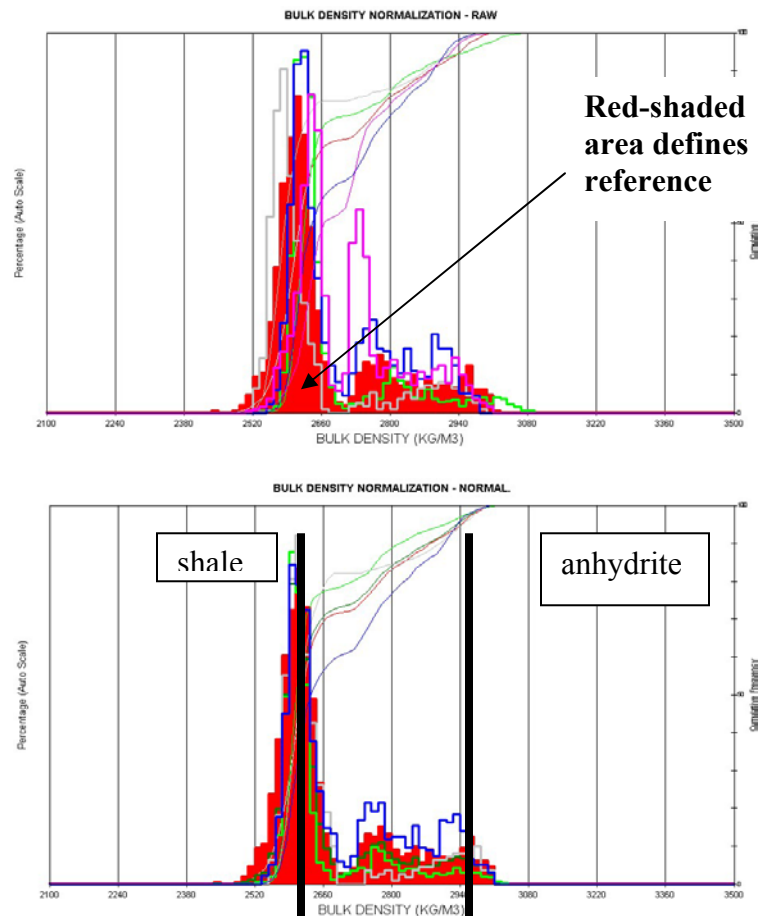# LOG NORMALIZATION

The Problem

Wireline log measurement normalization is an important step in the formation evaluation process, especially for field/regional study evaluation, particularly when consistent and homogeneous log data is required for further evaluation and analysis. For many fields, wireline measurements have been recorded by differing service companies with differing generations of logging tools. Other issues including log calibration error and scaling can also lead to misleading results.

The Process

Normalization re-calibrates primary log measurements (ρ_b, Δt, Φn, and GR) to an agreed reference using one or two-point calibration histogram techniques. A ($y = mx + b$) shift is performed in a 2-point calibration and a bulk shift is performed in a single-point normalization model. The two-point normalization process involves the location of a consistent low reading interval and a consistent high reading interval that appears in each well in the field or area. Moving selected values for each well to fit a known reference completes the process. (A thick anhydrite bed and a shale zone are demonstrated in the examples shown below).

Prior to any normalization process, the log data undergoes basic editing: curve standardization and splicing, depth alignment, elimination of first and last readings and data reconstruction (if necessary in rough boreholes).
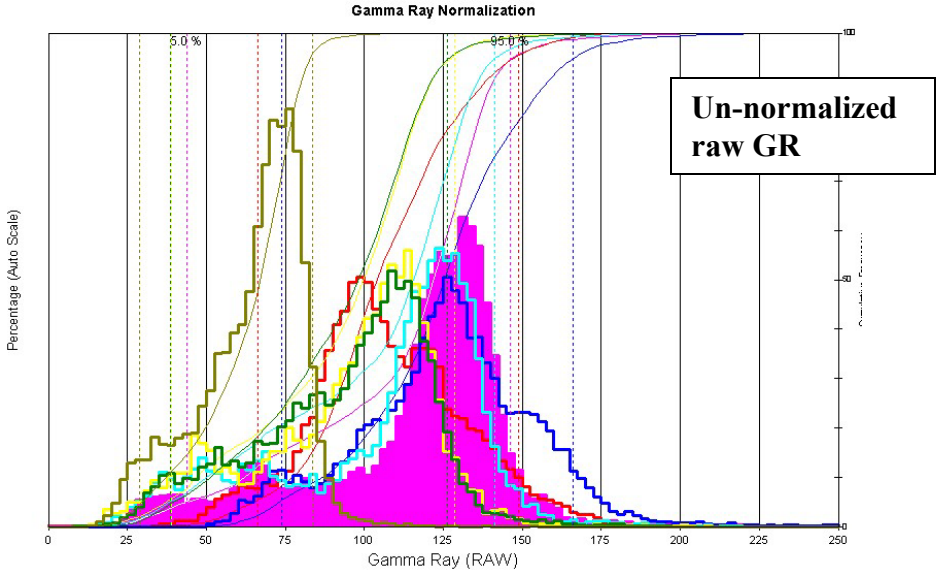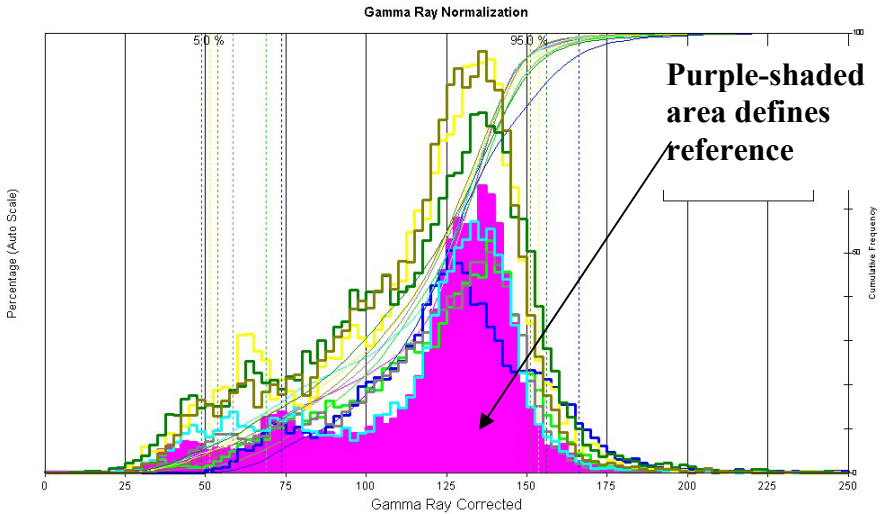
Bulk Density Normalization

NOTE *(It is extremely important that the normalization procedure be carried out over individual log runs and not over a completely spliced data set.)*

LOG NORMALIZATION

Gamma Ray Before 2-point Normalization

Gamma Ray Normalization

Un-normalized raw GR

Gamma Ray After 2-point Normalization

**Gamma Ray Normalization**

Purple-shaded area defines reference

NOTE *(It is extremely important that the normalization procedure be carried out over individual log runs and not over a completely spliced data set.)*

LOG NORMALIZATION

Acoustic Log Normalization

Acoustic logs generally do not require significant normalization processing as much as radioactive devices. Most service companies have very similar measurements. Random noise spikes and cycle skips can be common problems that are repaired using Hunt Wallace's acoustic editing software.
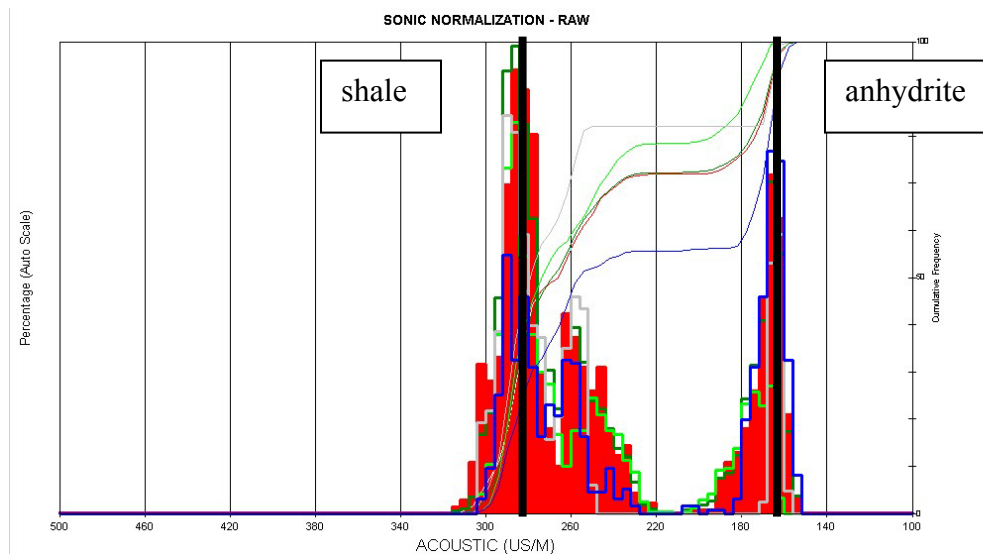
Example of raw compressional acoustic travel time from sample field.

Conclusions
Wireline log measurement normalization is an important step in the formation evaluation process, especially for field/regional study evaluation. Normalization re-calibrates primary log measurements (ρ_b, Δt, Φn, and GR) to an agreed reference using one or two-point calibration histogram techniques. Hunt, Wallace prefers to use 2-point calibration techniques. Zones that have similar rock properties throughout an area or field are used in the calibration process. Prior to the normalization process, the log data undergoes curve standardization, depth alignment, elimination of first and last readings, data reconstruction (repair log measurements that have been distorted by hole problems), and "create zone" so that normalization corrections apply to measurements within a specified log run interval by well.

NOTE *(It is extremely important that the normalization procedure be carried out over individual log runs and not over a completely spliced data set.)*