy from the acceleration increases the velocity and pressure of the fluid. These pumps are known to be very inefficient. This means that it takes more energy to increase the flow and pressure of the fluid when compared to a piston-style pump. However, you have a significant advantage in flow rates from a centrifugal pump versus a piston pump. If you are drilling deeper wells with heavier cuttings, you will be forced at some point to use a piston-style mud



Columnist Derek Anderson says that, when he worked with Ingersoll-Rand, the right-sizing of piston-style pumps to fit on mobile rigs presented an engineering problem. It was a problem, he says, that Centerline Manufacturing helped fix. Source: Derek Anderson / Drilling Equipment Resources

pump. They have much higher efficiencies in transferring the input energy into flow and pressure, therefore resulting in much higher pressure capabilities.

Piston-style mud pumps utilize a piston or plunger that travels back and forth in a chamber known as a cylinder. These pumps are also called "positive displace-

ment" pumps because they literally push the fluid forward. This fluid builds up pressure and forces a spring-loaded valve to open and allow the fluid to escape into the discharge piping of the pump and then down the borehole. Since the expansion process is much smaller (almost insignificant) compared to a centrifugal pump, there is much lower energy loss. Plunger-style pumps can develop upwards of 15,000 psi for well treatments and hydraulic fracturing. Centrifugal pumps, in comparison, usually operate below 300 psi. If you are comparing most drilling pumps, centrifugal pumps operate from 60 to 125 psi and piston pumps operate around 150 to 300 psi. There are many exceptions and special applications for drilling, but these numbers should cover 80 percent of all equipment operating out there.

The restriction of putting a piston-style mud pump onto drilling rigs has always been the physical size and weight to provide adequate flow and pressure to your drilling fluid. Because of this, the industry needed a new solution to this age-old issue.

A TRIBUTE TO INNOVATIONS

Enter Cory Miller of Centerline Manufacturing, who I recently recommended for recognition by the National Ground Water Association (NGWA) for significant contributions to the industry.

As the senior design engineer for Ingersoll-Rand's Deephole Drilling Business Unit, I had the distinct pleasure of working with him and incorporating his Centerline Mud Pump into our drilling rig platforms.

In the late '90s — and perhaps even earlier — Ingersoll-Rand had tried several times to develop a hydraulic-driven mud pump that would last an acceptable life- and duty-cycle for a well drilling contractor. With all of our resources and design wisdom, we were unable to solve this problem. Not only did Miller provide a solution, thus saving the size and weight of a typical gear-driven mud pump, he also provided a new offering — a mono-cylinder mud pump. This double-acting piston pump provided as much mud flow and pressure as a standard 5 X 6 duplex pump with incredible size and weight savings.

The true innovation was providing the well driller a solution for their

mud pump requirements that was the right size and weight to integrate into both existing and new drilling rigs. Regardless of drill rig manufacturer and hydraulic system design, Centerline has provided a mud pump integration on hundreds of customer's drilling rigs. Both mono-cylinder and duplex-cylinder pumps can fit nicely on the deck, across the frame or even be configured for under-deck mounting. This would not be possible with conventional mud pump designs.

Centerline stuck with their original design through all of the typical trials and tribulations that come with a new product integration. Over the course of the first several years, Miller found out that even the best of the highest quality hydraulic cylinders, valves and seals were not truly what they were represented to be. He then set off on an endeavor to bring everything in-house and began manufacturing all of his own components, including hydraulic valves. This gave him complete control over the quality of components that go into the finished product.

The second generation design for the Centerline Mud Pump is expected later this year, and I believe it will be a true game changer for this industry. It also will open up the application to many other industries that require a heavier-duty cycle for a piston pump application. **ND**

Derek Anderson is president of Drilling Equipment Resources, a family owned and operated drilling equipment and supply company based in Tulsa, Okla. He has had extensive experience in the drilling business over the past 23 years.