We have been asked this question hundreds of times "***How many feet can I get on your bits?"*** or ***"How many feet can we drill per shift with your drill?"***

THANKS TO STAN STEWART FOR ANSWERING FROM HIS EXPERIENCE. Stan says "One could answer either question with ***Somewhere between a few inches and many feet"***. (If you read through to the end he explains the quote near the bottom of the page)!

There are many different parameters that seriously affect both bit life and drilling speed, here are a few.

1 – **Drill holes per setup?** If the gear has to be moved and setup for each hole to be drilled considerable drilling time is lost moving gear. If more than one hole can be drilled from the same setup, and the drill just swung around on the new line then moving time is reduced.

2 – **Long holes?** Holes drilled out to the maximum rating of depth for the drill slows drilling rates significantly near the bottom of the hole due to strain on the machine and the number of drill rods that have to be pulled to recover the corebarrel and core after each run.

3 – **Corebarrel length?** If drilling conditions and drill site permit use of a ten foot corebarrel, drilling production nearly doubles from the rate achieved when using a five foot corebarrel. The longer corebarrel allows the recovery of more core each time the rods are pulled.

4 - **Hard rock?** Drill penetration rate is generally slower in hard rock gradually speeding up through the various hardness grades of rock to faster drilling in softer rocks. See the ***PHQ Bit Chart*** for the recommended matrix grades for various rock types.

5 – **Abrasive rock?** The abrasiveness of rock being drilled wears away the matrix holding the diamonds in the bit face, which is necessary to keep exposing more of the diamonds and keeping the bit sharp. (See #7) however if the matrix grinds away quickly diamonds are lost and bit life is reduced.

6 – **Competent ground?** In competent ground expect longer or full corebarrel runs of good core in reasonable lengths. In badly broken ground expect more blocking in the bit with the corebarrel full of smaller pieces of core or ground core which requires more frequent pulling of rods.

7 – **Bit matrix hardness matched to ground?** If the bit matrix is too soft, premature bit wear will occur, resulting in higher bit costs. If the bit matrix is too hard the matrix will not erode fast enough to release dull diamonds and expose sharp diamonds, and penetration can be reduced to an extent where production is compromised. ***See the Bit Chart***

8 – **Bit design matched to ground?** Number and depth of waterways suited to flushing the bit properly as well as the depth of matrix on the bit effect bit performance, bigger waterways are required where ground is abrasive and softer to help clear cuttings faster.

9 – **Drill operated at optimal RPM and WOB?** Rate of penetration is highly dependent on matching the rotation speed and the pressure applied on the bit to match the ground conditions to achieve maximum performance. Driller experience (See 11) helps achieve optimum performance. TERMINOLOGY **RPM** ROTATION PER MINUTE AND **WOB** WEIGHT ON BIT (FEED PRESSURE+ WEIGHT OF STRING).

10 – **Sufficient water supply and pressure to flush the bit?** If water flow is inadequate and not moving the cuttings away from the bit quickly then the bit is regrinding cuttings, wearing away the matrix. If flow is too high cuttings are washed away too fast and before eroding the matrix, dull diamonds remain in place, and penetration slows down.

11 – **Sufficient compressed air supplied at optimal pressure and volume?** In pneumatic drills performance drops at the same percentage rate as the reduction in either compressed air pressure or volume. The drop in penetration doubles if both are reduced at the same time. Optimal compressed air pressure is 100 psi and the volume must be matched to the particular drill requirements.

11 – **Expertise level of operators?** Skilled drillers through long experience learn to "*sense what is happening in the hole*" take corrective action and can maximize bit life, drill penetration rate and produce trouble free performance. Inexperienced drillers, indifferent drillers, or unobservant drillers ignore symptoms of problems and can destroy bits without even knowing what happened.

12 – **Performance incentives?** One drilling operation produces eighty feet or more of good core per man shift, another drilling operation produces twenty feet or less per man shift. The only difference is that one mine pays **BONUS** on the amount of feet of good core produced and the other mine does not!

STAN SAYS *"If I had to pick a general, average number, and considering that all of the above conditions are favourable, I would say that the screw feed drills (VEG VAG) should be able to average 60 to 80 feet of core in the box in an eight hour shift, and the smaller drills Bazooka PackSack Winkie 30 to 50 feet in an eight hour shift."*

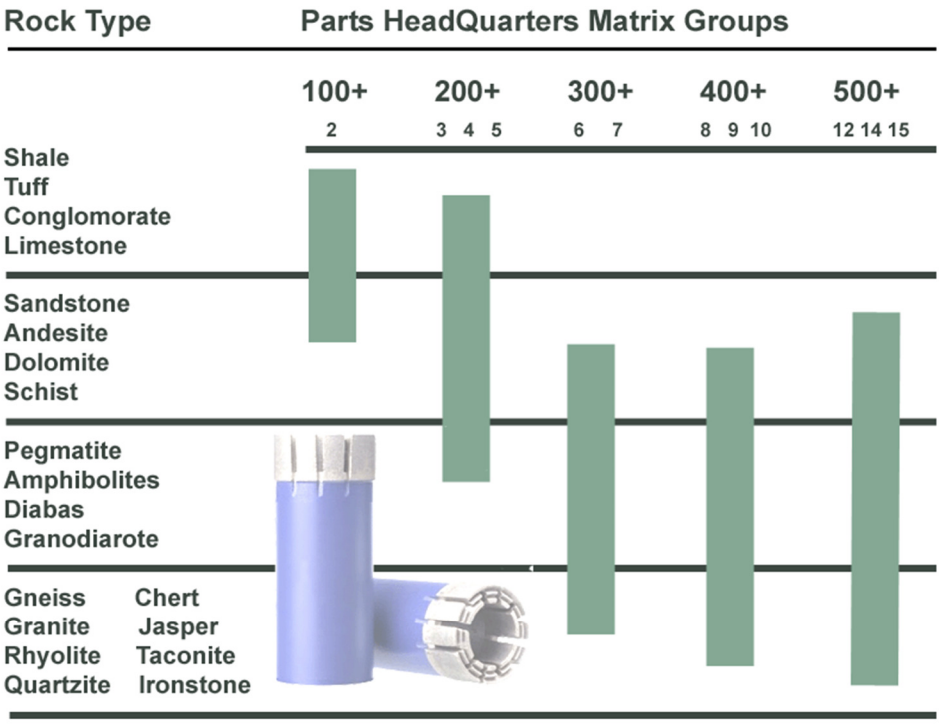
Somewhere between inches and thousands of feet

STAN TOLD US: *"I remember an old salesman years ago, who told me this answer when asked how many feet can you get on a bit. He said that he saw a large drilling project where there was a very soft band in an otherwise hard rock area. The drillers would change the bits to go through the very soft material to get faster penetration, and bit wear was practically nothing. The drillers could get several thousand feet on the bit used for the soft area. He said that he has also seen situations where the driller forgot to turn on the water, and "cooked" the bit in about one inch. His standard answer was* ***"somewhere between one inch and several thousand feet"***

A VERY BIG VOTE OF THANKS TO STAN STEWART FOR HIS INPUT IN GIVING PHQ MOST OF THIS INFORMATION.

PHQ Diamond Coring Bits - Matrix Hardness Chart

DIAMOND IMPREGNATED BIT MATRIX CHART



Higher numbers denote free cutting bits for harder rock or faster penetration

100 Highly fractured extremely abrasive coarse grained rock
200 Broken and abrasive medium coarse grained rock
300 Competent moderately abrasive rock
400 Competent slightly abrasive fine grained rock
500 Highly Competent moderately abrasive very hard rock

LOWER COMPRESSED AIR VOLUME/PRESSUE = LOWER POWER

HARDER ROCK TYPES USUALLY REQUIRES THE USE OF DIAMOND BITS FROM THE HIGHER MATRIX GROUPINGS.

BROKEN ROCK TYPES USUALLY REQUIRES THE USE OF DIAMOND BITS FROM THE LOWER MATRIX GROUPINGS

Group 100 - Coring bits for powerful high-torque drills
Drill very well in extremely abrasive rock

Group 200 - All purpose coring bits for high load drilling
Drill very well in fractured formation

Group 300 - Coring bits for lower powered medium load drills
Drill very well in medium hard formation

Group 400 - Versatile durable high penetration coring bits
Drill very well in changing formation

Group 500 - High penetration coring bits in all rock types
Drill very well in fine grained hard rock

EXCESSIVE HOLE DEVIATION USUALLY REQUIRES THE USE OF
DIAMOND BITS FROM THE HIGHER MATRIX GROUPINGS.

A LESS POWERFUL DRILL USUALLY REQUIRES THE USE OF
DIAMOND BITS FROM THE HIGHER MATRIX GROUPINGS