

ToeTapper



CT Energy's Toe Tapper is a unique coiled tubing friction reduction tool. The tool generates a negative pressure pulse that stimulates the coiled tubing frictional drag. By using a variable restrictor in fluid flow, the Toe Tapper is tuned to dump fluid into the annulus at a low frequency. This generates a periodic fluid hammer effect, due to a sharp reduction in pressure at the bottom of the coiled tubing. This pressure pulse actuates the flexible coiled tubing, reducing the friction coefficient from static to dynamic. The slower frequency of the tool gives more time for the energy of the pressure pulse to act on the coiled tubing, which also improves cuttings removal (as the coiled tubing actuates over a larger area). The fluid hammer effect also generates a mechanical force. While the valve cycles, the hydraulic inertial forces react axially and produce and impact an energy pulse which improves weight transfer. Evidence has shown that this pressure pulse improves the helical buckling threshold, as the rigidity of the coiled tubing with the Toe Tapper is more dynamic, with higher rigidity at the pressure peaks.

The tool's unique capability of producing a low frequency pulse means that the tool provides a more effective friction reduction through a pressure pulse that has more time to act on coiled tubing. As a result of this decreased friction, far greater well depths can be achieved.

To achieve maximum tool efficiency, approximately 5%-8% of the fluid being pumped down coil tubing is vented to the annulus through a nozzle near the bottom of the Toe Tapper. This venting generates a more efficient negative pressure pulse, which produces the fluid hammer effect responsible for breaking friction. The low frequency negative pressure pulse actuates the coiled tubing over a longer period, allowing the coiled tubing more time to move. The fluid venting also permits slightly higher pump rates, which in turn improves debris removal and well cleaning.

Features

- Power section can be tuned to change pressure pulse frequency.
- Valving system can be tuned to increase/decrease pressure pulse magnitude.
- Can be used with a variety of fluids including N₂.

Benefits

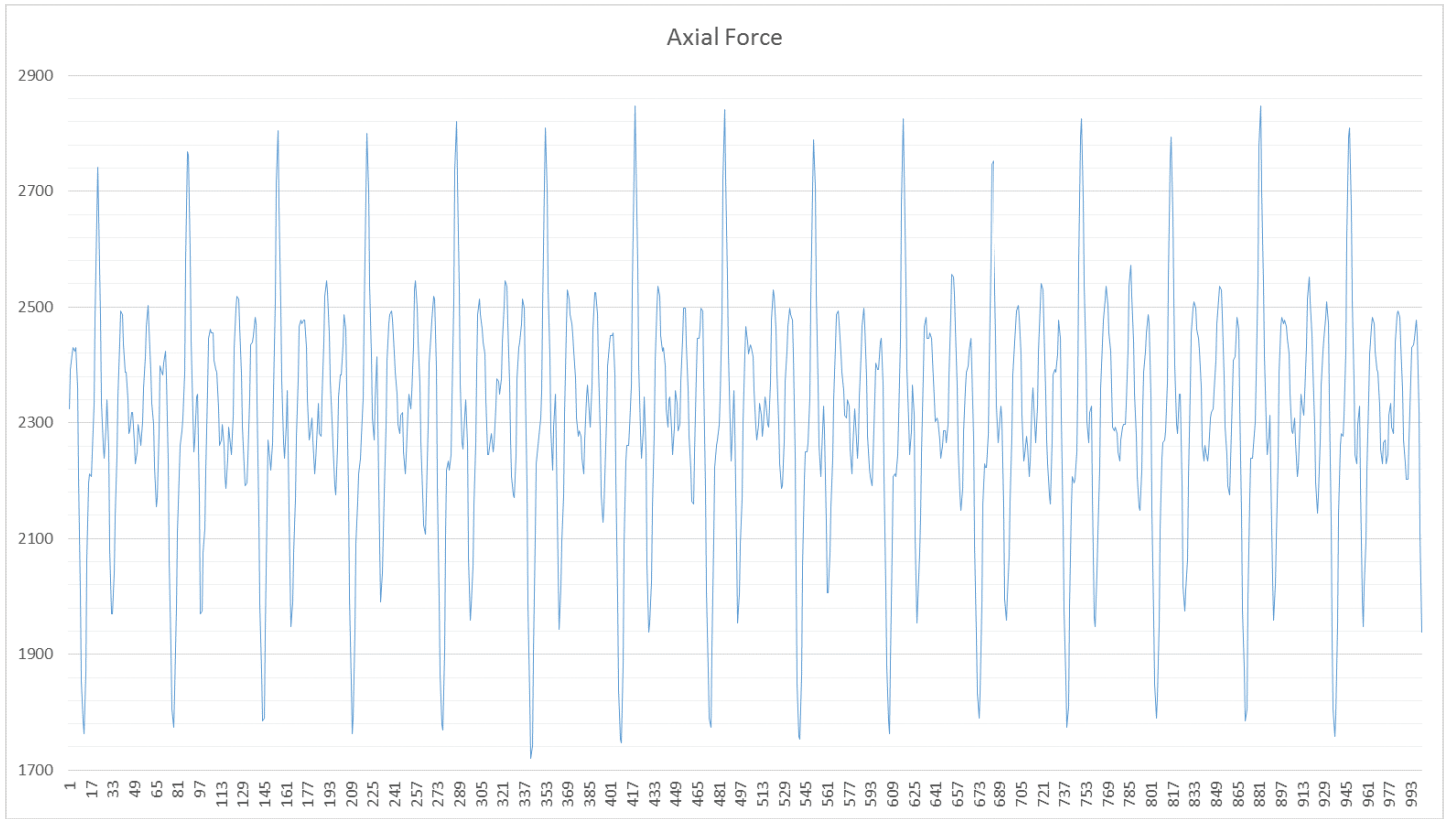
- Fluid hammer effect produces hydraulic pull, improving weight transfer.
- Low frequency enables the high amplitude pressure pulse time to act on the coiled tubing effectively.
- Reduces friction caused by helical buckling.
- Improves milling time.
- Extended reach in long horizontal sections.
- Improved debris cleaning.

Applications

- Extended reach well stimulation operations.
- Extended reach well intervention procedures.
- Extended reach composite bridge plug milling.
- Extended reach fracture hardware milling.
- Extended reach toe preparation.
- Extended reach sand cleanout.
- Extended reach production logging.
- Extended reach abrasive perforating.



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Technical Data

Tool Size	MUL	Weight	Flow Rate	Temperature	Operating Frequency	Differential Pressure	Tensile Strength	Torsional Strength	Threads
mm (in.)	m (in.)	kg (lb)	m ³ /min (bpm)	°C (°F)	Hz	kPa (psi)	kN (lbf)	Nm (ft-lb)	mm (in.)
54 (2.125)	1.70 (67)	20 (45)	0.11-0.23 (0.71-1.43)	175 (350)	4-7	2,750-5,515 (400-800)	89 (20,000)	1,695 (1,250)	38.1 AMMT (1.5 AMMT)
73 (2.875)	1.47 (58)	48 (105)	0.19-0.63 (1.2-4.0)	175 (350)	5-8	2,750-5,515 (400-800)	347 (78,000)	4,745 (3,500)	60.3 PAC (2.375 PAC)
79.28 (3.125)	1.67 (65.8)	60 (132)	0.38-0.79 (2.4-5.0)	175 (350)	5-8	2,750-5,515 (400-800)	574 (129,000)	5,152 (3,800)	60.3 API REG (2.375 API REG)

