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.

**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 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**

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

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