"Built to last, built to cut fast"

IMPREGNATED BIT OPERATION CONSIDERATIONS

BIT BREAK IN

Take time to condition a new bit in the first 10 feet (3 m)

- **NEW** bits should be reamed to the bottom of the hole, start back about 1 foot (30 cm)
- At bottom, use 50% of normal RPM and 25% of normal load. The bit face **must be abraded** to expose the diamonds.
- After 2-3 feet (.6-1 m) gradually increase the load and rpm to the recommended RPI (see the RPI chart, below)
- Do not allow the bit load to increase if the penetration rate is not increasing
- Maintain a **high torque** while using the **lowest bit load possible**.

ROTATIONAL SPEEDS RELATIVE TO RPM

Optimum rotational speeds depend on the formation types being drilled and inter-relationship between the rig capabilities, peripheral equipment being used, and the individual drilling styles.

Ideally, the RPI should be between 160 - 250 for impregnated drill bits. RPI is a ratio of the rotational speed (rpm) to the penetration rate.

To calculate, divide the rotational speed (rpm) of the bit by the rate of penetration. eg. 900 rpm divided by 4 in/min = 225 RPI. Provided you use the correct matrix type for the formation, using this guideline will ensure smooth drilling with the bit wearing evenly.

The ideal RPI may vary with tool diameter, here is a guide for wireline tools:

- A - (1.875") RPI = 227
- B - (2.360") RPI = 217
- N - (2.980") RPI = 212
- H - (3.782") RPI = 185
- P - (4.827") RPI = 165

Metric : use the RPC method. The ideal RPC range is 80-100. (RPM / cm per minute)

If the RPI is too low, excessive bit wear and diamond loss will occur. If the RPI is too high, the bit may "polish", that is, diamonds will not be exposed, and penetration rates will reduce.

Factors such as drill string vibration or rig constraints might prevent operating within an optimum RPI range, in which case a lower matrix number could be used to compensate.

FLUID VELOCITY

The drill fluid must remove heat from the bit and transport the rock cuttings up the drill hole to the surface. The pump output and fluid volume must increase as penetration rates increase, conversely the fluid volume should decrease if the penetration rate decreases. The return velocity of drill fluids should be approximately 4 in/sec. (10 cm/sec). However, some drillers use between 30 and 50 cm/second. Lost circulation impacts fluid velocity and cutting removal.

FLUID VOLUME

Excessive fluid volume can lift the drill string, and reduce drilling performance. Too little fluid volume will cause the bit to wear out prematurely.

In very hard, fine-grained formations, fluid flow can be deliberately reduced a small amount. This will expose diamonds quickly on the bit, increasing penetration rate.

Normally, the matrix number should be increased to achieve increased penetration. Reducing fluid flow will reduce bit life.

		A W/L	B W/L	N W/L	H W/L	P W/L
Very hard rock	US GPM	3 to 4	5 to 6	6 to 8	8 to 9	10 to 11
Very hard rock	l/min.	14-18	23-27	27-36	36-41	45-50

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		A W/L	B W/L	N W/L	H W/L	P W/L
Hard rock	US GPM	4–5	6–8	8–9	10–12	12–13
Hard rock	l/min.	18–23	23–36	36–50	45–54	55–60
Other	US GPM	6–8	7–10	12–14	14–16	15–17
	l/min.		32–45	54–64	64–73	68–77

DRILL STRING VIBRATION

Do not allow vibration. Vibration will quickly reduce bit life and overall drill performance. Factors contributing to drill string vibration are:

- Misalignment of the drill string with the hole
- Excessive bit weight or rotation speed
- Bent core barrel or rods
- Oversize hole (wash out or equivalent)

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