Medusa Full Spectrum Analysis for WellCAD and Logger Suite

ALT and **Medusa Systems BV** are glad to announce their collaboration in a project to incorporate the patented full spectrum analysis for borehole spectral gamma data into **WellCAD** and **LoggerSuite.**

Novel analysis of borehole gamma ray spectra

The latest releases of WellCAD version 4.4 and LoggerSuite version 11.1 contain an implementation of the full spectrum analysis (FSA) method developed by Medusa Explorations BV in collaboration with the Nuclear Physics Institute of the University of Groningen (Netherlands). FSA comprises the mathematically most efficient method to derive nuclide concentrations from gamma ray spectra. The method utilizes virtually all spectral data present in a gamma spectrum to derive nuclide concentrations.

Figure 1 shows the classis **"windows stripping approach"** to spectrum analysis. Only counts from fixed energy windows are taken into account to derive nuclide concentrations.
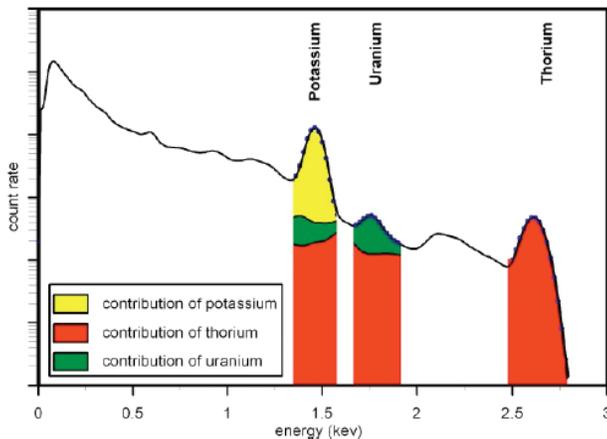

Figure 1: Classic "windows stripping" approach

Figure 2 demonstrates the "full spectrum" approach, which virtually takes the counts from the entire spectrum into account.
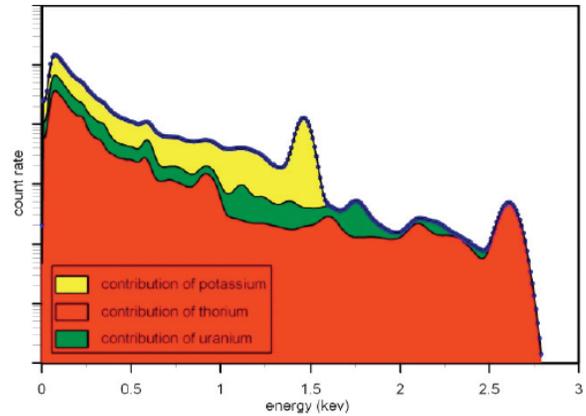

Figure 2: Advanced "full spectrum" approach

Gamma ray analysis is performed in two steps. First spectrum stabilization will be performed: Each multi-channel spectrum in the data set will be converted to a spectrum having all count peaks at the corresponding energy position. This process implies a close comparison with reference spectra obtained during the calibration process of the spectral gamma tool at the Medusa calibration facility. In a second step the now stabilized spectrum will be convoluted into concentrations of (naturally occurring) radionuclides (^{40}K, ^{238}U, ^{232}Th, or other man-made nuclides like ^{137}Cs or ^{60}Co). Corrections taking borehole diameter, rock density, casing type and thickness, tool position and borehole fluid conditions into account can be applied.
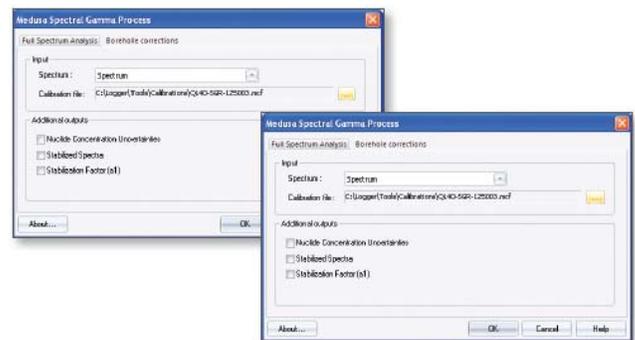

Figure 3: User interface in WellCAD

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WellCAD provides an easy to use interface to load the source log containing the raw spectrum data, select the Medusa calibration file and enter the parameters from which the borehole condition corrections will be computed and applied (Figure 3). The process will compute and output in WellCAD the nuclide concentrations and corresponding uncertainties, the stabilized spectra and he applied stabilization factor. Figure 4 shows the comparison of the raw spectrum showing a considerable spectrum drift due to temperature variations and the resulting stabilized spectrum which will be used as base for the nuclide concentration computation.

Figure 4: Spectrum with Cs peak drifting (left) and after stabilization (right)

Figure 5 shows a typical data presentation in WellCAD.

Figure 5: Grand Junction calibration pit data sample

All ALT spectral gamma tools (QL40-SGR) will be calibrated at the Medusa calibration facilities. The FSA and spectrum stabilization has been implemented into ALT's data acquisition software LoggerSuite as well enabling areal time processing of spectral gamma data during the logging operation.

Feature Overview

- Full spectrum Analysis of borehole spectral gamma data in WellCAD and LoggerSuite.
- Automatic Spectral Gain Stabilization.
- Absolute System Calibration.
- Sensor Quality Control.
- Response curves for natural and man-made radionuclides.
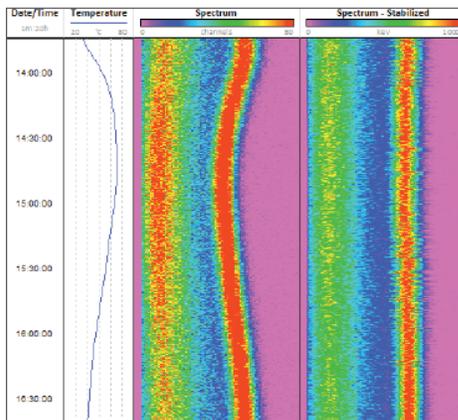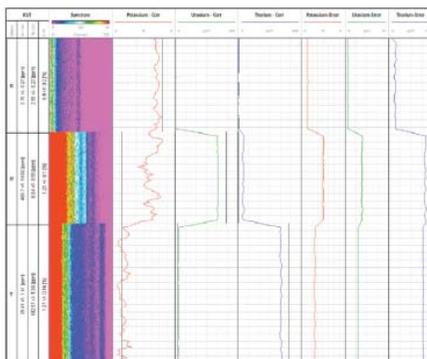- Borehole condition corrections.
- Easy to use

Associated Services

- Absolute calibration of your gamma tools inside the Medusa calibration setup.
- Quality verification of spectral gamma logging tools
- Assessments of tool efficiency and temperature behavior
- Creation of Monte Carlo detector response curves for any source geometry

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