SUMMARY

The TTB plug is a mechanically locking plug which may be deployed through a conventional NQ bit without removal of the drill string. This gives it an advantage over the competition which must be deployed through a shoe. The TTB plug is primarily used in grouting applications. The use of the plug in the case study below reduced the cost of inserting plugs by $2,200 and reduced the time to install by 8.75 hours.

BACKGROUND

Traditionally the installation of mechanical plug for grouting required the drill string to be removed from the hole so that a shoe may be fitted. A shoe needed to be fitted to allow the plug to be pumped out the end of the drill string after it had been re-lowered to its depth.

The TTB plug can be deployed through a standard ID NQ bit or HQ bit. It does require an adapter to the back end to direct all the pump's flow through the inner tube. It also requires a "smooth lifter case".

PRODUCT APPLICATIONS

Most TTB plugs are set to allow grout to be placed in the hole without having to fill the entire hole with grout. A plug may be placed below an unstable formation to allow grout to be placed into the formation to add stability. Once the grout has dried the hole is re-drilled through the formation and plug, once through the plug the drill string can be quickly lowered to the bottom to commence drilling. Grout may also be poured on top of the plug to facilitate wedging.

CASE STUDY

A 1,000m hole has been completed. It has been determined by the client that a plug must be placed at 900m with cement to 800m with a second plug being place. Above that they have requested a third plug be placed just below the overburden at 100m.

We will investigate 3 scenarios, the absolute minimum cost of removing the drill rods from the hole without setting a plug, the cost of setting 3 of the competition's plugs, and the cost of removing the rods and setting 3 TTB plugs.

It is important to understand a drilling contractor charges an operating field cost rate when undergoing activities that are not coring. This rate is below the fully realized operating cost of a drill once overhead, wage, cpp, etc. are included. For example, an operating field cost might be charged at $150 per hour, however it costs a drill contractor close to $300 per hour. When a drilling contractor spends time charging operating field costs, instead of coring rates they are increasing their overall cost per m, while also decreasing their net meters drilled and overall profitability.

Assumptions; For this study we assume the operating field cost of the drill is $300/hour, the charged operating field cost is $150, the charged rate for coring is $100/m, the rods can be tripped in or out of the hole at a rate of 250m/hour, the average shift drills 36m(3m/hr).

CASE 1: MINIMUM REMOVAL COST [$600, 4 HOURS]

If the rods are just removed from the hole is will take 4 hours (1,000m/[250m/hr]). The cost of operation for these 4 hours is $1,200 in operating costs of which $600 will be recovered. We will assume that no profits were lost during this time because it is the fastest method to recover the rods.

CASE 2: COMPETITION'S PLUGS [$3,075, 14.25 HOURS]

The use of the competitions plug is more involved because the drill string must be first removed from the hole as in CASE 1, but there are additional steps; a shoe must be fitted, the string is lowered back into the hole, then removed a second time. For this study we will assume that the sting re-enters the hole without issues. Once the string is lowered back to depth a plug may then be pumped down the string, followed by the grout, when required.

The total time removing the string with core barrel, re-entering with a shoe, and removing the string again has increased to 12 hours (4hrs out, 4hrs in, 4hrs out). If we assume each plug takes 45minutes to pump down, we have a total time of 14.25 hours. The additional 10.25 hours will be charged as field operating cost. It will can also be considered lost profits because this time could be use to increase the companies net meterage. The 10.25 hours will result in a cost to the company of $3,075, of this $1,537 will be recovered through the operating field cost.

The lost coring charges based on the 36m shift average generate 30.75m drilled in 10.25 hours and $3,075 charged. Removing the operating cost of $1,537, gives a profit loss of $1,538. If you include the cost of charging an operating field cost with the lost profit, this method costs $3,075 and takes 14.25 hours.

It must also be understood there is additional risk with lowering a drill string back down the hole without a core barrel or inner tube. If the rods are dropped, they will fall, very quickly, to the bottom of the hole. When the rods reach the bottom, the result is most often catastrophic for a lower portion of the drill string. If they become planted a cutter and smaller drill string must be brought on site. This could take anywhere from a day to weeks to fish out the drill rods. That time only be charging the operating field cost and operating at a loss. Again, increasing your overall cost per m, and reducing the time available for a high total net meterage.

CASE 3: TTB PLUGS [$825, 5.5 HOURS]

The TTB plug may be deployed through the drill string while it is being removed from the hole as shown in Case 1, it does however take time for the tube to be dropped to the bottom of the string, and for the wireline to retrieve the empty tube. We will assume this takes 30 minutes per plug for a total of 1.5hours of profitable time lost. The cost of charging an operating field cost for these 1.5 hours is $225, and the potential charges from coring for these 1.5 hours is $450, minus the operating field cost for 1.5 hours of $225, gives $225 in lost profit. The use of an TTB plug costs $825 and takes 5.5 hours.

Because the drill string is being removed similar to CASE 1, the exposure to risk of dropping the rods is no greater than simply pulling the rods. The drill string also may be pulled with, or without, an inner tube. If removed with the inner tube inserted, the inner tube will reduce the speed in which the rods can reach.

CASE STUDY CONCLUSIONS

The use of TTB plugs in this scenario has the potential to reduce the cost of installing plugs by $2,200 and reduce the time to install the plugs by 8.75 hours.