For HDD Drillers, Returns Are a Welcome Sight

Drilling fluids returns on horizontal directional drilling projects can be difficult to deal with. If not recycled, drilling fluids returns can be a muddy mess that must be either solidified or sucked up with vacuum equipment and hauled off constantly throughout the duration of a bore. Drilling fluid returns can run off into ditches or bodies of water where additional clean-up can be costly, and contractors constantly get complaints about the unsightly mess. The only thing worse than having to deal with drilling fluid returns is not having returns while drilling, and this article will focus on the importance of return flow along with ways to maintain return flow.

A lack of drilling fluid returns on a horizontal directional drilling project is most often a sign that something bad is getting ready to happen. Unless loss-circulation problems such as voids have been encountered, a lack of drilling fluid returns usually means that drill cuttings are not exiting the borehole, and the product line and/or the drill stem and tooling is at risk of getting stuck or breaking. A lack of drilling fluid returns is also a good indication that annular pressure is building, which can cause severe damage to surrounding pavement and/or structures.

Matching drilling fluids to soil conditions is the first step to maintaining return flow. If reactive soils such as clay are left unchecked, clay will swell up around the drill stem, along with bailing up around the bit or reamer, and restrict return flow. In coarse soils such as sand, drilling with a fluid that has poor fluid-loss control can lead to the hole collapsing around the drill stem and tooling, which will restrict return flow. In coarse soils such as sand, drilling with a fluid that has poor fluid-loss control can lead to the hole collapsing around the drill stem and tooling, which will restrict return flow. Insufficient gel strength can cause drill cuttings to pack up around the drill stem, restricting return flow and overpressuring the formation.

Different soil conditions require different pumping rates, and it is important to provide adequate fluid to maintain flowable returns, which are essential for removing drill cuttings from the bore path. When drilling in coarse soils such as sand or gravel, one needs a ratio of two to three times the amount of drilling fluid to soil in order for the drilling fluid returns to be of a consistency where they can easily exit the borehole without creating excessive annular pressure. Frack-outs (drilling fluid returns breaking through the surface) occur when the annular pressure exceeds what the formation can withstand. Because clay is reactive (soaking up drilling fluid, swelling and sticking), the ratio is from three to five times the amount of drilling fluid verses soil, in order to maintain flowable returns.

Drilling techniques also play a big role in maintaining return flow. When push steering maneuvers are performed, it is important to pull back and rotate the bit through these areas in order to provide sufficient annular space between the borehole and drill stem, and prevent bottlenecks where cuttings can pack off and restrict flow. Drillers should select reamers that are properly matched to the soil conditions and select reamers that do not restrict sufficient pump rates or return flow. For example, spiral or fluted reamers have far too much surface area for clay to stick to (blocking returns from the exit side) and do not provide enough chopping action for clay.

Return flow is the closest thing to real-time data that a drilling contractor has when it comes to determining how the drilling process, drilling fluid, and native soils are interacting, and return flow should be constantly monitored. Often, unexpected changes in soil conditions can be picked up by monitoring the return flow, and changes in the drilling fluid mix can be made before problems become critical. Back-reaming speed is largely determined by the amount of fluid that is delivered to the reamer and how that fluid interacts with native soils, therefore contractors should always have someone monitoring the return flow during back-reaming operations, and that person should be in contact with the driller, alerting him to changes. If the returns are coming back in a thick peanut butter consistency, for example, pullback speed on the back-ream should be slowed down enough to where the consistency of the returns flows more easily.

It is ironic that, even with all of the headaches and problems caused by the return flow exiting a bore-path on an HDD project, it is sorely missed when it is not there. The lubricity it imparts on the drill stem and cutting tools, drill cuttings it removes, and information it provides is invaluable, along with the assurance that annular pressures are not building to the point of causing costly damage to pavement and/or structures. Understanding how to maintain good return flow on an HDD project and constantly monitoring return flow can greatly increase a contractor’s odds for success.

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