CASE STUDY 3

2026 SPE WELL INTERVENTION SUMMIT
PORT HARCOURT

Optimizing Gas Field Management Efficiency and Sustainability with Pulsed Neutron Logging

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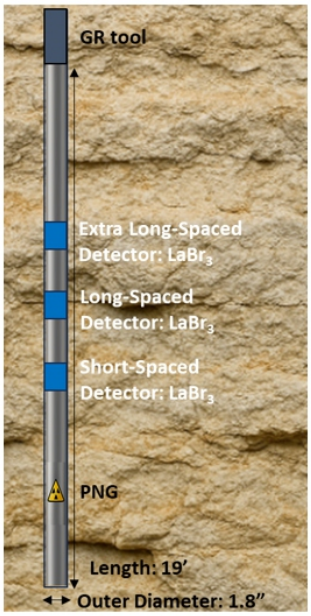
Pulsed Neutron Tool: Historical Enhancements

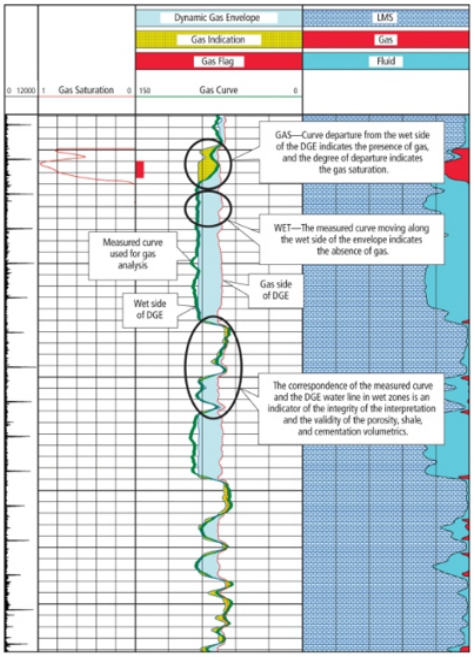
	Key Components	Controlling Factor	Historical Improvements	Impact
1	**Outer diameter**	Accessibility	From 3-5/8 to 1-11/16 inches	Through-tubing Accessibility
2	**PN generator**	Source output	Increasing PNG output	Higher number of fast neutrons
3	**Scintillation detector crystal**	GR count rates & resolutions	Adopting high-performance crystal material	Higher count rates & resolutions
4	**Electronics**	GR processing	From analog to digital	Dead time reduction

Impacting the operational efficiency & reducing carbon footprint



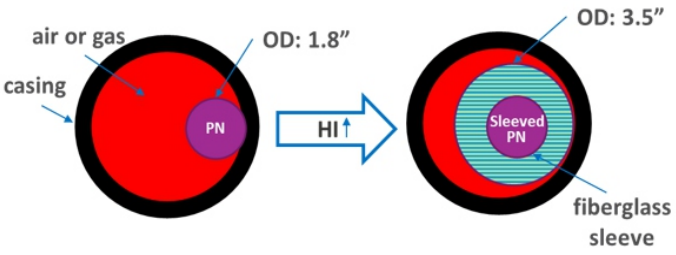
Forward Modeling & Integration

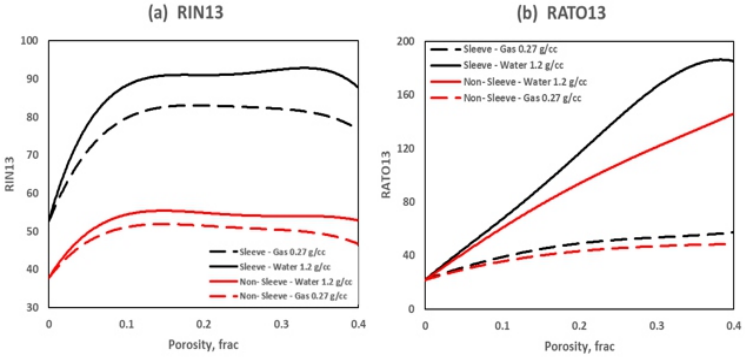
- **MCNP modeling**
  - Prediction of the life cycle & interaction of an individual neutron
  - The same process is repeated for 100 million neutrons for one porosity point
- **Parameters**
  - Well-specific data
  - Formation-specific attributes
- **Measurements**
  - RIN13: an inelastic GR ratio between SS & XLS
  - RATO13: a capture GR ratio between SS & XLS



Gas-Filled Borehole Application

- **Gas-filled wellbore in gas-producing wells**
  - Key PN data's formation sensitivities diminish
- **Sleeved-PN tool specifications**
  - Covering three detectors and the PN source
  - A layer of hydrogen-rich fiberglass material
  - Acting as a hydrogen shield, improving formation sensitivity





In-Situ CO_2 Monitoring

- With P & T changes, RIN13 & RATO13 for CO_2 has less variation than CH_4
- PN data are less sensitive to CO_2 density variation than CH_4