BOREHOLE IMAGING

Optical or Acoustic method

Optical imaging method

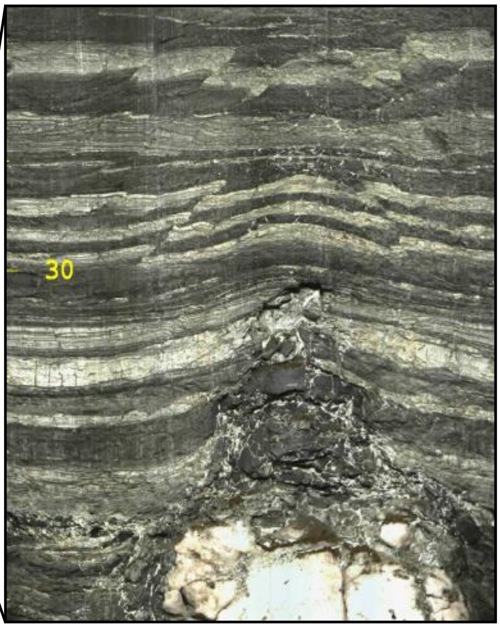
Thanks to the unsurpassed image quality available from our equipement, an optical borehole scan is possible of resolving the finest of details present on the borehole wall :

- to allow a complete visual appreciation of the target zone in terms of lithology, mineralisation, alteration,
- to develop a structural model of an ore body and host rocks based on an analysis of the different types of discontinuity present (bedding, joints, fractures, diaclases, veins ...)

Acoustic imaging method

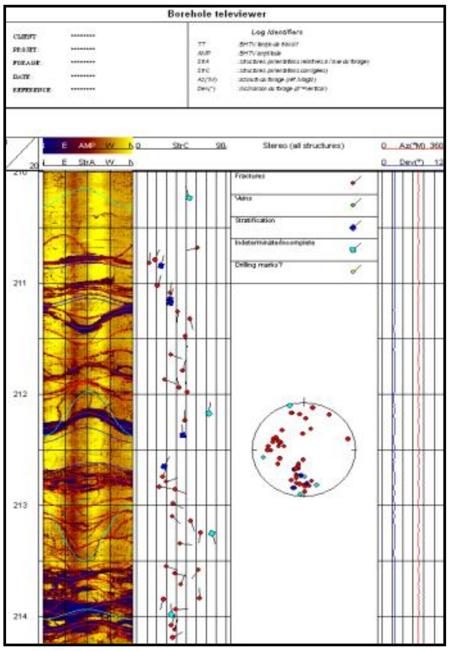
In cases where the borehole fluid is not suitable for an optical scan, it is nevertheless possible to obtain high quality images of the borehole wall using the acoustic method. This method gives rise to a pair of images, one representing the two-way travel time of the ultrasonic pulse over the return trip between the sonde and the borehole wall, the other being the amplitude or force of the signal received by the sonde.

The result is a precise and orientated acoustic reflectivity image of the formations encountered by the borehole.



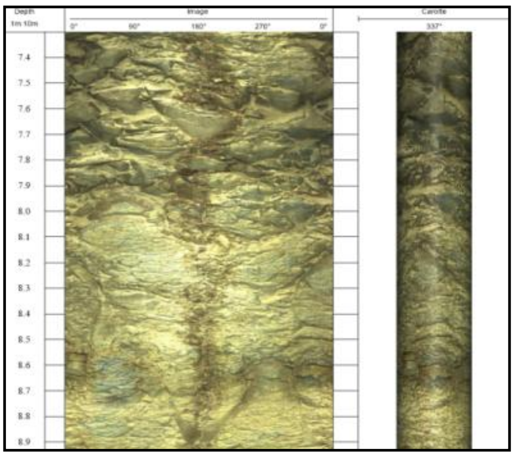
Left

Optical image log example showing the level of detail that is possible to obtain (borehole dameter 96 mm - 3.8")

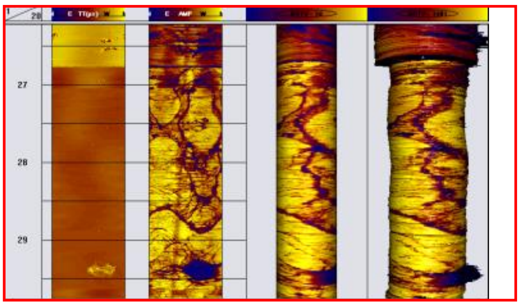


Right

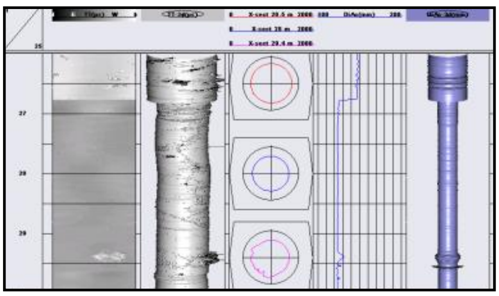
Reflection amplitude image, picked structures (tadpole presentation and stereographic projection, rose diagrams for the principal families of structures)



Acoustic imagery example showing a "virtual core" created using the travel time and amplitude images (optv and bhtv example)



The acoustic travel time data can be used to generate an orientated, high-resolution 3D model of the borehole. This method requires the knowledge of the sonic propagation speed in the borehole fluid, this can be determined by means of a calibration recording carried out in an interval of known diameter such as a cased section.



The principal application of this method lies in determining the local stress direction by analysing borehole ovalisation or breakouts.

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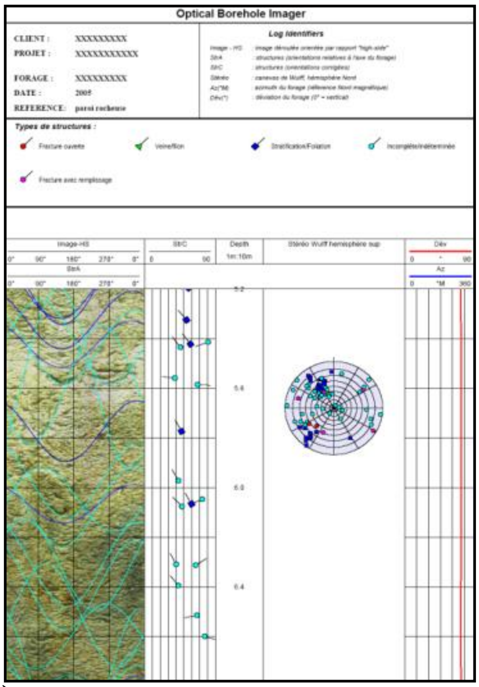
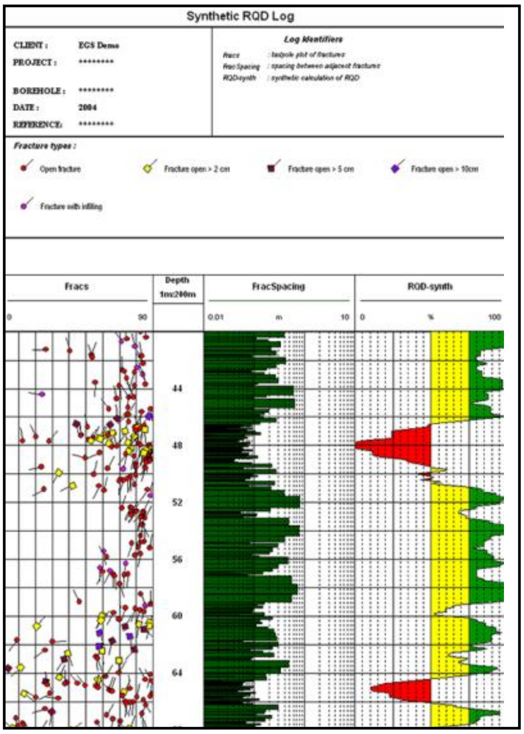
BOREHOLE IMAGING

Structural analysis

The different types of planar structures observed on the optical or acoustic borehole image logs can be picked, orientated and classified by means of an interactive software package.

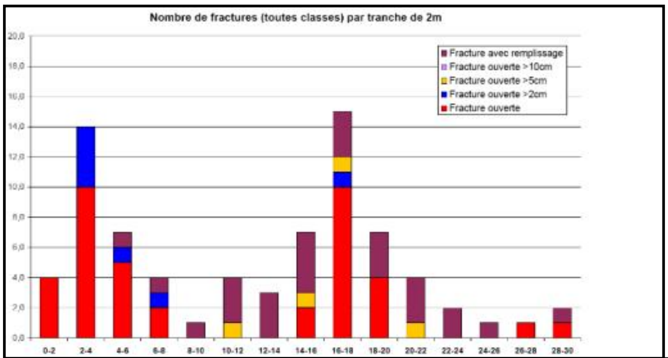
Their true dip and azimuth values are calculated by taking into account the deviation of the borehole.





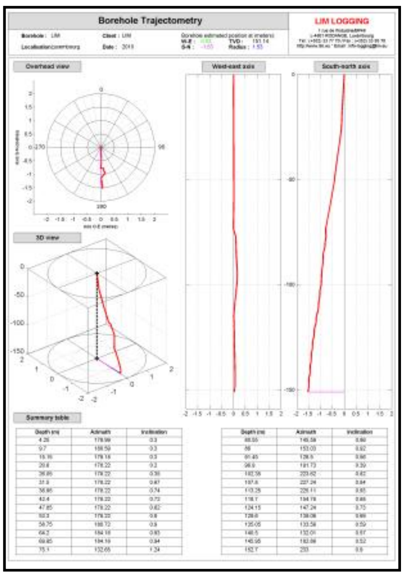
These data can be presented on the image logs themselves, or exported and used in other forms of analysis such as stereographic projections, rose diagrams of histogrammes. It is also possible to produce a synthetic RQD log based on the spacing between fractures observed on the image logs, these have shown to correlate well with observations made directly on the core samples.

Fracture spacing (central column) and synthetic RQD logs (right hand column) derived from OPTV log fracture data.

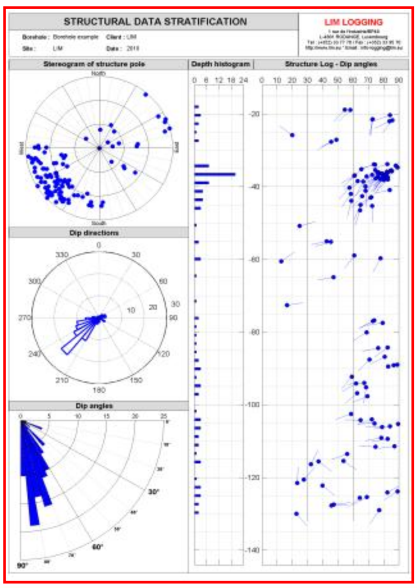


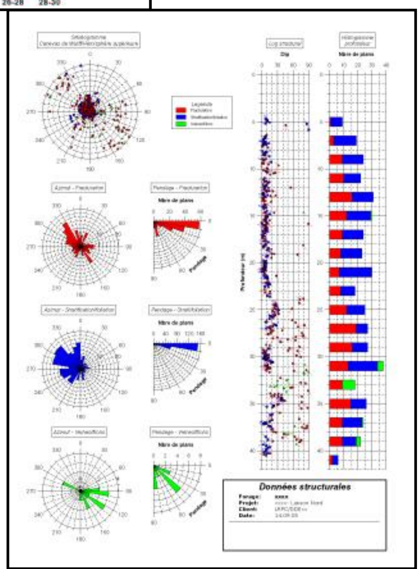
Histogramme giving the frequency distribution as a function of depth of the different families

Both of these methods provide a continuous measurement of the borehole deviation and azimuth useful for quality control purposes. With the acoustic method, the borehole diameter can also be determined.



Borehole deviation survey results: bullseye view, North/South and East/West sections, 3D projection





Structural summary sheet for a borehole presenting the data in several formats

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