Hydro-mechanical perforation of wells

HYDRO-MEHANICAL PERFORATION OF WELLS HAS BEEN SUCCESSFULLY USED BY LEADING RUSSIAN OIL AND GAS PRODUCTION COMPANIES **SINCE 2003** AND PROVIDES MAXIMUM EFFICENCY OF CASING/LINER AND FORMATION PENETRATION.

LEADING EXPERTS RECOMMEND THIS METHOD AS THE MOST EFFECTIVE AND SAFE METHOD TO PERFORATE A WELL.

APPLICATION:

- During workover of wells.
- During perforation operations prior to hydraulic fracking in vertical, deviated and horizontal wells. In the process of perforation, slots are formed in the production casing/liner with simultaneous propagation of caverns by hydro nozzles.
- In injection wells helps to inject more volumes in comparison with cumulative perforation.
- Possibility of cutting additional slots between plug and perf zones.

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Parameters of Cut perforation

3/8”	Slot width 3/8 in
3.28’/40	3.28ft/40 min average perforation speed
210’	210ft – maximum opening interval per 1 run

DOUBLE-KNIFE CUTTERS

Purpose

The perforator is designed for additional opening of pays zones of oil and gas wells by cutting of longitudinal slots and bottom-hole zone hydro jetting through these slots.

The multi-functionality of the perforator is achieved by the ability to inject fluids through it after the perforating process.

The perforator allows you to form two slots simultaneously with 180 phasing and simultaneously 6 caverns up to one meter deep.

Features

The distinctive feature of the 5 3⁄4" and larger perforators is the ability to install the downhole motor and reamer to the lower connection thread and to perform pre- and post-perforation reaming in a single run operation.

Design possibilities

The perforator design allows to conduct:

- displacement of well fluid volume before and after perforation;
- acid treatments;
- well kick-off (start of well) by compression, swabbing, including hydrodynamic studies.

The perforator allows well kill after shearing of knockout valves.

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Technical specifications and sizes of double-knife cutters

PARAMETERS	UNITS	CASING OD					
		4"	4 1/2"	5"	5 3/4"	6 5/8"	7"
Outer diameter	in	3.15	3.62	3.94	4.65	5.43	5.83
Total length	ft	6.33	6.89		6.86	7.05	
Weight	lbs	128	165	207	216	264	286
Number of hydraulic nozzles	pcs	6					
Slot width	in	0.35			0.39		
Knife exit in relation to the perforator body	in	0.79	0.91	1.02	1.18	1.38	1.42
Connection thread	in	As per a request					
Distance between hydraulic monitors	in	3.94		4.92	5.91		

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FOUR-KNIFE CUTTERS

Purpose

The perforator is designed for opening of pay zones in oil and gas wells by cutting of longitudinal slots and bottom-hole zone hydro jetting through these slots.

The perforator can form 4 slots simultaneously with a 90° phasing and simultaneously jet 8 caverns up to one meter deep.

Features

The distinctive feature of the models in sizes 5 ¾" and larger is the ability to install the downhole motor and reamer to the lower connection thread and to perform pre- and post-perforation reaming in a single run operation.

Design possibilities

The perforator design allows to conduct:

- replacement of well fluid volume before and after perforation;
- acid treatments;
- well kick-off (start of well) by compression, swabbing, including hydrodynamic studies.

The perforator allows well kill after shearing of knockout valves.

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Technical specifications and sizes of four-knife cutters

PARAMETERS	UNITS	4“ casing OD	4.5”-7” casing OD
Outer diameter	in	3.15	As per request
Total length	ft	5.58	
Weight	lbs	110	
Number of hydraulic monitors	pcs	8	
Slot width	in	0.35	
Knife exit in relation to the perforator body	in	0.79	
Connection thread	in	Any	
Distance between hydraulic monitors	in	3.94	

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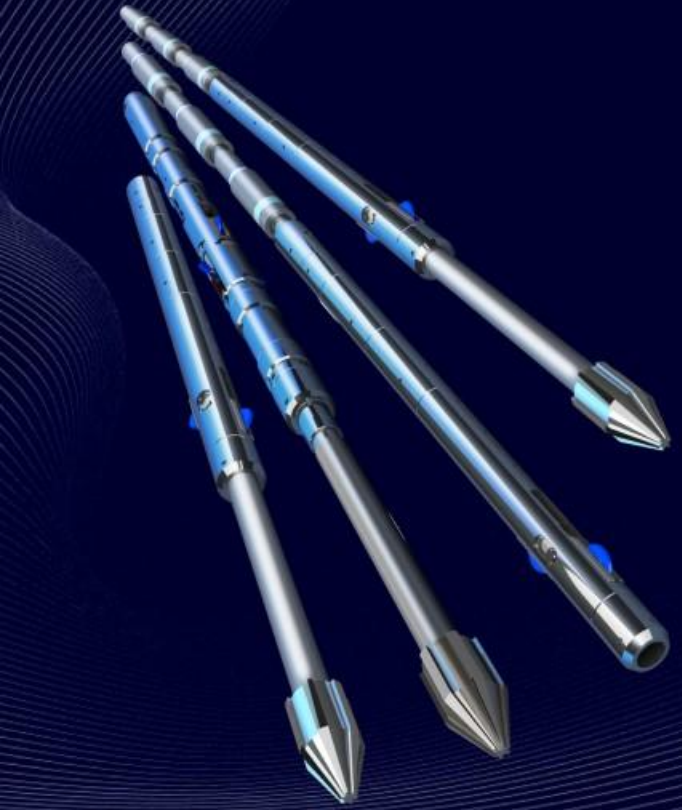
APPLICATIONS



1. INJECTION OF ANY CHEMICALS INTO A WELL
2. WELL KICK-OFF (starting of a well) THROUGH KICK-OFF COLLARS
3. USING REAMER WITH DOWNHOLE DRILLING MOTOR

Possibility of complex work as per the Customer's needs

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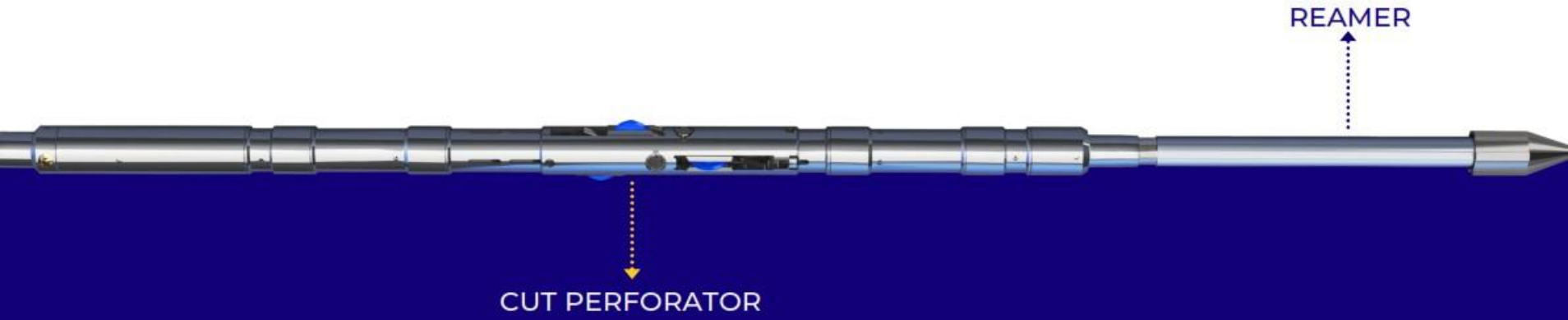
Cut perforation & acid (chemical) injection in 1 run

CUT PERFORATOR - LAYOUT WITH REAMER



Reamer

It is designed for additional wellbore calibration when leaving the cut "window" in the string, for working out and restoring the inner diameter of the casing, as well as for workover operations in wells.

Features

The distinctive feature of the models in sizes 5 3⁄4" and larger is the ability to install the downhole motor and reamer to the lower connection thread and to perform pre-and post-perforation reaming in a single run operation.

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Technical specifications and sizes of cut perforators with reamer

PARAMETERS	UNITS	5-3/4" double-knife	6-5/8" – 7" double-knife	5-3/4" four-knife	6-5/8"-7" four-knife
Outer diameter	in	4.65	Manufactured as per request	4.65	Manufactured as per request
Total length	ft	7.61		9.19	
Weight	lb	315		353	
Number of hydraulic monitors	pcs	6		8	
Slot width	in	0.39		0.39	
Knife exit in relation to the perforator body	in	1.18		1.1	
Connection thread	in	Any		Any	
Distance between hydraulic monitors	in	4.72		3.94	

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Technological advantages of Cut perforation with reamer

1. SAVINGS ON BRINGING WELLS BACK TO STEADY-STATE MODE BY COMBINING TWO TYPES OF WORK IN ONE RUN: RESTORATION OF THE PRODUCTION CASING ID/OVALITY AND PERFORATION
2. LARGE AREA OF PRODUCTION CASING PERFORATION
3. SAVE PERFORATION OF THE PRODUCTION CASING AND ELIMINATION OF CIRCULATION AND CROSS FLOW BEHIND CASING

Main Technological Advantages of Cut Perforation

	Nekko cut perf.	Cumulative perf.
1	SAFE OPERATIONS WITHOUT THE USE OF EXPLOSIVE MATERIALS	STORAGE, TRANSPORTATION, OBTAINING PERMISSIONS FOR EXPLOSIVE MATERIALS
2	SAVE PERFORATION OF THE PRODUCTION CASING AND ELIMINATION OF CIRCULATION AND CROSS FLOW BEHIND CASING	INTEGRITY OF CASING/LINER AND CEMENT BOND ARE COMPROMISED
3	SAVING ONE OR MORE RUNS DUE FLEXIBLE ASSEMBLY OPTIONS AS PER CUSTOMER REQUIREMENTS. FOR EXAMPLE SCRAPPING AND PERFORATION IN 1 RUN.	SOMETIMES MORE THAN 1 RUN IS REQUIRED FOR DIFFERENT OPERATIONS
4	THE PERFORATION AREA IS SUBSTANTIALLY LARGER IN COMPARISON WITH CUMULATIVE PERFORATIONS. THE REQUIRED OPENING AREA IS OBTAINED IN 1 RUN. PERFECT FOR INJECTION WELLS	SOMETIMES REPERFORATION REQUIRED TO INCREASE INJECTIVITY. ADDITIONAL RUNS MAY REQUIRED