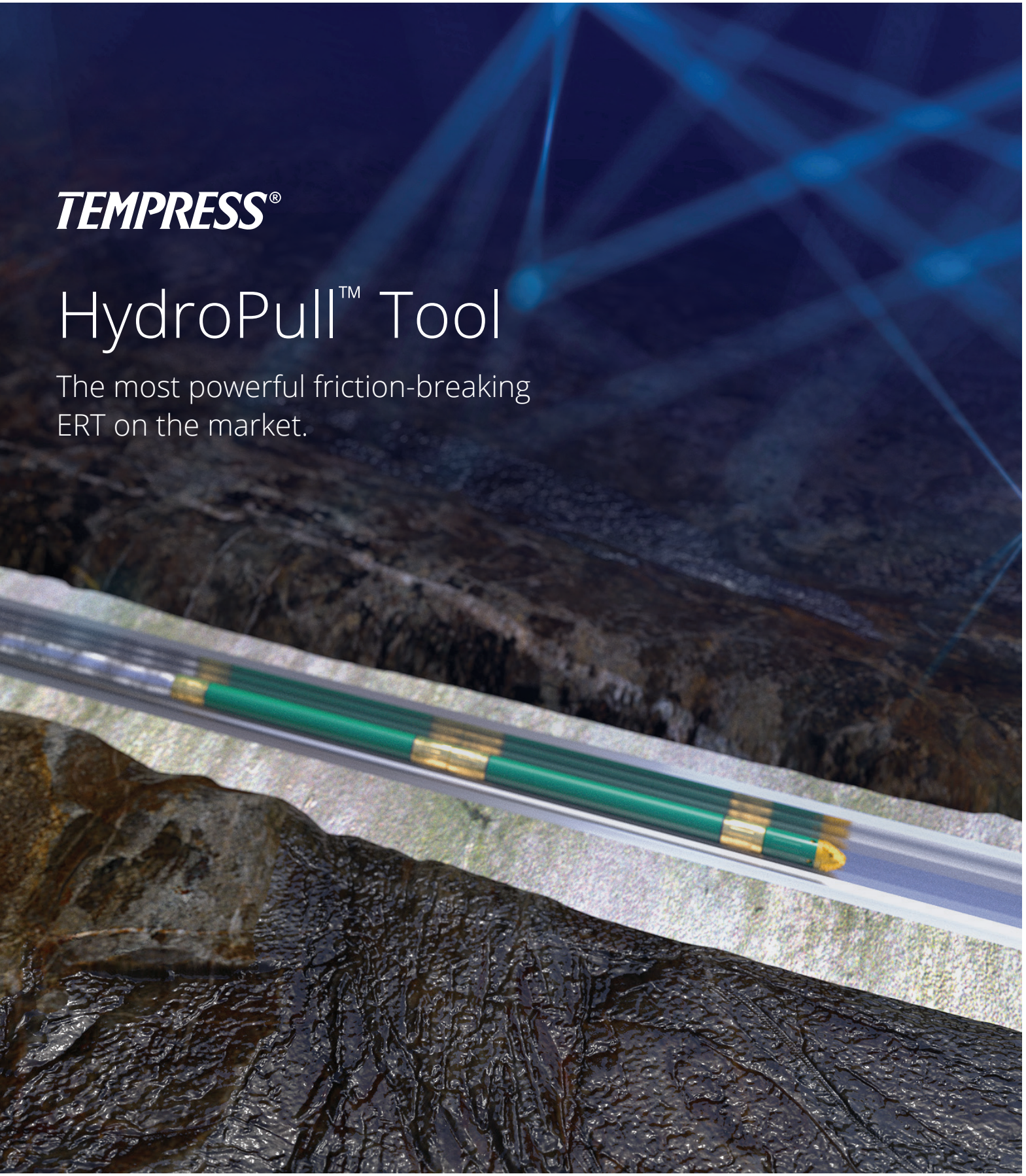
OIL STATES™

TEMPRESS®

HydroPull™ Tool

The most powerful friction-breaking ERT on the market.



Specifications

The HydroPull™ tool incorporates a cycling valve that momentarily interrupts the flow to create water-hammer pressure pulses inside coiled or jointed tubing used in horizontal well interventions. The water-hammer effect generates traction forces that pull the tubing into the well at up to +30 ft/min (9 m/min) or more. These periodic pulses also vibrate the tubing, which reduces friction drag and extends the lateral reach of the tubing by delaying the onset of helical buckling and lockup.

The HydroPull™ tool is typically run above a downhole motor for milling applications. This patented tool continues to set and break all existing records for extended reach applications. The tool is tunable for different impact levels, flow levels, and custom applications.

WATCH NOW

Applications

- Extended-reach well service
- Composite bridge plug milling
- Ball seat milling
- Coiled and Jointed tubing
- Sand cleanout
- Valve shifting
- Acidizing
- Chemical placement
- Screen and perforation cleaning
- Scale removal
- Depleted well service
- Fishing

Feature	Benefit
Pulling Force	• Pulls tubing into long tortuous wells • Reduces plug milling time • Eliminates the need for friction-reducing beads and chemicals • **Routine entry of 3 to 4 mile horizontals**
Flow Pulsation	• Better hole cleaning • Increases turbulent flow in the casing for sand and debris removal • **Routinely mill 70+ plugs per day**
Configurable	• Range of configurable flow rate and impact levels
Low pressure differential	• Effective on various coil sizes or high-pressure wells
High reliability	• Multiday extreme-reach jobs without tripping • Over 99% downhole success rate • **Mill 100+ plugs in a single run**
Polymer gel compatibility	• Effective sweeps minimize short trips
Nitrogen compatibility	• Effective on commingled fluid for depleted well service
Software Modeling	• Proprietary software program is available to evaluate horizontal reach capability in the well based on job specific input parameters • The program also calculates circulating pressures, pump pressure requirements, the transport of sand and cuttings, and pull (feed) rate

More information at www.oilstatesintl.com

Completion & Production Services

Tools	1.69" Standard Flow	2.12", 2.38 Standard Flow	2.12", 2.38" High Flow
Max continuous flow rate	1.8 bpm (290 lpm)	2.0 bpm (320 lpm)	2.4 bpm (380 lpm)
Max intermittent (jarring) flow rate	2.2 bpm (350 lpm)	2.6 bpm (410 lpm)	2.9 bpm (460 lpm)
Average pressure differential at max	750 psid (5.2 MPa)	450 psid (3.1 MPa)	420 psid (2.9 MPa)
Max traction (impact) force	1,800 lbf (800 daN)	2,200 lbf (980 daN)	1,550 lbf (690 daN)
Pulse cycle rate	9-20 Hz	10-23 Hz	9-21 Hz

Tools	2.88" Standard Flow	2.88" High Flow
Max continuous flow rate	3.8 bpm (600 lpm)	5.0 bpm (790 lpm)
Max intermittent (jarring) flow rate	4.5 bpm (710 lpm)	5.5 bpm (870 lpm)
Average pressure differential at max	550 psid (3.8 MPa)	590 psid (4.1 MPa)
Max traction (impact) force at max	3,930 lbf (1750 daN)	5,100 lbf (2270 daN)
Pulse cycle rate	3.4 – 8.0 Hz	3.4 - 8.0 Hz

Tools	3.12", 3.38" Standard Flow	3.12", 3.38" High Flow
Max continuous flow rate	4.2 bpm (670 lpm)	6.0 bpm (950 lpm)
Max intermittent (jarring) flow rate	4.5 bpm (710 lpm)	>6.0 bpm (>950 lpm)
Average pressure differential at max	550 psid (3.8 MPa)	560 psid (3.9 MPa)
Max traction (impact) force at max	4,580 lbf (2040 daN)	6,750 lbf (3000 daN)
Pulse cycle rate	3.9 – 9.0 Hz	3.4 - 8.0 Hz

Tools	2.38" XL Extra High Flow	3.12", 3.38" XL Ultra High Flow	3.50" XL High Flow
Max continuous flow rate	3.0+ bpm (480 lpm)	7.0 bpm (1100 lpm)	8.0 bpm (1270 lpm)
Max intermittent (jarring) flow rate		>7.0 bpm (>1100 lpm)	
Average pressure differential at max	In Development	830 psid (5.7 MPa)	In Development
Max traction (impact) force		2,200 lbf (980 daN)	
Pulse cycle rate		10-23 Hz	

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Information

The HydroPull™ tool is consistently setting or breaking existing records.

Flow Rate Effect

The traction force is linearly proportional to the flow rate in the coil and is controlled by the impact configuration. Configurations available for most applications include Standard Impact and High Impact. Max Impact is available for most tool sizes the most demanding applications.

Two-Phase Flow

The HydroPull™ tool can be operated on two-phase flow, though the presence of nitrogen dampens the pulses. The tool can also be run with a Tempress Motor Gas Separator (MGS™). The HydroPull tool may also be run downhole with straight gas, if required.

Last Chance Screen

Clean fluid with no sand should be run. A last chance screen is included with each HydroPull™ tool to prevent gravel and other debris from blocking internal passages and to minimize the chance for premature failure of other bottomhole assembly components. The screen openings are 0.063-in. (1600 microns) or 0.094-in. (2350 microns) depending on tool size and job requirements.

HydroPull™ Operation Guide

An operation guide is included with the HydroPull™ tool that provides operating instructions and job reporting requirements. These guides are also located within our Client Login site on our website.

Case Histories

Please contact us or visit our website for the most recent HydroPull™ Case Histories.

Contact Information

Tempress Technologies Inc.
2200 Lind Avenue SW
Building A, Suite 108
Renton, WA 98057
Phone: 425.251.8120
www.tempresstech.com

Completion & Production Services

Performance Software

Our proprietary software program is available for HydroPull™ tool job planning. The software evaluates horizontal reach capabilities in the well based on job specific input parameters. Survey data can be utilized for the most accurate results. The program also calculates circulating pressures, pump pressure requirements, the transport of sand and cuttings in the horizontal and vertical sections of the well, predicted lockup, and the rate at which the tool will pull the workstring into the well. This software is located within our Client Login site on our website.

HydroPull™ Extended Reach Model with Simplified Well Profile
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This performance software is designed specifically for use with Tempress® tools only

enter all blue data

	Well date and designation	mm/dd/yr		Well name
	Select units	**US Units**		see *Instructions* tab
	Kickoff point (TVD)	9,000	ft	
	End of curve/landing point (TVD)	10,000	ft	
Well Data	Toe depth (TVD)	10,000	ft	0.0 deg toe-up
	Measured depth (MD) objective	24,000	ft	
	ID of casing in vertical and curve	4.67	in	
	Lateral ID (cased or open hole)	4.67	in	
	Average dog leg severity in horizontal	2	°/100 ft	
	Static friction coefficient	0.24		.21 for pipe-on-pipe friction reducer, .24 with no FR
Workstring *(see tab)*	Coiled tubing length	28,000	ft	
	Coiled tubing OD	2.625	in	*see Workstring* tab
	Wall thickness	0.156	in	
BHA	Minimum flow ID in motorhead or circ valve	1.000	in	upstream of HP and/or WBS
	HydroPull tool diameter	3.12, 3.38	in	
	HydroPull configuration (flow rating, impact rating)	High Flow, High Impact		
	Number of nozzle ports (bit or bullnose)	6		see *Nozzle Sizes* tab
	Bit port diameter	0.438	in	
	Tempress Water Bypass Sub	No		
	No-load motor pressure	50	psid	0 if no motor (see *Motor Data* tab)
	On-off bottom motor pressure differential	750	psid	0 if no motor
Operating Parameters				
	Pump flow rate	4.50	bpm	
	Minimum weight on bit	650	lbf	
	Wellhead circulating pressure (choke)	100	psi gauge	
	Fluid friction reducer effect	50%	% reduction	
	Fluid density	8.34	ppg	spec. gravity = 1.00
	Fluid lost (-) to or gained (+) from formation	0	bpm	use estimate, default is 0
Results	Differential pressure through BHA	1,300	psi	
	Pump pressure (drilling/milling)	3,210	psi	
	Bottomhole circulating pressure (BHCP)	4,670	psi	
	Wellhead snubbing force	620	lbf	
	Hydraulic liftoff force	740	lbf	
	Water hammer pulse in annulus	250	psi	median to trough differential
	Water hammer pulse in work string	690	psi	median to peak differential
	Minimum rupture disk rating	4,300	psi	
	Impact (pull) force at BHA	4,260	lbf	
	Fluid velocity in horizontal section	358	ft/min	OK
	Vertical cuttings transport ratio (1-mm sand)	85%		OK
	Water Flow to motor	4.49	bpm	
	Water bypass (if WBS selected)	-	bpm	
	On-Off bottom motor flow variation w/WBS	-		
Results				
	Maximum coil feed rate in the lateral	15	ft/min	see Instructions tab
	Coil lockup MD without HydroPull	17,741	ft	
	Max extended reach MD with HydroPull	**27,720**	**ft**	CT length limited
	Increased reach potential due to HydroPull	9,979	ft	

Refer to HydroPull Operators Guide for more information or call 425.251.8120 for well planning assistance

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Revised Oct 2025 TT