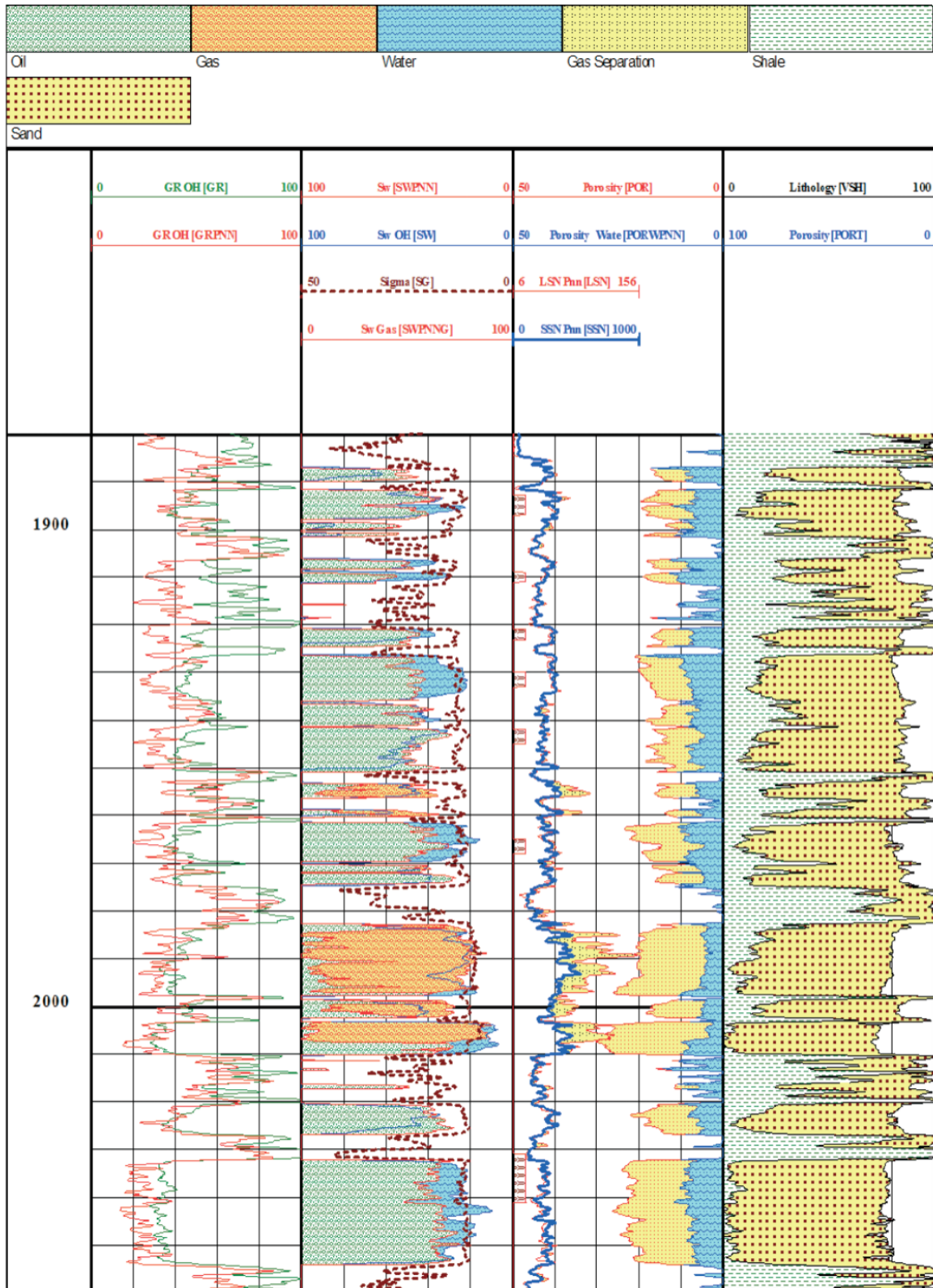


PULSED NEUTRON NEUTRON

PNN™



SYSTEM DESCRIPTION

PNN™

The Pulsed Neutron Neutron Tool is a Thermal Neutron Decay type of tool that detects thermal neutrons. The improved technology of detectors together with the unique Σ processing, imaging and quantitative hydrocarbon saturation interpretation enables usage of the tool in lower salinity and lower porosity formations.

Downhole Tool

- Communication Section with CCL
- GR (Natural Gamma Ray Section)
- Neutron Detectors Section
- Neutron Generator Section

Highest possible portability

Independent from the system in the Logging unit ensures 100% compatibility with any logging unit.

Surface equipment - inside carrying case

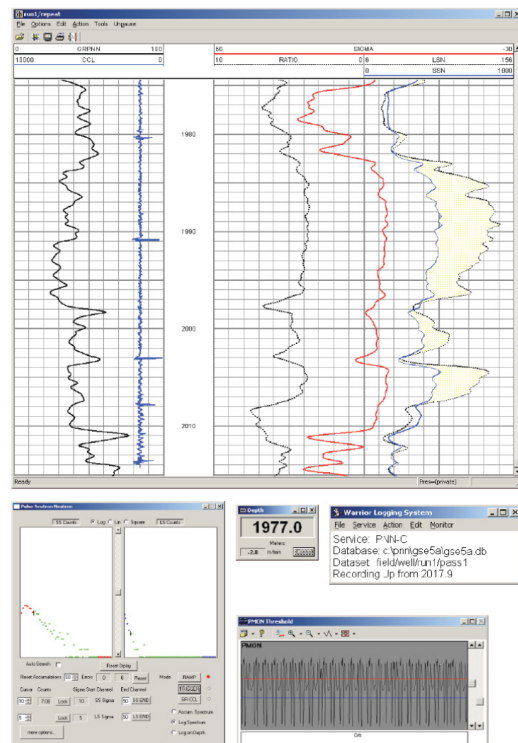
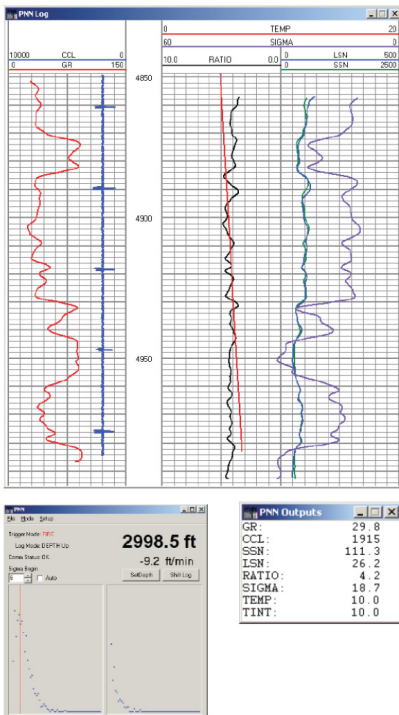
Surface equipment is contained in a portable carrying case requiring only line and encoder pulses from the existing unit.

Portable PNN Panel Software

Enables very quick training for engineers. No special well-site calibrations. All raw data is saved in a single file that is later used for all additional data manipulation, filtering, visualization and processing.

Warrior Logging System Compatibility

The PNN tool string is fully compatible to standard Warrior logging Acquisition System. It requires no extra surface hardware other than standard Warrior features.

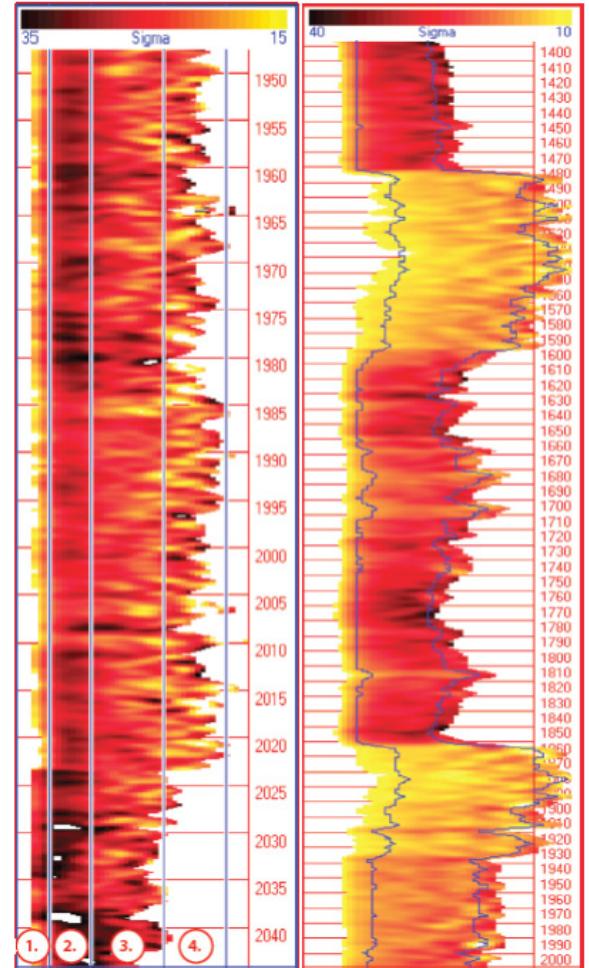
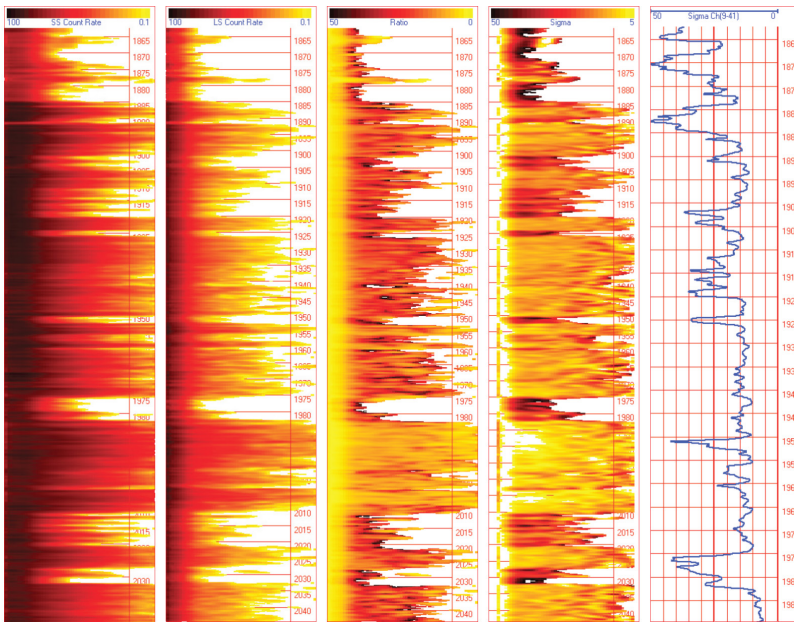


DATA PROCESSING AND INTERPRETATION

PNN™

Data Processing Steps:

- Data Visualization - Sigma Images
- Stop-Check Measurement
- Borehole Elimination Techniques
- Extensive Sigma Processing Modules



Applications:

Quantitative and qualitative saturation evaluation

- Remaining hydrocarbon reserves
- Location of oil-water, gas-water, and gas-oil contacts
- Warning of impending gas or water breakthrough at producing zones

Complete Formation Evaluation of old or new drilled wells is available for possible recompletion. PNN™ log provides information on:

- Porosity
- Shale or clay fraction
- Hydrocarbon saturation

Interpretation Types:

Qualitative Interpretation

- Gas/Oil, Gas/Water and Oil/Water contacts
- Long and short, total or partial count rate
- Processed SIGMA curves

More Interpretations

- Shaliness Calculation from different Parameter SIGMA Curves
- Porosity Calculations from Hydrogen Index
- Spectrum Derived PNN Density Curve

Quantitative Interpretation

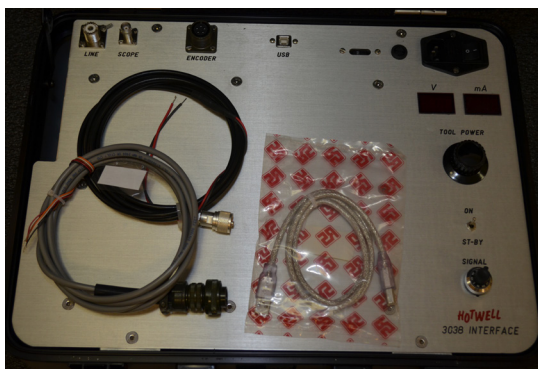
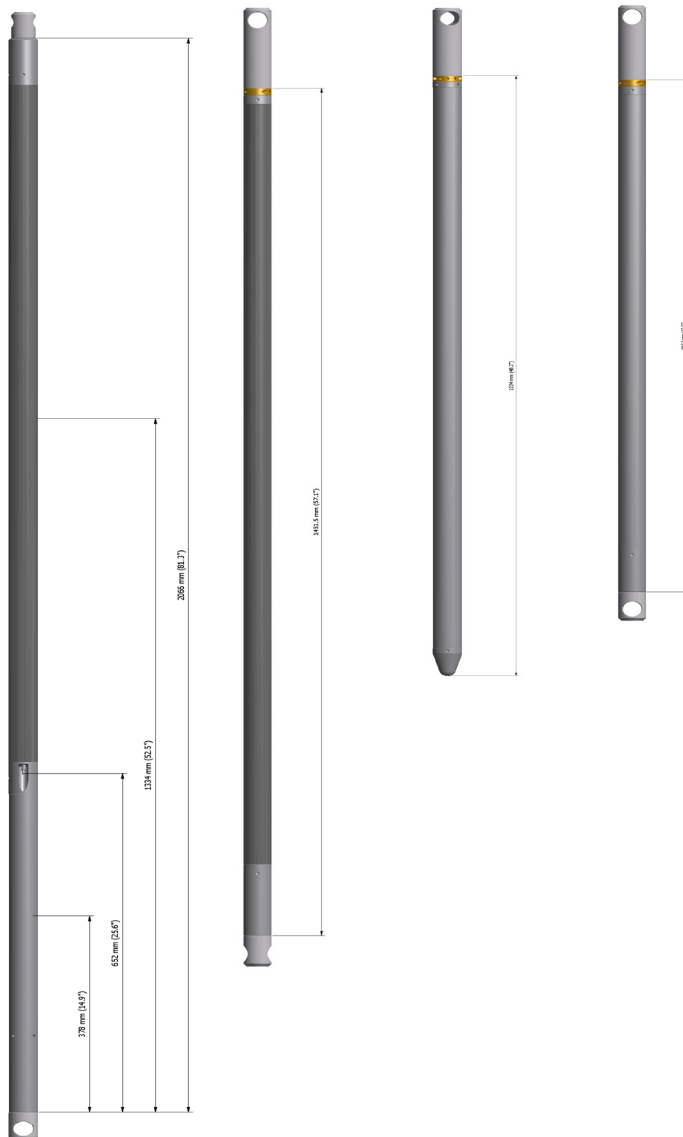
- 5 advanced water saturation Interpretation modules
- Direct Saturation Calculation (Accurate Petrophysical Analysis required)
- Graphical Methods (Cross-plot Determination of Parameters and Saturation)
- Time Lapse Techniques (long term results)

TOOL SPECIFICATIONS

PNN™

SPECIFICATIONS

Tool Length	18.7 ft (5700 mm)
Diameter	1.68" (43 mm)
Weight	92 lbs (41.5 kg)
Pressure Rating	15000 psi (105MPa)
Temperature Rating	300°F (150°C)
Detectors:	
CCL	Coil with dual magnets
Gamma Ray	NaI crystal with PM Tube
Temperature	Borehole and Internal
Neutron Detectors	He-3, proportional
Neutron Generator	14.1 MeV, 2x10 ⁸ n/s
Surface Interface	Warrior Data Acquisition System or Hotwell Portable Panel



Hotwell Portable Panel

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