

BHI Processing and QC



Borehole Image Logs can provide an in-depth understanding of the geological setting of a well. They can provide in-situ stress, structural and stratigraphic information, and can be used from the placing of a lateral to helping place frac stages. However, like with any analysis, the value of the final product is related to the quality of the input data.

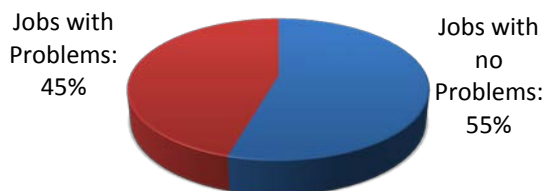
The logging tools use complex navigation sondes to orient the images, and rely on accurate caliper measurements. These require regular preventative maintenance, wellsite calibration and accurate tool string information to provide an image which can be reliably used for any kind of interpretation.

Task Fronterra’s workflow includes checking the following items:

- Data format and content
- Tri-axial magnetometer and accelerometer data
- Z-axis accelerometer and timing curve
- Caliper calibration
- Data delay offsets
- Depth match
- Orientation offsets
- Formation image integrity

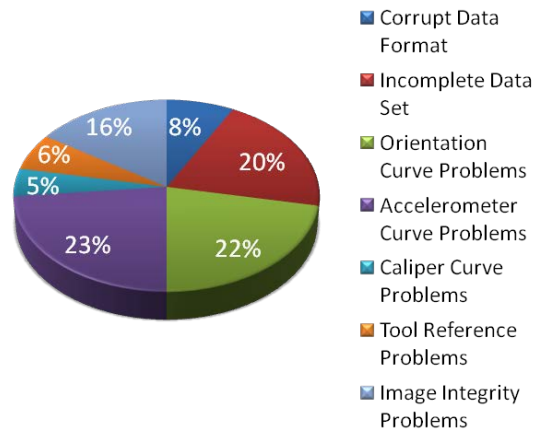
In recent years the quality of data received has reduced, with typically 45% of data provided containing some kind of issue preventing an accurate analysis. Without comprehensive quality control many of these issues will go un-noticed.

Jobs with Problems vs. Jobs without Problems



What causes these problems? Some examples of the causes are:

- Magnetized centralizers
- Complex calibration procedures
- Customer tapes missing information
- Tool offsets poorly or not recorded
- Transducers incorrectly mounted in tool
- Incorrect downhole recalibration
- Curve mnemonic changes



Task Fronterra has a comprehensive quality control procedure to identify these issues. The workflows were developed by ex-service company personnel who are familiar with the various tools and who also have developed some of the software.

When problems are encountered, the customer will be notified and corrections will be requested from the service company. When the service companies cannot provide corrected data Task Fronterra will correct the data where possible themselves. All these corrections will be noted in the quality control text of the image log analysis report.

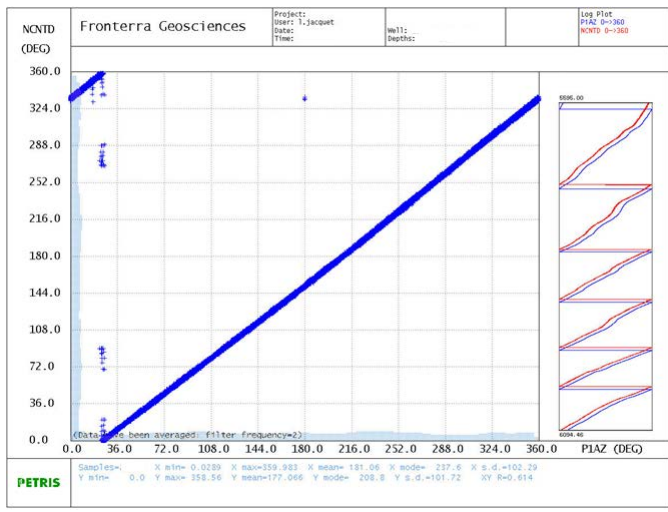
Failure to identify and correct these issues can have a serious impact upon the results: erroneous dip/fracture angles and directions, *in-situ* stress directions, borehole trajectory, etc. – all of them ultimately affecting the Net Present Value of an asset.

Example of Faulty Caliper Data:

CURVE	LOG	C-TYPE	VN	TOP	BOTTOM	U	MIN-VAL	MAX-VAL	UNIT	HISTORY
CAL1	RAW	CALI	1	6682.6	9226.7	F	473.63	3857.40	IN	R
CAL2	RAW	CALI	1	6682.6	9226.7	F	600.58	3046.86	IN	R
CAL3	RAW	CALI	1	6682.6	9226.7	F	390.62	2490.22	IN	R
CAL4	RAW	CALI	1	6682.6	9226.7	F	556.64	2744.12	IN	R
CAL5	RAW	CALI	1	6682.6	9226.7	F	766.60	3037.09	IN	R
CAL6	RAW	CALI	1	6682.6	9226.7	F	507.81	3608.38	IN	R

The example above shows caliper data in inches, which is clearly faulty - the values shown are in fact (un-calibrated) millivolts. Using the original calibration record which was supplied with the data, it was possible to correctly re-drive the caliper data. (The service company still provided the client with an interpretation using the above data.)

Example of Incorrect Orientation:



The example above is from an acoustic imaging tool, which has a set of magnetometers in the tool itself that can be used for orientation. However, the information from the orientation section is more typically used. A cross-plot of the “North” from the acoustic imaging tool against the equivalent curve from the orientation sonde should produce a straight line through the origin (0,0). In this case the orientation offset was incorrectly computed and

about 25 degrees off, which would have lead to an incorrect geological analysis.

Due to the nature of the data and the number of issues which we see in datasets, Task Fronterra always prefers to process any data it interprets itself. Where raw data is not available Fronterra will work with processed data and will perform as much quality control as possible.

Task Fronterra will also process data as a stand-alone service, providing output in recognized industry formats. Data can be turned around rapidly as either a processing service or as part of an interpretation. Our aim is to provide the maximum value for every piece of information available.

As an independent company, Task Fronterra can process data from any source. New tools are typically rapidly implemented due to our close relationship with our software vendors.

The Task Fronterra Difference

- Independent Consultancy
- Image log processing workflows developed by ex-service company personnel including software developers
- Can handle any tool currently commercially available
- Open minded as Task Fronterra understands the pressures in the field and the complex nature of this service. Task Fronterra never believes they have seen everything that can go wrong
- Proven experience in fixing logs that service companies could not correctly process themselves
- The desire to maximize the value of every piece of data at every point of the workflow from acquisition to interpretation

Task Fronterra Geoscience is a global independent provider of industry leading, integrated geoscience solutions, from single well analysis to complete reservoir studies.