

Acoustic Conformance Xaminer® (ACX™) Service

IDENTIFIES AND CHARACTERIZES LEAKS AND FLOW AROUND THE WELLBORE AND BEHIND PIPE

OVERVIEW

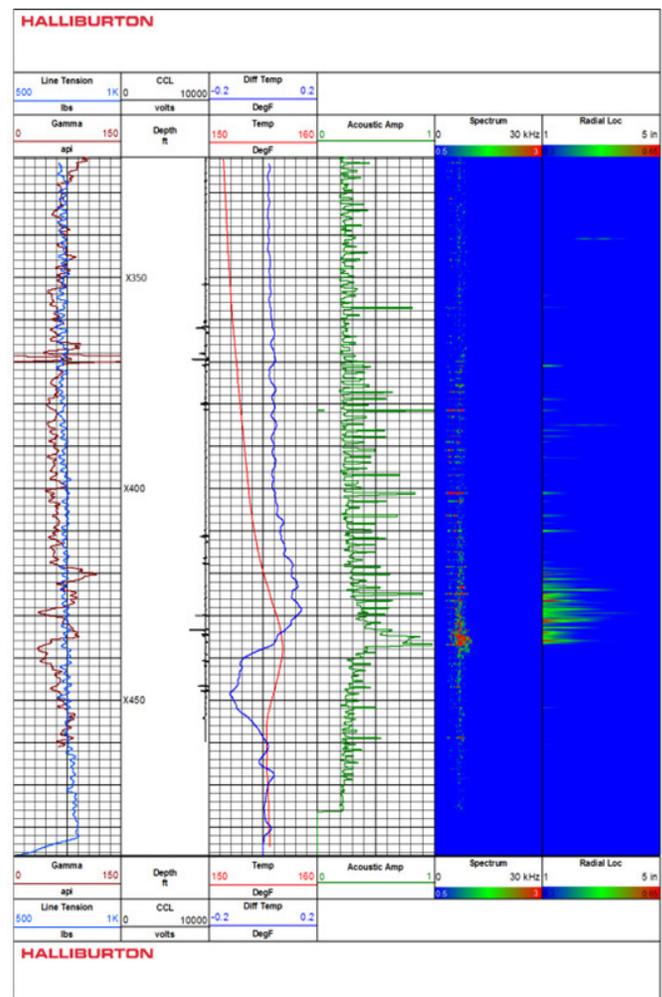
Halliburton has a new-generation acoustic analysis tool that uses hydrophone array technology to locate and describe communication paths and flow areas—vertically and radially in the wellbore area in real time. The array triangulates on the sound/flow source in or around the wellbore. Array analysis also helps eliminate false picks off of frequency and magnitude shows that have more to do with the well structure than the leak source. The radial locator has proven invaluable in some wells that have been logged by identifying which annulus or component of a completions system is leaking.

The ACX™ service also reduces time by providing a continuous mode to quickly identify areas with possible leaks in the wellbore. In addition, it can accomplish stationary measurements to refine and reaffirm areas where leaks are identified by monitoring activity. Through post-run data analysis, the ACX service can provide the flow rate and phase estimations at the location of areas with possible leaks. In controlled testing, flow rates as low as 0.01 gpm have been identified. Field examples have also identified very low flow rates, which have been verified by customers.

ACOUSTIC CONFORMANCE XAMINER® SERVICE

The ACX service provides the following information:

- » Real-time data
 - Vertical location
 - Radial location
 - Frequency map
 - Acoustic magnitude
- » Post-Processing reports
 - Flow rate degree
 - Phase type (liquid-gas)
 - Flow mapping



ACX™ Log:

- Gamma ray for correlation
- Temperature log
- Acoustic magnitude
- Frequency map
- Vertical and radial location

This field example indicates that a tubing leak, located radially slightly over 1 in. from the center of the wellbore, is at X436 ft. Annular radial activity is noted above that point, showing flow going up the annulus.

Advanced Processing

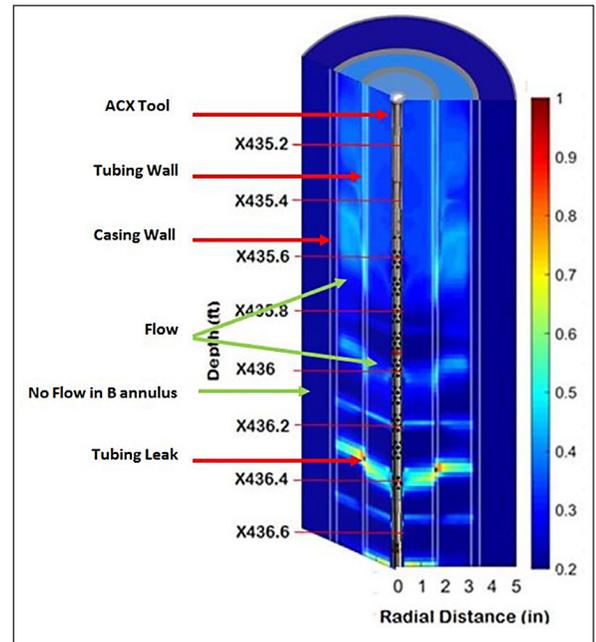
During the real-time capture, the surface data received enables quick on-site results. The ACX™ tool additionally stores high-definition data internally that can be downloaded at surface and sent to the Formation & Reservoir Solutions group for advanced high-definition processing.

This data permits a closer examination of the flow and acoustic events around the wellbore. Flow mapping analysis can also be done with the data to create a map of the acoustic activity and present it in a 2D image that will show the flow path in the well.

The image to the right is a flow map that has been generated from the field log previously shown. The image illustrates a cross section of the wellbore with the tool in the middle. So as marked, the flow can be seen going through the tubing wall (Tubing Leak). Flow can be seen in the tubing and in annulus A (Flow), distinguished by the white mist coloring, while annulus B is dark blue indicating no flow observed (No Flow).

Cased-Hole Diagnostic Services

The ACX service was designed to be a part of a full suite of diagnostic services. It is combinable with production logging instruments, cement evaluation instruments, and much more.



Flow Map: Indicating a tubing leak and flow in tubing and annulus A, as marked.

The right portion of the map has been duplicated and presented on the left to better illustrate the wellbore.

Dimensions and Ratings

Max Temperature	350°F (177°C)*
Max OD	1.69 in. (4.29 cm)
Tool Length	12 ft (3.66 m)
Max Pressure	15,000 psi (103 421 Kpa)
Min Hole ID	2 in. (5.10 cm)
Tool Weight	45 lb (21 kg)

*350°F (177°C) for 1 hour

Borehole Conditions

Borehole Type	Open <input checked="" type="checkbox"/> Cased <input checked="" type="checkbox"/>
Borehole Fluids	Salt <input checked="" type="checkbox"/> Fresh <input checked="" type="checkbox"/> Oil <input checked="" type="checkbox"/> Air <input checked="" type="checkbox"/>
Recommended Max Logging Speed	25 ft/min (7.62 m/min)
Tool Positioning	Centralized <input checked="" type="checkbox"/> Eccentrized <input type="checkbox"/>

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com/ACX

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

H011959 8/16 © 2016 Halliburton. All Rights Reserved.