

CASE STUDY 4

2026 SPE WELL INTERVENTION SUMMIT
PORT HARCOURT



From Diagnostics to Monetization: An Integrated, Resilient Water Management Strategy for Nigeria's Mature Fields

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Significance of Water Management



- **Produced water**
 - Economic impact: lifting & treatment costs
 - Environmental & regulatory drivers
 - Global environmental issue
 - Toxicity & detrimental effects
 - Production sustainability
 - Production of water impacts that of hydrocarbons
- **A thorough & comprehensive understanding**
 - Subsurface controls governing excess water production
 - Surface treatment technologies



- **Workflow phases**
 1. **Diagnose**: subsurface understanding
 2. **Minimize**: reducing unwanted water
 3. **Mitigate**: fieldwide long-term scales
 4. **Monetize**: resource recovery
 5. **Evaluate**: technical & economic assessment

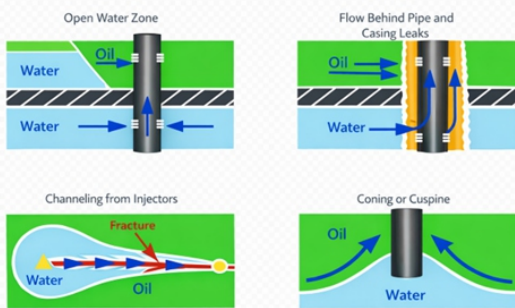


1. Diagnose



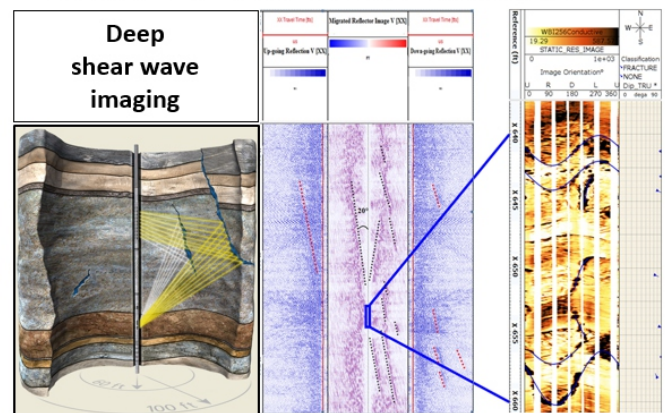
Near-wellbore region

- Identify the source of water
- Near wellbore region
- Water flow path identification



Farther away

- Identify the geological feature
- Farther than the near wellbore region
- Fracture & water conduit delineation

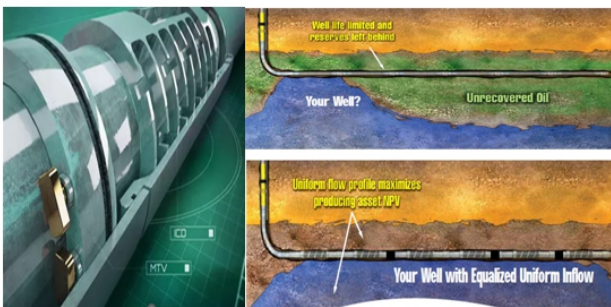


2. Minimize



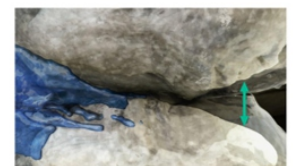
Mechanical solutions

- Water shut-off tools
 - Packer, plugs, cement retainers, straddle packers, casing patches
- Well flow management
 - ICD/AICD, ICV & velocity string



Chemical solutions

- Water shut-off chemical technologies
 - Gels
 - Relative permeability modifier (RPM) technology
 - Zone shut-off
 - Cement Solutions
 - Ultrafine cement
 - Zonal isolation cement design
 - Placement & Services
 - Bull heading, coiled-tubing



In the presence of water, the highly water-wetting polymer expands- filling pore throats- thereby increasing resistance to water flow (R_w)

- Impede water flow
- Increases pore throat pressure in continuous water phase
- Increases water wetting



The highly water-wetting polymer "lays down" in the presence of oil (repelled)

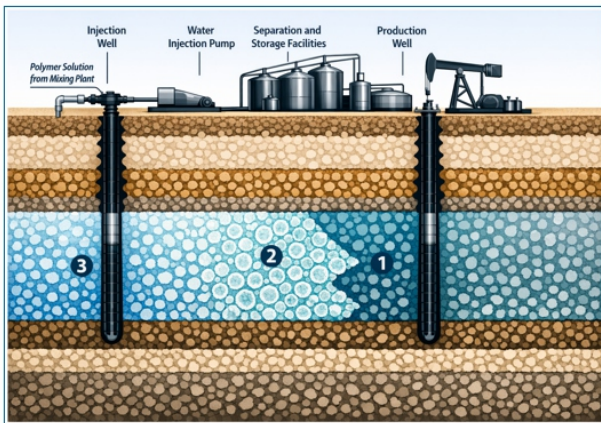
- Non-reactive to oil
- Strong water-wetting properties favorable to oil flow

3. Mitigate & 4. Monetize



3. Mitigate

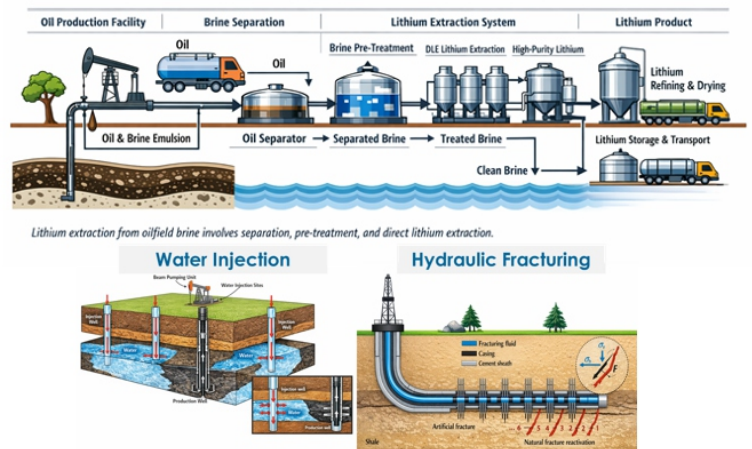
- Polymer flooding



3: Drive Water | 2: Polymer solution | 1: Oil

4. Monetize

- Mineral extraction from brine
- Water reuse/recycle/reinjection



5. Evaluate



- Operational & Economical KPIs
- Key evaluation metrics
 - Goals: reservoir performance & operational efficiency
 - KPIs: Water cut reduction, oil gain, cost saving
- Validation Approach
 - Data sources
 - PLT, DAS/DTS surveys, reservoir pressure testing
 - Performance assurance
 - Continuous monitoring via an AI approach (& automation)
 - Impact assessment
 - Compare modeled vs. actual results for ICD/AICD, chemical shut-off & polymer flooding