

3D Visualization – A New Way of Evaluating Internal Casing Defects

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ABSTRACT

Historically caliper tools were used in open hole wells to determine borehole corrections and cement volume requirements. Over time caliper technology was applied to cased hole wells utilizing a multi-finger caliper design to assess interior metal loss and general corrosion of the casing. Despite the evolution of these tools and widespread use, they were not without their drawbacks.

The fingers used to measure radii were tied to an array and were unable to take independent readings. The readings taken from each array were averaged and were unable to define small internal defects like pits. New multi-finger caliper tools have 40 or 60 independent arms and are able to detect small defects, but they still only provide maximum, minimum, and average internal diameter. These limitations do not allow the identification of defects such as pits, ovality and buckling. In addition, there is also no way to find out if casings are eccentric. Newer multi-sensor caliper tools have the ability to record deviation and high arm orientation but visualization of the data is difficult using common analysis presentations.

With the advent of 3D computational visualization software it is now possible to present internal defect details which are not visible on usual log presentations. This new analysis tool has the capability to use all 40 (or 60 depending on the casing size) arms for 40 unique maximum internal diameter measurements to generate a three dimensional image. This accurate image allows for easy identification of pits, holes, and parted casing. Along with the 3D image, there is also a cross section diagram showing details such as tool decentralization and casing ovality. The ability to visually move up and down through the data permits a view of possible buckling in conjunction with axial stress calculations.

This presentation will focus on 3D visualization in contrast to common caliper log presentations using comparative examples of defects such as parted casing, buckling, drill wear; general corrosion and pitting; and small internal defects.