



Integrated Reservoir Management
Technical Section

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SPE Integrated Reservoir Management Technical Section (IRMTS)

Newsletter

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Chairman's Message



"A community becomes a force for change when its purpose begins to travel through the actions of its people."

Muhammad Navaid Khan, Chair, IRMTS

Over the past few months, I have watched that happen within IRMTS. I have seen young members take our mission into universities, volunteers create opportunities for others, women shape both our technical direction and leadership culture, and professionals across regions contribute their knowledge without waiting to be asked. More than any statistic, this tells me that the idea behind IRMTS is taking root.

Our membership has now surpassed 10,000, with particularly strong growth among students. This is an important milestone, but I do not see membership growth as an achievement in isolation. Its value is the experience it connects, the conversations it starts, the people it develops; shaping not just how IRM is discussed, but how it is practised.

As we celebrate Women in Engineering, in an industry where women represent about 22% of the workforce, I am proud that **women represent more than 35% of the IRMTS Board** and continue to play a pivotal role in advancing our mission. This edition includes a special section featuring four women at different stages of their careers, from a student finding her voice to established leaders whose decisions have shaped assets and organizations.

Their journeys are different, yet they lead to a common lesson. Technical expertise builds credibility, but broader impact comes from stepping beyond disciplinary boundaries, understanding operational realities, working through uncertainty, and enabling others to succeed. As Susan Howes, 2027 SPE President, reflects in this edition, the most effective leaders integrate people before they integrate technology. That principle lies at the heart of both leadership and IRM.

One of the developments I value most is seeing our Youth Wing move from an idea into genuine ownership. Its members are engaging with universities at a moment when the IEA estimates **the sector needs 40% more qualified entrants by 2030** just to replace who is retiring. They are not waiting for the future of IRM to arrive. They are helping prepare it.

We recently launched a three-part **JPT series on IRM**, tracing the journey from ideation to execution. **With global recovery factors still at 20% to 40%**, the need to turn good ideas into better execution remains clear. Follow the next parts in our upcoming editions.

I am equally proud that four IRMTS Board members have received SPE Regional Awards this year. Their recognition is deserved, but its wider significance matters even more. It shows what happens when technical knowledge is combined with voluntary service and a commitment to helping others succeed.

Our next major step is taking shape in Latin America: the first SPE Integrated Reservoir Management Workshop. Not another event, but a chance to move IRM from something we explain to something we implement.

My request is simple: do not just read about this community. Help shape it. Step forward to share your knowledge, or nominate someone whose contribution deserves recognition through the SPE IRM Luminaries Program. We have crossed 10,000 members. What matters now is the influence we create.

Honoring Excellence in Volunteer Service

The SPE **Integrated Reservoir Management (IRM) Technical Section** proudly recognizes four board members as recipients of the **2026 SPE Regional Awards**.

These prestigious honours acknowledge their exceptional leadership, dedicated service, and lasting contributions to the Society and the energy profession. Their achievements reflect the IRMTS leadership's commitment to advancing collaboration, technical excellence, and the global reservoir management community.



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**WE CONGRATULATE
SPE IRMTS BOARD MEMBERS
ON WINNING THE 2026 SPE REGIONAL AWARDS!**



HAYAT ALHASHMI

**SERVICE AWARD
MENA REGION**



SHUBHAM PATEL

**YOUNG PROFESSIONAL MEMBER
OUTSTANDING SERVICE AWARD
ASIA PACIFIC REGION**



WILLOW LIU

**SERVICE AWARD
CANADA REGION**



MARYVI MARTINEZ S.

**SERVICE AWARD
MENA REGION**

Honoring Excellence in Volunteer Service



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NOMINATE YOUR INDUSTRY PEERS

IRM Community Recognition Program



CELEBRATE

Individuals who
illuminate the path
forward in IRM



RECOGNIZE

Leadership, innovation,
collaboration, and
impact globally



HONOR

Those who inspire,
elevate, and drive
meaningful change

Your nomination shines a light on excellence.
Together, we build a **stronger IRM community.**

Nominations are Now Open



SCAN HERE

IRM in Action: Leading Beyond the Reservoir

Insights from the 2027 SPE President

Engineering leadership is shaped not only by technical expertise but by the ability to develop people, strengthen organizations, and inspire the next generation.

As we celebrate **women in engineering**, we recognize those whose leadership continues to inspire the profession.

In this edition of **IRM in Action**, we speak with **C. Susan Howes** to reflect on a career defined by technical excellence, service, and leadership across the global energy profession.

IRMTS: Throughout your career, you have led technical teams, developed engineering talent, and now serve in one of our profession's highest leadership roles. In your experience, what distinguishes engineers who become influential technical leaders from those who remain exceptional technical contributors?

Susan: Our industry needs both **influential technical leaders** and **exceptional individual contributors**, and many **reservoir management professionals** have opportunities to pursue both paths during their careers. Students and early-career professionals often ask which path is "**better**," but there is no single right answer. The key is to continually develop both technical excellence and the ability to influence others.

What distinguishes influential technical leaders is not simply greater technical expertise, but the ability to enable others to succeed. Leadership is fundamentally about **influence** rather than authority. Influential leaders articulate a **shared vision**, empower others to **take ownership**, **foster collaboration** across disciplines, and create an environment where **technical expertise** can flourish. They recognize that the best solutions emerge from different perspectives working toward a common objective.

For technical individual contributors, one of the most valuable skills to develop is influencing without formal authority.



C. Susan Howes,
PE, PHR
2027 SPE President
President at SCA

With over 30 years of experience across reservoir engineering, reservoir management, business development, organizational capability, technical operations, and industry leadership, she has shaped technical excellence, workforce development, and the future of the energy profession.

Joint venture partnerships provide an excellent example where technical professionals must build **credibility**, **communicate effectively**, and **align multiple stakeholders** to reach decisions without relying on positional power. These experiences can enable reservoir management practitioners to develop the communication, collaboration, and **relationship-building** competencies that complement technical expertise and prepare engineers for leadership, regardless of the career path they ultimately choose.

IRMTS: As our industry embraces digital technologies and artificial intelligence, how can technical leaders ensure that engineering judgment, critical thinking, and multidisciplinary collaboration remain at the heart of effective decision-making?

Susan: As our industry adopts digital technologies and AI, technical leaders must ensure these tools augment engineering judgment, critical thinking, and multidisciplinary collaboration.

As an SPE Distinguished Lecturer on ethical decision-making, I emphasize that while AI can improve the speed and quality of data-driven insights, human judgment remains essential.

for interpreting results, evaluating uncertainty, and considering ethical, operational, and long-term business implications.

My work with the SPE Soft Skills Council, now the **SPE Leadership Development Committee**, reinforced our belief that technical excellence alone is insufficient. **Critical thinking** is a foundational competency developed early in a career, while **engineering judgment** evolves through experience and is strengthened by integrating **technical, commercial, and organizational** perspectives. Effective asset management depends on **multidisciplinary collaboration**, where a variety of expertise and cultural perspectives contribute to better decisions.

The most effective way to develop these competencies is through **experiential learning**. **Action learning programs** and **business simulations** that combine technical challenges with leadership, communication, and decision-making skills prepare early-career professionals to **leverage AI responsibly** while maintaining the **engineering judgment** and **collaborative leadership** required to solve increasingly complex energy challenges.

IRMTS: Integrated Reservoir Management is built on integrating people, data, disciplines, and decisions. What leadership practices have you found most effective in breaking down organizational silos and enabling teams to consistently deliver greater value?

Susan: Integrated Reservoir Management depends as much on **leadership** as it does on technology. While advances in **data science, decision science**, and **AI are enabling faster, data-driven decision-making**, the greatest challenge remains aligning stakeholders to make decisions that effectively manage trade-offs, such as balancing short-term performance with long-term value creation.

Breaking down organizational silos begins with communication. Effective leaders establish a consistent cadence of multidisciplinary meetings, transparent reporting, and regular engagement with project sponsors to ensure that information flows across functions and that

issues, uncertainties and risks are identified early. This creates alignment, accountability, and trust across technical and commercial teams.

I have often led multidisciplinary teams where important aspects of the technical workflow fell outside my own area of expertise. In those situations, I view leadership as **enabling** rather than directing. By creating an **environment** where **subject matter experts** are encouraged to contribute openly, challenge assumptions, and explain the implications of alternative approaches, the team consistently reaches stronger decisions than any individual could make alone.

Ultimately, the most effective leaders **integrate people** before they **integrate technology**. They **foster collaboration, leverage dissimilar expertise**, and **create a culture** where communication, mutual respect, and shared accountability enable teams to deliver greater value.

IRMTS: During Women in Engineering Month, we celebrate the growing impact of women across our profession. From your experience, how do women leaders strengthen technical organizations, and what perspectives or leadership qualities do you believe remain underrecognized within our industry?

Susan: I'm encouraged by the **growing number of women** entering the energy industry, although women remain **underrepresented** in many technical organizations. The greatest value women leaders bring is not simply greater representation, but **leadership that enables a variety of perspectives** to contribute to better technical outcomes.

High-performing technical teams thrive when leaders create an environment where every voice is heard and respected. Differences of perspectives extend **well beyond gender**; it includes unique backgrounds in discipline, **experience, culture, language, generation, and educational background**. These varied viewpoints strengthen problem-solving, challenge assumptions, and foster innovation, but only if leaders have the skills to facilitate

constructive debate, build consensus, and guide teams toward aligned decisions.

One leadership quality that remains under-recognized is the **ability to influence without authority** by **listening deeply, integrating different viewpoints, and creating trust across technical and organizational boundaries**. Leaders who have the experience of being part of an **underrepresented group** often bring heightened awareness of inclusion and are well positioned to **recognize perspectives** that might otherwise be overlooked.

Ultimately, the **strongest technical organizations** are those that value **both technical excellence and leadership competencies** that enable disparate teams to innovate, collaborate effectively, and deliver better decisions.

IRMTS: Looking ahead, what is your message to the next generation of engineers, particularly young women aspiring to technical leadership, about building a career that creates lasting impact on both the industry and the people they lead?

Susan: My advice to the next generation of engineers, especially young women aspiring to technical leadership, is to **first build a strong foundation of technical excellence**. Credibility comes from **mastering your discipline**, but lasting impact requires **continually expanding your perspective** through **cross-functional experiences** that strengthen your **commercial, leadership, and collaborative capabilities**.

Seek **challenging assignments** that stretch your skills, even when they feel outside your comfort zone. Treat every colleague with **respect**, cultivate **meaningful professional relationships**, and invest in a **network that extends** beyond your organization. Leadership is built through **influence, collaboration**, and the **ability to bring** a variety of perspectives together to solve complex problems.

Professional societies such as SPE provide outstanding opportunities to accelerate your development. **Volunteer in leadership roles** as a **student** or **young professional**, contribute to technical publications, and present your work.

These experiences **strengthen communication, broaden your professional network**, and develop the leadership competencies that complement technical expertise.

Most importantly, remember that **technical leadership** is measured not only by the **solutions you deliver**, but **by the people you develop and the culture you help create**. Invest in both, and your impact will extend far beyond your own career.

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Women in IRM: A Conversation with Women Leaders Driving the Movement

Joining the world in celebrating **International Women in Engineering Day** on 23rd June, IRMTS presents Women in IRM: A Conversation with Women Leaders that brings together four exceptional professionals at different stages of their careers to share candid reflections on growth, leadership, and impact as women in engineering.

Featuring **Willow Z. Liu**, Chief Scientist (Multiphase Flow) at MEDENG; **Manal Al Beshr**, Vice President Growth at ADNOC; **Marianne Espinassous**, Rumaila Area Development Manager at bp and **Miano Wamuyu**, Research Fellow at Wale University, these conversations explore the pivotal experiences, leadership lessons, technical innovations, challenges, and opportunities that have shaped their careers.

Through reflections on decision-making, mentorship, resilience, collaboration, and the evolving role of women in integrated reservoir management, they offer valuable perspectives for professionals at every stage of their journey.

Their experiences remind us that impactful careers are built not only on technical excellence, but also on curiosity, resilience, and a willingness to lead.

Willow Z. Liu, Chief Scientist (Multiphase Flow), MEDENG



Q. Thirty-three years of shaping how the energy industry understands and trusts its own data, that is not just a career, that is a legacy built across countless assets, operators, and decisions made with confidence because of work you helped pioneer. As we celebrate that contribution today, take us through the journey that built it: what drew you to this path in the first place, what it truly took to stay at the frontier and keep evolving across three decades of change, and what it means to you personally that the foundation you've spent a lifetime building is now helping the industry tackle something as defining as emissions measurement?

A. I did not set out to spend 33 years helping the energy industry trust its own data. But looking back, that is exactly what much of my career has been about. My path began in biomedical engineering, modeling multiphase blood flow through complex arterial networks. At first glance, that may seem far removed from oil and gas. In reality, it trained me to think about systems where the most important things are often the hardest to see: flow behavior, phase interaction, hidden constraints, uncertainty, and risk. You learn quickly that measurement is not just a number. A number without context can mislead. A number without physics behind it can become dangerous.

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When I moved into oil and gas, the scale changed, but the intellectual problem was familiar. Multiphase production systems are **messy, dynamic, and often unforgiving**. Fluids do not behave politely for our instruments. Flow regimes change. Conditions drift. Assumptions break.

In the early days of multiphase flow measurement, the challenge was not only to develop technology, but to earn trust. Operators had to believe that the data could support real decisions: allocation, production optimization, reservoir management, field development, and investment.

That trust was not built by marketing. It was built the hard way, through physics, calibration, field experience, uncertainty analysis, and years of explaining what the data could and could not say.

This is why I believe **measurement sits at the center of almost every serious energy transition pathway**. Geothermal needs reliable subsurface and surface flow measurement to understand reservoir performance and long-term sustainability. Hydrogen transportation requires metrology that can deal with new fluid properties, leakage risks, blending, materials compatibility, and custody-transfer confidence.

CCUS depends on measurement to prove containment, quantify injection and storage performance, and maintain public trust. Methane mitigation is impossible without defensible detection, quantification, and reconciliation of emissions data. Across all these areas, the industry does not simply need more sensors. It needs measurement systems that can withstand scrutiny.

This is something I emphasized in my SPE TWA interview: **transition is not a license to abandon engineering discipline. It is a reason to double down on it**. The tools may change – AI, virtual metering, digital twins, autonomous monitoring – but the fundamentals remain stubbornly important.

Personally, it is deeply meaningful to see the foundation I spent my career building in multiphase flow and measurement now becoming relevant to emissions, methane mitigation, CCUS, geothermal, hydrogen, and environmental accountability. It reminds me that engineering careers are rarely linear. Sometimes the work you do in one era becomes essential in another.

For young women considering engineering, my message is simple: **do not be afraid of difficult fields. Go where the problems are messy, consequential, and not yet fully solved. Build your fundamentals. Ask uncomfortable questions. Learn physics before chasing the trend. Engineering is not about fitting neatly into existing systems, it is about improving them.**

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Manal Al Beshr, Vice President Growth, ADNOC



Q. A decade or more of building your career in integrated reservoir management at a national oil company in the Middle East, at the very heart of the world's energy story, is a journey that speaks to exceptional expertise and a deep personal commitment to your nation's future. Take us through that journey: what inspired you to pursue reservoir management in the first place, how you grew and navigated the challenges that shaped you along the way, and what does it mean to you to have built this career at the heart of the region that powers the world?

A. Looking back, what first drew me to reservoir management was the **challenge of understanding what could not be seen directly**. I was fascinated by the subsurface, and by the way data, experience, and judgment had to come together before a decision could be made. As my career progressed, however, the real meaning of the work became clearer. **A reservoir model or production strategy is never just a technical output. It can influence the value of an asset for decades and, in turn, support economies, communities, and energy security.**

Building my career at ADNOC gave that responsibility a more personal meaning. As an **Emirati woman**, I have had the privilege of **contributing to an industry that has played a defining role in my country's development while helping provide reliable energy to the world**. That connection between technical work and national purpose has stayed with me throughout my journey.

My experience gradually widened beyond reservoir engineering. I worked across different reservoirs, with multidisciplinary teams, and in both onshore and offshore environments. I also took on leadership responsibilities in operations, where decisions were immediate and accountability was direct. Leading people, managing safety and performance, and making decisions under pressure gave me a perspective that no technical role alone could have offered. It also meant stepping into a space where women were still less commonly seen and learning to build trust through consistency, preparation, and the results we delivered together.

Those experiences changed how I thought about reservoir management. I saw more clearly that **technical excellence is only part of the answer**. The best decisions are made when **geoscience, engineering, operations, and business come together with a shared understanding of the asset and a common objective**. That belief drew me towards Integrated Reservoir Management.

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For me, IRM became a way to connect people, knowledge, and decisions. Leading initiatives to implement it across the ADNOC Group has been one of the most rewarding parts of my career. Seeing it move from an idea into a more established way of working, and seeing teams use it to make better, more integrated decisions, has given me a great sense of pride.

Today, as Vice President of Growth, the scope of my role has changed, but many of the lessons remain the same. Sustainable growth still **depends on sound judgment, different perspectives, and the courage to make decisions when the path is not completely clear.**

Success, to me, is not defined by positions or projects alone. It is reflected in the value we create, the people we help grow, and the contribution we make to our nation's future. **If my journey encourages even one young engineer, especially a woman, to pursue technical excellence, step into unfamiliar spaces, and lead with purpose, I will consider that one of my greatest achievements.**

Marianne Espinassous – Rumaila Area Development Manager, bp



Q. Forging a career in integrated reservoir management, building technical depth in the demanding environments of MENA's giant fields, evolving into one of bp's go-to experts in uncertainty and risk, and now bridging that expertise into the energy transition, is a journey that asks everything of you technically, professionally, and personally. Take us through how you built that career: the challenges you had to navigate, the moments that truly defined you, and what it took to grow from a reservoir engineer into someone who now shapes how organisations make better decisions in the face of the unknown?

A. From Uncertainty to Impact: A Career in Integration and Decision Quality. Reflecting on my career, a few defining experiences have shaped the professional I am today—and continue to influence how I approach decisions, people, and leadership.

I started in bp's technology centre, where I was first exposed to one of the foundations of subsurface work: **decision-making under uncertainty.** The scale, impact and risks of the energy industry made that challenge very real. It quickly became more than a technical topic for me; it became a recurring thread throughout my career, shaping how I think about **value, risk and uncertainty.**

Women in IRM: A Conversation with Women Leaders Driving the Movement

An early operational role as a production engineer on the Foinaven FPSO was equally formative. It gave me a practical understanding of how work gets done in the field, **and how critical integration is**. Translating objectives into something meaningful for operators, while bringing operational realities back into subsurface and project teams, is often under-recognised but essential to alignment and commitment to action.

These experiences sparked my passion for integration as an enabler of value creation. In Algeria, I contributed to the Southern Fields major project sanction, where investment decisions shaped the long-term future of assets. That process reinforced the **importance of identifying risks and opportunities early, and understanding the uncertainties behind them**. Over time, I sought broader challenges across geological settings, fluid types and international contexts, which brought me to the Middle East, with greater scale, pace and discovering new cultures working in different countries.

I also spent 15 months in bp's front-end project organisation. Working closely with commercial teams and developing decision models added a new dimension to my experience.

It deepened my commitment to Decision Quality as a practical framework and widened my horizons, including around proactive stakeholder engagement.

Beyond the technical aspects, **people and encounters have been central to my journey**. I have been fortunate to work with colleagues and mentors who supported and challenged me, especially during difficult or uncertain moments. Honest feedback—sometimes hard to hear—helped me progress, adjust direction and keep learning. Being able to reach out, test ideas or ask for advice has made a real difference. Teaching has also helped me grow further, while giving back through the development of others.

Engaging with the wider industry, including through the Society of Petroleum Engineers, has also been important. It has given me opportunities to contribute to advancing practice and to learn through inspiring exchanges.

My family has played a key role too, providing constant support and perspective. When facing important career or life decisions, I have often found myself applying the same structured thinking: considering options, stakeholders and long-term implications, but the final decision was always made jointly or with the support of my family.

To young women wondering about their path, **I would say this: take up space. Very often, the biggest barriers are the ones we place on ourselves so do not wait until you feel perfectly ready**. Stay curious, be open to opportunities that may not look obvious at first, and do not hesitate to ask for help. It is a strength. Build strong relationships within your organisation and across the industry. **Say yes to challenges that expand your perspective**, even when the path is not fully clear. And **in a world being reshaped by technology and AI, do not stand at the edge — embrace it with curiosity and critical thinking to help shape what comes next**.

Women in IRM: A Conversation with Women Leaders Driving the Movement

Miano Wamuyu – Research Fellow, Wale University



Q. You are still a student and yet you have already stood in geothermal fields at Olkaria and in petroleum terminals on the Mombasa coast, earning real, hands-on experience across the full breadth of what energy means in Africa today, while also showing up as a community leader. That is remarkable. Tell us what that journey has been like: what drew you to energy and reservoir engineering in the first place, what those early experiences have revealed to you about the industry and about yourself, and what you dream of contributing to Africa's energy future as you step fully into this field?

A. I think I always knew I wanted to be an engineer, even before I knew what kind of engineer I wanted to become. Growing up, I mostly saw men wearing hard hats and working on big technical projects, and I rarely saw women in those spaces. Then, when I was about seven years old, I saw **a woman engineer speaking on TV**. I don't even remember what she was talking about, but I remember thinking, "That's exactly what I want to do." **That was the first time I could truly see myself as an engineer.**

As I studied Petroleum Engineering, my understanding of the profession kept growing. **University gave me the theory**, but it wasn't until my internships at KenGen and Kenya Pipeline Company **that everything started to make sense**. At KenGen, I had the opportunity to work alongside drilling and reservoir engineering teams, and seeing how much **thought, science and collaboration goes into developing a geothermal resource** that really fascinated me. It also inspired my undergraduate research on drilling fluids and eventually led me to join the Integrated Reservoir Management (IRM) initiative as a Youth Wing member, where I'm still learning from professionals with years of experience.

Leadership has also been a huge part of my journey. **Through the Society of Petroleum Engineers, I grew from being a class ambassador to taking on bigger leadership roles**. Those experiences taught me that engineering isn't just about finding technical solutions, it's also about **working with people, learning how to communicate ideas, taking initiative and creating opportunities for others along the way**.

One of the biggest lessons I've had to learn **is how to find my voice**. Engineering is still a male-dominated field, **and as a young woman who's just starting her career, it's easy to question whether you belong**.

Women in IRM: A Conversation with Women Leaders Driving the Movement

I've definitely experienced moments of imposter syndrome. But over time, I've realised that confidence doesn't come before the opportunity, it comes from showing up, asking questions, staying curious and being willing to learn

I'm still at the beginning of my career, so I wouldn't say I've mastered reservoir management yet. What I have built is a **strong foundation and a genuine curiosity about responsible resource development, sustainability and the future of the energy industry**. That's what excites me most, because I know there's still so much to learn.

If I could say one thing to a young woman thinking about engineering, it would be this: **don't wait until you feel completely ready. Apply for the opportunity anyway. Ask the question. Volunteer for the challenge. Your career doesn't have to be perfectly mapped out, and you don't need to know everything before you start. You belong in those technical rooms just as much as anyone else. Every engineer starts somewhere, and I'm excited to see more women stepping into those spaces and shaping the future of our industry.**

On International Women in Engineering Day, we proudly recognised and celebrated all the incredible women within IRM, those in IRMTS, and across the wider industry.

Your expertise, dedication, and innovation continue to shape the future of engineering, driving progress and inspiring excellence every day.

Whether through leadership, technical brilliance, or collaborative spirit, your contributions are invaluable and deeply appreciated.

The day also served as a reminder of the importance of fostering inclusion, supporting growth, and championing the next generation of women in engineering.

As we celebrate your achievements, we reaffirm our commitment to creating an environment where women thrive, lead, and continue to break barriers. Thank you for your resilience, passion, and the lasting impact you continue to make within IRM and beyond.



Youth in Integrated Reservoir Management: From Research to Recognition: How SPE Student Contest Winners Think, Work, and Win

The SPE Integrated Reservoir Management Technical Section Youth Wing hosted an inspiring webinar, "**From Research to Recognition: How SPE Student Contest Winners Think, Work, and Win**," featuring the first-place winners of the 2025 SPE International Student Paper Contest across the undergraduate, master's, and PhD categories. The session highlighted not only groundbreaking research but also the innovation and dedication driving the next generation of petroleum professionals.



Time-dependent Effects of fracturing Fluid Retention on the Geomechanical, Petrophysical, and Microstructural properties of Tight Sandstone

Representing the undergraduate category, **Salman Alrasheed** (King Fahd University of Petroleum and Minerals) presented research on the long-term effects of retained seawater-based fracturing fluids in tight sandstone. Using NMR, acoustic testing, XRD, and SEM analyses, the study showed that retained polymer residues reduce rock strength, porosity, and potentially permeability by adsorbing onto pore surfaces. The findings highlight the need to optimize fracturing fluid design to minimize formation damage and improve long-term reservoir performance.

Effect of Potential Determining Ions Concentration and Temperature on Wettability Alteration of Dolomite

Master's category winner **Azza Al Manthari** (Sultan Qaboos University) investigated how engineered water chemistry and temperature alter wettability in dolomite reservoirs. Her research found that engineered water formulations at temperatures above 75°C significantly improved wettability, increasing oil recovery by up to 25%, with the best results achieved during secondary recovery. The study highlights engineered water injection as a cost-effective, environmentally friendly EOR solution for carbonate reservoirs.

From Classic Image Processing to State-of-the-art Deep Learning: A Neutral Benchmarking Study of Segmentation Techniques on SEM Images of Calcite Microcrystals.

PhD category winner **Isaac Jayachandran** (Texas A&M University) presented research on using computer vision and AI to automate the segmentation of SEM images of carbonate microcrystals, which can contain 25–50% of hydrocarbons in many reservoirs.

By benchmarking 35 image segmentation algorithms through an open-source workflow capable of processing millions of SEM images, the study advanced objective geological characterization and has the potential to improve reservoir rock typing, reservoir models, and development decisions.

The winning research showcased **innovative, practical solutions** to key reservoir engineering challenges, highlighting the impact of **AI, advanced EOR, and unconventional reservoir technologies**.

Youth in Integrated Reservoir Management: From Research to Recognition: How SPE Student Contest Winners Think, Work, and Win

Interactive Insights: Moderated Q&A

Q1. What motivated you to choose your research topic?

A. Issac: Originally planned field-based research, but COVID forced a shift to computational methods. Chose AI-assisted microporosity analysis to eliminate time-consuming manual image annotation and create a scalable solution for tight carbonate reservoirs.

Azza: Focused on improving oil recovery from mature dolomite carbonate reservoirs. Identified a research gap in dolomite EOR studies and investigated cost-effective, environmentally friendly recovery methods.

Salman: Inspired by the industry's transition toward unconventional resources. Explored hydraulic fracturing to understand not only productivity improvements but also its limitations and potential adverse effects.

Q2. What are your top tips for writing a strong technical paper?

A. Azza: Build the paper around a clear problem statement, practical objectives, and robust data analysis. Begin writing while the research is still underway.

Salman: Learn the structure of technical papers by reading literature, then document your work continuously rather than waiting until the end.

Isaac: Use writing as a thinking tool, not just for reporting results. Record ideas from day one and investigate unexpected or negative results—they often produce the most valuable science.

Q3. How do you communicate complex research effectively?

A. Salman: Invest time explaining the problem first—without context, the audience cannot appreciate the solution.

Isaac: Don't present to impress; present to spark curiosity. Tell a clear story, simplify technical language, and tailor the level of detail to your audience.

Azza: Keep a logical flow and let visuals carry the message, using figures and charts instead of text-heavy slides.

Q4. What is your one piece of advice for future SPE Student Paper Contest participants?

A. Salman: Presentation skills matter as much as technical quality—practice extensively and keep slides visual.

Azza: Trust yourself and communicate your research with clarity and confidence.

Isaac: Understanding the history, evolution, and context of your field gives your research greater purpose and strengthens your motivation.

Q5. What separates a good paper from an award-winning one?

A. Azza: Clear figures, concise writing, insightful analysis, and a standalone abstract that tells the complete story are essential.

Salman: Award-winning papers don't just present results—they explain the reasoning behind them, demonstrating deep technical understanding.

Isaac: Passion is the differentiator. Researchers who genuinely care about their work actively seek feedback, embrace improvement, and produce more impactful science.

Concluding Remarks

The discussion provided valuable advice on **research, scientific writing, technical presentations**, and **succeeding** in the **SPE Student Paper Contest**.

SPE WEBINARS AND LIVE EVENTS: Q2 2026

Q2 2026 featured a strong lineup of webinars centered on decision-making, digital innovation, and value optimization in reservoir management. The quarter included expert-led sessions on probabilistic forecasting and bias reduction, digital shadow workflows using reduced-order modeling and virtual sensing, and systematic approaches to unlocking hidden value in mature fields. These webinars were delivered in collaboration with the **SPE Asset Management Technical Section (AMTS)**, **SPE Offshore Completions Technical Section (OCTS)**, and the **SPE Research & Development Technical Section (RDTS)**, bringing together professionals across reservoir engineering, data science, and production optimization to share practical, real-world insights.



In the first webinar of the quarter, we hosted **Prof. Reidar B. Bratvold** – Professor Emeritus, **University of Stavanger** in collaboration with the SPE Asset Management Technical Section. He presented on the examination the reliability of probabilistic production forecasts, showing how bias and overconfidence persist despite increasingly sophisticated models.

Drawing on evidence from the Norwegian Continental Shelf, he highlighted the impact of flawed forecasts on decision-making and demonstrated practical, transparent methods to improve calibration using historical reference classes, ultimately strengthening value-based decisions under uncertainty.



In this session, **Indira Saripally** – Reservoir Management Team lead, **Occidental Oil and Gas Co.** illustrated how significant value often remains overlooked in mature fields, despite their continued contribution to production and cash flow. It presented a structured, integrated approach to identifying and unlocking hidden opportunities by combining reservoir characterization, production diagnostics, and facility constraints. The discussion emphasized practical tools such as gap-to-potential analysis and systematic workflows to screen and rank opportunities, enabling more disciplined, data-driven decision-making in asset management.



Eduardo Gildin, PhD—Associate Department Head, DPE, **Texas A&M University** and **Mateus Fernandes, PhD**—Senior Petroleum Engineer, **Petrobras**, presented how digital shadow workflows, powered by reduced-order modeling and machine-learning-based virtual sensing, can enhance real-time reservoir surveillance and decision support. They demonstrated how these approaches accelerate simulation and forecasting while preserving model fidelity and showcased practical applications for estimating missing data and integrating workflows, addressing key challenges in validation, deployment, and field implementation.

WEB EVENTS DIRECTORY

Missed Our Web Events? Catch Up Anytime!

- | | |
|--|---|
| <ul style="list-style-type: none"> • 24 June, 2026 Rapid Simulation and Virtual Sensing for Reservoir Decision Support: A Digital Shadow Perspective • 20 May, 2026 Hidden Value in Plain Sight: Revitalizing Mature Fields with Discipline • 28 April, 2026 Probabilistic Production Forecasts: Persistently Optimistic, Consistently Overconfident and Surprisingly Easy to Fix • 31 March, 2026 Ensemble History Matching and Optimization • 03 March 2026 Distributed Fiber Optics Sensing Masterclass: From Theory to Applications • 18 Feb 2026 The Bridge Between Conventional and Unconventional Stimulation Technologies • 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 | <ul style="list-style-type: none"> • 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 |
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PERSPECTIVE: EXPERT INSIGHTS

Probabilistic Production Forecasts: Persistently Optimistic, Consistently Overconfident and Surprisingly Easy to Fix

Production forecasts form the foundation of field development planning, investment decisions, reserves estimation, and production management. Despite significant advances in reservoir characterization, simulation, and digital technologies, production forecasts continue to exhibit systematic optimism and overconfidence. During an SPE Integrated Reservoir Management Technical Section (IRMTS) & SPE Asset Management Technical Section AMTS webinar, Prof. Reidar B. Bratvold presented compelling evidence from more than 25 years of production data on the Norwegian Continental Shelf (NCS), demonstrating that better technology alone has not improved forecasting performance. Instead, he introduced Reference Class Forecasting (RCF) as a practical, evidence-based approach for calibrating forecasts and improving decision quality.

Decision Quality and the Role of Forecasting

Prof. Bratvold began by emphasizing that the ultimate purpose of any corporation is value creation, and that value is generated through decisions. Consequently, decision quality directly influences corporate performance.

A key distinction was made between **decision quality** and **outcome quality**. While outcomes are influenced by uncertainty and chance, decisions should be evaluated based on the information, alternatives, and objectives available at the time they are made. Good decisions can occasionally produce poor outcomes, while poor decisions may sometimes yield favorable results by chance.

Because every decision concerns an uncertain future, forecasts become critical decision inputs.



(Speaker)

Reidar B Bratvold
Professor Emeritus
University of Stavanger



(Moderator)

Marianne Espinassous
Rumaila Area Development
Manager, bp

The challenge, however, lies not in uncertainty itself—which is unavoidable—but in the industry's **ability to quantify uncertainty accurately and without bias.**



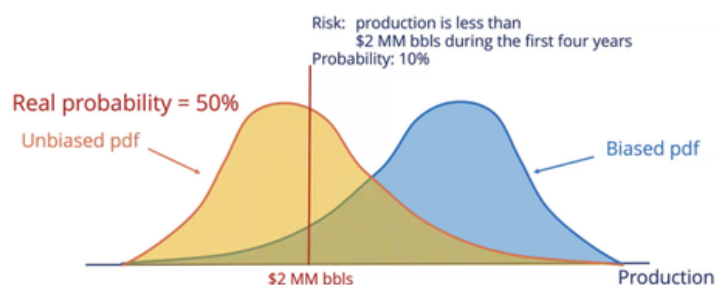
Understanding Forecast Bias: Optimism and Overconfidence

Prof. Bratvold identified two persistent cognitive biases continue to affect production forecasting:

- Optimism bias, where favorable outcomes are systematically overestimated.
- Overconfidence, where uncertainty ranges are unrealistically narrow, giving a false impression of precision.

These biases are measurable and become apparent when forecasts are compared with actual field performance.

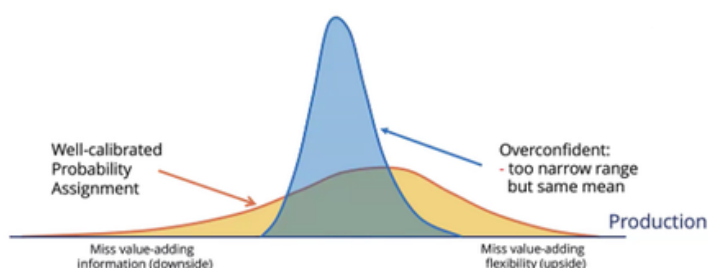
He illustrated how these biases distort risk perception. For example, a biased forecast may suggest only a 10% chance of failing to meet a production target, while an unbiased distribution—consistent with actual knowledge—may show the true probability is closer to 50%. Such distortions can cause companies to approve projects with unacceptable risk profiles or overlook better alternatives.



Optimistic forecasts can create the illusion of lower risk, making projects appear more attractive than they truly are. Overconfident forecasts, meanwhile, can prevent organizations from implementing appropriate mitigation strategies or capturing additional value.

Importantly, these biases are not merely opinions, they are measurable statistical properties that become evident when forecasts are compared with actual outcomes.

Overconfidence = Intervals that are too narrow



Production Forecasting Performance on the Norwegian Continental Shelf A Unique 25-Year Dataset

The webinar presented findings from an extensive study of 71 oil fields on the Norwegian Continental Shelf, covering approximately 25 years of production history.

Norwegian regulations require operators to submit probabilistic forecasts—including P90, mean, and P10 estimates—at the Final Investment Decision (FID) stage and update them during field life. This unique dataset enabled direct comparison between forecasts and actual production outcomes.

The analysis focused on the first ten years of production, where most project value is created and Net Present Value (NPV) is most sensitive.

Persistent Optimism in Production Forecasts

Results revealed significant optimism in production forecasts.

After two years of production, actual cumulative production averaged only about **77% of the original mean forecast**, indicating systematic overestimation. Although forecast performance improved somewhat over time, optimism remained persistent throughout field life.

The study also excluded startup delays to ensure conservative results, suggesting that real-world forecast performance may actually be worse than reported.

Are Cumulative Production Forecasts Optimistic in Later Years?



Significant Overconfidence in Uncertainty Estimates

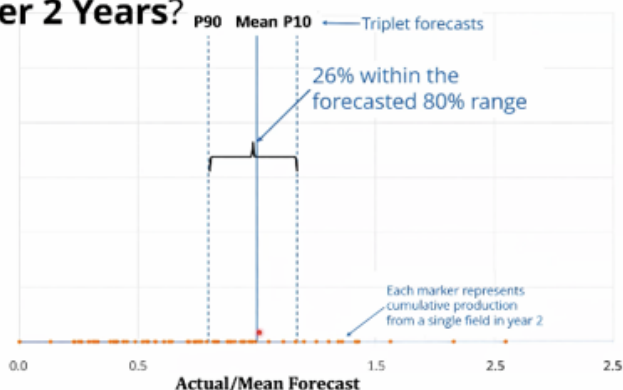
The study further examined whether probabilistic ranges were properly calibrated.

For a well-calibrated forecast, approximately **80% of actual outcomes should fall between P90 and P10 estimates**. However, the analysis showed that only **26% of outcomes** fell within this range after two years of production.

This result indicates severe overconfidence, with uncertainty ranges significantly narrower than actual field performance warranted.

Although calibration improved somewhat over time, substantial overconfidence remained throughout the production lifecycle.

Are Production Forecasts **Overconfident** After 2 Years?



Technology Advances Have Not Improved Forecast Quality

One of the webinar's most striking findings was that forecast quality has not improved despite dramatic technological advances.

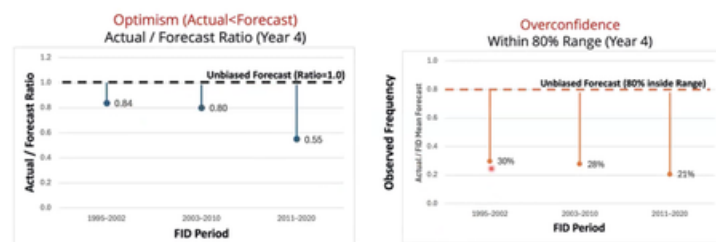
Over the past 25 years, the industry has benefited from:

- High-resolution reservoir models
- Advanced simulation workflows
- Increased computing power
- Big data analytics
- Machine learning and artificial intelligence
- Improved uncertainty workflows

Yet the study showed that both optimism and overconfidence have actually worsened in more recent years.

Fields sanctioned in later periods exhibited larger forecast shortfalls and poorer calibration compared with earlier developments.

These findings suggest that improvements in modelling technology alone do not automatically translate into better forecasts.



Why Forecast Bias Persists

Several organizational factors contribute to persistent forecasting bias:

- Limited ownership of forecast quality.
- Few systematic comparisons between forecasts and actual performance.
- Organizational incentives that encourage optimistic project evaluations.
- Continued reliance on deterministic thinking instead of probabilistic decision-making.

As a result, forecasts are often treated as tools for project approval rather than objective decision-support tools.

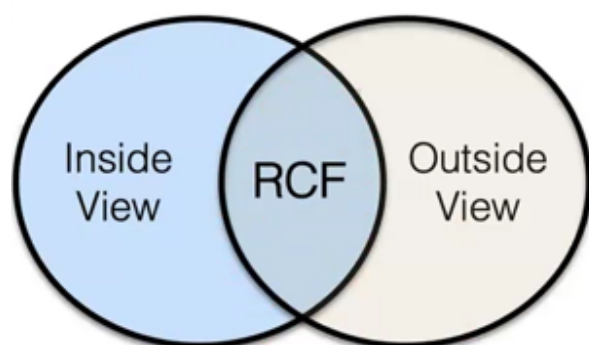
Reference Class Forecasting: Calibrating Forecasts with Historical Evidence

After demonstrating the limitations of conventional forecasting, Prof. Bratvold introduced **Reference Class Forecasting (RCF)** as a practical method for improving forecast reliability.

RCF applies the **outside view** to complement the traditional **inside view** used in reservoir engineering.

The inside view relies on geological interpretation, reservoir characterization, simulation models, and engineering judgement to predict field performance. While essential for understanding reservoir behavior, these forecasts frequently inherit optimism and overconfidence.

RCF supplements this process by comparing forecasts with outcomes from similar historical developments. Rather than replacing engineering analysis, it calibrates technical forecasts using empirical evidence from comparable projects.



How Reference Class Calibration Works

Calibration begins by comparing historical production forecasts with actual field performance to quantify systematic forecasting bias. These observations are then used to adjust future forecasts by:

- Correcting the forecast mean to reduce optimism.
- Expanding the P90–P10 uncertainty range to better represent actual uncertainty.

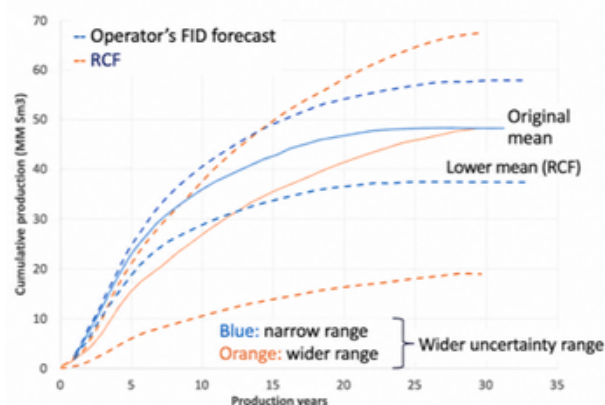
The resulting forecasts preserve the underlying reservoir engineering while providing probability distributions that are statistically consistent with observed field performance.

Using historical NCS data, Prof. Bratvold demonstrated that RCF substantially improved forecast quality by:

- Removing most systematic optimism.

- Producing uncertainty ranges that better matched observed outcomes.
- Improving Root Mean Square Error (RMSE) by nearly an order of magnitude.
- Delivering forecasts that were significantly better calibrated across an entire portfolio of projects.

Importantly, RCF does not guarantee perfect predictions for individual fields. Instead, it improves the statistical reliability of forecasts across many projects, enabling organizations to make better investment decisions under uncertainty.



Complementing Reservoir Engineering, Not Replacing It

A central message throughout the webinar was that Reference Class Forecasting is not a substitute for reservoir simulation or engineering expertise.

Detailed reservoir models remain indispensable for understanding subsurface processes, evaluating development alternatives, and optimizing production strategies. RCF simply adds an evidence-based calibration step before forecasts are used for strategic decisions.

Prof. Bratvold described this philosophy as **"outside-view calibration of inside-view forecasts,"** combining engineering knowledge with historical evidence to produce forecasts that are both technically robust and statistically reliable.

A Governance Tool for Better Decisions

Beyond improving statistics, RCF serves as an organizational governance tool.

Once a reference class has been established, calibration requires only a few minutes for each new project. More importantly, differences between the original forecast and the calibrated forecast stimulate valuable technical discussions:

- Is the selected reference class appropriate?
- Does this development genuinely differ from historical analogues?
- Which geological or operational factors justify deviations?
- Have important uncertainties been overlooked?

These discussions strengthen decision quality by challenging assumptions before major capital commitments are made.

Prof. Bratvold concluded that forecast quality should become an organizational responsibility supported by continuous feedback, calibration, and learning rather than relying solely on individual forecasters.

Interactive Insights: Audience Q&A

Q1: If Reference Class Forecasting is a post-forecast adjustment, how can we improve forecasts so that calibration is no longer needed?

A: Prof. Bratvold explained that the ultimate goal is to produce unbiased forecasts from the outset by improving model inputs and reducing bias in reservoir models. However, he believes RCF will remain an essential quality-control tool for verifying forecast calibration, even as forecasting practices improve.

Q2: How should companies build an effective reference class, and how much historical data is required?

A: While larger datasets improve confidence, companies do not need hundreds of projects to begin.

The reference class should include technically comparable developments, but even a limited dataset can stimulate valuable discussions about forecast assumptions. The emphasis should be on learning rather than waiting for a perfect database.

Q3: Is there an advantage to calibrating forecasts using full P10–P50–P90 distributions instead of only the mean forecast?

A: According to Prof. Bratvold, the difference is minimal. His research showed that mean-based and triplet-based calibration produce very similar results, while Bayesian approaches may provide additional improvements when more information becomes available.

Q4: Should different geological settings have separate reference classes?

A: Yes. Where sufficient data exist, separate reference classes for different reservoir types or geological environments can provide additional insight. More importantly, comparing different reference classes encourages technical discussions about which analogues best represent the project under evaluation.

Q5: How should teams use a calibrated forecast during project evaluation?

A: Prof. Bratvold emphasized that the calibrated forecast is not intended to replace the original engineering forecast. Instead, differences between the two should trigger sensitivity analyses and discussions about key uncertainties, helping teams identify assumptions that may require further investigation before investment decisions are made.

Q6: Why have production forecasts become less reliable despite advances in technology?

A: Increased field complexity is often cited as the reason, but Prof. Bratvold argued that complexity should lead to greater uncertainty, not poorer probabilistic forecasting. As projects become more challenging, forecast ranges should be widened and uncertainty explicitly acknowledged rather than maintaining overconfident predictions.

PERSPECTIVE: EXPERT INSIGHTS

Hidden Value in Plain Sight: Revitalizing Mature Fields with Discipline

Mature oil and gas fields are often viewed as assets in decline, characterized by falling production, aging infrastructure, and increasing operational complexity. Yet they continue to supply more than 60% of the world's oil production and remain a major source of future value when managed effectively. Rather than focusing solely on new discoveries, operators are increasingly looking to maximize recovery from existing assets through better reservoir understanding, improved technology, and disciplined field management.

During an SPE Integrated Reservoir Management Technical Section and SPE Offshore Completions Technical Section webinar, Indira Saripally presented a structured approach to identifying and unlocking remaining value in mature fields. Using examples from the Gulf of America, Oman, and West Texas, she demonstrated how systematic reservoir evaluation, opportunity screening, and continuous learning can transform declining assets into long-term production opportunities.

Why Mature Fields Still Matter

Saripally emphasized that a mature field should be defined by its **economic stage rather than its age**. While production decline, pressure depletion, and aging facilities are common characteristics, mature assets also offer significant advantages.

Decades of production history, established infrastructure, and **a well-understood reservoir reduce many of the uncertainties** associated with new developments, allowing operators to make more informed investment decisions.

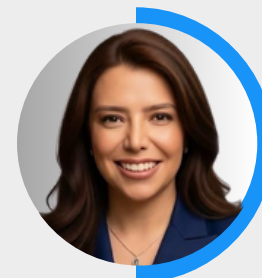
Although these assets often face increasing operational challenges, they continue to generate stable production and cash flow.



(Speaker)

Indira Saripally

Reservoir Management
Team Lead, Oxy



(Moderator)

Maryvi Santiago

Senior Reservoir
Engineer, ADNOC Group

As exploration opportunities become more complex and capital discipline grows, **extending the life of existing fields has become an increasingly important strategy** for improving recovery while maximizing the value of previous investments.

A Structured Framework for Reservoir Revitalization

The foundation of successful revitalization is understanding the difference between **current field performance and its remaining potential**. Saripally presented a practical workflow that guides engineers through identifying, evaluating, and implementing redevelopment opportunities.

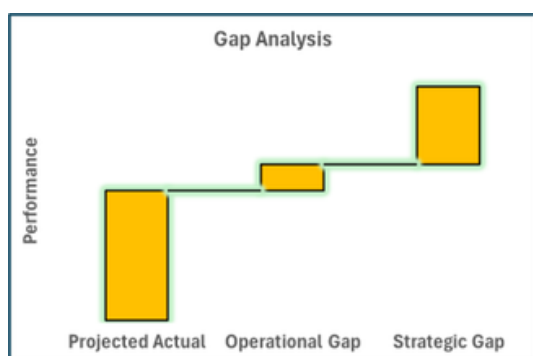
Rather than relying on isolated technical solutions, the framework promotes continuous evaluation and multidisciplinary decision-making.

Benchmark Current Performance

The process begins by assessing how the field performs relative to expectations. Historical production, recovery factors, analogue fields, and reservoir models help identify whether an asset is performing close to its potential or whether additional recovery opportunities exist.

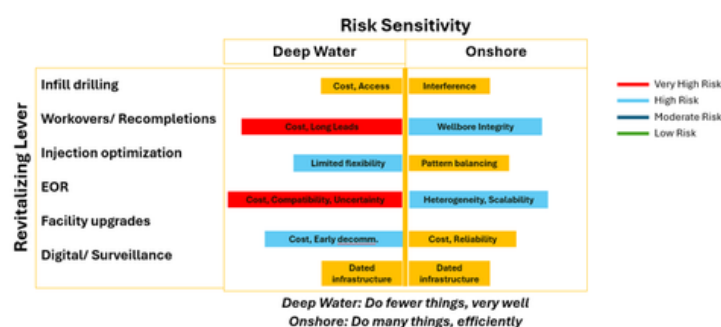
Identify the Gap to Potential

Once current performance is understood, engineers can **determine where additional value may be captured**. Performance gaps may result from operational inefficiencies, incomplete reservoir understanding, facility constraints, or suboptimal development strategies. Recognizing these gaps provides the basis for future redevelopment.



Equally important, redevelopment should be viewed as an ongoing process rather than a single project. New wells, surveillance data, and production performance continuously improve reservoir understanding, enabling development plans to evolve as new information becomes available.

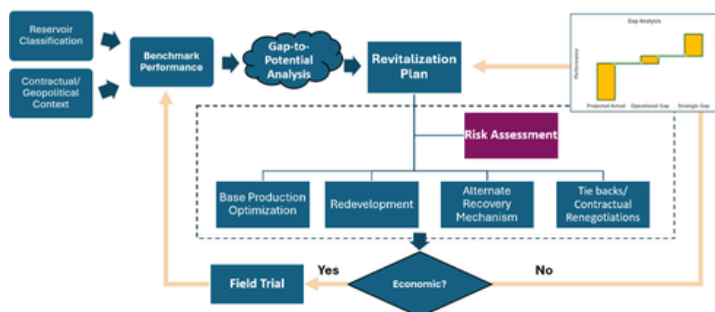
This structured approach shifts reservoir management **from reactive problem-solving to proactive opportunity identification**, allowing operators to systematically unlock value throughout the remaining life of a field.



Evaluate Redevelopment Opportunities

Potential solutions may include infill drilling, sidetracks, waterflood optimization, enhanced oil recovery, intelligent completions, or facility upgrades.

Each opportunity should be **assessed from both a technical and economic perspective** to ensure that investment is directed toward the highest-value projects.



Manage Risk and Continuously Improve

Because mature assets often involve aging infrastructure and depleted reservoirs, technical opportunities must be balanced against operational and economic risks.

Case Study 1: Gulf of America (GOA) Higher Margin Production

The first case study highlighted how a structured redevelopment strategy helped extend the productive life of a mature deepwater field in the Gulf of America. After more than **20 years of production**, the field faced declining reservoir pressure, aging infrastructure, and limited drilling opportunities. Despite these challenges, benchmarking and performance analysis indicated that significant recovery potential remained.

A key challenge involved supporting two reservoir zones with different pressure histories using **a single injector well**. The upper reservoir had benefited from years of waterflooding and required continued pressure maintenance, while the lower reservoir had produced under depletion and needed pressure restoration. With only one available drilling slot on the offshore platform, drilling separate injectors was not an option.

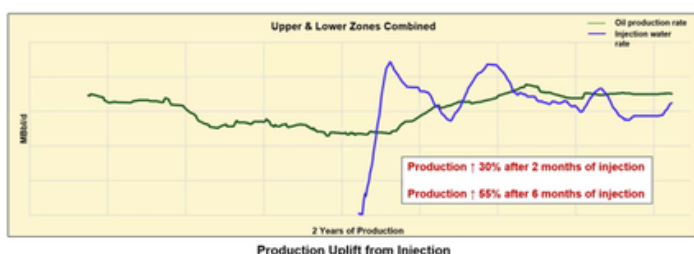


To address this constraint, the team designed an **intelligent dual-zone injector** capable of independently controlling water injection into each reservoir.

The completion incorporated **downhole flow-control devices** and permanent monitoring systems, allowing injection rates to be optimized as reservoir conditions evolved.

Beyond the technology itself, the project demonstrated the importance of **integrated planning**. Reservoir engineers, drilling specialists, completion engineers, and operations teams worked together to anticipate future operating conditions and build flexibility into the well design.

The success of the project was driven as much by **multidisciplinary collaboration** as by the intelligent completion technology.



Key lesson: In mature offshore developments, maximizing recovery depends on **integrating technology with careful planning** and long-term reservoir management rather than relying on individual technical solutions.

Case Study 2: The Oman Story Unlocking Hidden Potential

The second case study showed how re-evaluating an existing reservoir can reveal opportunities that had previously been overlooked.

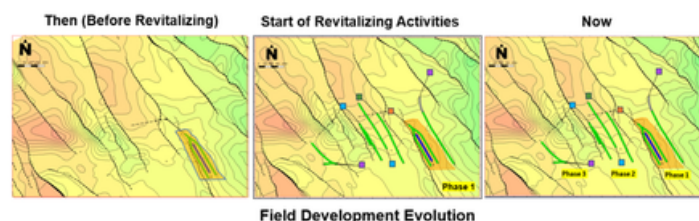
A carbonate field in North Oman had long been considered a marginal asset because of **thin reservoir intervals, low permeability, and complex faulting**. Early development was limited to a single horizontal producer, and further investment was considered uneconomic.

A new multidisciplinary team revisited the field using updated geological interpretations and a structured **gap-to-potential assessment**.

Rather than accepting historical assumptions, they challenged the existing reservoir model and identified significant uncertainty in the interpreted reservoir boundaries.

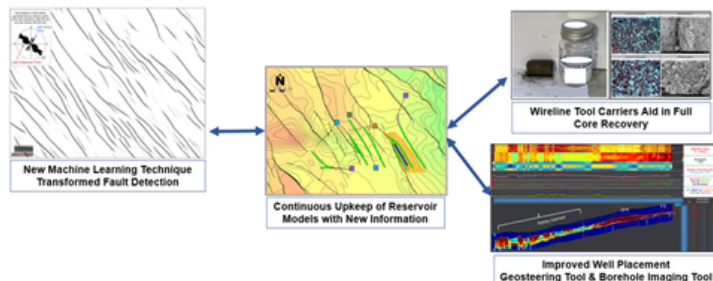
A step-out appraisal well confirmed that productive reservoir extended well beyond the previously mapped limits, fundamentally changing the understanding of the field.

This discovery transformed what had been viewed as **a marginal development into a multi-phase redevelopment program** that included additional producers, injector conversions, and waterflood expansion.



Modern technologies played an important supporting role throughout the project. **Machine learning improved fault interpretation**, advanced wireline acquisition enhanced reservoir characterization, and **geosteering enabled accurate placement** of horizontal wells within thin productive intervals.

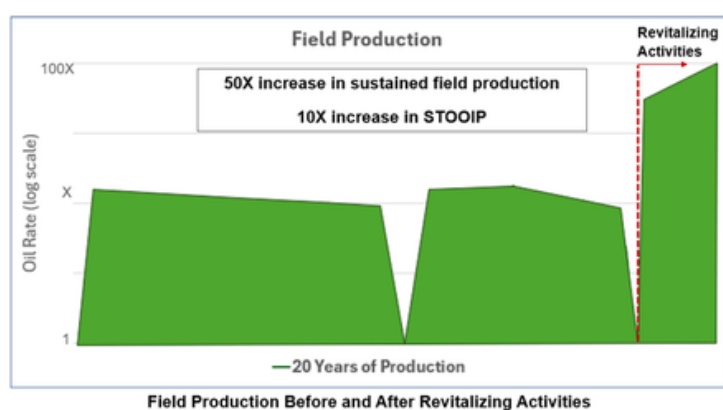
These technologies strengthened decision-making by improving the quality of subsurface information rather than replacing engineering judgment.



The redevelopment delivered remarkable results. **Production increased by more than fifty times** compared with the original development, while the estimated size of the productive reservoir expanded significantly.

Most importantly, these gains were achieved not by discovering a new reservoir, **but by improving the understanding** of one that had already been producing.

Key lesson: Revisiting mature fields with **new data, updated technologies, and fresh perspectives** can reveal substantial opportunities that were previously overlooked.



Lessons from the Two Case Studies

In both cases, **multidisciplinary collaboration, disciplined planning, and continuous reservoir learning** enabled operators to unlock value that conventional approaches had missed.

Rather than viewing mature fields as assets nearing the end of their life, these projects demonstrate that **systematic reservoir management** can continue to generate significant technical and commercial value long after initial development.

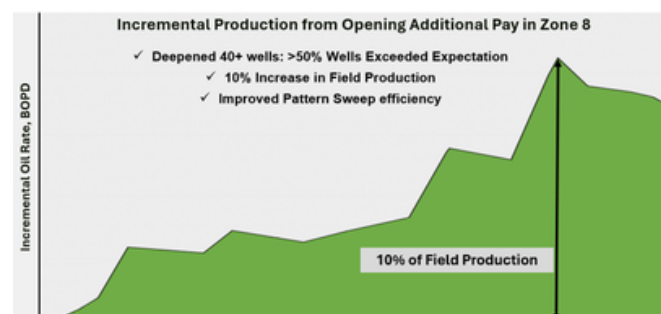
Case Study 3: CO₂ Flood in Permian Timing it Right

The final case study focused on legacy fields in West Texas, where **decades of production** have been supported through primary recovery, waterflooding, and CO₂-enhanced oil recovery (EOR).

Rather than relying on a single redevelopment initiative, operators have adopted **a philosophy of continuous optimization**, using production surveillance, reservoir simulation, and field performance data to identify incremental recovery opportunities over time.

One example involved opening an additional pay interval in Zone 8, where a review of the mature reservoir identified bypassed hydrocarbons that could be produced through an existing well.

This **low-cost intervention** delivered incremental production without new drilling, demonstrating how continuous reservoir evaluation **can unlock hidden value**.



Each **redevelopment cycle** provides new insights into reservoir connectivity, sweep efficiency, and remaining reserves, enabling engineers to refine development strategies and extend field life.

The case reinforced that **mature field management is not a one-time effort** but an ongoing process of learning, adapting, and improving.

Key lesson: Even highly developed assets can continue to deliver incremental value when redevelopment opportunities are identified through **continuous reservoir evaluation** and timely decision-making.

Key Takeaways

Across all three case studies, several common themes emerged that define successful mature field revitalization:

- Start with the reservoir. **Understanding the gap between current performance and remaining potential** is the foundation of every redevelopment decision.
- **Challenge existing assumptions.** Revisiting historical interpretations with new data and technologies can uncover opportunities that were previously overlooked.
- **Integrate technology with engineering.** Intelligent completions, machine learning, and advanced surveillance deliver the greatest value when combined with sound reservoir engineering and multidisciplinary collaboration.
- **Balance opportunity with risk.** Technical solutions must be evaluated alongside operational constraints and economic considerations.
- **Think beyond individual projects.** Reservoir revitalization is a continuous cycle of evaluation, implementation, monitoring, and improvement rather than a single redevelopment campaign.

Interactive Insights: Audience Q&A

Q1. How was surveillance managed for the dual-zone injector?

A. The surveillance program operated at three levels: daily monitoring of injection rates and downhole pressures, periodic pressure build-up

and fall-off tests to calibrate injectivity, and scheduled evaluations to determine when acid stimulation would be required to restore injectivity. This combination of real-time and periodic data acquisition ensured that both zones continued to meet pressure and rate targets as reservoir conditions evolved.

Q2. How will AI and digital technologies change mature field management?

A. AI and machine learning are increasingly being used to process large volumes of surveillance data, identify production trends, and improve reservoir monitoring. In data-rich mature fields, these tools can automate analyses that were previously performed manually and help integrate high-frequency operational data into reservoir models, enabling faster screening and optimization of redevelopment opportunities.

Q3. Why is mature field revitalization becoming more attractive?

A. As exploration opportunities become more limited and capital discipline increases, operators and governments are placing greater emphasis on maximizing recovery from existing assets. Mature fields already have established infrastructure and production history, making them important sources of future value when redevelopment opportunities are identified and executed effectively.

Q4. Which step of the revitalization workflow is the most iterative?

A. The development of the revitalization plan is typically the most iterative stage. Engineers must evaluate multiple redevelopment options, perform economic assessments, compare candidate projects, and repeatedly revisit assumptions as new data and operational insights become available.

Q5. What guided the drilling location selection in the Oman case study?

A. Reservoir simulation was the primary driver for selecting drilling locations, while seismic reprocessing and fault interpretation were used to fine-tune well placement and optimize positioning relative to reservoir compartments.

PERSPECTIVE: EXPERT INSIGHTS

Rapid Simulation and Virtual Sensing for Reservoir Decision Support: A Digital Shadow Perspective

The evolution of reservoir management has reached a critical juncture where Reduced Order Modeling (ROM) and virtual sensing now represent the industry's next frontier for real-time decision support. In a detailed technical webinar moderated by Dr. Sardar Asadov (Texas A&M University), experts Dr. Eduardo Gildin (Professor at Texas A&M) and Dr. Mateus Fernandes (Petrobras) outlined a comprehensive framework for moving from computationally intensive simulation models to a high-speed "Digital Shadow" perspective for enhanced reservoir monitoring and optimization.

Complexities and Challenges in Reservoir Management

Reservoir engineers rely on **high-fidelity simulation models** that require continuous updates as field information evolves. These models are **computationally intensive** and **time-consuming**, creating a significant challenge for timely decision-making.

According to an **SPE poll**, the majority of engineers identify **history matching** and **model tuning** as the primary bottlenecks in their workflows. The industry is now seeking **"Intelligent Reservoir Management"** that is faster, smarter, and more connected

Digital Definitions: Model, Shadow, and Twin

Dr. Gildin clarified the **hierarchy of digital replicas** based on data flow:

- 1. Digital Model:** A digital replica with only manual data flow.
- 2. Digital Shadow:** A virtual replica where data flows automatically and one-way from the physical object to the digital model



(Speaker)

Eduardo Gildin, PhD
Associate Department
Head, DPE
Texas A&M University



(Speaker)

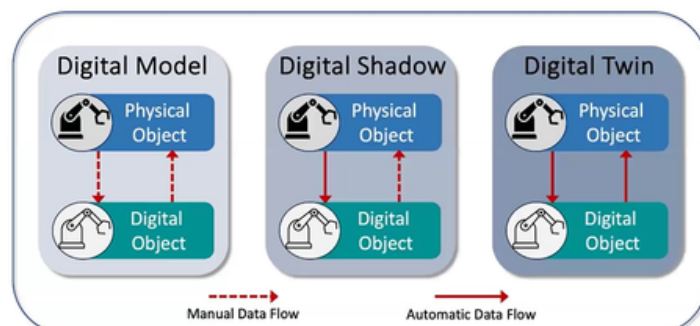
Mateus Fernandes, PhD
Senior Petroleum Engineer
Petrobras



(Moderator)

Sardar Asadov, PhD
Postdoctoral Researcher
Texas A&M University

3. Digital Twin: The industry's **"Holy Grail,"** requiring automated bidirectional interaction where the digital model can send instructions back to the physical system.



The Holy Grail and the Cost of AI

While many use the term **"Digital Twin,"** most current industry applications are actually Digital Shadows.

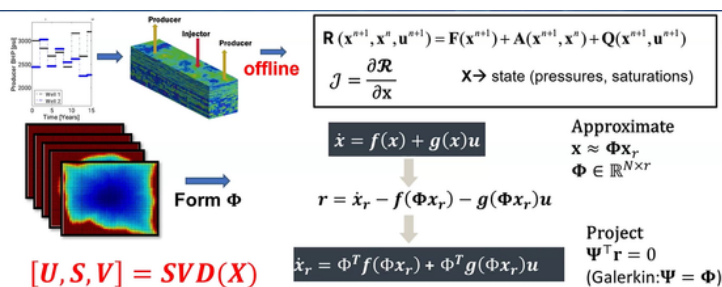
Dr. Gildin's "**Holy Grail**" for simulation involves models that are **theoretically proven, physics-based, mass-conserving, and scalable**.

He noted that while **massive AI models (Frontier Models)** are popular, the **computational cost** is **enormous**; therefore, cheaper, robust reduced-order frameworks are essential.

Projection-Based Reduced Order Modeling (ROM)

This methodology involves running a **high-fidelity simulator** and **recording snapshots of data** such as pressure and saturation.

This information is then embedded into a **smaller solution space** using a **projection matrix (Φ)**, creating a replica that preserves the physics of the fine model.



Traditional projection methods face the **Kolmogorov n-width barrier**, where **hyperbolic (transport) equations** do not show a **fast decay in modes**. To overcome this, **solutions** must be embedded into a **nonlinear manifold** to ensure robustness.

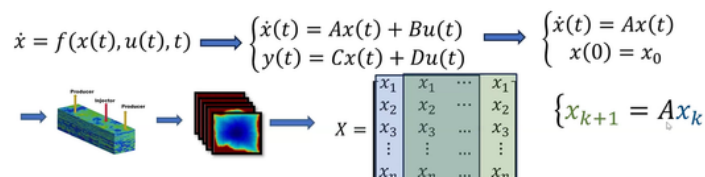
Problem Setting: Operator Learning

The goal is to identify a system of matrices (A, B, C, and D) directly from the simulated data. This allows the system to be written as a piecewise linear framework that can represent the entire reservoir equation efficiently.

The Methodological Toolkit (DMD to DeepONet)

Dr. Gildin detailed several advanced methodologies:

- **Dynamic Mode Decomposition (DMD):** A data-driven method that linearizes complex nonlinear systems by inverting a data matrix from snapshots.
- **Parameterized DMD (p-DMD):** An extension that uses interpolation to handle uncertain parameters, which is essential for history matching.
- **Koopman Operator:** The theoretical foundation that allows nonlinear dynamics to be represented in a linear, infinite-dimensional space.
- **E2CO (Embedded to Control and Observe):** A framework that transforms simulation images into dynamical systems while accounting for well production.
- **Neural Operators:** Modern approaches like FNO (Fourier Neural Operators) and DeepONet were noted as the next evolution in this field.



Sparse DMD for Carbon Capture (CCS)

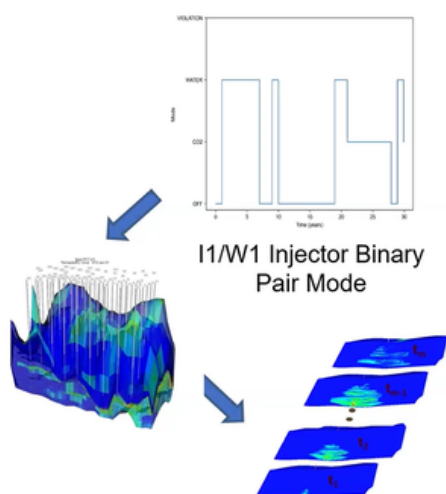
In CCS, **DMD** is used to capture **CO₂ plume** evolution. The method linearizes the transport problem, providing a **"digital shadow"** of the plume migration that is significantly faster than traditional simulators.

SACROC Unit:

Heterogeneity and CO₂ Plume Evolution

This case study focused on the **SACROC CO₂-EOR** project, which is characterized by strong heterogeneity. The objective was to test if **Dynamic Mode Decomposition (DMD)** could handle such complex, nonlinear dynamics during CO₂ plume evolution.

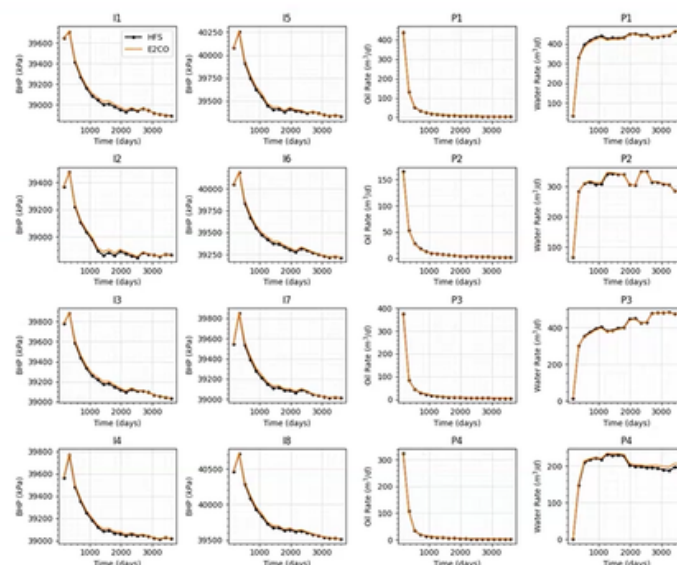
- **Methodology:** Dr. Gildin used a model with approximately 10,000 grid blocks, simulating 100 years of operation to gather data snapshots.
- **Results:** The DMD framework reduced the **10,000-grid block model** to an approximate model of only **40 modes**.
- **Performance Speedup:** In some plume evolution tests, computation time dropped from **2 hours to 2 minutes**. Specifically, for the SACROC model, a commercial simulator took 6 minutes, while the **DMD proxy achieved the result in 25 seconds**



The Egg Model: Handling Complex Geometry

The **"Famous Egg Model"** is a channelized reservoir model known for its irregular geometry and faults, which typically pose a challenge for **standard Convolutional Neural Networks (CNNs)**.

- **Methodology:** Researchers used **E2CO (Embedded to Control and Observe)** combined with **Graph-Like Encoding (GLE)** to handle these weird geometries. The model was reduced from a very large scale to a size of 100.
- **Results:** The methodology showed a very high degree of agreement between predicted and true values for both saturation fronts and pressures across several layers.



- **Performance:** Once trained, the proxy provided a speedup of almost 1,000x, allowing for the testing of 100 different well realizations in less than two seconds

What is Missing for IRM?

To move from a **"Shadow"** to a **"Twin,"** the industry requires **continuous model updates** via **virtual sensing** to provide a **bidirectional data loop**.

Sensor Virtualization in Offshore Assets

Dr. Mateus Fernandes discussed how offshore systems, like those in the **Brazilian Pre-salt**, involve complex subsea structures thousands of meters deep. **Physical sensors (PDGs)** are prone to failure due to harsh conditions, and replacement is prohibitively expensive.

Sensor virtualization, or **virtual sensing**, is a software-based approach that uses validated algorithms to estimate **physical** or **non-physical variables** from a continuous stream of input data.

Core Components of a Virtual Sensor

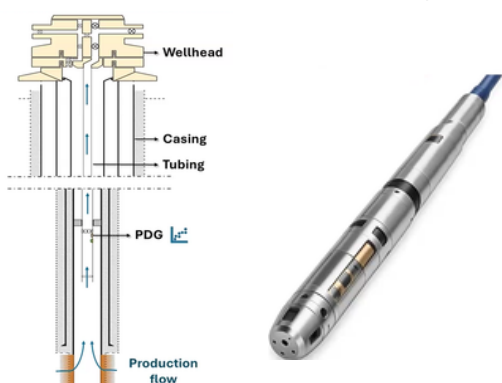
To function effectively in real-time, a virtual sensor requires several integrated components:

- **Validated Algorithm:** This "engine" can range from simple physical equations to sophisticated machine learning models, purely data-driven approaches, or hybrid physics-guided methods.
- **Continuous Input Data Stream:** The system must be fed reliable data from other physical sensors, virtual sensors, or a combination of both.
- **Low-Latency Infrastructure:** Essential for providing real-time feedback and tracking field operations without significant delays.
- **Automated Calibration Framework:** Necessary to maintain accuracy over time as reservoirs undergo depletion or fluid breakthroughs (addressing "concept drift").
- **Data Conditioning (Preprocessing):** Often the most laborious stage, this involves removing signal noise, gaps, and "frozen" signals to ensure data quality.
- **Feature Engineering:** This utilizes engineering knowledge of the physical process to select the most impactful inputs, such as wellhead pressure or choke aperture.

Role in Production Monitoring

Virtual sensors are a critical part of the "**Digital Shadow**" framework, helping to close the gap between field data and reservoir decision support. Their primary roles in **production monitoring** include:

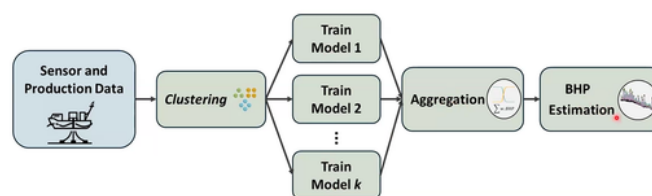
- **Estimating inaccessible variables (e.g., BHP)**
- **Individualizing Production Rates**
- **Flow regime tracking**
- **Health and anomaly detection**
- **Specialized Injection Monitoring**



The Virtual Sensing Workflow

Dr. Fernandes outlined a rigorous implementation framework:

- **Data Acquisition:** Gathering data from supervisory systems and databases.
- **Data Conditioning (Pre-processing):** The most laborious part, involving the removal of noise, signal gaps, and "frozen" signals.
- **Feature Engineering:** Using engineering knowledge to select inputs like wellhead pressure and choke aperture.
- **Base Models:** Training a variety of models, from linear regression to tree-boosting and LSTMs

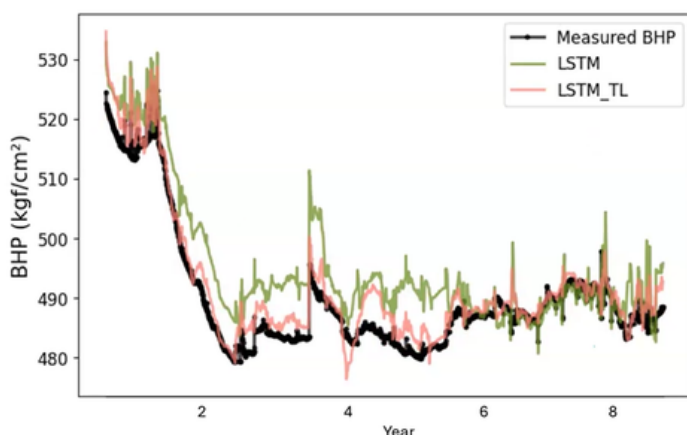
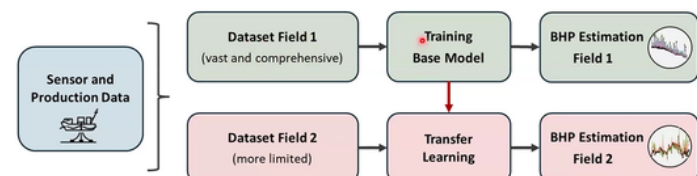


The Virtual Sensing Workflow

Dr. Fernandes detailed a pilot project at Petrobras aimed at replacing failed **Permanent Downhole Gauges (PDGs)** in the **Brazilian pre-salt with virtual sensors**.

- **Methodology:** Because large fields have highly varied production conditions, they utilized **K-means clustering** to partition the data. Specialized models were **trained for each cluster** and then **aggregated using fuzzy memberships**.
- **Test Case 1 (8 Years of History):** In a well with a long production history, several models (Neural Network, Linear Regression, and XGBoost) successfully tracked BHP throughout the entire 8-year period.
- **Test Case 2 (Intelligent Completion):** In a well that changed production zones multiple times, the linear regression model within the clustering framework actually outperformed more sophisticated deep learning models

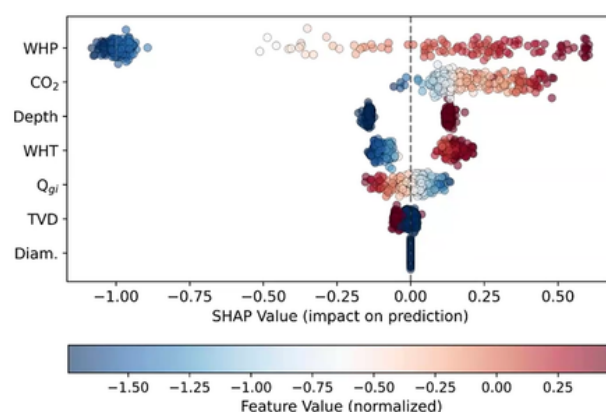
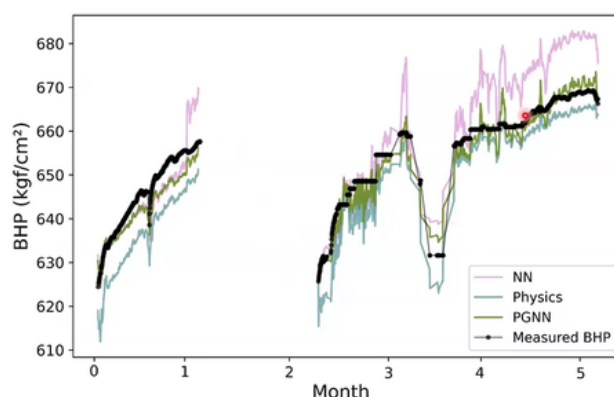
- **Transfer Learning:** In scenarios with new fields and limited data, they used a "base model" from a data-rich field and performed fine-tuning, which significantly improved performance over models trained from scratch.



Gas Injection Wells: Physics-Guided Neural Networks (PGNN)

To estimate BHP in gas injection wells with **variable CO₂ content**, a hybrid approach was required to handle **near-critical or supercritical flow conditions**.

- **Methodology:** Researchers used a **PGNN** that incorporates an integral form of the **pressure gradient equation (accounting for gravity, friction, and acceleration)** as a physical loss during training. They used a finite segment method to iteratively calculate **pressure changes from the wellhead to the bottomhole**.
- **Results:** The case study used data from two **WAG injectors over 8 years**. The PGNN outperformed both purely data-driven and purely physics-based models.
- **Interpretability:** **SHAP analysis** confirmed that **wellhead pressure** and **CO₂ content** were the most influential variables, which aligned with established physical knowledge and helped build confidence in the model.



Reduced-order models enable faster forecasting and optimization while preserving key reservoir dynamics.



Virtual sensors provide critical information when gauges fail or installation is impractical.



The webinar concludes with the following key takeaways for the future of reservoir management:

- **Integrating Reduced Order Modeling** for rapid simulation with virtual sensing for real-time monitoring effectively closes the gap between field data and decision support.
- Establishing these **Digital Shadows** provides the technical foundation required to eventually achieve the bidirectional interaction of a true **Digital Twin**.
- Success requires balancing a **3% to 5% error trade-off** for massive speed gains while prioritizing engineering fundamentals as the core of digital evolution.

Interactive Insights: Audience Q&A

Q 1. Are all commercial simulators currently capable of performing Dynamic Mode Decomposition (DMD)?

A. (Dr. Gildin): Yes. It is important to note that the simulator itself does not "do" DMD; rather, DMD is a process performed on the data generated by the simulator. As long as your commercial software can export information such as pressure, saturations, and concentrations, you are "good to go" to perform DMD on that data.

Q 2. How can these reduced-order models be used in well placement optimization to find the optimum well configuration?

A. (Dr. Gildin): Reduced-order modeling is essentially a training process based on snapshots. While one could theoretically perform extensive training with "pseudo-wells" in every possible location, this would be computationally prohibitive. Instead, engineers can use parametric DMD to handle well locations or transfer learning. With transfer learning, you can update only specific parts of a model already trained on a set of wells to accommodate a new configuration, which is the most cost-effective approach.

Q 3. How do you balance the trade-off between simulation speed and accuracy when deploying this digital shadow for real-time support?

A. (Dr. Gildin): There is "no free lunch," and a trade-off is always present. However, the level of accuracy required depends on the objective. For decision support or production optimization, a model does not necessarily need to be error-free. An engineering approach typically finds a 3% to 5% error to be an acceptable trade-off for the massive gains in simulation speed.

Q 4. How do you balance the trade-off between simulation speed and accuracy when deploying this digital shadow for real-time support?

A. (Dr. Fernandes): Both interpolation and high-fidelity simulation are viable, but the best practice is to try the simplest method first, such as basic interpolation or simple models. If those results are unreliable, engineers should then move to more integrated flow simulators specifically designed for wells and pipelines.

Q 5. What is the confidence interval for these predictions, and how far into the future can we predict with high confidence?

A. (Dr. Gildin): While the "holy grail" is a model valid for all ranges, techniques like DMD linearize complex nonlinear systems, which is highly effective for the short horizons typical of production optimization. **(Dr. Fernandes):** Models are not meant to be used forever without oversight; they must be reviewed and retrained as the reservoir evolves. For virtual sensing projects at Petrobras, models are typically reviewed once or twice a year to incorporate new data and updated conditioning techniques.

Q 6. How well are these models able to predict flow assurance issues, such as wax deposition or scale?

A. (Dr. Fernandes): Virtual sensors can be used in the same way as physical ones. For example, a virtual PDG can be used in combination with wellhead sensors to calculate delta pressures. From these calculations, engineers can infer performance degradation and anticipate issues like wax or scale in their daily routines.

Q 7. How can the continuous variation in oil prices be integrated into these optimization models?

A. (Dr. Gildin): Because reduced-order models are computationally cheap and extremely fast, they are uniquely suited for short-term (daily or yearly) optimization. Traditional, slow simulators cannot easily respond to daily price changes, but these rapid proxies can process those parameters to provide helpful tools for immediate decision-making.

THE RESERVOIR CHRONICLES: TRIVIA & TIDBIT

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In **1929**, when oil wells were drilled almost exclusively vertically, **H. John Eastman** introduced a bold new concept. At the time, few could have imagined how profoundly it would change the future of drilling.

Its defining moment came in **1933**, when a catastrophic blowout in Conroe, Texas, burned for months. Called upon to drill a relief well, Eastman successfully intercepted the damaged well using his pioneering technique of **controlled directional drilling**, proving its value under one of the industry's most demanding conditions.

That success marked a turning point, leading to the widespread adoption of directional drilling and laying the foundation for today's advanced directional and horizontal drilling technologies.

Source: History of Petroleum Technology – SPE

SPECULATE: QUIZ ZONE

Born in 1907, I revolutionized reservoir evaluation by linking rock properties with electrical measurements.

My legacy:

Established the relationship between porosity, resistivity, and hydrocarbon saturation

Authored a landmark study that laid the foundation for modern log interpretation

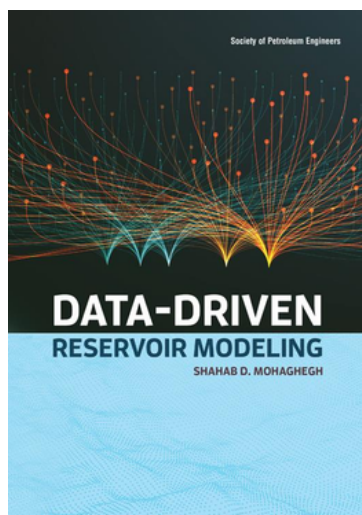
Helped define the field of petrophysics

I didn't just analyze reservoirs—I created the framework that still guides formation evaluation across the energy industry today.

Who Am I?



PETROPAGES: BIBLIOPHILE BULLETIN



Data-Driven Reservoir Modeling

By **Shahab D. Mohaghegh**

Society of Petroleum Engineers

DOI: <https://doi.org/10.2118/9781613993040>

ISBN electronic: 978-1-61399-889-2

Publication date: 2017

Data-Driven Reservoir Modeling introduces new technology and protocols (intelligent systems) that teach the reader how to apply data analytics to solve real-world, reservoir engineering problems. The book describes how to utilize machine-learning-based algorithmic protocols to reduce large quantities of difficult-to-understand data down to actionable, tractable quantities. Through data manipulation via artificial intelligence, the user learns how to exploit imprecision and uncertainty to achieve tractable, robust, low-cost, effective, actionable solutions to challenges facing upstream technologists in the petroleum industry

Spotlight Publication

Autonomous Optimization at Scale

This article contains highlights of the paper “**Autonomous Optimization at Scale: Leveraging AI for Closed-Loop, Real-Time Production Optimization,**” authored by D. Burmaster, Y. Yang, and V. Gupta, ExxonMobil Upstream Integrated Solutions Company, Spring, TX, USA; S. G.Vela and E. Karantinos, XTO Energy Inc., a subsidiary of ExxonMobil, Spring, TX, USA; M. R. Nallapusala and S.Chempath, ExxonMobil Upstream Integrated Solutions Company, Spring, TX, USA. The paper has not been peer-reviewed. It was prepared for presentation at **ADIPEC 2025** and is published as **SPE-229298-MS** by the **Society of Petroleum Engineers**.

Background & Technical Challenges

Gas lift is a widely used artificial lift method, but its effectiveness depends on the **availability of compressed injection gas**. Compression constraints caused by **equipment limitations, aging infrastructure, increasing demand, and unexpected outages** often restrict production.

Most traditional optimization systems focus on **individual wells** and **assume sufficient gas availability**. During **compressor constraints**, however, operators must determine how to distribute **limited gas across hundreds of wells** to **maximize total oil production**. Manual optimization is often too **slow to respond to rapidly changing conditions**. The challenge is compounded by **incomplete well data, unreliable sensors, and the nonlinear relationship between gas injection and oil production**. To overcome these limitations, **ExxonMobil** developed an **autonomous, real-time optimization** system that continuously allocates gas across **more than 600 wells** based on changing **compressor capacity** and **production potential**.

Solutions

The proposed solution is a **closed-loop optimization** platform that combines **artificial intelligence, machine learning, physics-informed modelling, and automated controls**. The system continuously determines **gas availability, evaluates well performance, and automatically adjusts gas allocation** to **maximize field-wide production**.

The foundation of the optimizer is the **Gas Lift Performance Curve (GLPC)**, which describes the relationship between **gas injection rate** and **oil production** for each well. For wells with sufficient instrumentation, **GLPCs** are generated from **automated multi-rate testing**. For wells **lacking reliable measurements**, machine learning models estimate **equivalent performance curves** using available operational and reservoir data.

Three key parameters are used to construct these curves:

- Optimum gas injection rate
- Expected production at optimum injection
- Minimum stable injection rate (MSR)

These inputs allow the system to generate quadratic approximations of well performance even when critical measurements are unavailable.

Spotlight Publication | Autonomous Optimization at Scale

A second innovation is the **estimation of gas availability**. Instead of **relying on compressor flow meters, detailed gas balancing, or compressor simulations**, the system uses **compressor discharge pressure** as a **real-time indicator of available compression capacity**. Low pressure indicates that **demand exceeds available capacity**, while **pressure near the target** setpoint indicates **additional gas can be allocated**. This approach greatly **reduces data dependencies** and **improves scalability**. Finally, **gas is allocated** according to **marginal production benefit**. Rather than **prioritizing wells based on total production or gas efficiency alone**, the optimizer identifies where **each additional unit of gas will generate the greatest incremental oil production and allocates gas accordingly**.

Implementation Details

The optimization framework treats **each compressor network and its connected wells** as an **independent optimization system, enabling large-scale deployment across multiple facilities**. Machine learning plays a critical role in generating performance curves. A Random Forest model estimates the optimal injection rate using physics-based engineered features such as gas-liquid ratio and well characteristics.

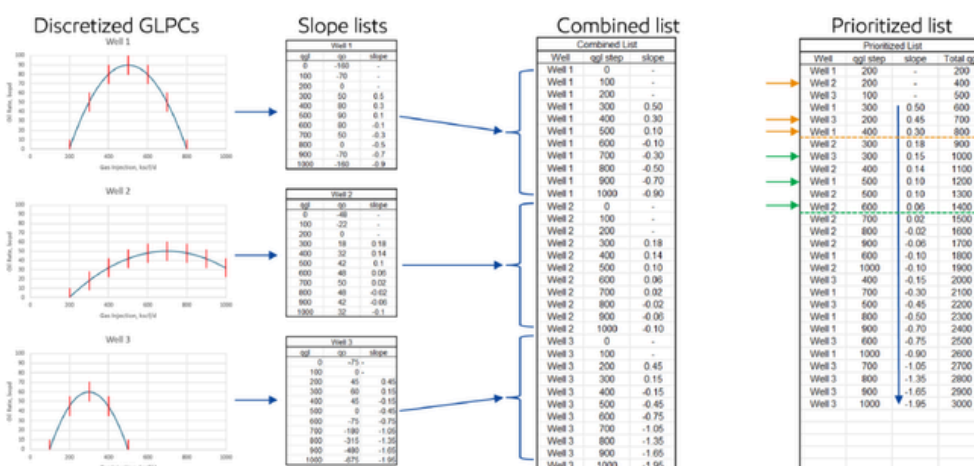


Figure 1: A prioritized list describing how to allocate gas to all wells for any amount of gas available for injection is constructed by discretizing the GLPCs for each well into a set of discrete sections, combining those sets, and ordering the sections by the additional marginal production associated with them.

A **LightGBM model** predicts production at that rate using **historical well tests, reservoir information, and operational parameters**. Combined with **minimum stable injection rates** derived from **engineering analysis** and **operator experience**, these predictions are used to create complete gas lift performance curves. To estimate system constraints, the optimizer continuously **monitors compressor manifold discharge pressure**. Using pressure feedback and current injection setpoints, it calculates the **amount of gas** that can realistically be allocated during the next optimization cycle. Major operational changes, such as compressor shutdowns or restarts, are automatically recognized during subsequent optimization runs. For gas allocation, each GLPC is divided into **small discrete increments**. The incremental production gain associated with each gas increment is calculated, and all increments from all wells are combined into a single prioritized list. **Available gas** is then **allocated starting with the increments** that provide the **highest marginal oil benefit** until the gas constraint is reached. The optimizer also incorporates practical field constraints. Wells must always receive at least their **minimum stable rate** to avoid liquid loading and production interruptions.

Spotlight Publication | Autonomous Optimization at Scale

Injection setpoints are rounded to **25 kscf/d** increments to **simplify field operations and reduce unnecessary control** changes caused by measurement noise. The software continuously monitors operating conditions and can issue new control actions **approximately every 15 minutes**, creating a fully autonomous closed-loop optimization process.

Results and Operational Impact

Deployment across dozens of **compressor systems** demonstrated substantial production and operational benefits. To quantify performance, the authors introduced a metric called **Optimization Achievement**, defined as the **ratio of actual expected production** to the **maximum achievable production** under the same gas availability conditions. These metric isolates optimization performance from **fluctuations in compressor capacity** and **gas availability**. Using a **comparison period of 60 days before** and **60 days after deployment**, ExxonMobil calculated a **production-weighted average uplift of 3.6% across optimized gas-lift wells**. Importantly, this improvement was achieved on top of an existing single-well optimizer that had already generated **approximately 2% uplift compared** with traditional manual optimization. The system also **improved operational stability**. By **continuously matching gas demand** to **available compressor capacity**, it stabilized compressor discharge pressure and reduced the likelihood of cascading compressor failures. More stable gas supply conditions also improved reliability for other artificial lift systems connected to the same infrastructure, such as gas-assisted plunger lift wells.

Another significant benefit was **improved utilization of compression assets**. Because **capacity** was determined **dynamically** from real operating conditions rather than fixed engineering estimates, the software frequently **identified previously unused compressor capacity**. In several cases, **gas injection rates were increased without causing pressure declines**, demonstrating that facilities could support greater throughput than operators had assumed.

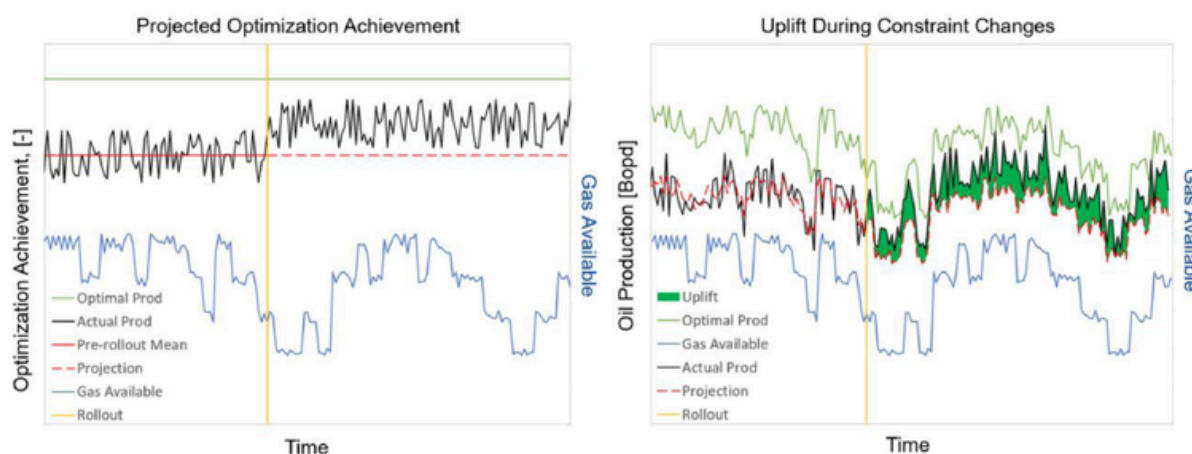


Figure 2: The average pre-rollout Optimization Achievement is used to project expected production, enabling uplift to be calculated as the difference between actual production and the projected value.

Spotlight Publication

Autonomous Optimization at Scale

This resulted in additional production gains without requiring investments in new compression equipment. The project also demonstrated excellent scalability. Following the groundwork established by ExxonMobil's earlier single-well optimization program, deployment across hundreds of wells and dozens of systems was completed in approximately two months. Most implementation effort was devoted to operator engagement and training rather than technical configuration, highlighting the practicality of large-scale adoption.

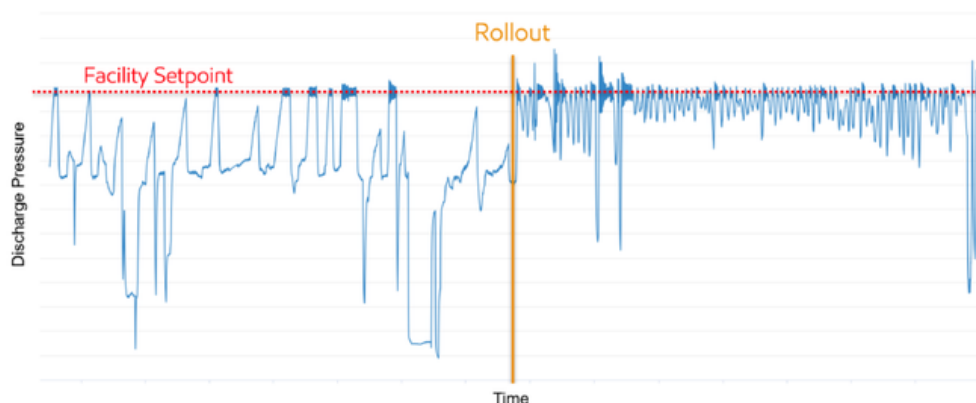


Figure 3: Discharge Pressure Stabilization

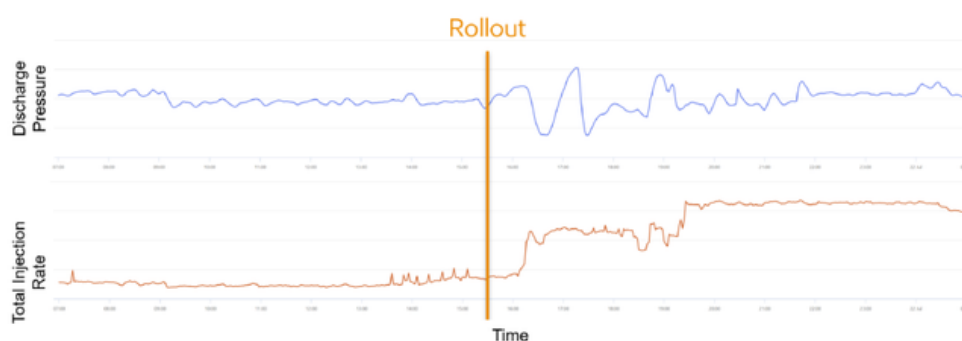


Figure 4: Throughput Increase without Associated Discharge Pressure Drop

Forward Outlook

Although the current optimizer focuses primarily on **gas injection rates**, **production performance** is also influenced by **choke settings** and **flowline backpressure**. To address these limitations, ExxonMobil is developing a **next-generation optimization platform** based on **multidimensional production response** surfaces rather than simple gas lift performance curves. The future system will integrate **reservoir inflow**, **wellbore hydraulics**, and **choke pressure-drop models** into a unified framework. This will enable **simultaneous optimization of gas injection rates, choke positions, and flowline constraints** while accounting for **multiple transient operating conditions**. By expanding optimization beyond gas allocation alone, the next-generation platform is expected to deliver additional production gains, improve operational flexibility, and further enhance asset utilization. The study demonstrates that **autonomous AI-driven optimization** can successfully **manage complex field-wide constraints**, **improve compressor utilization**, **increase production**, and **provide a scalable framework** for real-time production optimization across large oil and gas operations.

SPE IRMTS IN PICTURES

During the second quarter, the IRMTS members actively participated in various events as highlighted by the images, reinforcing the section's commitment to technical excellence, knowledge exchange, and global collaboration. Q2 2026 reflected the **continued global impact and engagement of the SPE Integrated Reservoir Management Technical Section (IRMTS)**, with a strong emphasis on **knowledge sharing, youth development, and professional recognition**.

The IRMTS Youth Wing played a pivotal role in inspiring the next generation, as **Maryvi Martinez Santiago** and **Hayat Jibar Alhashmi** delivered insightful sessions to university students on the importance of soft skills and the growing role of AI in oil and gas operations.



The quarter also highlighted IRMTS representation at key industry platforms, with **Maryvi** and **Khalid Javid** contributing to the ADIPEC Technical Committee selection process, reinforcing the section's involvement in shaping high-quality technical discourse in the industry.

Parag Bhoraniya was selected as one of seven delegates to represent SPE at the **2026 Emerging Leaders Alliance (ELA) Conference**. The ELA Conference is a three-day intensive leadership development program that fosters leadership across the engineering and scientific community through collaboration among seven leading engineering societies, including SPE.

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From the Editors' Desk

As the **SPE Integrated Reservoir Management Technical Section** continues to expand its multidisciplinary focus, its initiatives increasingly reflect the evolving needs of the energy industry—where technical integration extends beyond reservoir workflows to encompass leadership, innovation, and knowledge sharing. Building on this vision, IRMTS has continued to strengthen its programs across **decision and risk analysis, opportunity management, and digital and AI applications**, reinforcing the role of Integrated Reservoir Management as a framework for **informed, collaborative, and value-driven decision-making**.

This edition places a special focus on recognizing **International Women in Engineering Day (INWED) 2026** through conversations with four accomplished women leaders representing diverse organizations, regions, and stages of their careers. Their experiences highlight the importance of **resilience, mentorship, and continuous learning** while offering valuable perspectives to inspire the **next generation of women engineers**.

Alongside this, the **IRMTS Youth Wing** hosted a student-led webinar featuring the **winners of the 2025 SPE International Student Paper Contest**, who shared both their research and practical insights into developing **award-winning technical papers**, demonstrating the **value of peer learning and early-career engagement**.

With this momentum, IRMTS will continue to deliver impactful experiences that prepare its members to contribute, collaborate, and lead with confidence. 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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Events

August 25-27, 2026

SPE Artificial Lift Conference and Exhibition - Americas (26ALCE)

The Woodlands, Texas, USA

September 22-24, 2026

SPE Permian Basin Energy Conference (26PBEC)

Midland, TX, USA

September 29-30, 2026

SPE/ICoTA Asia Pacific Well Intervention and P&A Conference and Exhibition (26APWI)

Kuala Lumpur, MYS

September 29-31, 2026

GOTECH (26GOTS)

Dubai, ARE

October 13-15, 2026

SPE APOGCE 2026 (26APOG)

Brisbane, Queensland, AUS

Workshops

Sep 08-09, 2026

SPE Workshop: Beyond Boundaries – Advancing Cost-Effective and Sustainable Solutions in Flow Assurance (26WM16)

Kuala Lumpur, MYS

Sep 15-17, 2026

SPE Workshop: Integrated Water Management – Pathways for Sustainable and Environmentally Responsible Oilfield Operations (26AR11)

Rio de Janeiro, BRA

Sep 17-18, 2026

SPE Workshop: Development and Utilisation of Underground Space (26WA11))

Harbin, CHN

Workshops

July 21-22, 2026

SPE Workshop: Technology and Innovative Thinking for Unlocking Stranded Gas Resources (26WM15)

Kuala Lumpur, MYS

July 21-22, 2026

SEG/SPE Workshop: Fibre for the Future: AI-Driven Intelligence for Exploration, Production & Development (26WM17)

Kuala Lumpur, MYS

Call for Papers

March 23-24, 2027

SPE/ICoTA Well Intervention Conference and Exhibition

The Woodlands, Texas, USA

Deadline: Sep 01, 2026

May 03-05, 2027

Offshore Technology Conference (OTC) 2027

Houston, TX, USA

Deadline: Sep 08, 2026