

INTRODUCTION.

Satisfactory results with Diamond Core Drilling requires intelligent application of equipment and established techniques. Core Barrels and Diamond Core Bits are expensive and should be treated with care. Improper use and treatment will result in poor core recovery, slow drilling rate, damaged bits and barrels, excessive round trips and higher drilling cost.

THE IMPORTANCE OF HAVING A CLEAN HOLE FOR DIAMOND CORE DRILLING SHOULD NEVER BE SLIGHTED; THE BEST WAY TO ASSURE A CLEAN HOLE IS TO KEEP IT CLEAN FROM THE START.

CORE BARREL.

The 4" x 5-1/2" large series core barrel is constructed much the same as the series "M" core barrel. However, more sturdy and it features reverse circulation. The advantage is that core is not ground up by contact with a rotating part. The barrel design is considered to give the best core recovery in all formations and is now accepted as standards by the Diamond Core Drill Manufacturers Association. The 4" x 5-1/2" large series core barrel is now in general use where ever difficult coring materials are encountered or where large physical volume of core is required for test and analysis.

Core barrel care is a continuous job. It starts before the barrel is ever used and never stops until the barrel is retired from service. To obtain maximum service at minimum cost, the following suggestions are offered:

1. Make sure all threads are perfectly clean and well lubricated with a clean lubricant before making up the threaded joint.

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2. All threaded joints should be "hand tonged". That is torque of the joints should be applied with hand wrenches. Over-torquing will impose excessive stress on the threads. Insufficient torque can cause joint wear and premature failure.
3. Before each trip, in hard rock only, apply a light coating of rod dope or grease to the outer tube of the barrel.
4. After each trip, inspect the barrel for excessive wear on outer tube and inner tube. Check the bearings by hanging the barrel and turning the inner tube by hand. Check the outer tube and inner tube for straightness.
5. Never strike the inner tube with a metal object to remove core. A tap with a rubber mallet or hard wood block is usually sufficient to free stuck core.

DIAMOND CORE BITS.

Diamond Core Bits are expensive and should be treated with great care. The design, diamond quality, diamond size, weight of diamonds used, diamond exposure, matrix metal hardness and number of water ways all vary, depending upon the type of rock in which the bit is to be used. Preferably, the 4-inch core size bit should be used in jointed or vugular rock. This size bit provides better core recovery.

Diamond bits should be taken out of service as soon as appreciable wear begins to show on the crown. If the bit is used until diamonds begin to tear out and roll around in the bottom of the hole, it will rapidly be destroyed. Bits removed from service are usually returned to the manufacturer for re-processing. The stones are cut out, graded and re-set adding new stones to bring the bit up to standard. The bit is then returned and placed back in service.

Causes of bit and diamond wear controllable by the driller are:

1. Rate of rotation of the bit.
2. Pressure on the bit.
3. Water pressure and clearance of sludge.
4. Dropping rods.
5. Running a dull bit.
6. Grinding out core.
7. Dropping bit when removing bit from core barrel.
8. Wrench slipping and breaking stones

CORING PROCEDURE.

After the core barrel has been assembled and bit put on, then the barrel can be put in the hole using conventional equipment and technique. Care should be taken while going into the hole to pass slowly any shoulders, as hitting these with the diamond bit may cause damage. If a tight hole is expected at all, this section should be passed through very slowly. Touch bottom lightly and then pull back one or two feet and start circulation at a high volume to flush the hole clean. During the flushing period, it is well to rotate slowly and go down to the bottom lightly. If rotation gives any indication of binding in the hole, investigate its cause before attempting to core.

On completion of flushing period, reduce fluid volume to desired figure and measure this flow if possible. With about 20 R.P.M. set bit on bottom lightly and note pump pressure. With about 1000 pounds on bit make a few inches slowly to permit bit to seat itself in the rock. Increase rotary speed gradually to 40 R.P.M. and gradually increase weight to approximately 3000 pounds at the end of the first foot. It is very important to make this first foot slowly, as core is starting up the inner tube past the core lifter. During this period of coring, the pump pressure should increase some as the bit seats itself, and a check on the fluid volume should be made. After everything is checked it is then possible to vary the R.P.M. and weight until best penetration rate is established. These changes should be made smoothly and only when the barrel is stabilized over its full length.

When coring is completed, stop rotation but maintain circulation, and pull the bit slowly off bottom. Most cores break easily, however, it may be necessary to maintain a steady pull with the hydraulic head for a few minutes then slowly start to rotate still pulling back. The core should break with a snap. After the core is broken pull back slowly one or two feet and than try to go to bottom. If this is accomplished, it is a good sign that no core has been left in the hole.

INDICATIONS OF CORING.

Once core has started up the inner tube, all surface indications should remain constant if everything is going well at the bit and in the core barrel. A rapid increase in pump pressure usually indicates that core blocking has occurred in the barrel and that crushing and grinding of the core is occurring inside the bit below the inner tube. Come out of the hole and empty the core barrel when blocking occurs. A drop in pump pressure while coring usually indicates that the fluid has found an easier passage. Surface return of the fluid may stop. Slow rotation and decrease weight until the cause can be investigated. Fluid loss due to formation change is not serious, continue to drill until coring is complete.

A change in drilling rate usually indicates a changing formation. In hard rock a gradual decrease in penetration rate normally indicates that the bit is becoming dull, correction should be made by increasing the weight on the bit until coring is complete.

Increased torque on the drill string indicates binding in the hole which may be caused by core grinding, sticky formations, or caving around the drill rod or core barrel. Some of these conditions can be corrected by increased circulation rate.

REAMING.

Reaming with a diamond bit only a small proportion of the diamonds are in contact with the rock. A stabilized core barrel, medium rotary speeds, and a rate of penetration three times as fast as originally drilled, will give good reaming results.