The RSS-NMR method for re-examining mature or brownfield fields allows for the full exploitation of an old field using traditional methods. Then, one can move on to EOR (Enhanced Oil Recovery or Assisted Recovery) techniques.

We have just laid the foundations for an **absolute lifecycle strategy for an oil field** . By combining RSS-NMR with traditional methods and then EOR (Enhanced Oil Recovery), we will optimize every drop of available oil while minimizing investments.

This is how RSS-NMR fits perfectly as the centerpiece that bridges the gap between optimized traditional mining and the transition to EOR.

The Maximum Life Cycle of the Deposit in 3 Stages

[Step 1: Seismic 60s/80s] — ► Classic Primary/Secondary Recovery (Exhaustion of obvious areas)

[Step 2: RSS- NMR Scan] — ► Traditional Extension (Side tracks /Refilling forgotten tanks)

[Step 3: EOR Mapping] — ► Targeted Tertiary Recovery (Chemical, gas or thermally assisted injection)

Step 1: Exhaust the field using traditional methods (Thanks to RSS-NMR)

Even before talking about EOR (which is expensive in terms of infrastructure and chemicals), RSS-NMR allows traditional production methods to be pushed to their maximum.

- **Targeting bypassed pockets:** RSS-NMR identifies areas of high porosity and high saturation with mobile hydrocarbons that have been ignored by old seismic surveys.
- **A low-cost conventional approach:** To exploit these open areas, you use traditional methods (drilling, sidetracks , conventional downhole pumps). You extend the field's natural production (or production through standard water injection) without significant additional technological costs.
- **The investment side already paid for:** You saturate your existing production network and you amortize your current installations to the maximum.

Step 2: The Ideal Stepping Stone to EOR (Tertiary Recovery)

Oil extraction (EOR), whether by polymer, surfactant, CO_2, or thermal injection, often fails for one simple reason: **a lack of geological precision** . If you inject an expensive product into a poorly mapped subsurface, the product will follow the path of least resistance (fractures) and miss the trapped oil.

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Turning point : The RSS-NMR becomes the ultimate weapon for preparing for the EOR:

1. Residual saturation mapping (*Sor* : *Saturation in Oil) Residual*)
Continuous wave NMR or spectral analysis is the only technology capable of accurately measuring the amount of oil remaining stuck to the pore walls (stationary oil in traditional methods). It tells you exactly **where** EOR is mathematically profitable.

2. Definition of permeability and heterogeneities
EOR requires understanding how fluids move through rock. NMR provides a clear picture of pore size distribution. This allows you to determine whether your polymers or gases will efficiently sweep through the reservoir or be lost.

3. Avoid wasting EOR
Instead of blindly applying EOR to the entire block (which would ruin the project), RSS-NMR allows you to do **"Smart EOR"** : you only inject solvents or gases into specific compartments identified as rich in residual oil.

In Summary: A Smooth and Ultra-Profitable Transition

By structuring your project in this way, you create a perfect logical sequence:

1. You use **RSS-NMR** to find "easy and invisible" oil (forgotten reservoirs) and extract it using **traditional** high-margin methods.
2. Once these new pockets have been exhausted by conventional methods, you use the ultra-precise fluid mapping already established by the RSS-NMR to design and launch your **EOR program** on areas with high residual potential.

This is the ultimate roadmap to extract every last barrel from a Brownfield by transforming an old asset from the 60s/80s into a model of technological efficiency for decades to come.

- The discovery of reservoirs hidden during previous seismic surveys, because the technology was not sufficiently developed to perform a complete analysis of the block, has led to some pleasant surprises with RSS-NMR.

This is precisely what is called, in exploration jargon, revealing "hidden oil" (**hidden oil). pay zones**). Working on a block with old seismic data (2D from the 60s or 3D from the 80s) is like

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looking at a blurry medical X-ray: you can make out the main outlines, but you miss the critical details.

The arrival of RSS-NMR on this type of historical block completely changes the game and holds excellent surprises for operators.

Why did older technologies fail to address these reservoirs?

At the time, technological limitations (rudimentary computer processing power, basic processing algorithms, and low-sensitivity sensors) led to two major problems:

1. **Lack of vertical resolution:** If a very high-quality reservoir (high porosity) was less than 15 or 20 meters thick, the seismic waves of the time

They passed right through it without "seeing" it. It was fused into the surrounding rock mass on the screens.

2. **The masking effect (Shadowed areas):** Complex geological structures located above (such as collapse faults, sedimentary unconformities, or variations in rock density) absorbed or disrupted seismic energy. The signal returning from below was unusable, leaving entire areas of the block in total darkness.

<u>The "Good Surprises" revealed by RSS-NMR</u>

By reanalyzing the block with today's science, RSS-NMR doesn't seek to improve the image of the rock; it bypasses it to directly target the fluids. This highlights major opportunities where previously nothing was thought to exist.

1. The discovery of isolated compartments (Fault blocks)

Old seismic surveys often showed a structure resembling a single large block. In reality, the deposits are often segmented by tight micro-faults .

- **The surprise:** While it was thought that the main well had drained the entire area, the RSS-NMR reveals a massive fluid anomaly right next to it. It's an intact compartment, under high pressure, that was never touched by historical production.

RSS NMR
THE SIMPLE WAY OF EXPLORATION
GEO-NMR.NET
Exploration by satellite

Michel L. Friedman-Matarese (Destom LH 67/11)
Mobile: +591-71696657
WhatsApp: +591-71696657
Email: michel@geo-nmr.net
In Charge: Africa & Américas
Speaker: FR-UK-ES-BR/PT
GMT: -04h
Base: Bolivia, Santa Cruz

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2. Stratigraphic traps and wedges

Sometimes, the reservoir does not end abruptly against a fault, but gradually thins (bevel) or changes in composition (transition from porous sand to compact clay). Older technologies were unable to map these transitions.

- The surprise: The RSS-NMR traces the signature of hydrogen and shows that the reservoir extends much further or that it has accumulated in subtle traps that the geometry of the 80s considered a sterile zone.

3. Secondary productive levels (Bypassed) Pay ")

During the initial drilling, operators targeted only the main reservoir (the largest, most obvious). Shallower or interspersed zones showed slight indications, but were ignored or classified as "uneconomical" due to a lack of tools to assess their potential.

- **The surprise:** By scanning the block, the NMR proves that these secondary levels contain excellent saturation of mobile oil. Sometimes, a simple refilling (drilling the existing casing above) is all that's needed to open a new production valve without drilling a single centimeter of new well.

In conclusion: Valuing the blindness of the past

These "pleasant surprises" are not the result of chance, but the mathematical consequence of the technological leap. What engineers in the 60s and 80s left behind due to a lack of technical resources is now your most profitable asset.

Thanks to the RSS-NMR, the geological history of the block is being rewritten, transforming areas of administrative and technical uncertainty into proven and immediately exploitable oil reserves.

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Michel L. Friedman-Matarese (Destom LH 67/11)
Mobile: +591-71696657
WhatsApp: +591-71696657
Email: michel@geo-nmr.net
In Charge: Africa & Américas
Speaker: FR-UK-ES-BR/PT
GMT: -04h
Base: Bolivia, Santa Cruz