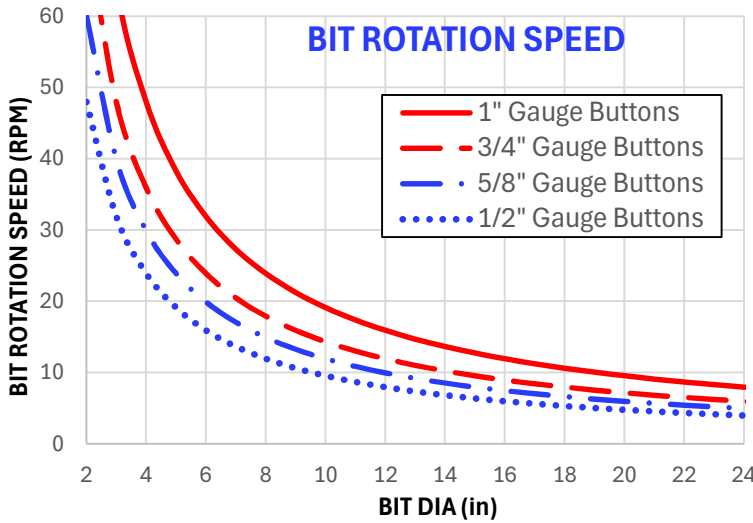




# DRILLER CHEAT SHEET



HAMMER WEIGHT		DRILLING TORQUE		TARGET WOB		
SIZE (in)	WEIGHT (lb)	BIT DIA (in)	STEADY (ft-lb)	SPIKE (ft-lb)	MIN (lb)	MAX (lb)
2	29	4	350	1400	2400	4800
3	53	6	800	3000	3150	6000
4	84	8	1500	5250	4200	8000
5	137	10	2000	6500	4500	9000
6	200	12	2600	7800	5400	10800
8	400	16	5000	10000	7200	14400
10	800	20	7500	15000	7500	16000
12	1400	24	12000	24000	9000	19200
15	2700	30	17500	35000	9600	21000
18	3500	36	25000	50000	10800	25200
24	5200					

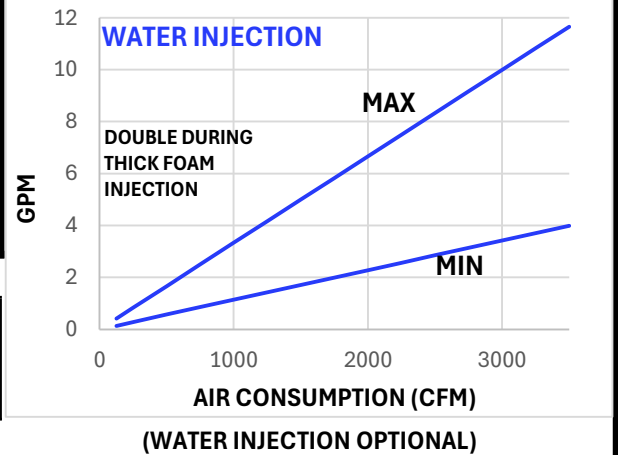
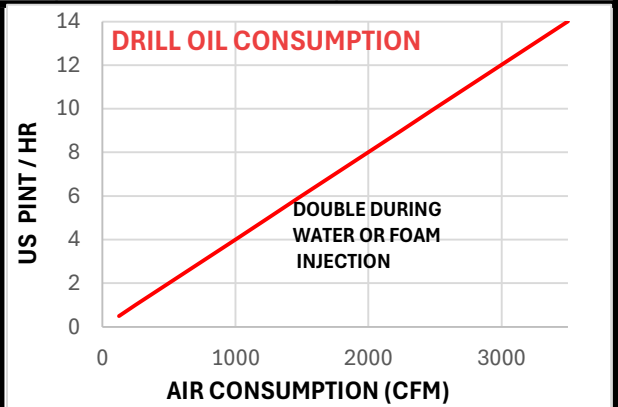
START DRILLING WITH VALUES FROM CHART. MARK LINE ON DRILL PIPE. ADJUST RPM UNTIL MARK ADVANCES .375-.750" PER REVOLUTION.

TORQUE SPIKES IN HARD NON-UNIFORM ROCK. RIG CAPACITY SHOULD EXCEED SPIKE. WOB = THRUST + HAMMER + PIPE. PIPE WEIGHT IS CRITICAL IN DEEP HOLES.

WATER IN HOLE BACK-PRESSURE		ASSEMBLY TORQUE (ft-lb)				DKI HAMMER AIR CONS. (MAX PRESSURE)		
DEPTH (ft)	P (psi)	API REG CONNECT	PIPE TOP SUB	HAMMER SIZE (in)	TOP SUB HAMMER	SIZE (in)	P (psi)	AIR (CFM)
50	22	2-3/8	2500	4	3900	2	250	105
100	43	2-7/8	4500	5	4800	3	350	480
150	65	3-1/2	6000	6	6700	4	350	640
200	87	4-1/2	15000	8	8600	5	350	720
250	108	6-5/8	38000	10	10600	6	350	720
300	130	8-5/8	65000	12	13000	8	350	1264
				15	20700	10	250	1290
				18	22800	12	250	1700
				24	29300	15	250	2500
						18	200	3160
						24	200	4500

CHOKE FLOW BYPASS (AIR HAMMERS, CFM)					
PRESSURE (psi)	ORIFICE SIZE (in)				
	1/8	1/4	3/8	1/2	3/4
150	26	104	233	413	930
250	42	166	374	664	1495
350	58	229	515	916	2060

CHOKE OPENING ALLOWS THIS MUCH AIR TO "SKIP" THE PISTON



(AIR) ANNULAR / UP-HOLE / BAILING VELOCITY (V)

$$V = \frac{3.05Q}{(D^2 - d^2)}$$

V = UP-HOLE VELOCITY (ft/s)  
 Q = AIR FLOW AT SURFACE (CFM)  
 D = BIT DIAMETER (in)  
 d = DRILL PIPE DIAMETER (in)

VELOCITY EFFECTS:	
0 - 50 ft/s	POOR EVACUATION
50 - 120 ft/s	TARGET ZONE
120+ ft/s	EROSION / BACKPRESSURE

**ALTITUDE & TEMP CORRECTION FACTOR (C<sub>AT</sub>)**
**(AIR DRILLING ONLY)**

ALTITUDE (ft)	TEMPERATURE (°F)								
	-40	-20	0	20	40	60	80	100	120
SEA LEVEL	0.81	0.85	0.88	0.92	0.96	1.00	1.04	1.08	1.12
2,000	0.87	0.91	0.95	1.00	1.04	1.08	1.12	1.17	1.21
4,000	0.94	0.99	1.02	1.07	1.11	1.16	1.21	1.25	1.30
6,000	1.01	1.06	1.10	1.15	1.20	1.25	1.30	1.35	1.40
8,000	1.09	1.14	1.19	1.24	1.30	1.35	1.40	1.46	1.51
10,000	1.17	1.23	1.28	1.33	1.39	1.45	1.51	1.57	1.62
12,000	1.27	1.33	1.38	1.44	1.51	1.57	1.63	1.70	1.76

ALTITUDE AND TEMP CHANGE THE DENSITY OF AIR.

THIS CHANGES HAMMER AND FLUSHING PERFORMANCE:

1. CALCULATE THE AIR FLOW (Q) REQUIRED FOR TARGET UP-HOLE VELOCITY (V)
2. DETERMINE C<sub>AT</sub> FROM THE TABLE USING THE ALTITUDE AND TEMP OF JOB SITE.
3. FIND Q<sub>c</sub> COMPENSATED AIR FLOW NEEDED ON SITE

$$Q_c = Q \times C_{AT}$$

**DKI WATER HAMMER INFO**
**(WATER) ANNULAR / UP-HOLE / BAILING VELOCITY (V)**

$$V = \frac{.408Q_w}{(D^2 - d^2)}$$

V = UP-HOLE VELOCITY (ft/s)

Q<sub>w</sub> = WATER FLOW (GPM)

D = BIT DIAMETER (in)

d = DRILL PIPE DIAMETER (in)

**VELOCITY EFFECTS:**

0 - 2.5 ft/s	POOR EVACUATION
2.5 - 6.0 ft/s	TARGET ZONE
6.0+ ft/s	EROSION / BACKPRESSURE

**CHOKE FLOW BYPASS (WATER HAMMERS, GPM)**

PRESSURE (psi)	ORIFICE SIZE (in)				
	1/8	1/4	3/8	1/2	3/4
1000	9	37	84	149	336
1500	11	46	103	183	411
2000	13	53	118	211	474
2500	15	59	123	235	529


**DKI HAMMER WATER CONS. (MAX PRESSURE)**

SIZE (in)	P, (psi)	NEW (GPM)	WORN (GPM)
3	2450	40	80
4	2450	60	100
5	2650	80	120
6	2150	85	145
8	2150	125	200

**WATER QUALITY:** MAX TOTAL SUSPENDED SOLIDS (TSS) = 150 mg/L. MAX PARTICLE SIZE: 50µm

**TIPS & TRICKS**

1. STORAGE: SHORT TERM - BLOW DRY AIR 5MIN, POUR 1GAL ROCK OIL DIRECTLY IN PIPE, BLOW AIR  
LONG TERM - BREAK DOWN AND FULLY CLEAN/DRY ALL COMPONENTS. APPLY ROCK OIL, ASSEMBLE. STORE VERTICAL.
2. MAX ROP: RUN MAX P + START WITH RPM CHART, SLOWLY INCREASE UNTIL ROP PLATUES AND THEN MAINTAIN (MAY INCREASE WEAR)
3. IF HOLE IS DRY, CHECK VALVE CAN BE REMOVED FOR 3-5% INCREASE IN ROP
4. REPLACE SEAL KIT ANY TIME HAMMER IS DISASSEMBLED
5. KEEP LIGHTLY WORN BITS. USE THEM TO FINISH A HOLE AFTER BIT FAILURE. BRAND NEW BITS MAY NOT FIT.
6. REGRIND BUTTON FLATS TO INCREASE ROP AND INCREASE DURABILITY OF BIT AND HAMMER
7. WATER INJECTION → DUST SUPPRESSION, CLAY | FOAM INJECTION → CHIP EVACUATION, HOLE INTEGRITY, CLAY | OIL ONLY → DEFAULT
8. THRUST AND TORQUE GAUGES READING PRESSURE (PSI, BAR) ARE RIG-SPECIFIC. SEE RIG MANUAL FOR CONVERSION TO (lbf) OR (ft·lb)

**TROUBLESHOOTING**

1. HAMMER SUDDENLY STOPPED FIRING - CHECK EXHAUST TUBE AND PISTON
2. BREAKING EXHAUST TUBES - INCREASE WOB & FEED RATE. REDUCE OPERATING PRESSURE AND ROP. REPLACE CHUCK.
3. CARBIDES WEAR: ON TRAILING SIDE - DECREASE RPM / ON LEADING SIDE - INCREASE RPM / EXTREME GAUGE WEAR - DECREASE RPM
4. DEBRIS IN HAMMER - WATER IN HOLE AND CHECK VALVE NOT WORKING. USE RUBBER CHECK VALVE FOR DEEP WATER APPLICATIONS
5. ROP DECREASING OVER TIME - WATER IN HOLE, DULL BUTTONS, OR POOR CHIP EVACUATION
6. HAMMER FIRING BUT ROP NEAR 0: POOR HOLE CLEANING (SOFT ROCK) - INC. AIR FLOW / OPEN CHOKE/ LARGER DRILL PIPE / USE FOAM FAILING TO BREAK (HARD ROCK) - INCREASE PRESSURE / REGRIND BUTTONS/ REPLACE BIT
7. HAMMER FIRING SPORADICALLY - HOLE COLLAPSING, POOR HOLE CLEANING
8. CHUCK AND BACK OF BIT MUSHROOMING/DEFORMING - POOR HOLE CLEANING, DEBRIS FILLING HOLE. SEE #6 & 7.
9. BIT SPLINES WEARING UNEVENLY/BREAKING IN SPLINES - BIT RUNNING AHEAD OF CHUCK OR WORN CHUCK. ADD WOB / REPLACE CHUCK

THIS SHEET IS A GENERAL GUIDE - SOME NEEDS WILL VARY BY GEOLOGY/APPLICATION. CALL FOR ASSISTANCE.

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