Integrated Reservoir Management Technical Section

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SPE Integrated Reservoir Management Technical Section (IRMTS)

Newsletter

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INSIDE THIS EDITION

Chairman's Message

"Foundations are not built to be admired. They are built to carry what comes next."

Muhammad Navaid Khan, Chair, IRMTS

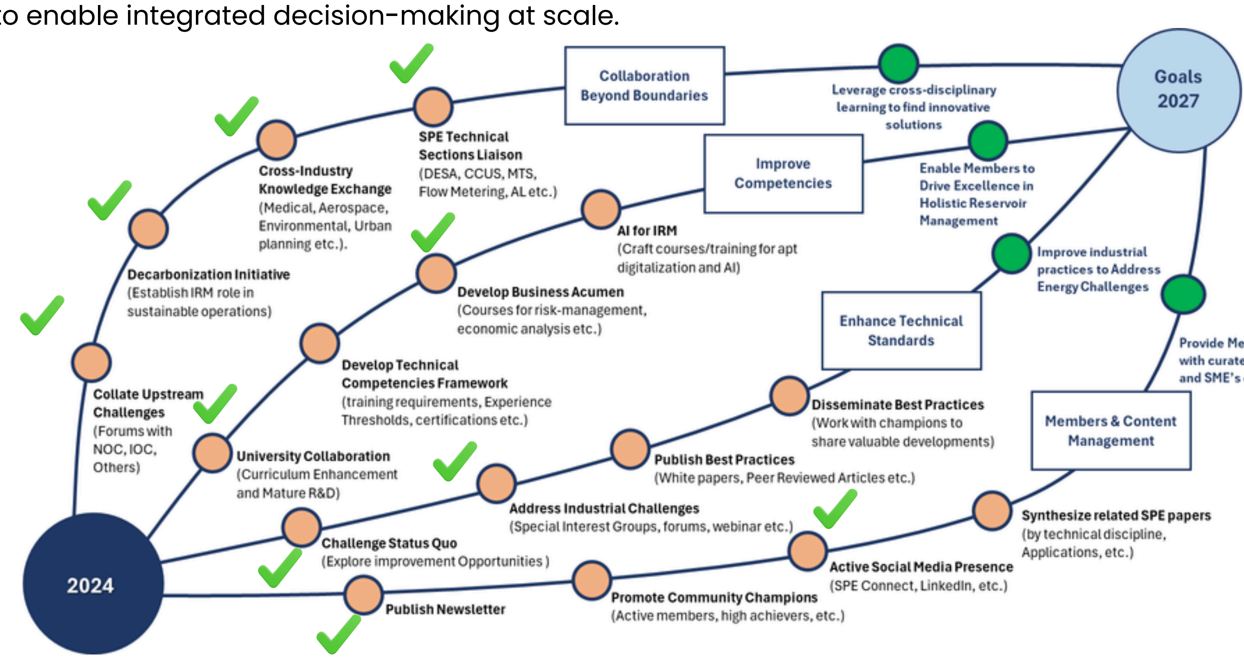
Dear Colleagues—As we enter 2026, the Integrated Reservoir Management Technical Section enters the year with a clear sense of direction, built on a solid foundation.

2025 was a year of deliberate foundation building. Our focus was on establishing reach, credibility, and continuity rather than isolated activity. As a result, IRMTS achieved **350%+ year-on-year membership growth**, delivered **20+ technical webinars**, engaged **50+ distinguished speakers**, and collaborated with **30+ organizations** across industry, academia, and SPE technical sections. Our outreach generated **100,000+ knowledge touchpoints**, extending IRM conversations well beyond individual events and into major global forums such as ATCE and ADIPEC, where IRMTS demonstrated a strong and credible presence.

Among these outcomes, **the launch of the first Youth Wing initiative among SPE technical sections** stands out. In response to declining youth engagement across professional societies, this initiative gives early-career professionals ownership of how they engage, lead, and grow within SPE, while building a sustainable pathway for long-term IRM capability.

The growth we achieved was not an objective in itself, but a foundation for what comes next. It was enabled by the dedication of our IRMTS volunteers and board members, to whom I extend my sincere appreciation.

The IRMTS strategy and roadmap have guided our efforts as a North Star, shaping the foundation built in 2025 and directing our focus for 2026 and beyond. Our ambition remains clear: to reinforce **IRMTS's role as SPE's system-level integrator**, connecting disciplines, communities, and perspectives to enable integrated decision-making at scale.



IRMTS Strategy & Roadmap — 2025 Foundation, 2026–2027 Direction

Chairman’s Message

“What we build matters...
What we sustain matters more!”

Strategic Focus for 2026

In 2026, IRMTS will concentrate on a set of high-leverage priorities:

- **Laying the foundation for a flagship IRM integration forum in 2027,** designed to enable cross-disciplinary, system-level engagement
- **Strengthening IRMTS’s role as SPE’s system-level integrator,** working across subsurface disciplines, partners, and technical sections
- **Targeted activation of high-growth and underrepresented regions**, starting with Asia Pacific
- **Establishing SPE’s first structured model to sustain IRM capability**, anchored through the IRM Youth Wing

These priorities are intentionally focused. They reflect where IRMTS can add the greatest value not by expanding activity, but by strengthening integration, continuity, and long-term relevance.

I am proud of the foundation we built in 2025 and confident in the direction we are setting for 2026 and beyond. As we begin the new year, I wish the IRMTS community continued progress and shared success as we advance this work together.

Best Wishes,
Muhammad Navaid Khan

IRM in Action:
Insights from a Leader Driving Digital Reservoir Innovation in Asia

PETRONAS has long been at the forefront of reservoir management, combining engineering expertise with advanced digital technologies to unlock more value from oil and gas resources. In a rapidly evolving energy landscape, the company is leveraging ***Digital, Data Analytics, Automation/AI (DDAA)*** to transform decision-making, improve operational efficiency, and explore new opportunities in real time.

We spoke with **Ts. Shahril Mokhtar, General Manager (Technology and Innovation) at UTDI, PETRONAS** about the challenges, successes, and future vision for digital Integrated Reservoir Management (IRM).

Ts. Shahril Mokhtar
General Manager
Upstream Digital, Technology & Innovation,
Development Division
Petronas

A seasoned energy professional with global experience across 14 countries, specializes in wells intervention, integrity, and digital transformation. He currently leads PETRONAS Upstream Technology & Innovation, driving AI, automation, and strategic growth while actively contributing to SPE and academia.

IRMTS: How have digital tools, AI, and machine learning transformed IRM workflows, and what impact have they had on field-level decisions?

Shahril: "Across IRM, the biggest leap forward has been in reservoir performance prediction," says the PETRONAS leader. "AI-driven petrophysical analysis has shortened simulations from weeks to seconds, while improving the accuracy of behind-casing opportunity identification. Field execution has consistently validated these predictions, delivering the expected production gains."

Real-time interpretation of lithology, porosity, permeability, and fluid saturation has opened new possibilities during drilling and completion, helping engineers identify untapped reservoirs earlier and make faster, more confident decisions.

"Simulations that used to take weeks are now completed in seconds."

A prime example is ERMAI, PETRONAS' in-house AI platform. Built on hundreds of wells' raw and interpreted data, ERMAI delivers objective, real-time petrophysical interpretation via a web-based machine learning engine. In 2024, it saved 82 rig hours and added 2.07 million boe.

By 2025, ERMAI was scaled further to include behind-casing opportunity identification, with simulations that previously took weeks now executed in seconds.

Yet, there are still gaps in AI solutioning within the IRM spectrum that needs to be addressed. One of the areas that AI technology maturity has not yet reached the level we require is to fully represent a real-time subsurface reservoir based on fibre-optic data such as DTS, DAS, or SDAS.

IRMTS: What are the biggest barriers to achieving the full potential of digital IRM, and how has PETRONAS navigated these challenges?

Shahril: "Data quality is always the foundation," he explains. "Even with years of structured management, it will never be 100%. Our approach is simple: trust data above 90% quality, but verify! This keeps progress moving without waiting for perfection."

System integration is less of a barrier today thanks to agnostic platforms, but mindset and digital ROI remain the core challenges. Many experts are cautious with AI-based tools until models are clearly aligned with reservoir engineering fundamentals.

At the same time, digital costs continue to rise — potentially up to 12% per year by 2030 — making it essential to maintain a 1:3 ROI.

"We are moving from point solutions to systemic solutions that connect Exploration, Development, and Production end-to-end."

PETRONAS addresses these barriers by shifting from standalone solutions to a fully integrated digital value chain. Upskilling reservoir engineers with AI and analytics capabilities helps cut discovery-to-production timelines by up to 50%.

IRMTS: How do you ensure digital tools enhance decision-making without causing overconfidence, and what skills, behaviors, or cultural shifts are critical for adoption?

Shahril: To prevent overconfidence, PETRONAS enforces six dimensions of data quality — **completeness, validity, consistency, uniqueness, timeliness, and accuracy** — keeping them at above 90%. All AI models undergo rigorous Proof of Concept, User Acceptance Testing, and stress tests requiring at least 85% accuracy with minimal bias. Until full autonomy is achieved, decisions follow a "trust but verify" model, where human judgment and AI insights are combined.

Three cultural shifts are essential:

1. **Risk tolerance:** Empowering experimentation and learning from failure.
2. **Commercial focus:** Directing effort to the areas of highest value.
3. **Growth mindset:** Viewing change as an opportunity to innovate and adapt.

On the technical side, selected reservoir engineers are upskilled in analytics and AI to bridge the gap with data scientists, ensuring transformation grows from within. Adoption also requires moving proven AI solutions from testing to full deployment and compliance, retiring legacy workflows.

"Digital IRM stalls when new tools remain optional — compliance is the key to embedding transformation."

IRMTS: Looking ahead, what does the ideal digital IRM ecosystem look like, and which changes would deliver the greatest operational and strategic impact?

Shahril: "In the ideal ecosystem, humans and AI operate as one agentic environment, co-dependent and fully integrated," he explains. Data flows automatically with zero manual entry, systems self-correct, and tools integrate seamlessly into workflows. AI recommends optimal reservoir actions, while humans govern and verify outputs.

The ultimate transformation occurs when AI models can connect directly to physical systems — from gas lift to water injection — enabling self-optimizing production.

"That is when integrated reservoir management achieves full autonomy."

Looking forward, he adds, "Our vision is to make reservoir management truly agentic: where AI accelerates optimal decisions and humans guide and verify, unlocking value we could not access before. This is the future PETRONAS is building for the next decade and beyond."

Further Readings

OTC-34782-MS: Delving into Artificial Intelligence World: Pioneering Machine Learning Platforms to Predict Reservoir Properties

SPE-212627-MS: Identifying New Behind Casing Opportunities Using Machine Learning

OTC-31419-MS: Bringing Huge Core Analysis Legacy Data Into Life Using Machine Learning

SPE WEBINARS AND LIVE EVENTS: Q4 2025

The fourth quarter for the section featured an engaging lineup of webinars and live sessions, highlighted by the Decision Quality and Decision Analysis webinar led by pioneers and experts in Asset Management. The quarter was filled with exciting key collaborations with the **SPE Asset Management Technical Section**, the **SPE Geothermal Technical Section** as well with professionals across fields of decision analysis, reservoir engineering, and so much more.

The SPE Integrated Reservoir Management and Asset Management Technical Sections hosted a webinar on Decision Quality and Decision Analysis, featuring experts **Greg S. Parnell**, **PhD (University of Arkansas)** and **William Klimack**, **PhD (bp)**. The session explored how structured decision-making transforms asset performance by distinguishing good decisions from great ones, from short-term interventions to long-term reservoir strategies.

In this webinar held in collaboration with the SPE Geothermal Technical Section, experts **Sonia Isabella López Kovács (Repsol), Sam Rivas Dorado, PhD (Rock Flow Dynamics), and Denis Voskov, PhD (TU Delft)** examined how decades of oil and gas reservoir modeling can drive geothermal innovation. The session also featured a detailed case study on the digital-twin reservoir simulation framework from TU Delft and offered key insights into adapting hydrocarbon expertise to advance geothermal energy development.

The webinar featured distinguished experts **Abdolrahim Ataei, PhD (OQEP)** and **David Anderson (SAGA Wisdom)**, who discussed how Rate Transient Analysis (RTA) provides early, production-driven insight into reservoir performance. Using case studies from the Middle East, Brazil, and Indonesia, they demonstrated how RTA complements traditional workflows by independently constraining hydrocarbons-in-place and enabling faster, more confident decision-making.

Reflections from ATCE 2025: Rethinking Sustainable Reservoir Management

One of the recurring themes from **ATCE 2025** was how casually the word sustainability is used, and how rarely it is anchored in everyday reservoir decisions. A clear message emerged during the session: **sustainability is not an additional objective layered on reservoir management; it is the outcome of doing reservoir management properly.**

Across the panel at ATCE 2025, a consistent view was reinforced: **uncertainty is inherent to reservoirs, but poorly managed uncertainty is the real source of waste.** Poorly constrained reservoirs drive overdesign, delayed interventions, unnecessary spend, and avoidable emissions. When surveillance is intentional, models are trusted, and decisions are made at the right time, sustainability becomes a natural by-product rather than a declared ambition.

The discussion also highlighted how far reservoir management remains from **true closed-loop operation.** While other industries rely on continuously updated models that directly inform action, subsurface decisions are still slowed by **fragmented workflows and handoffs**. The technology to close the loop already exists; the real gap is integration, not capability.

This is where the concept of the **"living model"** resonated strongly. A single, continuously updated representation of the reservoir, wells, and surface system fundamentally changes collaboration. Integration stops being a slogan when teams align around one evolving view of reality, enabling faster and more confident decisions.

Another key takeaway was the evolving role of the reservoir engineer. The future is not about turning engineers into data scientists, but about data fluency. **AI accelerates insight, but it does not replace judgment or physics.** Engineers remain responsible for interpreting uncertainty and converting information into action.

The session closed on a simple conclusion: sustainability is achieved by **removing fragmentation, not by adding tools.** When data, models, and intent are aligned, better decisions follow naturally.

These reflections align closely with the mission of **SPE Integrated Reservoir Management Technical Section (IRMTS)** and are explored in greater depth in a related JPT article for readers interested in practical examples and applied perspectives beyond the session.

Further Reading

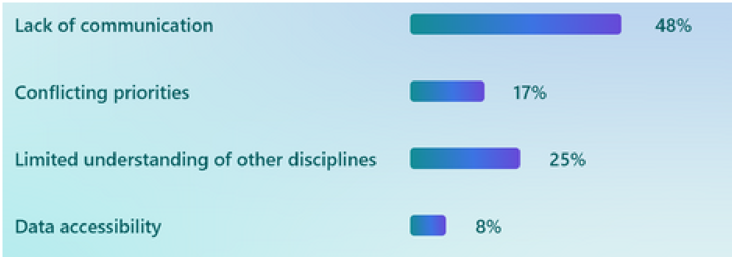
Beyond the Buzzwords: A Practical Blueprint for Sustainable Reservoir Management | JPT Article | December 9, 2025 by Muhammad Navaid Khan

Empowering Future Energy Leaders: SPE IRMTS at ADIPEC University Programme

The **SPE Integrated Reservoir Management Technical Section (IRMTS)** is proud to have played a leading role in a series of impactful engagements during the three-day **2025 SPE ADIPEC University Programme**, a flagship initiative designed to connect top undergraduate geoscience and engineering students from the Middle East and North Africa with leading industry professionals. Since its inception, the programme equips selected **40-50 students from ~15 Universities** in the MENA region with real-world insights into the energy sector through technical sessions, networking opportunities, and professional development activities held alongside ADIPEC.

IRMTS took center stage in designing and delivering the first Technical Session, ***"When Algorithms Meet Experience: Integrating Disciplines and Data for the Future of Reservoir Management."*** The session was expertly led by IRMTS board members **Muhammad Navaid Khan, Sule Gurses, and Siddharth Jain** exploring how digital transformation, AI/ML workflows, and multidisciplinary collaboration are reshaping reservoir management. Through live polling, real examples, and an engaging panel discussion, students gained actionable understanding of how human expertise and data-driven approaches complement each other in addressing subsurface uncertainty and optimizing field performance.

The session's interactive design also offered the IRMTS team valuable insights into the **mindsets of future petroleum engineers.** Interestingly, **48% of students identified lack of communication** as the *biggest barrier to multidisciplinary collaboration,* followed by **limited understanding of other disciplines (25%).**



When asked about the ***most valuable future skill***, students highlighted **proficiency in AI and data tools (37%)** and the **ability to integrate across disciplines (34%),** signaling a strong shift toward digitally enabled, collaborative engineering mindsets.

Beyond the technical sessions, IRMTS played a key role in the program's success. **Iftikhar Khattak (SPE IRMTS - Administrative Chair)** served as a **judge for the student competition,** assessing projects for industry relevance, clarity, and rigor. **SPE IRMTS Young Professionals Hayat Alhashmi** and **Shubham B. Patel** mentored student teams, guiding them through project development, presentations, and industry engagement.

The competition focused on securing an **optimized future energy mix with sustainability and AI integration.** This involvement enriched the student experience and reinforced IRMTS's **commitment to developing future energy leaders.** The team's coordinated effort ensured a smooth, interactive program that earned strong feedback from students and SPE organizers alike.

WEB EVENTS DIRECTORY

Missed Our Web Events? Catch Up Anytime!

- **10 Dec, 2025 |** Production-Driven Reservoir Characterization with RTA
- **12 Nov, 2025 |** From Oil and Gas Experience to Geothermal: How Reservoir Modeling Evolves
- **1 Oct, 2025 |** Decision Quality and Decision Analysis—Theory and Practice
- **24 Sep, 2025 |** Reservoir Management 2035—The Human + AI Alliance
- **10 Sep, 2025 |** Virtual Flow Metering Data for Advanced Reservoir Surveillance and Development Planning
- **27 Aug, 2025 |** PTA with Purpose: Objective-driven Interpretation and Scalable Modelling Workflows
- **23 July, 2025 |** Well Performance Masterclass: Integrating PTA, DCA, & RTA for Deeper Diagnostics
- **25 June, 2025 |** Field Proven Insights: 4D Seismic Application in Reservoir Management and CCS Monitoring
- **28 May, 2025 |** Enhancing Forecast Reliability through Computational Intelligence in Integrated Modelling using 4D Seismic data
- **6 May, 2025 |** Maximizing Waterflooding Value: Strategies, Technologies, and Future Outlook
- **28 Apr, 2025 |** Real-Time Production System Optimization and the Future Role of AI
- **9 Apr, 2025 |** Integrating Uncertainty with Data Analytics and Machine Learning for Subsurface Modeling
- **19 Mar, 2025 |** Geomechanics in Reservoir Management: Predicting and Optimizing Reservoir Behavior
- **19 Feb, 2025 |** Digital Twin for Production Optimization: Mere Hype or True Enabler?
- **21 Jan, 2025 |** Leveraging Tracers for Well Optimization and Reservoir Management: Strategies and Real-World Applications
- **11 Dec, 2024 |** Decode Your Reservoir: Machine Learning for Facies Prediction and Petrophysical Analysis
- **19 Nov, 2024 |** Steps in Intelligent Upstream Operations: Today's Innovations for Delivering Tomorrow's Goals
- **29 Oct, 2024 |** Cross-disciplinary collaboration in Integrated Reservoir Management: Integrating Geosciences, Engineering, and Economics
- **17 Sep, 2024 |** Launch Event – Introducing the SPE Integrated Reservoir Management Technical Section

Access the complete archive of past SPE IRMTS webinars by visiting the **SPE Energy Stream platform.**

CLICK HERE

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PERSPECTIVE: EXPERT INSIGHTS

Decision Quality and Decision Analysis - Theory and Practice

The inaugural webinar in Decision and Risk Analysis Series brought together the Integrated Reservoir Management (IRM) and Asset Management (AM) Technical Sections to explore how disciplined decision-making can unlock value in complex oil and gas projects. Moderated by Marianne Espinassous and Michael Edwards, the session featured two leading voices: Dr. Greg Parnell, Professor of Practice at the University of Arkansas, and Bill Klimack, Decision Quality Manager at BP. Together, they framed decision analysis as both a social process and a technical craft, anchored in clear decision framing, transparent trade-offs, robust analytics, and purposeful stakeholder engagement.

(Speaker)
Gregory Parnell, PhD
Professor of Practice
University of Arkansas

(Speaker)
William Klimack, PhD
Decision Quality Manager
bp

(Moderator)
Marianne Espinassous
Rumaila Area
Development Manager
bp

(Moderator)
Michael Edwards
Founder & CEO
EEI Consulting, LLC

Greg's origin story was disarmingly simple. After years in the Air Force presenting major program decisions, he realized the decision analysis course he'd taken had been the most practically useful class in his career. In choosing a PhD program, he met Ron Howard at Stanford.

"He didn't tell me about his research. He asked, 'How can I help you make your decision?'"

That question and the mindset behind it, became Greg's touchstone.

Greg grounded the group in first principles: **A decision is an irrevocable allocation of resources.** Decision analysis is a **socio-technical process** to create value for stakeholders facing difficult problems—multiple (and sometimes conflicting) objectives, complex alternatives, significant uncertainties, and large consequences. It stands on **axiomatic decision theory** (sound mathematics) and **behavioral decision research** (identifying and mitigating cognitive biases).

"Ultimately, we're not the decision makers—we provide insight to decision makers."

From Opportunity to Execution: The "Eagle's Beak" Reality

Greg's favorite illustration—**the Eagle's Beak**—makes a strategic point.

A good project definition (sharp framing of the opportunity; creative, viable alternatives) sets you up for good execution. Poor framing locks in a weak starting position. From there, uncertainty and execution quality determine the spread of outcomes.

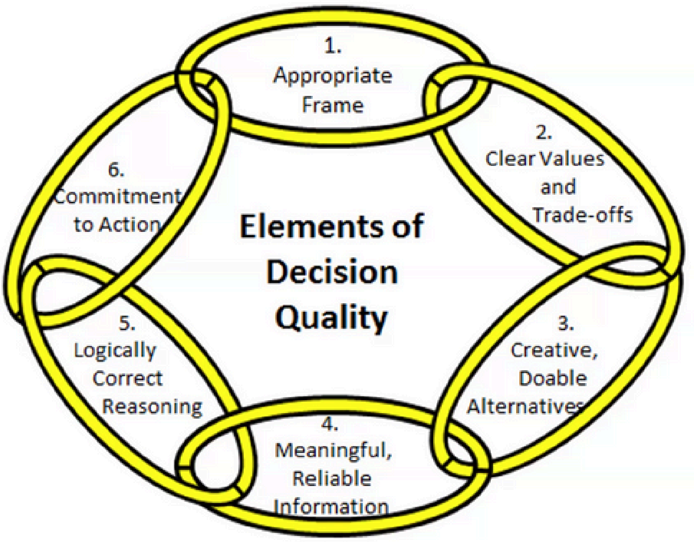
Value identification and project execution, he emphasized, are inseparable. We might focus the webinar on value identification, but if we don't set the project up so it can be executed well, the best analysis will never translate to realized benefits.

Designing Decision Quality

Greg re-ordered the classic Decision Quality Chain (Spetzler & Keelin) to begin with **Frame,** then **Values & Trade-offs, Doable Alternatives, Reliable Information, Logical Reasoning,** and **Commitment to Action.**

"You're only as strong as your weakest link… You can have a fabulous analysis, but if leadership isn't committed, you're nowhere."

In the process he teaches, DQ isn't a checklist at the end; it's woven into **every step**—from selecting an appropriate organizational process to framing, structuring alternatives, gathering and qualifying information, modeling uncertainty, and lining up recommendations with commitment to action.



Process Discipline: Moving Beyond Pure Analytics and Advocacy

Two approaches are not recommended:

- **Purely analytical:** The team disappears for months, returns with a polished model—but no connection to decision makers or stakeholders.
- **Advocacy:** The team champions a preferred solution, downplays competing options, and forces decision makers to sort truth from spin.

Instead, embrace:

- **Decision conferences:** Get cross-functional stakeholders together to build shared understanding and, where feasible, small working models.
- **Dialogue Decision Process (DDP):** Bill's emphasis. A structured series of checkpoints—frame, issues, values, alternatives, analysis, recommendation, decision, plan—that aligns management expectations with project team progress.

"Framing is the most important step," Bill said. *"The opportunity statement should say what we're trying to do and why—not how."*

Bill offered a vivid example: a team was tasked to reconnect a disconnected well pad. In framing, they reframed the mission as **"fill the facility"**—and discovered cheaper, higher-value alternatives beyond the original "plumb it back" instruction. The lesson: **frame the outcome, not the method.**

Analytics That Communicate: Trees, Influence Diagrams, S-Curves, Tornadoes, and VoI

Decision Trees

Bill walked through the essentials: **squares** for decisions; **circles** for uncertainties; **branches** for alternatives and outcomes; probabilities that **sum to 1;** and end-node values in **economic (NPV)** or **utility space (multi-objective decisions).** Roll back trees via **expected value**; for continuous uncertainties, discretize into P10/P50/P90. Trees get "bushy" quickly—structure with care.

Risk Profiles (S-Curves)

Bill's preferred way to communicate trade-offs is the **S-curve** (CDF of NPV, cumulative probability on the vertical axis). These profiles make stochastic dominance visible: when one alternative's curve sits consistently to the right and below another, it dominates.

"Eventually we want to generate risk profiles... They show the complete picture of what you can choose between."

He contrasted a "safer" lower-upside alternative with a "riskier" higher-upside option that carries a long left tail—a clear view of what you're buying in upside and what you're risking.

Tornado Diagrams

Rank uncertainties by impact on total outcome variability. Use tornado charts both to **focus modeling effort** on material drivers and to **target levers** you can influence (e.g., CAPEX reductions) where it matters most.

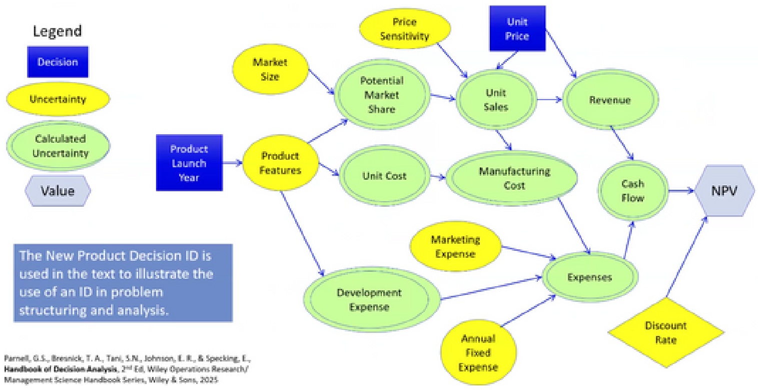
Value of Information (VoI)

Reposition uncertainty **before** a decision to compute **EVPI**, the upper bound of what perfect information is worth.

Model **imperfect information** (false positives/negatives) for **EVII** to decide whether more data collection is economical. Decision-focused modeling avoids **gold-plating analysis** where information won't change choices.

Influence Diagrams

Greg showed how influence diagrams (structurally equivalent to trees) simplify **communication**: they suppress detailed outcomes while keeping **causal structure clear.** In client work, he pairs them with Excel dashboards—one sheet for inputs/outputs (e.g., launch year, price points), another for calculations—then runs ChanceCalc+ (open-source) to produce scenario distributions, dominance comparisons (via S-curves), and tornado sensitivities. It's fast, transparent, and easy for stakeholders to engage.



Soft Skills: The Superpower Behind the Methods

Greg made the case that soft skills can be more decisive than any method:

- **Strategic thinking** tied to organizational goals and the problem domain.
- **Leading cross-functional teams**, often with part-time contributors.
- **Management basics** (budget, schedule) that keep analysis moving.
- **Research in domain**, modeling approach, and data sources.
- **Interviewing** decision makers and SMEs to build composite models better than any single expert's view.
- **Facilitation** to validate models and data, and to reconcile differing expert opinions into a **coherent shared understanding.**
- **Audience-centric communication:** *"It's about them, not us… We're not trying to impress with analysis; we're trying to give decision makers information they can understand."*

If leaders aren't familiar with S-curves, teach quickly and politely—or translate results into language they use every day.

Case Studies: National-Scale Decisions and Long Horizons

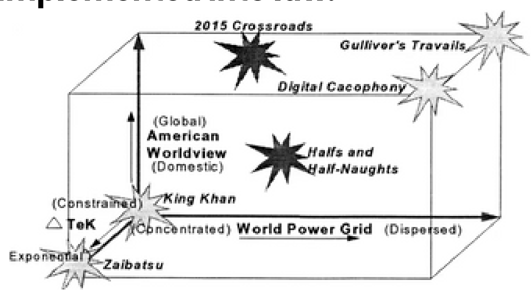
Air Force 2025 Study

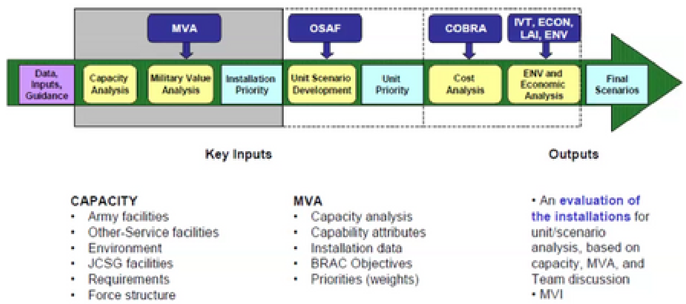
A year-long effort with **200+ experts** built a **134-measure** value model across **43 futuristic concepts**, evaluated under multiple scenarios. The team identified **UAVs/drones** as high-value, relatively low-tech-challenge solutions long before wide adoption—despite resistance from communities whose legacy systems might be displaced. Retrospective validation came years later as drones reshaped the battlefield.

"We're very proud that we identified some of the important developments," Greg reflected.

Army Base Realignment & Closure (BRAC 2005)

Mandated capabilities were translated into measures and prioritized using **swing-weight matrices** (importance × variation across alternatives). Focus prioritized **mission-immutable factors**, then mission support elements, leaving dollar-solvable issues last. The outcome: **$7.6B in savings**—more than the previous **four rounds combined**—and **95% approval** by the presidential commission, the highest across DoD. Decisions were **implemented into law.**





Interactive Insights: Q&A with the Experts

Q1. How do we verify and validate decisions, and build confidence when communicating them to leadership?
A. Greg's answer fell into three pillars:

1. **Analyst capability—**objective, credible, experienced, and decidedly not advocates.
2. **Model credibility—**defensible structures and methods.
3. **Data quality—**validated with subject-matter experts and decision makers.

Bill recommended assessing **Decision Quality** explicitly, **using nominal group technique:** individuals rate DQ dimensions privately, then discuss as a group to surface gaps and align on what the team really knows (and doesn't). The aim isn't a score—it's an honest conversation about confidence, uncertainty, and readiness.

On **adoption costs** and **adaptive methodologies**, both speakers encouraged scoping such factors in the frame when the mission is organizational change or new process deployment. Decision analysis is **fit-for-purpose**—it works within waterfall, Agile, or spiral approaches and adapts to the **nature of the decision**, not the other way around.

Q2. How do we verify and validate against the new technologies when we are doing our decision quality, decision analysis overall. Any thoughts about those opportunities and challenges?
A. Both speakers were optimistic—but cautious—about AI's role.

Greg: Generative AI can assist across the process—from framing ideas and calculating expected value or VoI to running Monte Carlo simulations and drafting reports. Treat outputs like those from a smart junior analyst: helpful, but in need of review.

Bill: LLMs shine at summarizing stakeholder inputs and issue raising. Still, "someone must own the output". AI sometimes invents ("hallucinates")—so teams must validate source, logic, and numbers.

Organizations increasingly deploy AI on internal servers to use proprietary data safely—an operational trend mentioned by both panelists.

Q3. In field development, decisions on surveillance, well placement, and strategy often rely on tools like VOI, decision trees, and scenario analysis. How can early-career professionals clearly communicate these complex evaluations so non-technical leaders make informed decisions?
A. Bill's guidance:

- Convert **results to economics** where possible (NPV, margins, value-at-risk).
- Use **risk profiles** to **show trade-offs** plainly—upside vs. downside.
- Address **left-tail risks** and **real options** (pilots, off-ramps, staged commitments) to buy flexibility when uncertainty is high.

Greg added: meet leaders where they are—quickly teach the tools they don't know, or translate insights into **familiar business language.**

Q4. Why invest in Decision Quality when outcomes aren't guaranteed?
A. *"A good decision doesn't guarantee a good outcome,"* Bill acknowledged—uncertainty is real. But if the organization is committing hundreds of millions or billions in capital, doing the work to understand trade-offs, probabilistic outcomes, and feasible alternatives is worth it. Over time, portfolios of high-quality decisions drive better long-term performance.

Greg noted that client stories and case results are persuasive for leaders deciding whether to adopt a DQ mindset: **demonstrated savings, approvals, and outcomes build institutional trust.**

Further Readings

1. SPE-181246-TR | Guidance for Decision Quality for Multicompany Upstream Projects
2. Handbook of Decision Analysis, 2nd Edition
3. Decision Superhero Book 1: Driving Informed Decision-Making with Probability, Explainable Models, and Decision Science

PERSPECTIVE: EXPERT INSIGHTS

From Oil and Gas Experience to Geothermal: How Reservoir Modelling evolves

This article brings together valuable insights from Sonia López, Dr. Sam Rivas-Dorado, and Dr. Denis Voskov on advancing geothermal energy. Sonia emphasized how subsurface expertise and drilling technologies from oil and gas can accelerate geothermal deployment. Building on this, Sam explored modelling workflows that adapt hydrocarbon reservoir methods to geothermal systems, highlighting both opportunities and challenges. Denis complemented these insights with the TU Delft Campus project, showing how advanced simulation and uncertainty analysis are applied in practice. Together, their contributions illustrate how petroleum engineering knowledge can be harnessed to deliver reliable and scalable geothermal solutions for the energy transition.

(Speaker)
Sonia López
Reserves Audit Leader, Repsol

(Speaker)
Sam Rivas Dorado, PhD
Geoscience Modeler & Structural Geologist, Rock Flow Dynamics

(Speaker)
Denis Voskov, PhD
Reservoir Engineering Chair, TU Delft

(Moderator)
Teodor Damian
Subsurface Lead, Senior Petroleum Engineer, Shell

Geothermal Energy Assessment and Modelling: Leveraging Oil and Gas Expertise by Sonia López

Sonia began by revisiting the geothermal fundamentals, explaining how heat from the Earth provides continuous, low-emission energy.

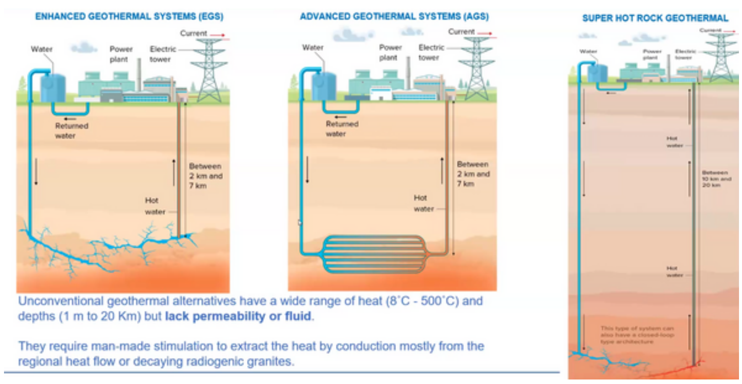
She highlighted how **shallow wells support heating while deeper wells enable power generation** and noted that geothermal electricity is concentrated in tectonic regions, whereas Europe mainly uses geothermal for heating.

Sonia classified geothermal systems into conventional and unconventional. **Conventional systems rely on natural reservoirs with heat, permeability, and cap rock seals.**

While unconventional systems such as Enhanced Geothermal Systems (EGS), Advanced Geothermal Systems (AGS), and superhot rock projects, **create permeability artificially through fracturing and fluid injection.**

These technologies promise vast energy potential **but face challenges of depth, cost, and public perception.**

Industry players including Fervo Energy, GeoEnergy, Chevron Mitsui, and GreenFire are advancing these solutions.

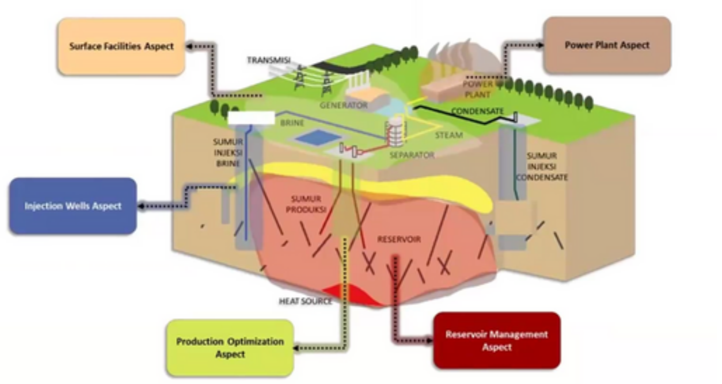


A central theme of Sonia's talk was the synergy between geothermal and oil and gas. **The workflows are strikingly similar**: exploration, drilling, completions, production, and reservoir management.

Subsurface skills in geology, petrophysics, reservoir engineering, and well testing translate directly into geothermal projects.

Inactive or suspended wells can be repurposed for heat extraction, while co-production opportunities exist in fields where hot water is produced alongside hydrocarbons.

Reservoir modelling (conceptual, static, and dynamic) remains critical for estimating resources, predicting heat extraction, optimizing well placement, and sustaining long-term production.



Source: Modified design from Saptadji, 2020

Sonia concluded by situating geothermal within the broader energy transition. **Oil and gas companies are diversifying portfolios** to include carbon capture, hydrogen, and geothermal energy.

The International Energy Agency's 2024 report, **The Future of Geothermal Energy, underscores the importance of oil and gas involvement** in driving cost-effective innovation and scaling geothermal projects.

By leveraging existing infrastructure, workforce skills, and digital technologies such as AI and advanced simulation, **the industry can accelerate geothermal adoption** and deliver meaningful contributions to low-carbon energy systems.

Handling Static Modelling Variables and Uncertainty in a Geothermal Setting by Dr. Sam Rivas

Sam began with a central question: **Can oil and gas modelling workflows be adapted to geothermal systems? His answer was clear yes,** with adjustments.

At a fundamental level, the modelling process is similar: building grids, interpreting seismic, assigning properties, and running uncertainty analyses.

The difference lies in the resource being modelled. Instead of hydrocarbons, geothermal projects focus on heat in place, requiring attention to parameters such as temperature, porosity, rock density, and specific heat.

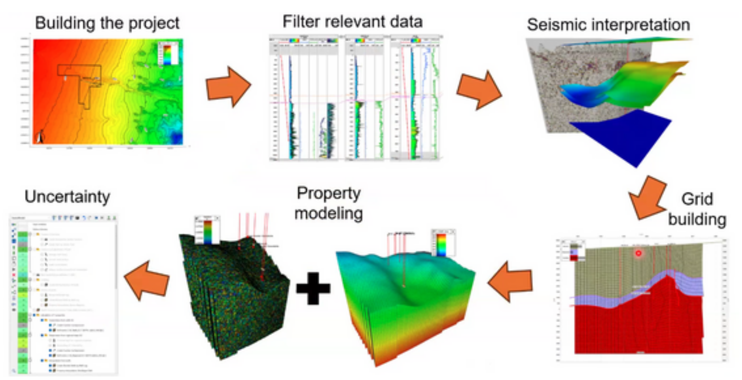
Sam illustrated this adaptation using the Utah FORGE site, a natural laboratory sponsored by the U.S. Department of Energy.

The site's fractured granite and metamorphic basement rocks provide an ideal setting for geothermal reservoir studies. Using seismic data, fracture logs, and well measurements, **Sam constructed a static model to estimate volumetric heat in place.**

Key steps included:

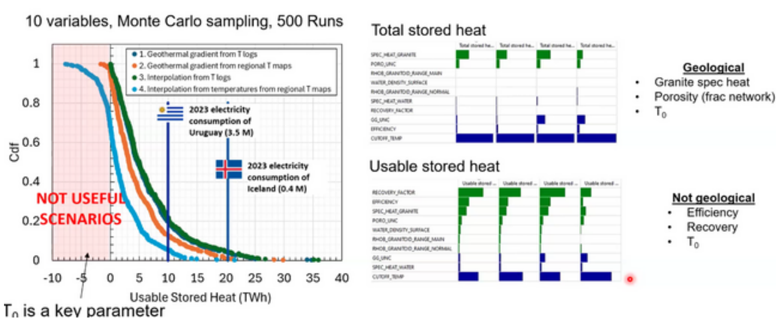
- Temperature modelling from well logs and regional maps to generate geothermal gradients.
- Fracture analysis to derive porosity and permeability through discrete fracture network (DFN) modelling.
- Rock density modelling using granite averages and simple distributions.
- Water density modelling, highlighting the need for hydrogeological expertise to refine assumptions.

Sam applied a volumetric heat equation like STOIP methods to estimate stored thermal energy and convert it to potential power output, with results matching published University of Utah figures.



Geothermal Modelling Workflow

Monte Carlo simulations across ten variables revealed that cut-off temperature, specific heat of granite, and porosity were the most influential parameters. Recovery factors and efficiency also played critical roles in determining usable stored heat.



Uncertainty Analysis

Sam stressed the importance of distinguishing energy from power and encouraged engineers to frame geothermal outputs in real-world terms.

His example showing that the modelled reservoir could theoretically power 1.7 million homes for a year, highlighted the scale geothermal resources can offer.

Sam showed that oil and gas modelling expertise can be effectively adapted to geothermal, though it requires new skills and interdisciplinary input especially in hydrochemistry and thermal properties.

His key message was clear: "We can do it. Modelling geothermal reservoirs is achievable, but it will challenge us to expand our knowledge and adapt our methods."

Uncertainty Reduction in Geothermal Projects Based on Diverse Data and Observations by Dr. Denis Voskov

Dr. Voskov began by situating geothermal within the broader energy transition. The Netherlands currently produces about 8 petajoules of geothermal energy annually and aims for 300 petajoules by 2050.

He highlighted TU Delft's campus project a 2.2 km geothermal doublet designed to supply roughly 25 MW of thermal energy for district heating as a practical example of this ambition in action.

He emphasized that while **the physical resource differs heat instead of hydrocarbons, the workflows remain familiar:** coring, logging, seismic interpretation, grid construction, and simulation.

The challenge lies in adapting petroleum frameworks to geothermal reservoirs characterized by water-bearing sedimentary systems, high heterogeneity, and unique operational constraints.

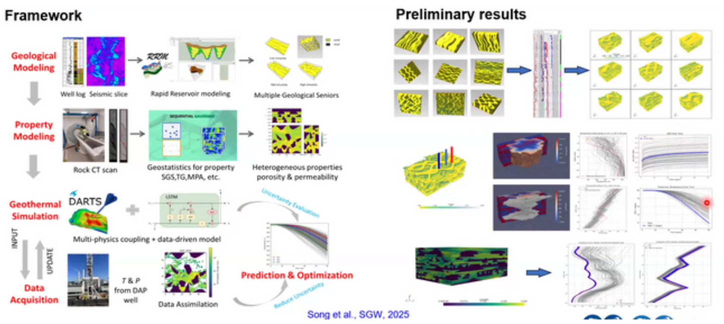
Voskov's team **constructed over 100 geological models to capture variability** in porosity and permeability. By comparing realizations with and without direct well data, they demonstrated how static measurements reduce uncertainty and heterogeneity.

Classical petroleum metrics such as Lorenz and Dykstra-Parsons coefficients were applied to quantify reservoir variability, reinforcing the value of data integration.

Using DARTS (Delft Advanced Research Terra Simulator), an open-source tool designed for energy transition applications, the team simulated bottom-hole pressures and temperatures under different scenarios.

Results showed that incorporating static data significantly narrowed prediction spreads, reducing the risk of exceeding regulatory pressure limits designed to prevent induced seismicity.

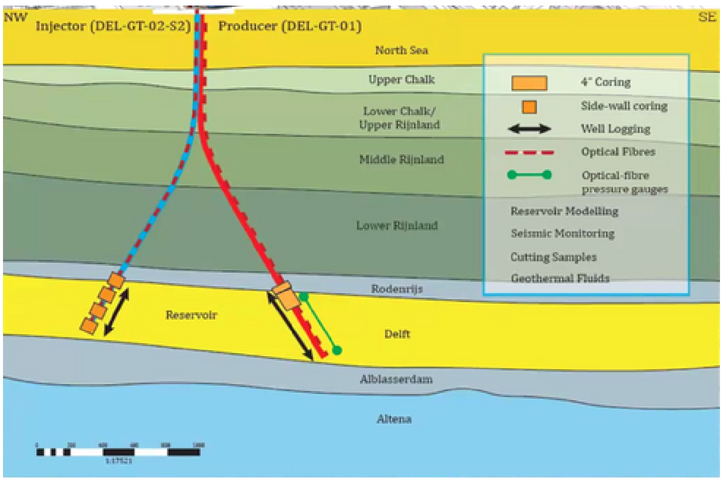
Voskov highlighted **the importance of digital twins and Rapid Reservoir Modelling** (RRM) frameworks to update models quickly as new data arrives. This approach enables adaptive management without lengthy reconstruction of geological models.



Digital Twins for Subsurface Geothermal Production

The TU Delft project is pioneering advanced monitoring techniques:

- Fiber optics for distributed acoustic sensing, strain, and temperature.
- Pressure gauges along production wells to capture transient behavior.
- Electromagnetic monitoring via electrodes in a planned observation well, designed to track cold-front propagation and plume development.



Voskov demonstrated how electromagnetic resistivity changes can be inverted to visualize geothermal plumes, reducing uncertainty by up to threefold when combined with thermal observations.

A final innovation involves coupling reservoir simulation with geomechanical data. Injection and production induce uplift, subsidence, and thermoelastic responses.

By integrating these effects, the team can better predict long-term reservoir behavior and surface deformation, enhancing safety and reliability.

Dr. Voskov concluded that geothermal projects demand rigorous data assimilation, uncertainty quantification, and risk analysis.

Petroleum engineering frameworks provide a strong foundation, but must be extended with new technologies **digital twins**, **fiber optics**, **electromagnetic monitoring, and geomechanical coupling.**

The TU Delft Campus project exemplifies how multidisciplinary innovation can **optimize geothermal systems, minimize risks**, and accelerate the energy transition.

Interactive Insights: Audience Q&A

Q1. What are the main uncertainties and risks in geothermal projects, and how do they compare economically with oil and gas?

A. Geothermal carries significant subsurface uncertainty including temperature, permeability, transmissivity, and long-term heat sustainability all drives project value.

High-temperature drilling and specialized completions increase costs, while permitting can be slow and unpredictable.

Economics depend heavily on local heat/electricity markets and policy incentives; returns are typically lower than oil and gas because geothermal produces heat rather than a tradable commodity.

Enhanced systems can improve revenue but add technical complexity.

Q2. Does geothermal static modelling require the same level of detail as oil and gas?

A. Yes, especially for EGS/AGS projects where fracture networks and small-scale heterogeneities strongly control flow and heat transfer. Conventional hydrothermal systems may allow coarser models, but advanced geothermal requires detailed grids, DFN modelling, and thermal-hydraulic coupling.

Q3. Is elemental inorganic geochemistry useful in geothermal exploration?

A. Yes. Geochemistry helps identify reservoir conditions, fluid pathways, and fluid-rock interactions. While not sufficient alone, it is a cost-effective tool that complements geophysics, drilling data, and geological mapping to reduce exploration risk.

Q4. Can dynamic simulation incorporate thermal fractures created by cooling during injection?

A. Yes. Thermal-hydro-mechanical coupling can be implemented through proxy permeability adjustments or fully coupled geomechanical models. Reliable results require strong mechanical Earth models supported by laboratory measurements of elastic and frictional properties.

Q5. How are downhole heat exchangers installed in advanced geothermal systems?

A. Advanced Geothermal Systems (AGS) create artificial reservoirs by fracturing hot, dry rock through hydraulic stimulation. A heat-transfer fluid is circulated through these fractures, heated by the rock, and brought to the surface to generate electricity.

Downhole heat exchangers typically U-tube or coaxial closed-loop are installed in deep, cased wells, with careful attention to material selection, corrosion control, and mechanical reliability under thermal cycling.

Oil and gas expertise in deep drilling and well engineering is critical for successful installation and operation.

Q6. Did the heat-in-place estimate for the granitic basement include fluid components?

A. Yes. Both rock matrix and pore fluids were included, as fluid heat capacity and mobility significantly influence total stored and recoverable heat.

Q7. How do we address uncertainty in fracture connectivity in DFN models?

A. True fracture connectivity cannot be fully predicted, but modelling remains valuable. By integrating analogues, borehole image logs, and regional tectonics, DFN scenarios can be built and tested probabilistically. Drilling ultimately calibrates the model, but scenario-based analysis helps identify likely flow corridors and reduce uncertainty.

Q8. Are vacuum-insulated tubulars being considered to reduce heat loss?

A. Yes. Vacuum-insulated tubulars are increasingly used in geothermal wells, especially closed-loop systems to preserve fluid temperature and improve thermal efficiency, despite higher cost and installation complexity.

Q9. Why do thermal gradients decrease with depth, and what is the significance of T_0?

A. Thermal gradients decrease because deeper rocks have higher thermal conductivity, allowing heat to dissipate more efficiently.

T_0 (cutoff or reference temperature) is critical in volumetric heat calculations: if T_0 approaches or exceeds reservoir temperature, estimated heat in place drops sharply, making it one of the most influential parameters.

Q10. Why isn't specific heat capacity mapped like other rock properties?

A. Because heat capacity varies far less than permeability or porosity, typically within ~20% in sedimentary systems, mapping it provides limited additional value compared to properties with orders-of-magnitude variability.

PERSPECTIVE: EXPERT INSIGHTS

Production Driven Reservoir Characterization with RTA

This article brings together practitioner insights from Abdolrahim Ataei, PhD and David Anderson on advancing production-driven Rate Transient Analysis for modern reservoir management. Rahim emphasized how integrating production data early through physics-based analytical workflows can narrow uncertainty and accelerate asset-level decisions, while David detailed the theoretical foundations and practical application of RTA, linking pressure transient analysis, decline behavior, and flowing material balance. Together, their field-based examples illustrate how treating production data as continuous subsurface evidence enables more reliable volumetric estimation, clearer identification of reservoir drive mechanisms, and better-constrained simulation across the reservoir life cycle.

(Speaker)
Abdolrahim Ataei, PhD
Technical Evaluations Manager
OQEP

(Speaker)
David Anderson
Founder &
Principal Reservoir Engineer,
SAGA Wisdom

(Moderator)
Mariela Araujo, PhD
PSE & Open Innovation
Principal Researcher
Shell

IPSDA Platform for Prudent IADM

"What we are talking about today—rate transient analysis—must be seen in the landscape of integrated asset development and management."

Dr. Ataei initiated the discussion by framing Rate Transient Analysis within the broader context of asset management and integrated production system workflows, deliberately addressing decision structure and uncertainty management prior to introducing mathematical formulations and field applications.

"Anyone who runs an asset knows there are four fundamentals: integration models, people and leadership, governance and process, and consistency and efficiency."

He paused here to make a critical point.

"But all of these pillars are built on one foundation—understanding what production data is telling you."

In this framing, RTA is not a specialist technique used by a few engineers late in field life. It is the **backbone that allows integrated decision-making to function.**

Dr. Ataei emphasized that IPSDA is not software-centric. It is **sequence-centric**—a series of diagnostic steps that progressively reduce uncertainty. *"This is not about complexity. This is about clarity."*

He reinforced this with a real example from asset practice.

"Using production data analysis, we reduced 23 equally possible history-match models down to five."

The implication was clear: **simulation did not become unnecessary—it became focused.**

"This is how you shorten numerical simulation workflows. This is how you save time and deliver value faster."

Why RTA Works as a Foundation

Dr. Ataei then explained why production-driven analysis is uniquely effective.

"First, it is fast. Second, it is accurate—because it is based on actual field behavior. Third, it is extremely cost-effective, because the data is already collected."

He pointed to **modern surveillance realities.**

"Today, we have downhole pressure gauges recording every millisecond and surface rates recorded every second."

The bottleneck, he stressed, is not data availability.

"The bottleneck is interpretation."

What Rate Transient Analysis Actually Is

"Rate transient analysis is extracting useful information about the reservoir, completion, and surface operations from the interpretation of continuous rate and pressure data."

David Anderson began by **demystifying RTA.** It was not presented as a new discipline, but as a natural extension of pressure transient analysis.

"The theory has been around for decades. What's changed is our ability to apply it practically and continuously."

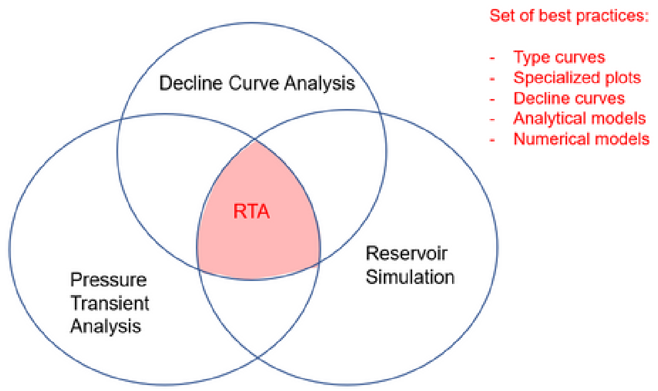
He reminded the audience that historically, production data analysis was fragmented.

"When I started my career, decline curve analysts and pressure transient analysts didn't talk to each other."

"Decline curves tell you what happened. PTA tells you why something happened—at a point in time. Simulation tries to bring everything together."

RTA connects these worlds by allowing **transient physics** to be applied over the **full production life of a well.**

"Production history is essentially a long drawdown test—if you treat it correctly."



Core Technical Concepts Underpinning the Workflow

Before moving into case studies, the speakers emphasized several non-negotiable technical principles.

Instantaneous Normalization

Variable-rate production is transformed into an equivalent constant-rate framework using instantaneous rate-pressure normalization. This step removes operational distortions and reveals the reservoir signal.

Material Balance Time

Superposition in time accounts for rate changes, allowing flow regimes to be identified despite operational noise.

"If you don't normalize and superpose properly, you're analyzing operations—not reservoirs."

Diagnostic First, Matching Second

Production type curves and specialized plots are diagnostic tools, not curve-fitting exercises. Their primary value lies in identifying:

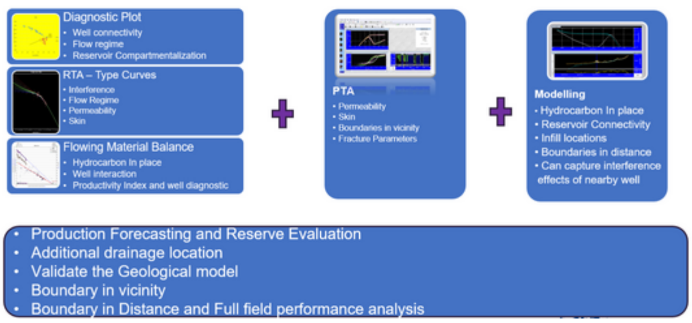
- Flow regimes
- Boundary effects
- Pressure support
- Interference

Flowing Material Balance: Volumetrics Without Shut-Ins

"In many assets, shutting in a well long enough to get average pressure is simply not practical."

FMB leverages the equivalence between the decline of flowing pressure and average reservoir pressure under pseudo-steady-state conditions. This enables:

- Early estimation of connected hydrocarbon volume
- Continuous volumetric monitoring
- Multi-well volumetric integration



Case Studies: Production-Driven Insights from the Field

Case Study 1: Offshore Gas Field: Establishing Connected Volume and Communication

Field Background: A Southeast Asian offshore gas field developed with five producing wells, structurally complex with potential fault compartmentalization.

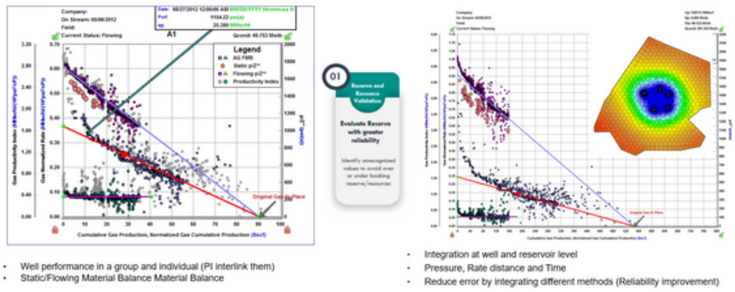
Objective: Quantify connected gas volume and assess inter-well communication using production data alone.

Challenges: Limited shut-in data, Offshore operational constraints, Early-life production variability

Workflow Applied: Single-well flowing material balance, Identification of pseudo-steady-state behavior, Expansion to multi-well FMB using reference pressure

Insights: Individual well indicated ~90 BCF connected volume, Multi-well FMB converged near ~550 BCF, Consistent pressure-rate behavior across wells confirmed communication

Impact: Dynamic connected volume lower than static GIIP, Identification of potentially undrained compartments, Improved infill drilling strategy



Case Study 2: Same Offshore Field: Early Detection of Aquifer Support

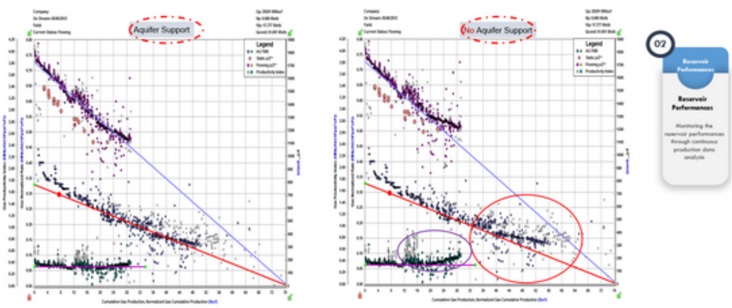
Objective: Identify reservoir drive mechanism before visible water production.

Diagnostic Signal: Production data drifting above depletion behavior on type curves.

Method: Sensitivity testing with aquifer terms in FMB, Matching pressure behavior with and without support

Key Insight: Aquifer support active early in field life

Decision Outcome: Reserve protection strategies implemented, Re-sequencing of well interventions



Case Study 3: Carbonate Oil Reservoir: Separating Productivity from Reservoir Depletion

Field Context: This case involved a Middle Eastern carbonate oil reservoir where wells required repeated acid stimulation to sustain production.

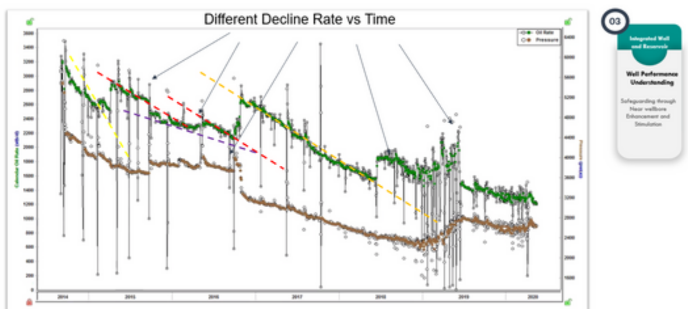
Objective: To determine whether production decline and recovery cycles were driven by: Reservoir depletion, or Near-wellbore productivity changes

Key Challenges: Strong rate response to acid jobs, Multiphase production, Risk of overstating reserves

Integrated RTA Workflow: Flowing material balance (to track connected volume), Productivity index tracking, Agarwal–Gardner type curves (to identify flow regime transitions)

"We adjusted PI for each acid job—but we never touched the connected volume."

Critical Insight: Despite multiple stimulations: Connected volume remained ~27 MMSTB, PI varied significantly over time.



Case Study 4: Multi-Well Dry Gas Field: Field-Scale Volumetrics

Context: David Anderson presented a high-permeability dry gas reservoir with five vertical wells producing under rate control.

Objective: To establish field-scale connected gas volume.

Workflow Applied:

1. Individual well RTA and FMB
2. Aggregate connected volume calculation
3. Multi-well flowing material balance using grouped production

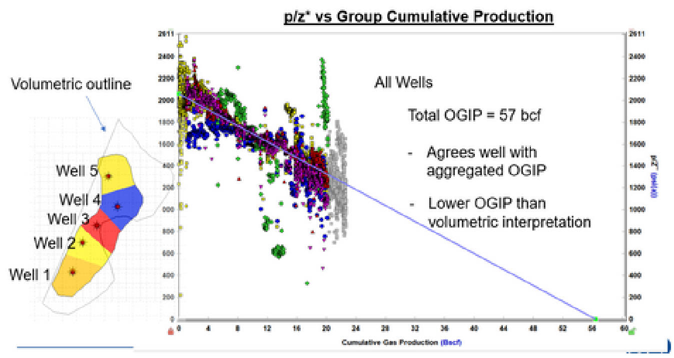
"I did this in a few hours—and it saved weeks of simulation effort."

Key Findings: Individual well volumes summed to ~61 BCF, Multi-well FMB converged to ~57 BCF, Static P50 GIIP was higher

"This is ground truth. If production can't see it, simulation shouldn't either."

Development Implications:

- Connected gas lower than static P50
- Simulation pore volume constrained early



Case Study 5: HPHT Gas-Condensate Reservoir: Constraining Extreme Complexity

Context: The final case involved a high-pressure, high-temperature gas-condensate reservoir with: Water drive, Compaction, Horizontal and vertical wells, Multiphase flow

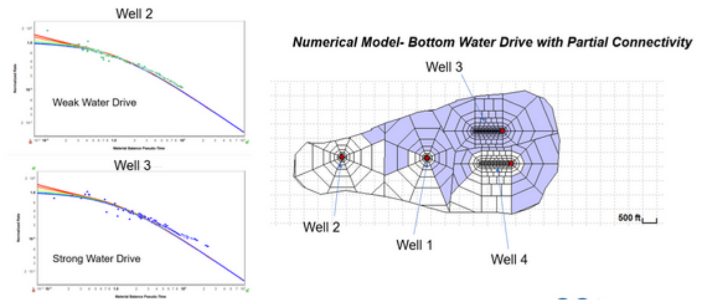
Objective: To reduce uncertainty before simulation by identifying:

- Dominant drive mechanism
- Pressure support behavior
- Feasible depletion pathways

RTA Diagnostics Applied: Production type curves, Depletion stem behavior, Pressure support indicators

Outcome:

- Pressure support confirmed early
- Simulation space dramatically constrained
- Faster convergence to credible forecasts



Conclusions

Production-driven Rate Transient Analysis transforms production data from a historical record into a real-time reservoir diagnostic. When applied early and integrated correctly, it:

- Anchors volumetrics
- Identifies drive mechanisms
- Separates wellbore effects from reservoir behavior
- Reduces simulation non-uniqueness
- Accelerates high-confidence decision-making

Interactive Insights: Audience Q&A

Q1. How do you manage uncertainty in RTA when downhole pressure data is not available?
A. Dr. Ataei emphasized that bottom-hole pressure measurements are not always mandatory for effective RTA. He explained that tubing-head pressure, which is commonly measured at high frequency, can be converted to bottom-hole pressure using standard wellbore models. Differences in data resolution between pressure and rate measurements—such as hourly pressure versus daily rate—can be handled through basic time alignment without compromising the analysis.

Anderson added that the reliability of surface or annular pressure data is reservoir dependent. He expressed high confidence in surface-based pressures for dry gas reservoirs, noting that these systems often provide a stable pressure signal suitable for RTA. In contrast, oil reservoirs under artificial lift or low-energy conditions require greater caution and often additional data to establish confidence in bottom-hole conditions.

Q 2. How do you handle multiple wells in flowing material balance when interference is present?
A. Anderson explained that interference is not a complication to be eliminated, but rather the physical basis that enables multi-well flowing material balance. His recommended workflow begins with individual well analysis to identify slope changes in flowing material balance trends. These changes are then correlated with the timing of nearby wells coming onstream to confirm subsurface communication.

Once connectivity is established, combining the wells into a group analysis often results in a single, coherent flowing material balance trend, even in the presence of interference. This behavior has been validated both theoretically and in high-permeability gas fields.

Dr. Ataei added that this approach has been successfully applied to very large systems, including reservoirs with hundreds of wells and multi-TCF gas in place. He emphasized that the long-term objective of RTA is multi-well, multi-layer, and multi-phase integration, rather than isolated well interpretation.

Q 3. Was liquid loading an issue when fitting the decline in the gas field examples?
A. Anderson noted that liquid loading is ultimately an issue in all gas wells, but its

timing and impact depend on reservoir energy and permeability. In the examples presented, liquid loading was not dominant early because the reservoirs were high-permeability, high-energy systems. He explained that liquid loading typically appears much earlier in tight gas and multi-fractured horizontal wells.

He also highlighted that liquid loading is identified during diagnostic screening—using specific production signatures—rather than during decline or type-curve matching, to avoid misinterpreting operational effects as reservoir behavior.

Q 4. How does RTA differ between conventional and unconventional reservoirs?
A. Anderson explained that the underlying physics of RTA are the same across reservoir types, but the observed flow regimes differ significantly. Conventional reservoirs typically transition quickly to radial and boundary-dominated flow, enabling earlier volumetric interpretation.

In unconventional reservoirs, long transient flow periods dominate, and linear or fracture-controlled flow persists for extended time. As a result, traditional pressure transient analysis is often impractical, and DFITs replace classical PTA, while RTA becomes the primary tool for long-term production interpretation.

Q 5. How can initial reservoir pressure be estimated when it cannot be measured reliably?
A. Anderson cautioned against indirect approaches such as relying on drilling mud weight, noting that such methods can be misleading. He stressed that direct measurements—such as flow-and-build-up tests in high-permeability reservoirs or injection fall-off tests in low-permeability systems—remain the most reliable means of determining initial reservoir pressure.

Dr. Ataei added that uncertainty in initial pressure should be explicitly incorporated into the analysis. He emphasized the use of uncertainty or Monte Carlo analysis to assess the impact of pressure uncertainty on reserves and forecasts, framing it as a business risk decision rather than a purely technical one.

Q6. Can RTA be applied to pumping wells in Coal Seam Gas (CSG) reservoirs where fluid level measurements are available?
A. Anderson clarified that coal seam gas reservoirs present a distinct production behavior. Early in field life, these systems are typically saturated and dominated by water production, requiring extended periods of pumping to depressurize the coal and enable gas desorption.

During this dewatering phase, bottom-hole pressure can often be estimated with reasonable confidence—provided fluid levels and system backpressure are known and the reservoir has sufficient energy. However, he acknowledged that early-time data in CSG systems is difficult to interpret.

Once gas breakthrough occurs and gas rates become measurable, confidence in RTA interpretation improves significantly. Anderson concluded that while early CSG analysis is challenging, meaningful RTA can still be performed with appropriate caution.

Q7. How does RTA compare with PTA using advanced techniques such as deconvolution?
A. Anderson explained that while deconvolution is theoretically powerful, it is highly sensitive to small data errors and operational noise, particularly because it relies on short-duration pressure data. Compression effects and measurement uncertainties often mask the reservoir signal in practice.

He noted that although deconvolution may be superior in theory, RTA offers a key practical advantage: access to long-term production data. This extended time scale provides more reliable insight into far-field reservoir behavior, making RTA more robust for real-world applications.

Youth Voices in Integrated Reservoir Management:
How We're Thinking, Learning, and Contributing

IRM is evolving fast and IRMTS Youth are in the engine room

Through vibrant ideas, real decision making and early field exposure, the **Youth Wing** exists to contribute...not just to observe. Representing a collective of fresh thinking, active learning and 'reverse mentors', the IRMTS Youth Wing has come together in this article to share their perspective on how integrated, lifecycle-driven reservoir management is understood, challenged and strengthened from ground up. Let us hear them out!

"Thinking across disciplines as a technical advantage"

Zhambyl Sarbas
Reservoir Engineer
Tengizchevroil

Fragmented workflows remain a major challenge in reservoir management. Sharing data, models, and uncertainty improves forecasting and decision alignment, and for youth, thinking across disciplines early is a real technical advantage.

"IRM generates living models that evolve with the asset"

Wamuyu Miano
Student
Kenyatta University

The IRM Youth Wing helps translate theory into applied understanding through simplified workflows, case-based discussions, and peer learning across regions. It makes IRM something you grow into, not something you shy away from.

"Translating IRM theory into applied understanding"

Ameen Ahmed
Reservoir Engineer
Anton Oil

IRM is evolving toward more adaptive workflows through the integration of real-time surveillance, advanced analytics, and dynamic modeling. Over the next decade, it will shift from static models to continuous learning and responsive decision-making across the asset lifecycle.

"Breaking the silos with IRMTS"

Abednego Wakili
Petroleum Engineer
CypherCrescent

I joined the IRMTS Youth Wing because reservoir development demands integrated, data-driven collaboration across disciplines. IRM offers a holistic approach to reservoir understanding, development, and performance across the asset lifecycle. IRMTS breaks silos while empowering early-career professionals to contribute and grow as future leaders.

"Sustainability through surveillance and data quality"

Sharon Soler
Solution Manager
Bentley Systems

Field experience reshapes how you think about reservoirs, showing how early development decisions drive long-term performance. For me, sustainability begins with disciplined reservoir management, strong surveillance, and informed decisions made early.

"When innovation meets experience, IRM delivers real impact"

Sydney Nassanga
Advisory Associate
JEPA Africa

Effective IRM emerges when fresh analytical thinking from young professionals combines with the operational insight and execution wisdom of experienced experts, accelerating the transition from theory to practice. This synergy enables smarter, faster, and more practical reservoir management decisions.

"AI doesn't replace expertise—it amplifies it"

Parag Bhoraniya
Engineer (Wells Ops)
Shell

I see AI as a means to improve uncertainty management, enabling faster evaluation of multiple subsurface scenarios through tools like probabilistic interpretation and accelerated history matching. Rather than replacing experts, AI strengthens human judgment and supports better technical decisions.

"Curiosity, guided well, becomes value"

Vera Dogo
Graduate Engineer
TechnipFMC

Early-career engineers bring curiosity that challenges assumptions, spots data gaps, and explores new workflows. With the right mentorship and integrated exposure, this mindset translates into practical, value-adding improvements.

"From theory to field, integration builds confidence"

Elhans Imanovs
Sr. Reservoir Engineer
Equinor

Field experience reshapes how you think about reservoirs, showing how early development decisions drive long-term performance. For me, sustainability begins with disciplined reservoir management, strong surveillance, and informed decisions made early.

From a youth perspective, the concept is about growing within the system, not observing it from the outside. By engaging early with integration, uncertainty, and teamwork, young professionals learn how real reservoir decisions are made and where they can add value.

The IRMTS Youth Wing becomes a space where curiosity turns into contribution, confidence builds through real exposure, and leadership develops naturally alongside technical growth.

Tell Us Your Story

Are you a **Y**oung **P**rofessional with ideas worth sharing?

Write to us with your thoughts at
irmtechnicalsection@gmail.com
and we will publish your story in our next edition!

THE RESERVOIR CHRONICLES: TRIVIA & TIDBIT

Interested in testing your knowledge of Integrated Reservoir Management?
Or curious about the evolution of reservoir management through the years?
Then don't miss this recurring feature packed with insights, challenges, and learning!

DID YOU KNOW?

In 1968, in the heart of the East Texas Field, a quiet experiment set out to answer a bold question: *can residual oil saturation be measured using just one well?*

A reactive tracer was injected, the well was shut in to allow in-situ reaction, and upon production, tracer partitioning and return profiles revealed the first quantitative estimate of residual oil saturation from a single well—the world's first Single-Well Chemical Tracer (SWCT) test.

By 1971, patent rights were issued, formally establishing SWCT as a repeatable, single-well diagnostic for Sor, and laying the technical foundation for its continued use in waterflood performance assessment and EOR decision-making.

Source: Chapter 5: The Single-Well Chemical Tracer Test—A Method for Measuring Reservoir Fluid Saturations in Situ (PEH - Vol 5)

SPECULATE: QUIZ ZONE

Born in 1855, I drilled the well that launched the modern petroleum industry.

My legacy:
Father of petroleum engineering
Spindletop pioneer who transformed Texas into an oil powerhouse
Namesake of SPE's highest technical award for innovation and leadership

I didn't just strike oil, I set the stage for a global energy revolution.

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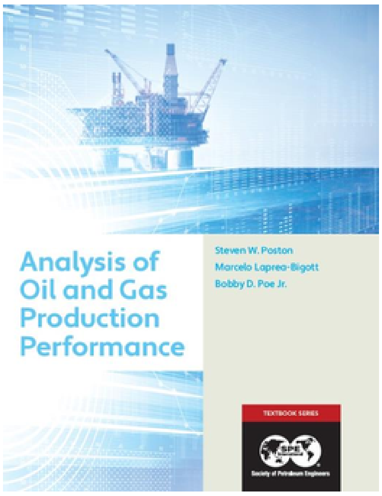

Analysis of Oil and Gas Production Performance
By Steven W. Poston; Marcelo Laprea-Bigott; Bobby D. Poe, Jr.
Society of Petroleum Engineers
DOI: https://doi.org/10.2118/9781613993040
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Publication date: 2019

The practical aspects of analyzing production performance have changed due to the increased exploitation efforts in unconventional reservoirs. ***Analysis of Oil and Gas Production Performance*** expands on these developing well-evaluation procedures and includes the latest best practices for new areas of shale and tight formation reservoirs. Built on the core fundamentals of curve analysis found in Poston and Poe's book, ***Analysis of Production Decline Curves***, this new book is intended for engineers, geologists, and anyone working in the oil and gas industry with an interest in production forecasting of conventional and unconventional resources for evaluation and development.

Spotlight Publication

DECODING Waterflood Short-Circuiting

This article contains highlights of paper SPE-207591-MS "**Strategies to Mitigate the Challenges of Short Circuiting in Waterflood Reservoirs with Tracers: A Case Study**" by Jawhara Mahrouqi, Monalisa Chatterjee, Mahmood Harthi, Abdulhameed Shabibi, Saif Matroushi, Yasser Al Khusaibi, Ali Anbari, Said Rahbi, and Rabha Omairi et. al. The paper has not been peer reviewed. The content of this paper was presented at the ADIPEC held in Abu Dhabi, UAE, 2021.

Background & Technical Challenges

Where a high oil to water ratio plays a significant factor in the profitability of hydrocarbon production, not all types of water production are bad for reservoirs and need not be a serious concern at certain stages of the lifecycle of the reservoir. During the active oil production stage of a waterflooded reservoir, water plays an important role managing the sweep by mobilizing the oil and displacing it through more homogeneous formations. This type of water is called **necessary or good water** production (Abdullah et. al. 2019). It is the water that is associated with oil production in the later stages of water flood or from active aquifers that lead to a direct loss of oil production if attempted to be restricted, is usually an unwanted one.

A brownfield in southern Oman was experiencing severe water short-circuiting in two injector–producer patterns. While most patterns showed good conformance confirmed by production and artificial lift performance, the complex inverted nine-spot pattern made it difficult to identify offending injectors and unexpected flow paths. Low-API oil combined with slightly fractured and faulted geology led to injection imbalance, resulting in high water cuts. The **objective was to restore well productivity, increase oil output and reduce water production.** **To diagnose breakthrough mechanisms**, chemical water tracers were deployed within an Integrated Reservoir Management (IRM) framework to identify flow directions and responsible injectors. To investigate the breakthrough occurrences and mitigate the challenge, chemical water tracers were introduced in the reservoir as a part of Integrated Reservoir Management framework to identify flow directions and offending injectors.

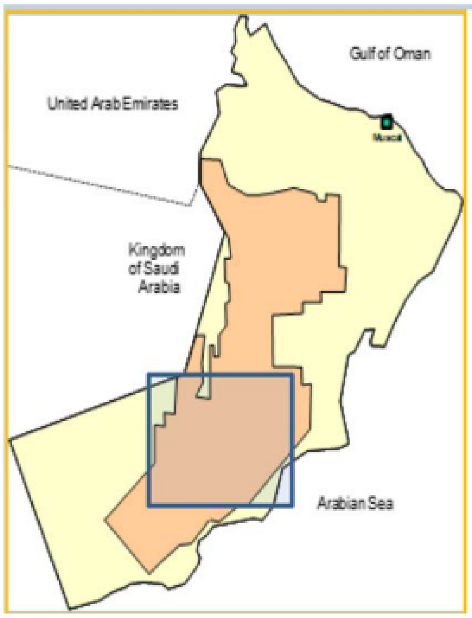

Figure 1: Brown Field location map

Methodology & Solutions

The Phase-1 of the two-phase chemical tracer study, discussed in this paper, was carried out to determine reservoir conformance that was contributing to short circuiting and once the cause was identified and treated, Phase-2 was carried out post well intervention to validate the success of the treatment. Phase-1 of the tracer study was initiated in October 2019 where two injectors, I-1 and I-2 and nineteen producers across two adjacent patterns were traced with two unique chemical water tracers. **Massive tracer responses were obtained within the first few days in few wells**, directly pointing out towards the offending injector(s).

Solutions
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Waterflood Short-Circuiting

Chemical Tracers as a part of Integrated Surveillance Tool

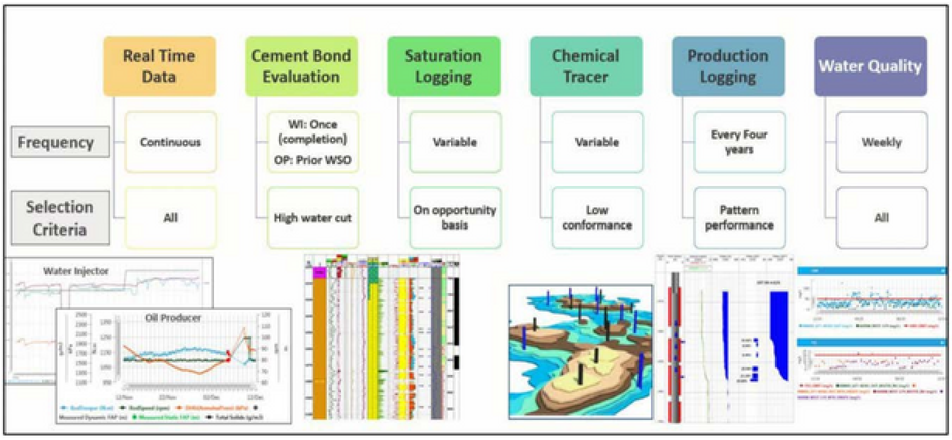


Figure 2: Integration of Chemical Tracers within the VOI chain of IRM

Integrated Reservoir Management frameworks are widely applied to improve asset performance by reducing cycle time, **enhancing multidisciplinary alignment through key performance indicators, and fostering continuous challenge of existing practices.** Chemical tracers provide high Value of Information (VOI) within IRM by improving understanding of reservoir heterogeneity, fault connectivity, flow paths, sweep efficiency, and water breakthrough, while reducing uncertainty and improving simulation forecasts. Accordingly, tracer deployment was integrated into the IRM VOI chain for Field A as a best-practice reservoir surveillance tool.

Results

Plot-1 and Plot-2 are two very strong examples of difference in flow matrix within a flowpath one experiencing an early time **fracture/ high permeability corridor** (Plot-1) and another experiencing a relatively much better sweep between the injector producer pair (Plot-2). Where the response between Injector I-2 and P-1 readily helped track down the short-circuiting pathway, the other between I-2 to P-2 showed that it was experiencing a close to ideal sweep.

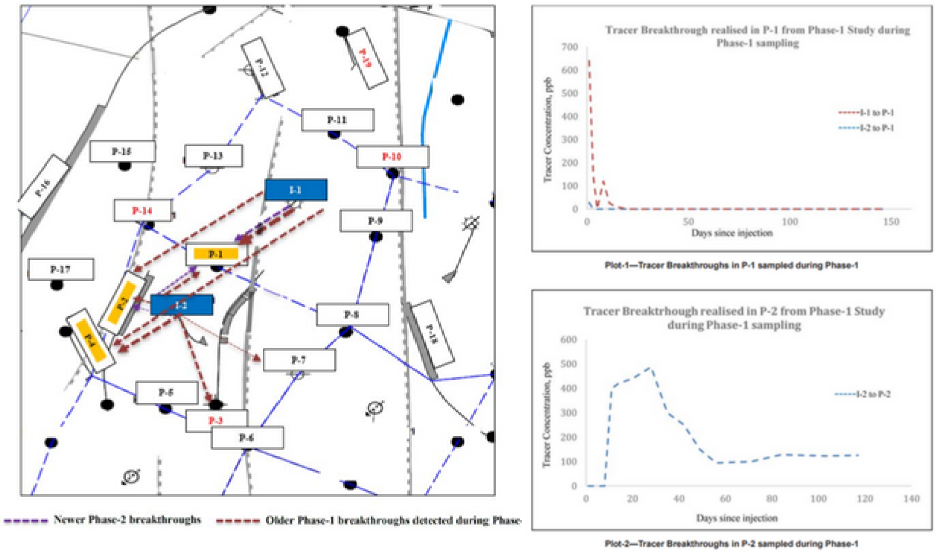
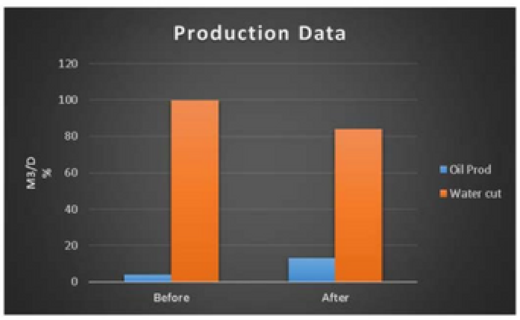


Figure 3: Tracer Breakthrough Map of Phase-1 and Phase-2

Outcome



Plot 3: Pre and post well intervention effects on oil and water production in P-1

Based on the actions taken from results (Plot-3) of the tracer study the team successfully achieved a

- **15% reduction in water cut**
- **Three-fold increase in oil rate**

at the principal target producer validated a successful well intervention thus possibly eliminating the ill effects of short circuiting within the studied patterns.

SPE IRMTS in Pictures

SPE IRMTS marked the close of 2025 with massive global footprints! The IRMTS concluded 2025 with a **strong and visible presence across major global industry platforms**. IRMTS members actively participated in flagship events including **ADIPEC 2025** at Abu Dhabi in the UAE and **ATCE 2025** at Houston in the USA, reinforcing the section's commitment to technical excellence, knowledge exchange, and global collaboration. At ATCE 2025 in Houston, IRMTS members had the opportunity to engage with industry leaders and pioneers, including a memorable interaction with pioneering reservoir engineering authority Dr. Blasingame, underscoring the section's deep connection to both foundational theory and evolving best practices.

The collage depicts how the SPE IRMTS members made impactful contributions at the ADIPEC University Program as well as captures a proud milestone for the IRMTS Youth community, with **Youth member Wamuyu Miano** being recognized at the **Africa Queen of Energy-Student Award 2025**, highlighting the growing impact, diversity, and leadership of young professionals within the IRMTS network. In recognition of the ecosystem that supports IRMTS initiatives, the section also acknowledged its 2025 sponsors, expressing sincere appreciation for their continued partnership and contributions. These collaborations have been instrumental in enabling technical programs, youth engagement, and knowledge sharing activities throughout the year.

Together, these moments reflect the expanding global footprint of IRMTS in 2025 spanning technical leadership, youth empowerment, and industry partnership as the section continues to strengthen its role in shaping the future of integrated reservoir management.

Thank You to Our Sponsors

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Strengthening Partnerships in Integrated Reservoir Management

The SPE IRMTS Section warmly welcomes partners and sponsors to join us in our mission to advance knowledge in reservoir management, digitalisation and innovation within the energy sector. Through strategic sponsorship, organizations can play an active role in supporting initiatives that drive technical excellence, professional development, and knowledge sharing across disciplines. Your partnership enables SPE IRMTS to organize impactful programs, technical forums, and networking events that connect industry leaders, researchers, and young professionals in shaping the future of energy.

Sponsorship Opportunity

Would you be interested in supporting the SPE IRMTS?
Reach out to our Sponsorship Champion, [Maryvi Martinez Santiago](), to explore opportunities to collaborate with us and amplify your organization's presence within the global energy community.

From the Editors' Desk

As we move into 2026, the SPE Integrated Reservoir Management Technical Section builds on a year of purposeful momentum and growing connectivity across the IRM community. The focus of 2025 was on strengthening foundations—expanding reach, encouraging cross-disciplinary engagement, and reinforcing IRMTS's role in advancing integrated, system-level thinking across the energy industry.

Throughout the year, IRMTS publications highlighted integrated workflows that connect **reservoir understanding, surveillance, performance evaluation, and recovery optimization**—reinforcing IRM's core objective of enabling better-informed decisions across the asset lifecycle. In an environment shaped by increasing reservoir complexity, compressed decision timelines, digital advancement, and evolving energy priorities, Integrated Reservoir Management continues to serve as a critical framework for resilient and value-driven asset management.

Looking ahead, 2026 will be defined by a more focused, high-impact strategy. IRMTS will continue to strengthen its role as SPE's **system-level integrator, expand engagement in high-growth regions, and establish sustainable pathways for long-term IRM capability** through the IRM Youth Wing.

We invite our readers to stay engaged and share ideas, feedback, and topic suggestions for future editions. You may reach the IRMTS communications team at irmtechnicalsection@gmail.com or technicalsections@spe.org as we continue to grow IRMTS as a connected, forward-looking technical community.

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UPCOMING SPE INTERNATIONAL EVENTS

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Events

January 13-14, 2026
IPTC Summit on AI for the Energy Industry (26IPTC)
Dubai, UAE

February 3-5, 2026
Kuwait Oil & Gas Show (26KOGS)
Kuwait City, Capital Governorate, KWT

February 3-5, 2026
SPE Hydraulic Fracturing Technology Conference and Exhibition (26HFTC)
The Woodlands, Texas, USA

February 18-20, 2026
SPE International Conference & Exhibition on Formation Damage Control (26FD)
Lafayette, LA, USA

March 31- April 2, 2026
Offshore Technology Conference Asia (OTC Asia) (26OTCA)
Kuala Lumpur, Malaysia

April 13-15, 2026
GOTECH (26GOTS)
Dubai, UAE

Workshops

January 28-29, 2026
SPE Workshop: SPE Workshop: Gas Field Development for a Changing Asia: Driving Sustainability and Efficiency
Kota Kinabalu, Sabah, MYS

February 03-04, 2026
SPE Workshop: Data - Return on Intelligence
Calgary, AB, CAN

March 10-11, 2026
SPE Workshop: Improving Recovery Factors in Onshore Fields
Salvador, Bahia, BRA

Call for Papers

June 23-25, 2026
SPE Europe Energy Conference and Exhibition
Istanbul, TUR
Deadline: January 16, 2026

June 16-18, 2026
Africa Technology Conference
Abidjan, Côte d'Ivoire
Deadline: February 6, 2026

October 21-23, 2026
SPE Annual Technical Conference and Exhibition
Houston, Texas, USA
Deadline: March 9, 2026