



Progressive cavity pumps feed a centrifuge

pumps can be used successfully in this type application and can produce reduced operating costs.

The Drilling Process

During the drilling process, clean drilling mud is pumped down through the tubing and serves as the driver for positive displacement motors. As it travels down the pipe, pressurizes the motor, goes through the nozzles of the drill bit and returns back to the surface through the annulus, the drilling mud provides lubricity and cooling to the rotating parts and flushes out the rock cuttings.

The viscosity and weight of the mud is critical for an efficient rate of penetration depending on the geologic formation. Also important is the selection of the bit and the fluid velocities of the drilling mud returning back to the surface as it flushes the cuttings from the bottom hole. Several types of drill bits are available, such as polycrystalline diamond compact bits and rock bits, which require the motor to rotate at a certain rpm. The higher rpm diamond bits will generate higher flush velocities where as the rock bits used at lower rpms will have slower linear velocity of the fluid in the annulus.

The solid pieces of rock are non-uniform in shape and can vary in size. Once at the surface level, they cannot be disposed without first being properly processed. Most drilling muds consist of synthetic chemicals and are expensive, so it is economical if they can be recycled. No matter what steps are taken, some mud will always adhere to the rock pieces. Therefore, it is extremely important to remove all traces of the mud from the rock. Specialized systems are required for cleaning the

Efficient Drill Cuttings Transfer with Progressive Cavity Pumps

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The ability to pump solids with less mud and more efficiency makes progressive cavity pumps an attractive choice.

Progressive cavity pumps (PCPs) have a unique advantage in handling solids, liquids, gases and a combination of all three. In applications in which the solid content is high and the liquid amounts are low, as long as the sealing lines are minimally lubricated, the solids handling capability of PCPs has

proven reliable and economical compared to alternate technologies, such as conveyors or augers.

Drill cuttings transfer is one area in which the progressive cavity pump is widely used and has helped end users reduce their operating costs. Individual PCP manufacturers should be contacted to see if their



cuttings to meet environmental regulations—some of which are centrifuges, shakers and customized systems designed by the major oil companies for their individual applications.

Offshore Applications

In offshore applications, space is a premium, which makes storage of the returned mud and cuttings impractical and expensive. To be processed, drill cuttings have to be shipped by barges from the rig to land. For the cuttings to be pumpable, often additional drilling mud has to be added to the slurry. This is again expensive, since the space on the barge is taken up by the greater volume of mud which limits the amount of cuttings that can be transported in each trip from rig to land.

The PCP can handle the pumping of cuttings with small quantities of mud, allowing a greater volume of cuttings to be brought to shore per barge trip. Every 1 percent of additional cuttings that can be transported per trip results in customer savings of thousands. Many PCPs can be mounted on the barge or on the rig. In most instances, these pumps function equally well in a vertical position to reduce the floor space on the rig.

Pump Selection

The selection of the right size pump is a function of the operating conditions and the cavity size. The modularity of the pump is an advantage. In one installation, the cutting dimensions were slightly larger than anticipated. The problem was resolved by changing the rotor/stator combination to one with a slightly larger cavity.

The ability of PCPs to maintain consistent flow ensures that the fluid amount in the system will stay the same. This ability to “meter” the product prevents the need for additional measuring devices. The drill cuttings

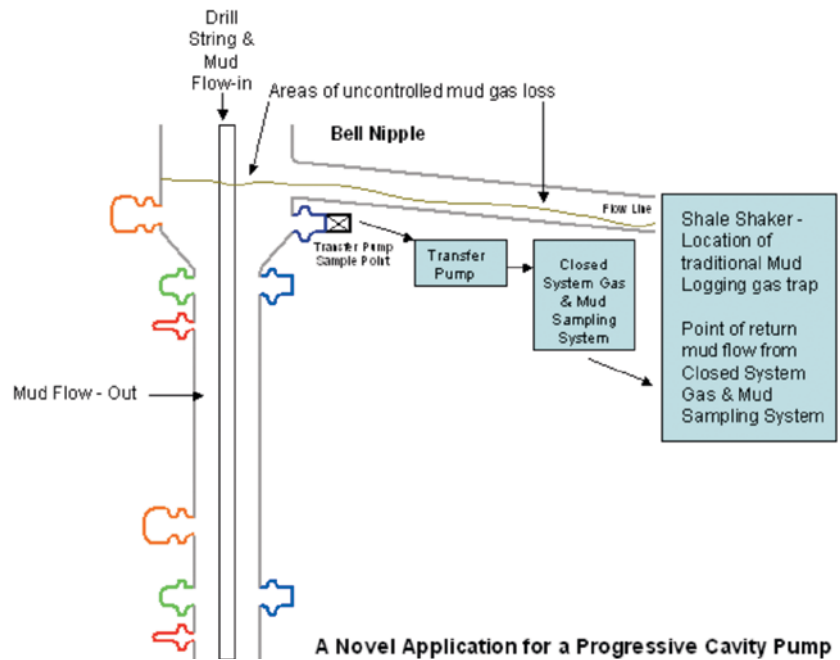


Figure 1. Case study application of the progressive cavity pump.

can be transported from the rig site to centrifuges, shakers or any type of separation system.

Case Study

An end user applied the PCPs in a novel way. The pump was used to transfer a controlled volume of mud from the full return mud flow, well below the break-over point in the bell nipple. Using a variable frequency controller, driven by the mud pump stroke counters, the output of the PCP resulted in a constant ratio between the total mud volume pumped and the volume of mud transferred to the proprietary closed system gas & mud sampling system. This is shown in Figure 1.

This controlled volume of mud contained all formation gases, fluids and cuttings without exposure to atmospheric conditions, making it representative of the mud conditions in the bell nipple. After proprietary gas extraction and measurement of other mud parameters, the analyzed mud was discharged so that the sample stream merged with the main mud

flow. No volume of mud was lost from the total circulating system during this process, keeping pit level readings and loss/gain calculations fully relevant.

As more complex systems develop to process the recovered drilling mud and dispose of the drill cuttings, PCPs offer a viable, economical solution to transport the drill cuttings, both onshore and offshore.

Kamran Mirza is director of business development, at seepex, Inc. in Enon, Ohio. He has 34 years of experience with PCPs. He began as a project engineer developing power sections for drilling motors and downhole pumps for the oil and gas industry. Mirza developed the progressive cavity multiphase pump for Robbins & Myers and served as director of engineering and manufacturing for the Dyna-Drill Division of Smith International, and as director of manufacturing for Baker Hughes Drilling Systems. He has authored several technical papers and holds two patents in multiphase pump technology. Mirza has a M.S. in Mechanical Engineering from the University of New Mexico.