HALLIBURTON

CASING EVALUATION

CASE casing evaluation

Detailed analysis provide easy interpretation of casing condition

FEATURES

- Compatible with existing FASTCAST, CAST-M, and MIT tool data
- Improves casing evaluation for both inner and outer defects
- Corrects for tool eccentricity, thus helping to distinguish even minute casing problems
- Log presentations can be customized to meet specific requests or needs. Presentations include raw data, segmented curves, and images, including 3D displays
- Joint and depth listings of defects allow easy input into other programs or a simple method to monitor known casing deformities

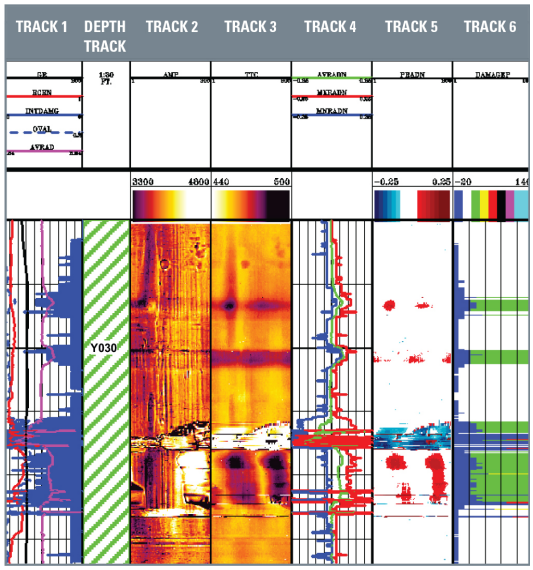
BENEFITS

- Delivers a more reliable indication of casing condition
- Provides a complete analysis for casing inspection, including interior/exterior corrosion, scaling, depth, and joint summaries, as well as 3D images
- Spreadsheets are provided which allow the customer to easily monitor the casing condition over time
- Works with competitors' data

HEALTH, SAFETY, AND ENVIRONMENTAL

- Helps customers monitor and prevent catastrophic casing problems
- Proper CASE software usage allows monitoring of casing erosion and corrosion

- The CASE processed log indicates where a packer was set, and the inner casing surface was damaged during removal
- Track 1 provides gamma ray (GR) for depth correlation, eccentricity (ECEN), ovality (OVAL), average radius (AVRAD) and pipe wear (INTDAMG)
- Eccentricity is a measure of tool centralization. Ovality indicates casing shape. Radius is a casing integrity indicator and INTDAMG is the percentage of pipe wear on a scale of 0 to 50 percent



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- Track 2 is the amplitude of the first arrival and can be used to visually indicate casing damage
- Track 3 is an eccentricity-corrected travel time for the first arrival. This will be used in determining casing ID or radius
- Track 4 shows the minimum, maximum, and average of the normalized pipe radius PRADN
- Track 5 is a normalized pipe radius. The blue intervals indicate deformed pipe and the red intervals indicate reduced wall thickness from packer removal process
- Track 6 provides a pipe damage indicator color coded by percent of damage for easy identification of pipe wear, where the damage is color coded with the following percentages: white< 20%<green<40%<yellow<60% <red<80% and black > 80% damage

Halliburton's CASE™ casing evaluation and inspection software, using data from the ultrasonic FASTCAST™ or CAST-M™ tools, or the multifinger caliper tools (MIT), provides accurate casing evaluation. With ultrasonic data recorded in the casing mode, CASE software provides precise casing ID and thickness measurements that allows easy casing integrity. When the ultrasonic data is acquired in the image mode or with the multifinger caliper tools, CASE software provides a detailed interpretation of the interior casing damage.

The inner surface wear on the casing can be monitored with the CAST™ tool in image mode. The high-resolution vertical and horizontal measurements greatly reduce the likelihood of overlooking defects in a string of pipe, preventing possible long-term problems.

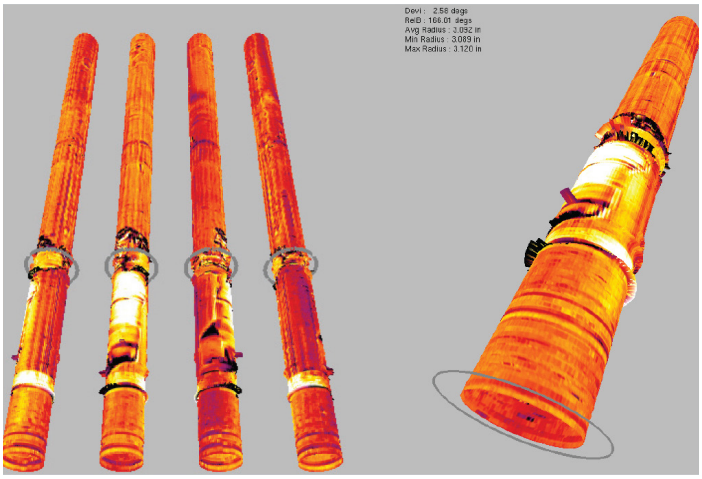
In cased-hole mode, the ultrasonic tools provide accurate casing ID and thickness measurements. With these measurements, it is possible to determine the total damage to the casing, and if the damage is internal, external, or both. The CASE software provides detailed information on the condition of the casing, preventing minor problems from becoming major problems. With both ultrasonic and caliper data, slight tool eccentering will lead to an inaccurate analysis. Spiral patterns can be an indication of eccentricity, not necessarily casing wear. The HoleShape program corrects the travel time data for tool eccentering, while the correction increases the detail of the travel time image, leading to an improved visual interpretation of casing defects.

The CASE program uses the fluid travel time, corrected travel time, and pipe thickness to evaluate the casing condition, and determines the percent of casing wear. If the casing is perfect (no damage in radius or thickness), then the normalized radius and thickness measurements will be zero. If the casing has internal corrosion, the radius measurement will be larger than the known, and the thickness will be smaller. Therefore, the normalized data will show the loss of casing wall as an increase in the pipe radius and a decrease in pipe thickness.

This information allows us to grade the pipe, based on the total loss of metal, and we can determine if the casing damage is inside/outside or a combination of both. These grades are based on industry standards, but can be adjusted based on customer requirements.

The final software in this suite is the CASE_JOINT™ program that finds, counts, and displays data based on each joint. For casing evaluation, collars can cause problems with the standard casing analysis logs. There are usually gaps between adjacent joints, additional metal in the collars, and possible damage near the collars from when the joints were made up. This program determines both joint and collar damage based on the grading used in CASE software.

The CHIME™ program combines all these programs and provides graphical displays of damage from both the ultrasonic and caliper tools. In addition, the CASE programs generate both spreadsheets and text files that list minimum, maximum, and average values of both the internal radius and the thickness of the casing, not only on a joint-by-joint listing, but also as a depth-by-depth listing. These files will allow continuous monitoring and comparisons of casing wear throughout the life of the well.



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The images above were generated from CHIME software showing the casing damage in 3D view.

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