



**ROTARY PERCUSSION
SYSTEM
PERFORMANCE SYNERGY**



**VAREL
INTERNATIONAL**

▼ Rotary Percussion System (RPS)*

Varel's patented RPS percussion tools provide unparalleled performance, versatility and reliability to virtually any rotary drilling environment. Designed for air rotary operations, the RPS delivers increased rate of penetration, reduced total drilling cost and more value to the bottom line with its unique ability to harness rotary and percussion forces.

Features

- Patented design allowing air rotary rig drillers to combine and leverage rotary drilling methods with percussion energies for maximum rate of penetration
- Operates on any air rotary drill rig with as little as 80 psi

Geological Applications

- The RPS system builds upon roller cone versatility; providing enhanced performance in both soft and hard formations.
- More effectively navigates transition zones and highly fractured formations; providing straighter boreholes and reducing bending stresses on drill steel.

Mining & Industrial Applications

- Water Well Construction
- Construction Industry
- Blast-hole mining operations



RPS General Specifications		
Model	O.D	Bit Sizes
RPS47	4.875"	5.5" - 6.25"
RPS54	5.5"	6.5" - 7"
RPS62	6.25"	7.25" - 7.875"
RPS70	7"	8.5" - 8.75"
RPS75	7.625"	9" - 9.5"
RPS85	8.625"	9.875", 10.625", 11"
RPS92	9.25"	10.625", 11", 12.25"
RPS106	10.75"	12.25", 13.75"

*US Patent No. 7,377,338
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RPS: Performance Synergy

The RPS is not a downhole hammer. The objective with RPS is the efficient application of the compressed air energy, not maximum striking force per blow. This efficient application of energy is highly complimentary to existing rotary drilling forces, and that complimentary SYNERGY is utilized in three ways to maximize rate of penetration and overall performance.

1. Percussion Energy and the Pulverization Zone

The RPS system delivers energy to the bit in addition to the energy delivered by the rotational and pull-down forces of standard rotary drilling. Unlike DTH hammers, this energy comes in relatively low impact bursts, up to 30 times a second. With the axial forces of percussion energy resulting in a pulverization zone that can be up to twice the length of the striking cutter (TCI, mill tooth, other) in depth. This pulverization zone creates two opportunities for synergy to occur:

- Additional material removed by the digging movement of the rotary forces
- Assist in completely burying the carbide / cutter

2. RPS Unique Cutting Action

Percussion blows combine with rotational forces to deliver impacts similar to chipping or chiseling, applied 16-30 times a second that smooth out torque and deliver several key benefits:

- Less vibration
- Cleaner, straighter bore gage
- Better, larger cuttings
- Opportunity to maintain or increase rotary pull down
- Ability to maintain or increase rotary RPMs
- Opportunity to go with more aggressive cutting structures

The combination of all these benefits creates the opportunity to drill more aggressively while maintaining safe and smooth drill operations.

3. RPS Versatility

With RPS you are able to drill a much broader array of geological formations and drilling conditions with greater ease and higher performance.

- Drill in softer formations with a more aggressive bit and still be able to penetrate layers of harder rock.
- Drill in hard formations with a hard formation bit and still drill efficiently through soft clays or alluvium.
- Never worry about water or other bore intrusions that might cause the tool to stop. You can still keep drilling straight rotary.
- Switching out bits is easy - all RPS tool are built with API bit connections.

▼ RP Series Bits

Varel RP Series bits are based on the company's highly successful line of Ridgeback® Marathon blast hole mining bits. RP bits are engineered to stand up to the demands of rotary percussion tools and maximize the performance available from rotary percussion systems drilling. These bits incorporate the following enhancements:

- Heavy duty welding process in the dome of the bit above the cones
- Use of patented HET™ tungsten carbide inserts to provide for a toughened, impact resistant cutting structure
- Three peripheral plates each welded over the bit seams adjacent to the nozzle bosses to add structural strength to the RP series bits

In combination these features make RP bits the best option for RPS applications.



ROTARY PERCUSSION BIT AVAILABILITY

Diameter		SOFT>MEDIUM			MEDIUM>HARD			HARD>VERY HARD			Pin Size	Approx Wt	
Inches	mm	1	2	3	1	2	3	1	2	3	Inches	lbs	kg
6-3/4	171				RP50	RP60					3-1/2	46	21
7-7/8	200			RP43	RP53						4-1/2	76	35
9	229				RP53						4-1/2	96	43
9-7/8	251				RP53		RP63	RP67			6-5/8	145	66
10-5/8	270				RP53		RP63	RP67			6-5/8	157	72
12-1/4	311					RP60					6-5/8	225	102

- BECO threads available upon request
- Additional sizes will be available in the future

Bit Selection

For maximum efficiency to be gained with the RPS tool, it's imperative to choose an optimal drill bit for the system. Due to the tremendous amount of energy concentrated at the bit, a high quality bit is required for success.

Critical components of drill bit selection should include:

1. Consideration of the synergies realized by utilizing bits with more aggressive cutting structures.
2. Confirm that products are high quality and built or modified to withstand the additional forces resulting from the percussion energy, particularly axial forces.

Cutting Structure Considerations

- Compare current drill bit selection to one with a more aggressive cutting structure. It is suggested to use the most aggressive structure possible for increased ROP.
- Pay close attention to bit wear patterns. Journal failure may indicate carbides are being fully buried in formation, causing the body or cones to absorb additional energy that is not used for cutting. This may indicate an opportunity to increase cutting structure aggressiveness.

Bit Quality Considerations

- Re-run and re-worked bits are not recommended for use on the system. If driller chooses to use re-runs, it is highly recommended that the bit be reinforced with straps across the welds and be of the highest quality available.
- Reinforce welds are extremely important on smaller bit sizes.

General Guidelines

- Roller cone bits are most commonly used, particularly in medium and harder formations.
- Roller cone bits will have the advantage over straight hammer-type bits when cutting harder rock with seams of softer formations, including clay.



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