

PowerFlex and PowerEcho

Annular barrier evaluation services

APPLICATIONS

- Drilling
 - Top of cement
 - Liner overlap cementing
 - Drill-wear and burst pressure
 - Drill-out decisions
 - Casing centralization optimization
 - Slot recovery and sidetracks
- Cementing
 - Cement placement design analysis
 - Cement contamination
 - Cement properties
 - Centralization plan effectiveness
- Well integrity
 - Cement placement quality
 - Pipe centralization effectiveness
 - Microannulus diagnosis
 - Leak path analysis
- Cut-and-pull operations
 - Annulus condition
 - Barite sag
 - Top of cement
 - Eccentricity and contact points
 - Casing condition for pull determination

PowerFlex* and PowerEcho* annular barrier evaluation services significantly extend the operating range of ultrasonic cement and casing measurement technologies. This powerful family of services answers the need for robust and reliable measurements to quantify annular content and bond and to confirm centralization and condition of the casing, especially for the growing number of wells with heavy well fluids and large-diameter, thick-walled casings.

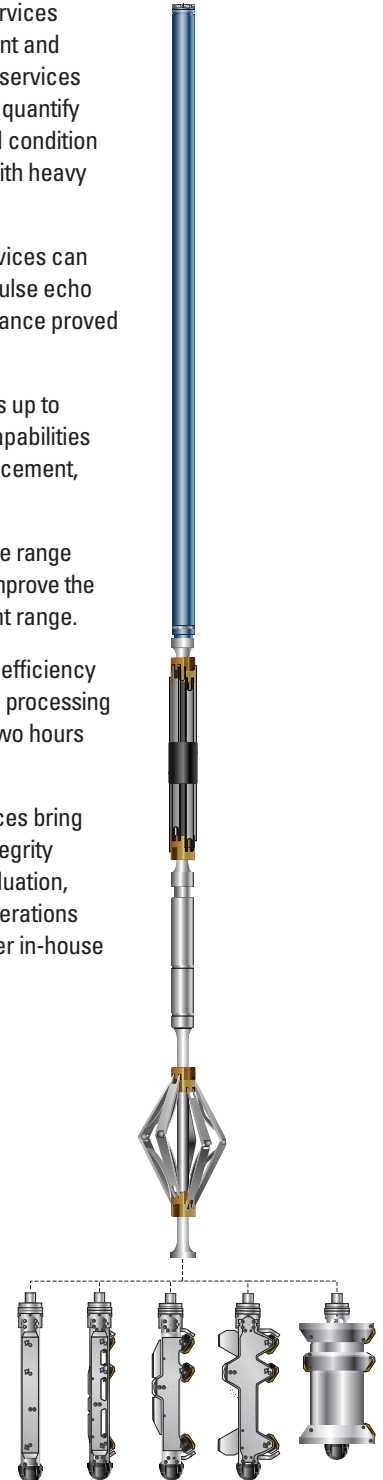
The powerful new transducers incorporated in the two services can effectively overcome the challenges of attenuation of the pulse echo and flexural wave signals in heavy muds, with their performance proved in weights exceeding 18 ppg.

PowerFlex and PowerEcho services operate in casing sizes up to 22 in and thicknesses up to 1 in. Their annular evaluation capabilities accurately quantify the cement condition and bond for any cement, from ultralight to heavyweight slurries.

In addition to expanding the measurement envelope to a wide range of well environments, PowerFlex and PowerEcho services improve the reliability and certainty of answers across the measurement range.

PowerFlex and PowerEcho services also increase wellsite efficiency via significantly improved logging speeds. Enhanced wellsite processing enables a turnaround time for the field answer product of two hours or less.

PowerFlex and PowerEcho annular barrier evaluation services bring certainty to decision making for drilling, cementing, well integrity evaluation, and well abandonment operations. Cement evaluation, annular barrier integrity determination, and cut-and-pull operations can be conducted with confidence by operators using either in-house workflows or the Techlog* wellbore software platform.



PowerFlex annular barrier evaluation service.

	PowerFlex Service	PowerEcho Service
Pipe inspection		
Casing ID, thickness		
Casing deformation and drift ID	Yes	Yes
Casing wall loss and drillpipe wear	Yes	Yes
Casing burst and collapse pressure	Yes	Yes
Max. safe pipe pull	Yes	Yes
Corrosion evaluation	Yes	Yes
Control and fiber-optic line location	Yes	Yes

Annular characterization		
Azimuthal cement map	Best option	Yes
Cement placement quality characterization	Best option	Yes
Microannulus	Best option	Yes
Foamed and lightweight cement (less than 11 ppg)	Best option	–
Contaminated cement	Best option	–
Casing cut and pull	Best option	Yes
Cement placement troubleshooting	Best option	Yes
Barite sag	Best option	Yes
Remedial squeeze	Best option	Yes
Visualization of pipe position and eccentricity	Best option	–
Cement sheath thickness	Best option	–

	PowerFlex Service	PowerEcho Service
Measurement Specifications		
Output	Acoustic impedance, cement bond to casing, flexural attenuation, Variable Density* log (VDL) of annulus waveform, solid-liquid-gas map of annulus material, hydraulic communication map, rugosity image, internal radius image, casing thickness image	Acoustic impedance, cement bond to casing, internal radius, casing thickness
Logging speed, [†] ft/h [m/h]	400 to 4,500 [122 to 1,372]	600 to 13,000 [183 to 3,962]
Depth of investigation, in [cm]	Casing and annulus: 3 [7.62]	Casing-to-cement interface
Horizontal resolution, °	5 or 10	5 or 10
Vertical resolution, in [cm]	0.6 to 6.0 [1.52 to 15.24]	0.6 to 6.0 [1.52 to 15.24]
Casing thickness		
Range, in [cm]	0.15 [0.38] to 1.0 [2.54]	0.15 [0.38] to 1.0 [2.54]
Accuracy, %	±2	±2
Resolution, in [cm]	0.002 [0.005]	0.002 [0.005]
Acoustic impedance		
Range, Mrayl	0 to 10	0 to 10
Accuracy, Mrayl	<3.3 Mrayl: ±0.5 >3.3 Mrayl: ±15%	≤3.3 Mrayl: ±0.5 >3.3 Mrayl: ±15%
Resolution, Mrayl	±0.2	±0.2
Flexural attenuation		
Range, dB/m	0 to 200	Not available
Accuracy, dB/m	5	Not available
Resolution, dB/m	1	Not available
Mud type or weight limitations [‡]	All types including weights greater than 18 ppg	All types including weights greater than 18 ppg
Combinability	Bottom only, combinable with most wireline tools	Bottom only, combinable with most wireline tools

[†] Some combinations may reduce logging speed, which is also resolution dependent.

[‡] Consult planning software to model the logging scenario.

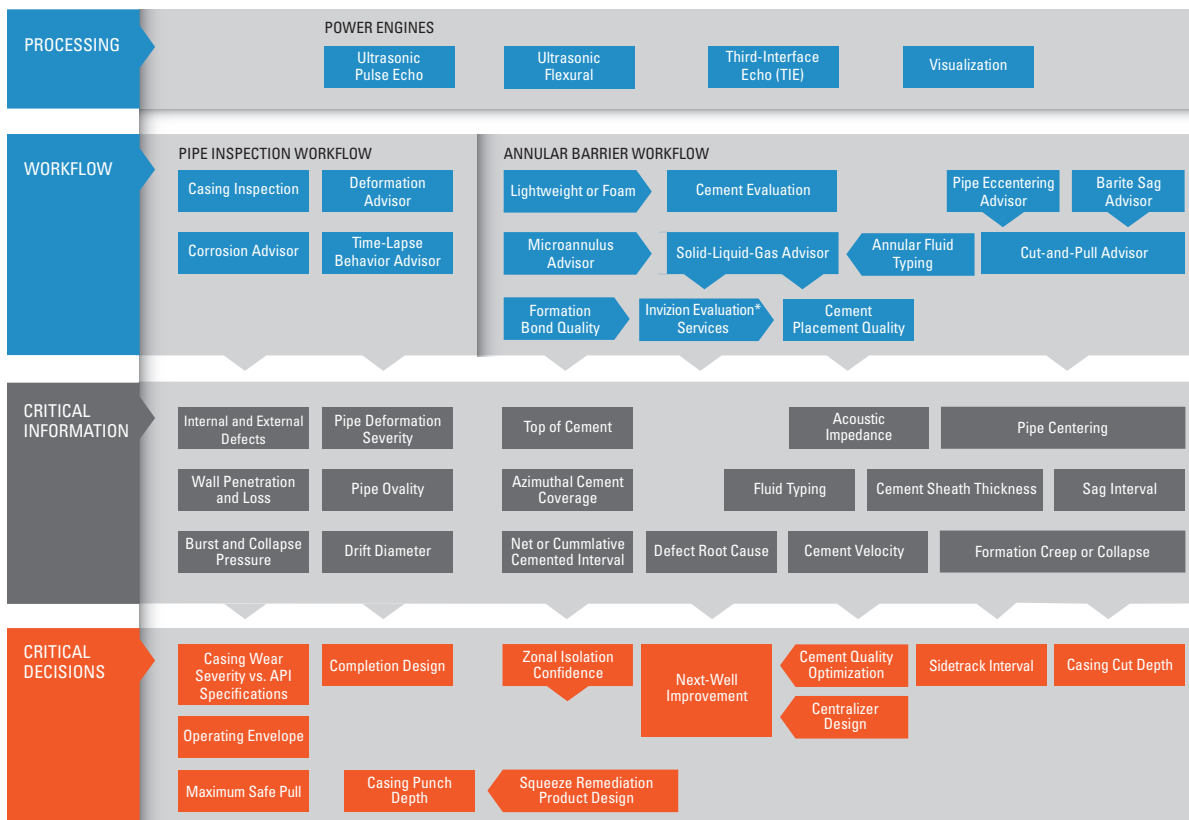
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	PowerFlex Service	PowerEcho Service
Mechanical Specifications		
Temperature, degF [degC]	350 [177]	350 [177]
Pressure, [†] psi [MPa]	20,000 [138]	20,000 [138]
Casing size—min., in [cm]	4½ Min. ID: 4 [10.16]	4½ Min. ID: 4 [10.16]
Casing size—max., in	16	22
Outside diameter, [‡] in [cm]	3¾ [8.57]	3¾ [8.57]
Length, [‡] ft [m]	14.58 [4.44]	14.58 [4.44]
Weight, [‡] lbm [kg]	299 [135.6]	299 [135.6]

[†] High-pressure versions available.

[‡] Without rotating sub.

PowerEcho Service Subs							
Mechanical Specifications	USRS-AB	USRS-A	USRS-B	USRS-C	USRS-D	USRS-E	USRS-F
Outside diameter, in [cm]	3.41 [8.66]	3.58 [9.09]	4.625 [11.75]	6.625 [16.83]	8.625 [21.91]	9.39 [23.85]	11.40 [28.96]
Length, in [cm]	9.8 [24.89]	9.92 [25.20]	9.8 [24.89]	8.3 [21.08]	8.3 [21.08]	9.06 [23.01]	9.06 [23.01]
Weight, lbm [kg]	7.7 [3.5]	7.7 [3.5]	10.6 [4.8]	15.0 [6.8]	18.3 [8.3]	17.64 [8.0]	20.06 [9.1]



The processing workflow for PowerFlex and PowerEcho services delivers confirmation and certainty as the basis for making critical decisions.

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