Integrated Reservoir Management Technical Section

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SPE Integrated Reservoir Management Technical Section (IRMTS)

Newsletter

APRIL 2025
ISSUE 01

SPE IRMTS Newsletter

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Integrated Reservoir Management Technical Section

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Connecting Minds, Advancing Energy Solutions

Welcome to the first edition of the SPE Integrated Reservoir Management Technical Section (IRMTS) newsletter! We're thrilled to launch this platform and have you as part of our growing community.

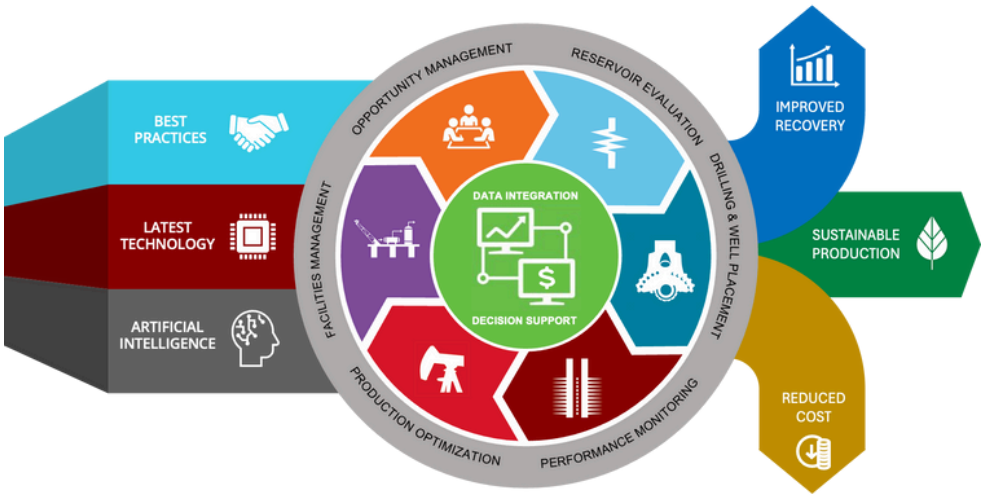
This newsletter is designed to connect technical experts, industry professionals, and academia, to foster collaboration and knowledge-sharing. Together, we will explore the latest advancements in reservoir management, discover highlight innovative practices, and work towards sustainable solutions for the energy industry.

As we embark on this journey, we invite you to actively participate. Share your insights, succes stories, and ideas to make this newsletter a valuable resource for all. Let us use this space to learn, grow, and drive meaningful change in reservoir management.

Thank you for being part of SPE IRMTS. Together, we are shaping the future of energy!

Warm regards,
Muhammad Navaid Khan
Chair, SPE IRMTS

The Objective of the Section



Unifying Expertise to Tackle Global Energy Challenges

The SPE Integrated Reservoir Management Technical Section (IRMTS) unites professionals and academia to drive innovation in reservoir performance. Focused around seven key workstreams, we leverage Best Practices, New Technologies, and Artificial Intelligence to improve recovery factors, sustain production, and reduce costs. We are committed to lead the way in knowledge upliftment operational excellence and sustainability, bringing together SPE sections and industry stakeholders to address global energy demands.

Meet The SPE IRMTS Leadership

A section is only as strong as its members and similar to the diversity of its membership - the section has a board consisting of diverse and dedicated individuals that have years of technical expertise. This coupled with their passion for the industry creates the perfect team. The section merge together team members from different parts of the world with diverse background. This ensures a right mix of global talent and energy expertise that serves the best to the industry.

MUHAMMAD NAVAID KHAN
Technical Section Chair

SULE GURSES
Program Chair

KHALID JAVID
Communications Chair

SIDDHARTH JAIN
Membership Chair

IFTIKHAR KHATTAK
Administration Chair

MARYVI MARTINEZ
Treasurer & Sponsorship Champion

TEODOR DAMIAN
Reservoir Evaluation Lead

SHERIF ABDELRAHMAN
Performance Monitoring Lead

MONALISA CHATTERJEE
Performance Monitoring Lead

KARIM SHAIKH
Production Optimization Lead

MARIANNE ESPINASSOUS
Decision & Risk Analysis Lead

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CYRIL BRIAN AVEVOR
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Latin America & Caribbean Regional Champion

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Middle East & North Africa Regional Champion

MARIELA ARAUJO
North America Regional Champion

ZHAMBYL SARBAS
Russian & Caspian Regional Champion

SHUBHAM PATEL
Communications Officer

VERA DOGO
Communications Officer

SYDNEY NASSANGA
Administration Officer

> ***We are committed to uniting a community of technical professionals and academia, driven to enhance reservoir performance by harnessing today's technological innovations and creating a collaborative space for strategic discussions and sustainable practices.***
>
> ***In line with SPE's mission, we aim to facilitate the exchange of technical knowledge and best practices, supporting the industry's drive toward operational excellence with a reduced carbon footprint.***

A PEEK INTO OUR PAST WEBINARS

> ***Practical applications of digital twins. Exploring the question: "How can we monetize these technologies for optimized reservoir management and production gains?"***

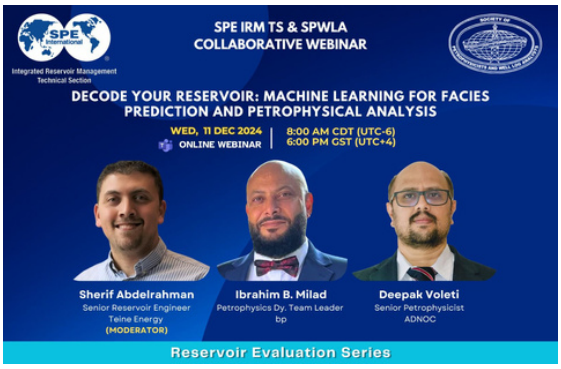
WATCH VIDEO

Zhambyl Sarbas
Carlos Mata
Sebastien N. Duchenne

> ***An overview of well optimization using tracers, including permanently installed tracer systems, inflow profiling, and innovative applications such as continuous production quantification.***

WATCH VIDEO

Cyril Brian Avevor
Kåre Langaas
Monalisa Chatterjee
Olaf Huseby



> ***Machine learning application to improve geological interpretation and petrophysical analysis.***

WATCH VIDEO

Sherif Abdelrahman
Ibrahim B. Milad
Deepak Voleti

> ***Emphasizes the power of cross-disciplinary collaboration in integrated reservoir management.***

WATCH VIDEO

Marianne Espinasaous
Karim Shaikh
Teodor Damian
Amr Ramadan
Sule Gurses

BECOME A WEBINAR SPEAKER!

Are you passionate about sharing your knowledge? We're looking for speakers for future webinars! If you have a topic that excites you, reach out to us. Together, we can create engaging and informative sessions.
Let's shape the future of our webinars together! Thank you for being an essential part of our community!
Reach out to us at: **technicalsections@spe.org**

PERSPECTIVE: EXPERT INSIGHTS

This section marks the beginning of a Q&A series with experts and SMEs, dedicated to Integrated Reservoir Management. The series will delve into the cutting-edge strategies and approaches redefining reservoir optimization, emphasizing innovation, sustainability, and efficiency. Through these insightful conversations, we aim to shed light on groundbreaking techniques, industry challenges, and their solutions. Our goal is to spark meaningful dialogue and inspire advancements in reservoir management, driving impactful progress in the ever-evolving energy sector.

Dr. MED KAMAL
2023 SPE President
Chevron Fellow Emeritus

Dr. RODOLFO CAMACHO
SPE Technical Director - Reservoir
Prof. UNAM, Mexico

IRMTS: *Integrated Reservoir Management (IRM) is often described as a dynamic and continuously evolving process. In your long career, what significant changes have you observed in IRM over the years? And what are the key factors that are shaping its future trajectory?*

Dr. Camacho: During the 70s and 80s, emphasis was put on the synergism between engineering and earth science. In the 90s, mainframe supercomputers, more powerful personal computers, and workstations provided ever-increasing computing power and more efficient database management systems that facilitated better reservoir management, enhancing recovery.

Reservoir management received significant attention, recognizing that it is a dynamic process, as you mentioned, and acquiring data during exploration and production stages, and they need to enhance recovery while minimizing capital investments and operating expenses.

This integrated reservoir management is again a dynamic practice because it must keep up with the continuously changing nature of business or business needs, financial and socioeconomic conditions, and human behavior, in addition to the complex interactions of its components.

Besides cost reduction, oil companies face the necessity to shorten the period between the appraisal and the production of the first oil. To redevelop a field as such, instead of being worked out successively, projects must be executed by multidisciplinary teams using sometimes parallel engineering methods.

Some tools helped this collaborative work through the integration of software that was used in reservoir characterization and modeling. They did allow us to visualize in 3D the reservoir structure as well as a 3D displacement in the same room. Different members of a team can test different development scenarios, quantify the associated productions, and eventually come to an optimum in terms of modeling strategies.

Numerical simulators evolved to describe the physics of fluid flow in porous media. Complexities arise because of faulted and fractured reservoirs, phase behavior, rock fluid interfaces, and other non-indignities.

With the advent of high-performance computing, simulation has become a well-accepted reservoir modeling method in the industry for significant capital decisions. However, 3 key challenges must be addressed when using numerical simulation.
The first is that the physics governing the fluid flow must be properly captured and fit for purpose.

Reservoir characterization must be adequate for forward modeling methods, and the time scale needed for computing efforts must be sufficient for decision-making purposes for optimization, considering the uncertainty.

Aided by the technological developments in recent years, we have witnessed a rapid increase in the volume of data collected and challenges in the description of the static and dynamic characteristics of unconventional reservoirs.

PERSPECTIVE: EXPERT INSIGHTS

Unconventional resources have demonstrated the necessity of using collected data more effectively for better modeling, analysis, uncertainty quantification, and decision-making in reservoir engineering applications.

Proper management and useful analysis of collective data to understand reservoir characteristics and behavior for both diagnostics and performance forecasting purposes have become a critical component of our modern residual engineering.
More recently, intelligent asset management for efficient and profitable oil field operations and technological improvements in connected and intelligent hardware are facilitating all field operations to collect more data than ever. This data, combined with machine learning and artificial intelligence, will lead to a near future of real-time reservoir management.

IRMTS: *As we know, decarbonization or net-zero targets are a challenge, which is imposing a challenge on our conventional operation. So in the energy sector, we are striving to achieve a net-zero target. How can we integrate reservoir management practices to support this goal? What strategies within IRM do you think are the most effective in accelerating progress toward environmental sustainability?*

Dr. Kamal: When we talk about the 3 major objectives of our industry right now, they are to provide the world with affordable, reliable, and environmentally friendly lower-carbon energy.

Part of it is, of course, the question that you asked me about: how can integrated reservoir management help in this direction of reaching Net Zero? There are several things that we can work on in this regard; I can mention some examples.

The first example, which is probably something very obvious for everyone, is our ability to inject carbon dioxide and underground information. Everybody knows that this is the most viable way of reducing carbon dioxide in the atmosphere. And we do that; we've been doing that for a long time as an enhanced or recovery project for 2 things. Number one, we are producing hydrocarbons, which is the energy the world needs, and we're also sequestering the CO_2.

It will be more important for us to focus not only on the EOR but also on continuously sequestering CO_2 underground for hundreds of years.

There are some challenges that we have in this direction, and we need to continue to work together as an integrated reservoir management group to make sure that we address these challenges and would be able to have that. This is just one example.

Another example is water management and recycling. Reservoirs require a lot of water for their operation. Anything that we can do to minimize the use of water in our operations or recycle the water that we'd be producing to help with reducing the need for that, that is, will be a very important thing for us to work with.

Another parameter that we can work with is that by employing the integrated reservoir management techniques, we can extend the life of reservoirs for a time, and we can increase the ultimate recovery from this reservoir. Now, extending the lifespan of the reservoir reduces our need for having additional reservoirs, additional drilling, and additional operations, and that would allow us to reach net zero.

One other example is monitoring emissions. We, for example, can incorporate the continuous monitoring of methane and CO_2 emissions during our production processes by using detailed tracking and automated controls that will help us in the production of wells.

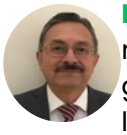
We can use our wells, especially the wells that are abandoned wells, for new forms of energy. For example, we can use these wells for geothermal production, or we can use these wells for injecting CO_2 underground.

So, as you can see, there are a whole lot of things we can do. We can also use renewable energy forms in our operations. Just let me give one very quick example. Chevron just started production from the field in the Gulf of Mexico. And this field is where we're producing from depths of 40,000 feet and pressures of 20,000 psi. The production platform is all run by electric motors and electronics, and it is powered by solar energy.

So, this is just an example of several examples of things we can be doing to reduce our footprint, carbon footprint.

IRMTS: *How do IRM practices enhance risk management and improve project economics while we are ensuring that we stay more sustainable and keep the operations profitable?*

PERSPECTIVE: EXPERT INSIGHTS



Dr. Camacho: The reservoir management must account for the risk that is resolved from geological uncertainties and the inherent limits of our ability to fully characterize reservoirs, verifying the consistency of all the state static and dynamic data. Reduce uncertainties always placing in a reservoir model.

In reservoir management, flaws are mitigated by the systematic application of integrated multidisciplinary technologies. Monitoring and surveillance programs are particularly critical because of the inherent uncertainties. To address uncertainty and risk, decision analysis in field development is strongly related to the uncertainties in the data and modeling methods.

Current approaches to deal with uncertainty focus on integrated representations of uncertainty sources and formalism for handling and modeling uncertainty. Integrated reservoir modeling represents the most valuable approach for estimating the reserves and computing the future production profiles, reducing the uncertainties always associated with static and dynamic reservoir descriptions.

A comprehensive management plan involves depletion and development strategies, data acquisition and analysis, geological and numerical model studies, production, and research. Research forecasts provide a listed risk assessment methodology that involves many thousands of simulations using many different estimates of future economic conditions. In project economic forecasting, the stochastic approach has proven to be the most natural approach to add these technical and commercial uncertainties.

A stochastic Monte Carlo simulation helps to understand the range of possible economic outcomes to enable effective decision-making; it is advisable to use an integrated stochastic workflow that addresses subsurface, surface, and cause uncertainties to select rank and quality opportunities early in the risk reduction process. The combination of many uncertainties, accounts, and complex models that require long simulation runs requires the consideration of other factors, such as the selection of critical variables through sensitivity analysis, proxies of objective functions, and the aggregation of variables.

In practice with the physics-based simulation models, optimization is seldom considered because of the great computational level required and lack of feasibility.

The computational speed of data-driven models makes quantification and analysis of uncertainty very practical when compared to physics-based models.

Finally, machine learning-based models have been successful in use for classification and prediction purposes to make development decisions related to unconventional and mature conventional fields regarding the optimization of well location, trajectory completions, water flooding, and selection of wells for stimulation.

IRMTS: *How can academia contribute to innovating something more in the domain of integrated reservoir management?*

Dr. Camacho: Working together, academia may establish more partnerships to apply these technologies to speed up reservoir simulation, make reservoir modeling and uncertainty analysis workflows more efficient, develop and implement economic optimization algorithms, and improve forecasting accuracy. There is a lot of room for improvement in these areas.

Scalability also reduces the computational intensity, and this could create a big promise for a future where the ability to model and history match entire fields in hours and use those models to make impactful operational and development decisions. Something that has not been possible for large fields, such as unconventionals, due to the scale, the slow running times, and the high cost.

Concerning other contributions from academia that are having the most significant impact, I would say that, again, machine learning is officially intelligent because they are playing a growing role in real-time monitoring. It helps operators make rapid decisions to address issues such as productivity degradation and water or gas breakthrough. By having automatic pressure buildup analysis and self-calibrating pressure models, the machine can autonomously identify problems and produce opportunities in the reservoir.

Another area is the optimization schemes. These schemes have been employed to provide efficient solutions for various problems requiring multi-criteria analysis, such as reservoir management problems. Algorithms based on natural and physical selection principles, such as neural networks and evolutionary algorithms, are being adopted for more robust

PERSPECTIVE: EXPERT INSIGHTS

optimization with higher chances of finding true global optima. For complex problems. This is also a good area of opportunity for academia, where the multidisciplinary research teams may work together with industry experts and could create technologies related to the energy transition. CCUS/CCS, underground hydrogen storage, and the strategies for emission reduction and energy efficiency. These are also a good area for academia.

IRMTS: How can *the technologies or the evolving practices that we have help manage the reservoirs in the unconventional reservoir setting?*

Dr. Kamal: Of course, we all recognize that we have difficulty in the unconventional reservoir, and things happen very slowly as far as the flow of the fluid is concerned.

So, when we're trying to get information about our reservoirs, it takes a very, very long time; for example, if you want to run a test to calculate the permeability, that will take you something like about 10,000 years. We're not going to do that. So, what we're doing is that we are keeping up with the advances and changes that we are making in things like rate analysis and things like decline curve analysis.

Different models of these things are being developed and continuously being worked on to be able to allow us to predict very quickly, get some information about the properties of the reservoir, and be able to predict the management. We are also continuously looking at data that we obtain from interference between wells, something that happened because now we have a whole lot of wells in close proximity to each other. And from that, we're allowing ourselves to get more information to help us with the characterization of the reservoir.

When we talk about the previous question, what is the role of data analytics and machine learning in that? We can now because we have a whole lot of data where this data is happening during the completion part, the fracturing of the reservoirs, and we can measure the data that we're getting there. And being able to pair that with the performance of the different wells in the different areas.

Looking at all this data and trying to use machine learning to be able to manage the reservoir. So we're adding all these things together, all these new technologies together, to help us with the reservoir physics itself.

And the flow the way we have it in conventional reservoirs simply takes too long, and we don't have time for that because, as most of the people here know, when you talk about unconventional wells, a lot of the production of the wells happens during the first few years and then the rate declines a whole lot. So, we need to be able to do the characterization and the performance predictions early in time, and know what we're using this data for.

IRMTS: *Why do you think that the SPE integrated reservoir management technical section is important for our industry? How do the members benefit from the active participation, and what specific actions do you recommend that we take to fully engage and get the maximum contribution from the community?*

Dr. Kamal: The main advantage of technical sections is that they are not limiting us to geographic locality. We can engage with members from all over the world and gain from the expertise and knowledge that they have. The integrated reservoir management section will help us look at all the different parts and all the different data that we are collecting from different groups to help us manage the reservoir-specific things. It's not only based on PVT data; it's not based only on core data, and it's not based only on what the reservoir simulation can do. It's integrating all the things and the experience that people have from all over the industry and how we share that and have this discussion among ourselves and the discussion about where the areas of weakness that we have that we need to be working on to improve our competencies that will be done during the technical section.

Dr. Camacho: The members of this technical session may benefit from participating in a way that combines complementary approaches and techniques and creates positive synergy between them.

I believe that this technical section will involve concepts and methods that include teamwork based on the integration of a wide range of professionals, tools, technologies, and data. The ingredients for this strategy are available but still need to be developed; probably a productive way of linking those ingredients together to build an integrated system. But another possibility that I think is important is to promote proximity with the operating companies to invite them to share experience in integrated reservoir management. I think that is a key action also.

TECHNICAL ENGAGEMENT & MEMBERSHIP INTEREST SURVEY

JOIN US IN SHAPING THE FUTURE:

Help us assess the technical interests, identify knowledge gaps, and understand the engagement preferences of **SPE IRMTS Members**.

SURVEY FORM

Share your thoughts and contribute to a stronger, more connected community.
Let's work together to enhance our collective knowledge and engagement!

THE RESERVOIR CHRONICLES: TRIVIA & TIDBIT

Interested in testing how much you know about integrated reservoir management? Or curious about the history of the reservoir management evolution, then this is the section for you!

DID YOU KNOW?

Waterflooding, a game-changer in oil recovery, was discovered by accident! Old, abandoned wells with rotted plugs allowed surface water to seep into oil-rich sands, sometimes forcing entire fields to be abandoned. In Venango County, where water traveled swiftly through porous rock, many wells were lost—until operators found a way to seal off the water and restart production. One remarkable well near Tidioute pumped only water for seven years before producing oil again!

Meanwhile, in the Bradford field, something incredible happened. Instead of ruining production, water moved slowly through the tight sands, pushing oil toward wells. Operators noticed the boost and investigated, leading to the revolutionary idea of controlled water injection. This discovery transformed flooding into a powerful recovery method, fueling a massive oil boom in McKean County!

Source: SPE Monograph Volume 3 - The Reservoir Engineering Aspects of Waterflooding (Second Edition) By H.R. "Hal" Warner, Jr.

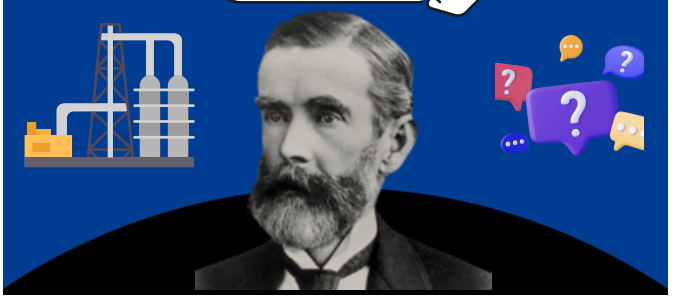
SPECULATE: QUIZ ZONE

Born in 1828, I laid the foundation for early reservoir engineering, making lasting contributions to the petroleum industry.
My game-changing works include:

Designing early petroleum drilling equipment
Defining the early concept of an oil pool
Estimating how much oil is in place
Recognizing the power of water flooding for better recovery
Advocating for systematic data collection at drill sites.

I am a brilliant mind - if I do say so myself!

WHO AM I?



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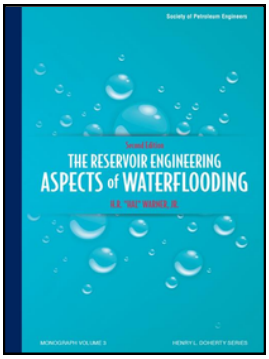

The Reservoir Engineering Aspects of Waterflooding (Second Edition)
By H.R. "Hal" Warner, Jr.
Society of Petroleum Engineers
DOI: https://doi.org/10.2118/9781613994214
ISBN electronic: 978-1-61399-886-1
Publication date: 2015

The first edition of The Reservoir Engineering Aspects of Waterflooding was published in 1970 and written by Forrest F. Craig, Jr. At the time of publication, much of the theory of oil displacement by water had been developed and many laboratory studies completed; however, the ability to perform computer modeling of 3D fluid flow in reservoirs with complex geologic depositions was in its infancy. In addition, several of the earliest, large-scale field applications of pattern waterflooding had begun, but long-term performance results were not yet known, and various infill drilling programs had yet to be implemented. This second edition reviews the fundamentals of waterflooding theory, and the experimental studies undertaken to understand the water displacement of oil in one, two, and three dimensions.

SPE IRMTS in Pictures

They say that one picture is worth a thousand words. As a section - we understand the value of not only voicing our passion and dedication towards integrated reservoir management excellence but also displaying the same through actions. In this section, we bring together a collage that portrays the tireless efforts of the board members and their commitment to expand the knowledge base through active networking and sharing. From meeting meeting key industry leaders or attending conferences, the members constantly strive to push the technical boundaries while harnessing the power of synergistic collaboration.

Look closely for photos featuring SPE Presidents, Directors, and Section Chairpersons. Their presence highlights our collaborative efforts and dedication to professional growth.

Editorial Team Message

Reservoir management today is no longer about isolated disciplines working independently - it is about **integration, adaptability, and foresight.** As the industry faces complex reservoir challenges, the ability to synergize geoscience, engineering, and data-driven decision-making has become indispensable in optimizing recovery and operational efficiency.

This **inaugural edition** of the SPE Integrated Reservoir Management Technical Section Newsletter reflects our commitment to bringing thought leadership, technical advancements, and practical innovations to the forefront. This issue provides a platform for collaborative knowledge exchange, featuring insightful articles, expert analyses, and industry trivia. We recognize the value of continuous learning and encourage professionals to engage in discussions that challenge conventional paradigms and promote best practices.

The energy landscape is shifting, and integrated reservoir management is evolving with it. We invite you to join us in pushing boundaries, refining methodologies, and shaping the **future of the energy industry.**

SPE IRMTS Editorial Team

Zeudy Galbán

Shubham Patel

Sydney Nassanga

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Ways to Connect

Interested in becoming part of this great movement? Join the section using the available links below, making sure that you follow us so that you can get all in on the updates!

Integrated Reservoir Management Technical Section

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JOIN US

Society of Petroleum Engineers

Professional Online Communities

UPCOMING SPE EVENTS

Events

21-23 April | Dubai City
GOTECH

22-24 April | Richardson
SPE Virtual Career Pathways Fair

5-8 May | Houston
Offshore Technology Conference

6-7 May | Al Khobar
SPE Petroleum Economics Symposium: Economics of the Future-Leading Transition and Driving Sustainable Growth Symposium

Call for Papers

2026 SPE Argentina Exploration and Production of Unconventional Resources Symposium
Deadline: 19 May

Offshore Technology Conference Asia
Deadline: 23 May

SPE Permian Basin Energy Conference
Deadline: 28 May

Workshops

28-30 April | Colorado Springs
New Perspectives in Well Performance Analysis and Production Forecasting

UPCOMING IRMTS WEBINARS

23 April | Virtual
Real-Time Production Optimization and the future of AI

6 May | Virtual
Maximizing Waterflooding Value: Strategies, Technologies and Future Outlook

28 May | Virtual
Advancing Forecast Reliability Through Integrated Modeling and 4D Seismic in Complex Offshore Fields