nergy.



Real-Time Well Status Prediction Using AI Techniques for Accurate Rate Allocation

> Also in this issue:
> YP Success Story: Elcio Dias
> Women in Energy: Empowering Tomorrow
> SPE Brazil: Seminario de Seguranca Operacional Offshore – as reported by our Editor
> Overview: upstream and E&P in a net-zero world
> News, and Upcoming Events





SPE Review London

The official e-magazine of the Society of Petroleum Engineers' London brand

ABOUT US

The Society of Petroleum Engineers (SPE) is a not-forprofit professional association whose members are engaged in energy resources, development and production. SPE is a non-profit professional society with more than 156,000 members in 154 countries, who participate in 203 sections and 383 student chapters. SPE's membership includes 72,000 student members. SPE is a key resource for technical knowledge related to the oil and gas exploration and production industry and provides services through its global events, publications, training courses and online resources at www.spe.org. SPE London section publishes SPE Review London, an online newsletter, 10 times a year, which is digitally sent to its 3000+ members. If you have read this issue and would like to join the SPE and receive your own copy of SPE Review London, as well as many other benefits - or you know a friend or colleague who would like to join - please visit www.spe.org for an application form.

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SPE Review London January 2025

GO: SPE London

Behind the Scenes: SPE Review Editorial Board

Elizaveta Poliakova, Editor in Chief

Elizaveta is a Reservoir Engineer at Trident Energy. She has an M.Sc in Petroleum Engineering from Imperial College London and a B.Sc. in Petroleum Engineering from the University of Leeds.

Elizaveta has been with SPE for more than nine years. She was the President of SPE Imperial College Chapter and the President of SPE Leeds Chapter. She was the SPE London Board Chair in 2022/23.

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Thank you to the SPE London Sponsors 2023/2024





Letter from the Chair

Dear SPE London members and colleagues,

Welcome to the first issue of the SPE Review for 2025. Six months into our committee's tenure, I'd like to highlight our successes so far and share our plans for 2025.

Highlights of 2024

- O **Monthly Lectures**: Continued hosting a great variety of Distinguished Lecturers and guest speakers.
- **University Engagement**: Our members spoke at events at several universities offering advice to students considering a career in petroleum engineering.
- O **Webinars**: We hosted webinars focused on 'Net Zero' themes, addressing the industry's role in achieving sustainability.
- **Social Events**: As part of the 'Energy on Draft' series, we ran social event in partnership with subsurface-related technical societies in London.
- O **Regional Promotion**: At the 'Regional Section Officers Meeting' in Aberdeen, we promoted our events to SPE sections throughout Europe.
- O **Women in Energy**: We re-launched the popular 'Women in Energy' annual event, this time exploring the topics of 'Energy Transition and AI'.
- O **Continuing Education**: We concluded 2024 with our successful annual event 'Introduction to Upstream Oil and Gas for the Net Zero World'.

I'd like to expand with a point about last year's event 'Introduction to Upstream Oil and Gas for the Net Zero World'. Although the event has been run 16 times in London, this was the largest audience since my records began (2014). Does this record attendance mean companies have renewed confidence in our industry? Or that the UK's plans for Carbon Storage are leading to greater interest in upstream oil and gas? In 2025, we'll build on this momentum and explore new ways to engage and inspire our audiences.

Plans for 2025

We're planning to continue 'all of the above' plus more! The events will retain the theme of 'The Energy Trilemma', discussing ways to manage the conflicting topics of energy security, affordability, and sustainability.

We will expand the range of events in 2025 with:

- O Young Professionals: Relaunching events for Young Professionals including speakers, site visits and a Careers Fair.
- O Student Engagement: Careers workshops for student members.
- O **Inter-society**: Expanding our network with other technical societies, with shared marketing and shared inter-society events in London.
- **Networking**: A new initiative a 'Welcome to London' networking event for industry professional who moved to London in the past 12 months.

We encourage members to participate in any of our society's activities. Please get in touch if you would like to volunteer with any of our committees, or if you have ideas to share. Email us at *spelondon@spelondon.org*.

I'll end on a light-hearted note: What should be the Greek word for aviation fuel? Pter-oleum!

Kind regards, Adam Borushek SPE London Section Chair 2024-2025

Letter from the Editor

Dear SPE London members and readers,

Welcome to the January 2025 edition of SPE Review London! In this issue, we explore the latest innovations, industry trends, and success stories that highlight the resilience and ingenuity of our community.

To kick off, our **Young Professionals Success Story (page 8) features Elcio Dias**, whose journey from a university laboratory assistant to a leader in operations excellence demonstrates the power of entrepreneurial spirit and technical expertise in shaping careers in oil and gas. His insights into the integration of AI, sustainability, and traditional energy practices are an inspiring read.

We also reflect on our **SPE London Women in Energy Seminar (page 16)**, which returned after a five-year hiatus. The discussion spanned across gender balance, the impact of AI and energy transition on careers. The event featuring industry leaders from bp, Shell, and S&P Global Commodity Insights provided a powerful platform for knowledge-sharing and mentorship.

I would also like to share that I represented SPE London at the SPE Brazil's Offshore Operational Safety Seminar (page 18). The event brought together over 350 professionals and students in Rio de Janeiro to discuss safety, compliance, and the future of offshore operations—critical topics as the industry continues to prioritize risk management and operational integrity.

On the technical front, the use of Artificial Intelligence (AI) and Machine Learning (ML) in the industry continues to grow, providing data-driven solutions to complex engineering challenges. **Turn to page 20** for a deep dive into how AI techniques are being used for real-time well status prediction, helping to optimize rate allocation and improve operational efficiency.

Looking ahead, we encourage you to mark your calendars for **upcoming SPE events (page 28)**, including the SPE Offshore Europe Conference in Aberdeen and the SPE International Conference on Oilfield Chemistry in Texas. These gatherings offer valuable opportunities to connect with experts, exchange ideas, and stay ahead of industry trends.

A special thank you to our editor, Ffion Llwyd-Jones, for putting this publication together with exceptional attention to detail and professionalism!

We hope this edition provides valuable insights. If you have feedback or would like to contribute to a future issue, please reach out to us at *spelondon@spemail.org*.

Wishing you all a productive and innovative year ahead!

Sincerely, Elizaveta Poliakova



NEWS DIGEST... NEWS DIGEST... NEWS DIGEST



Significant production boost

Chevron Corporation has begun oil production at its Future Growth Project at the Tengiz oil field in Kazakhstan.

The Tengiz field is recognized as the world's deepest-producing supergiant oil field and the largest single-trap-producing reservoir. The Project is the third processing plant at the Tengiz field, designed to significantly boost the facility's oil production capacity. *Read more:* Chevron



Spending caps

Oil producers' drive for increasing efficiency amid a cap on spending may have reverberations for the US oilfield services firms, according to a Reuters report. It notes that oil rig numbers are at their lowest for 4 years (since 2021) according to Baker Hughes. February 2022; Primary Vison reports that active frac fleets totaled 183 in the week to January 23, 2025. *Read more:* Efficiency drive

Commercial quantities

Talos Energy expects the first production in the second quarter of 2025 after discovering commercial quantities of oil and gas at the Katmai West #2 well in the Ewing Bank area of the U.S. Gulf of Mexico.



The company expects production in line with pre-drill estimates of approximately 15 to 20 thousand barrels of oil equivalent per day (MBoepd) gross. *Read more:* Commercial

Net production 2 MMboed +

Keeping capital expenditure at the same level while raising net production is CNOCC's stated aim for the coming year. The company plans to raise its net production to over two million barrels of oil equivalent a day (MMboed) in 2025. Output in 2024 is expected to have totaled 720 MMboe, marking a sixth consecutive year of record highs. CNOOC stated it will continue pursuing new oil and gas technology: "Relying on the 'HiEnergy' artificial intelligence model, the company will facilitate the in-depth integration of digital intelligence technology with the oil and gas business to promote lean management. The company will drive the integrated development of hydrocarbon sector and new energy sectors." *Read more:* Production

IPAA Board Chairman

Michael A. Hillebrand is the new board chairman of the Independent Petroleum Association of America (IPAA). Hillebrand is the CEO of Pennsylvania-based Huntley & Huntley. Following IPAA board



approval at the association's annual meeting in late autumn, Hillebrand officially assumed the role in January 2025. "Mike brings fantastic business and technical expertise to the role of chairman, coupled with a passion for industry and association advocacy," said Jeff Eshelman, IPAA president and chief executive officer. Read more: IPAA

NEWS DIGEST... NEWS DIGEST... NEWS DIGEST



Electric transportation

All-electric seagliders will take passengers to and from ADNOC's offshore oil and gas infrastructures, through a joint venture between ADNOC Logistics and Services and an Abu Dhabi seaglider operator to introduce REGENT seagliders into its fleet. The Viceroy seaglider can carry a payload of 3,500lbs (1,600kg) or 12 passengers.



"REGENT could ask for no better end user for seagliders in UAE than the largest energy producer in the country and leader in innovation and sustainability," said Billy Thalheimer, co-founder and CEO, REGENT. "Seagliders will drastically reduce the time, cost, and emissions of offshore energy logistics." *Read more*: Gliders

AI and ML to cross \$4.9 Bn

Oil and gas operational costs are being transformed by incorporation AI and ML, according to research and analysis by Global Market Insights. The company's report



shows a global valuation of USD 2.5 billion for AI & ML in the oil & gas market in 2024; it estimates

a CAGR of 7.1% between 2025 and 2034. Market growth is reported as a 'result of the increased attention towards digital transformation, heightened need for operational



efficiency, and a strong focus on the predictive analytics'. The report adds that companies gain insights from the advanced data analytics, AI and ML, thus improving their operations' cost effectiveness and efficacy. The technologies can also assist in ensuring adherence to environmental and safety regulations. Read more: Report

Oil and gas blocks on offer



Reuters reports that Trinidad and Tobago has offered 26 offshore oil and gas blocks for auction. The areas are for deepwater exploration and production, according to an official notice. The auction will close on July 2, 2025.

BP and Shell operate three deepwater blocks in the area and recently completed seismic work in those blocks. *Read more*: Blocks

Travelling together with passion on planet Earth



Elcio Dias is the leader of the recently created Operations Excellence department in Georgetown, Guyana. It is part of an Integrated Operations framework established between ExxonMobil and SBM Offshore for the production operations of a growing FPSO fleet, where both companies work together as one single organization.

Elcio is also an award-winning startup founder, passionate about geoengineering tech and nature-based solutions. ClubCarby is a climate-tech business focused on addressing the carbon cycle`s imbalance.

You started as a computer lab assistant and later founded Energy Junior during your university years. How did these early experiences shape your skills and career trajectory in the oil and gas industry? Entrepreneurship has been an important part of my life (I believe it is encoded in my DNA) and has been the most relevant competitive advantage I had in securing my first opportunities. It encompasses risktaking, innovation, and continuous learning.

I started my engineering degree bringing this attitude, volunteering to work in scientific projects even if I was still discovering Darcy's law, trying to help my professors along the whole academic calendar (including breaks/holidays) and consistently going beyond the classic class-homework approach.

Soon, I started getting my first opportunities. I was hired as a computer lab assistant to set up a new simulation lab, now called 'Labsim' where my SPE student chapter resides. During this experience I specialized in software such as SLB's Pipesim. While helping students understand the intricacies of the multi-phase flow simulation, I got my first work experience within the university.

Amid this scientific endeavor, I also had the opportunity to be the second Vice-President of our award-winning SPE UFES Student Chapter. Among other things, I idealized and founded my first 'startup' company, Energy Junior. It was officially founded in 2011 (almost 15 years ago, time flies 1x), and it turned into a 'Junior Enterprise' officially embraced by the university. So far, it has positively impacted hundreds (if not thousands) of lives.

Energy Junior was the greatest achievement I had as an academic and was critical to give me access to the oil and gas industry. Consequently, I started getting interesting offers from the market. In 2013, around two years before graduation, I had a summer internship in Subsea Engineering/SURF and Production Operations in Rio. I learned and understood more about complex technologies such as Hybrid Riser Tower, PLSV and FPSO, and why they are fundamental for offshore oilfield development.

Four months before graduation, I received another incredible offer from Halliburton to work with its Landmark software services at Petrobras HQ – another incredible experience.

ClubCarby is an ambitious project addressing climate challenges. What inspired you to found it, and how have your oil and gas experiences influenced your approach to climate tech? Hydrocarbons, carbon cycle and the earth's climate are all connected. Each one plays a critical role in the earth's dynamics and in life as whole. Carby is my second 'startup' company and basically envisions connecting hydrocarbons to earth's climate via the carbon cycle (reshaping the natural geological ways as much as possible), and improving anthropological influence on earth's dynamics (reducing our impacts, at least).

In other words, oil and gas (hydrocarbons) and climate are inherently linked. Carbon is the backbone of life. Overall, Carby is the most profound big dream I ever had. ClubCarby is our first product in the market and the numbers it is producing so far are impressive.

Winning the Enterprise Challenge and securing angel investors are significant achievements. What challenges did you face while transitioning ClubCarby from an idea to a viable product? In 2019, when I decided to pursue a master's degree in London, I was seeking new knowledge from the 'old world'; the ones who know their history, control their future. So, I stopped my 5-years offshore oil and gas experience to go back to university.

Travelling together with passion on planet Earth... continued

A productive sabbatical was on the horizon.

Time slowed down. I had more time to read, learn and improve myself, so ideas flourished once again. I was in London, the 'capital of the world', and by becoming a Londoner, I started connecting with a world in transition. Buses moved by green electricity, ULEZ, EVs running around all the time, what was all of that? New questions should be addressed. My life was about to change forever, and it was an exciting time. Being a petroleum engineer allowed me to see the world through geological lens; in fact, geology was always my thing. Carbon cycle, anthropological impacts on earth, and Bang! Carby.

Developing a business is based on trust and potential. Throughout my career in the oilfield, since university, I have had the pleasure of working with some great people, creating a strong network. Years later, some people in this network ended up becoming my first partners and angel investors in Carby. From this point to a viable product is another journey and it deserves a full chapter. But I can ensure that people are at the core of Carby and it should be like this at any company.

As a leader at TechnipFMC and MODEC, you managed diverse teams across multiple countries. How do you approach leading multicultural teams, and what lessons have you learned from these experiences?

Keeping long-term endeavors aside, my energy career has been on a rising momentum since I moved to London five years ago (time flies x2).

Some places I've worked include: MODEC, a giant Japanese FPSO builder and operator that helps oil and gas operators all over the world; TechnipFMC in Paris; Subsea7 in London for SURF Projects for multiple IOCs; Japan, France, UK and their subsidiaries or client connections spread worldwide including Brazil, USA, Ghana and Norway.

How to lead teams from all these countries and cultures? I will bring the same principle again: Trust. Regardless of where you are from, if there is trust, things tend to move and flow better. How to build trust? Well, that's not an easy one, is it? My approach is: Being fully honest, transparent, and genuine, no matter what. It will work for some, may not work for others. But that is how I have navigated the offshore upstream, attempting to cover the seven seas while building long-term alliances wherever I go. At the end, it is all about people.

In your role as Operations Excellence Team Lead with SBM Offshore, you oversee a portfolio of 100+ innovation projects with engineers from ExxonMobil and SBM Offshore. How do you foster collaboration and ensure alignment between two large organizations?

Working with SBM and ExxonMobil in an Integrated Operations framework in Georgetown/Guyana has been a rewarding chapter in my career.

These two great organisations are reinventing the ways of collaboration. The mutual support is almost natural, with oilfield operator and engineering contractor working as one team. At this level, it is the first time I have seen it in the energy sector. I have seen other great alliances, like the SIA between SLB, Subsea7, and Aker Solutions where BP showed some proximity, but the level of engagement and collaboration I can see in the integrated operations and the Guyana Enterprise are completely new.

Stabroek Block in Guyana is a blessed one with 12 oil and gas discoveries already publicly confirmed, making Guyana the brightest energy frontier. All the FPSOs being manufactured and the production operations involved require a lot of innovation and lean solutions to accelerate the expected outcomes . That is what we do in the Operation Excellence team. Both mother organisations representatives working as one team to help the production operations in-country to be continuously better. The focus is on the people, environment and, therefore, the business.

In your time at MODEC, you developed several digital tools and systems that improved safety, performance and cost management. What drove these innovations, and how do you identify areas for improvement?

My experience at MODEC and Petrobras in Brazil was key for my current role. At MODEC, we managed a fleet of six FPSOs (at the peak), varying in age and project types. So, imagine such large assets with thousands of critical equipment from multiple OEMs aging in the middle of the ocean. Aging exactly when the digital boom was happening. The only way

Travelling together with passion on planet Earth... continued

to keep safe operations is by applying digital solutions to continuously improve processes. That is what we have done.

My mind is always thinking about new solutions, and I am continuously looking for ways to solve old problems. I am good at connecting the dots, too. Previous missions in the oil and gas forged me with iron, then I always try to carry on the lessons learned. That is why innovative projects like the FPSO Budget Control, Production Ops Work Order audit and Fleetview for FPSO fleet Risk Management naturally gravitated to me (the first two were based on my ideas loaded with previous knowledge and the third was already being drafted in the company and I was appointed to coordinate it).

I am also a careful listener for innovation. When an experienced person (it does not matter if the OIM or the rigger) is sharing some ideas and lessons, I am always paying a lot of attention. So, many ideas come from exchanging knowledge with people. From time to time, I also enjoy a cup of coffee at the coffee shop. That is usually when some out-of-thebox ideas also come up.

You've worked on both traditional oil and gas projects and sustainability initiatives such as ClubCarby. How do you see the role of oil and gas professionals evolving in a more sustainabilityfocused future?

I have a particular thesis on this. I believe it will become a central topic for my future PhD endeavor. I see oil and gas professionals as the 'geonauts'. We are the ones exploring the most challenging environments in search for feasible resources. Initially, to supply humanity with energy, but we know that hydrocarbons are extremely rare and limited. It took hundreds of millions of years to get the blackgold ready. So, I believe that the great programmer of this game we are playing on earth (aka as 'the Creator' or 'God'), has given us intelligence enough to find hydrocarbons to use it as energy source to enable a certain progress only until we develop more sustainable ways to produce energy (renewables, fission and fusion, etc.).

The 'Anthropocene' is marked by oil and gas discovery and consumption, that unlocked energy supply and led humanity to our most prosperous time, but we shall have a moment when we reduce and almost stop burning the black gold. It does not mean that we will also stop producing it.

In my opinion, hydrocarbons will continue playing a special role as the most important raw materials for as long as possible, serving everything else that petrochemicals can serve, including to supply our adventures beyond earth. In fact, oil and gas are too rare to be burnt till the last barrel. We shall use it thermically until we develop more sustainable and efficient ways to get energy. When we burn hydrocarbons, it becomes majorly carbon (or its equivalent) in the atmosphere, we cannot recycle it easily. When we produce special materials from oil and gas, we can recycle it an infinite number of times (so we prolong the hydrocarbons lifecycle). Not to mention that the efficiency of an ICE car is much lower than an EV. So, oil and gas professionals shall, above all, be the guardians of hydrocarbons.

What advice would you give to young professionals who aspire to succeed in the oil and gas industry, especially those looking to combine traditional energy expertise with innovation in sustainability? Earth <> Hydrocarbons <> Carbon Cycle <> Life <> Humanity. We are all connected. Be curious. Be hungry. Be open to the future, but keep in mind that we shall connect the dots with the past.

Oil and gas were, still are, and will continue to be the greatest resource earth has given us (truly a blessing). Let's understand the game we are playing and use this gift called hydrocarbons with wisdom. As with all good things we experience, it will come to an end; hydrocarbons will not last forever. Be ready for the future but keep your feet on the ground (connected with the earth). Specialize yourself in something that will generate value to others.

The professionals of the future will have a nice toolbox, including a lot of digital tools, but the digital tools alone will not make all the difference. Your mind, enabled with human creativity, will still be required for a long, long time. So, enjoy it! Be humble but believe in yourself! You are a superhuman capable of incredible things.

Focus on one thing at a time and get things done. Time flies 3x. I have had good mentors throughout my career, including many SPE related ones.

So, count on us. We are willing to develop the next generation to be better than us.

GESGB YPs, SPE, EAGE, AAPG and iChemE present: Energy on Draft!



Would you like to meet like-minded professionals within your industry? The GESGB Young Professionals, SPE, EAGE, AAPG and iChemE London societies would like to invite you and your colleagues to our next social event in the Energy on Draft Series!

Come out, enjoy drinks, make new connections or simply catch up with old friends! Whether you are starting off in the industry or an experienced professional, this event is a chance to network with a diverse group of professionals in engineering, geoscience, finance, and business development.

Please note that this event will be self-funded (card/cash bar)

Date and time: Thursday, February 27 · 6 - 11pm GMT **Location:** The Oxford Market, 11-13 Market Place, London W1W 8AH **Booking:** Here's the link to Eventbrite

Sponsorship opportunities

Companies are invited to sponsor individual Energy on Draft events organised by the GESGB Young Professionals (YP) and affiliated YP societies. Sponsors must notify the event organisers of their intention to provide sponsorship in advance. Sponsorship contributions can be as simple as providing a card to fund refreshments on the night, or alternatively, additional promotional opportunities are also available. Please reach out if you'd like to discuss: ccromie@trident-energy.com

Overview of the upstream and exploration and production industry in a net-zero world

Dylan Parekh and Wasim Askar provide an overview of SPE London's 17th annual introductory upstream course 'Introduction to Upstream Oil and Gas (O&G) for the Net Zero World'.



The seminar provided an overview of upstream and exploration and production (E&P) industry, across the value chain from development all the way through to operations, covering disciplines such as geoscience, drilling, production facilities, reservoir engineering and upstream economics. The speakers also discussed pertinent topics and issues focused on sustainability and Environmental, Social, and Governance (ESG) reporting, as well as recent trends in energy transition careers and the transferability of traditional oil and gas skills to the net-zero world.

Торіс	Speaker
The Role of E&P in the Energy Trilemma	Adam Borushek, RISC
Geosciences	Paul Wilson, Perenco
Drilling	lain Hutchison, Merlin Energy
Reservoir Engineering	Frank Folorunso, Star Energy
Production Facilities	Omer Khoshnaw, INEOS
Upstream Economics	Long Wang, Harbour Energy
Sustainability and Reporting	Rachel Gavey, sustain:able
Upstream Digital Transformation	Alejandro Primera, SLB
Energy Transition Careers	Alison Isherwood, Consultant

Exploration & Production

The day started with setting the scene on E&P and its geopolitical importance, with world events such as conflicts, sanctions and energy transition policies impacting operations, and vice versa.

The participants were shown the evolution of the UK's energy mix over the years and introduced to the

concept of the Energy Trilemma i.e. how do we prioritise sustainability, security and affordability? This overarching challenge would contextualise the latter talks. The key takeaway being tha while the energy transition will pave the way for new lower carbon solutions, conventional fuel sources such as oil and gas must be part of the energy mix to secure Europe's energy future but also provide equitable, affordable energy for all.

Overview of the upstream and E&P industry in a net-zero

world.... continued

Geosciences

In the second session, there was a discussion on geosciences, focusing on various types of rocks and their role in the formation of a petroleum system. This system includes key components such as a reservoir, seal, and trap. Additionally, there was a demonstration on the use of seismic data, showcasing how sound waves are utilised to interpret geological information in initial exploration activities for viable reserves.

Drilling

Following a coffee and networking break, there was a presentation on various well types, including exploration, appraisal, development, production, and injection wells. The speaker also covered the different phases of a well, such as drilling, pumping, drilling time, and associated costs, as well as information about rigs. The participants also learned about the evolution of drilling, in particular the development of horizontal drilling from onshore as an innovative way to reduce a rig's environmental and carbon footprint and capex (drilling offshore is much more expensive than onshore). A key takeaway was the high degree of uncertainty that O&G companies face when embarking on drilling projects which are highly capital intensive and may result in a 'dry hole' – no economically viable and producible hydrocarbons are find. Another observation was the significance of drilling durations, as 80% of drilling costs depend on completing the project on time and within budget. Time and cost overruns can significantly impact the well's economic viability.

Reservoir Engineering

The next presentations was on reservoir engineering and petroleum reserves/resources. The classifications of reserves, such as proved, probable, and possible reserves, as well as contingent and prospective resources, were discussed. The key takeaway from the talk was the highly multidisciplinary nature of field development, with reservoir engineers, geologists, and petrophysicists collaborating to share data. They can build numerical simulations of the reservoir which provide vital information to the commercial and economic side of the business and help ascertain the amount of Oil/Gas-In-Place - total quantity of hydrocarbon contained in the reservoir – and simulating various production profiles and pathways.

Production Facilities

After the lunch break, the participants heard about various components of a production system such as gas separation, gas compression and gas treatment. A highlight of the session was the net zero considerations in production facilities through the application of technology and digital solutions, as well as enhancing maintenance schedules and processes. These measures help extend the life of the assets and subsequently have a positive impact on carbon emissions.

Upstream Economics

The next session was a talk on the economics of E&P where the participants learned about Governments' role in the markets and an overview of the key profitability metrics used to judge the feasibility of E&P projects such as the payback period, maximum cash exposure and profit to investment ratios.

Sustainability and Reporting

The next talk was on sustainability reporting, where participants learned about the ESG reporting process and landscape. The session provided an overview of key global bodies and frameworks, such as the Task Force on Climate-Related Financial Disclosures (TCFD), International Financial Reporting Standards (IFRS), and the International Sustainability Standards Board (ISSB). A key takeaway was the importance of corporations having an honest approach to decarbonisation and ESG, particularly considering recent climate litigation cases, such as the landmark Horse Hill Judgement that impacted planning permissions for O&G sites.

Overview of the upstream and E&P industry in a net-zero

world... continued

Upstream Digital Transformation

After a short break, the participants heard about how applications of data and Artificial Intelligence (AI) in upstream can help facilitate a digital transformation, in particular the use of big data and AI to analyse large volumes of seismic data and the use of sensors and edge computing to inform the predictive maintenance of machinery. These applications are likely to be highly transformational with 73% of energy C-suite executives viewing generative AI as a catalyst for reinvention, according to recent study from Accenture¹.

Energy Transition Careers

The final session focused on the energy transition and the careers needed to facilitate it. The participants heard about the global transition pathways and were provided with an overview of the sectors which are more difficult to decarbonise. The talk then closed giving an overview of how many traditional O&G careers can be transitioned into the renewable energy world with many transferrable skills, with the speaker herself having been on this journey from engineer to energy transition consultant.

We would like to thank all speakers, organisers and volunteers for helping to make this a highly successful event. SPE London plans to repeat this in 2025.

Notes

PDF files of the full presentations are available on the SPE London website, at https://www.spe-london.org/ resources/past-events/

¹Source: Oil and Gas Consulting Services | Energy Industry | Accenture







Overview of the upstream and E&P industry in a net-zero world... continued













Empowering tomorrow: Exploring the energy transition and artificial intelligence



Returning after a five-year hiatus due to the COVID-19 pandemic, the SPE Women in Energy (WiE) annual event took place in June at London South Bank University (LSBU). Organised by volunteers and hosted by the Society of Petroleum Engineers, London Section, the day creates a welcoming environment where members of the industry get together to discuss how to achieve gender balance from not only a personal level, but also to the corporate level.

The full day event included keynote speakers, workshops, panel discussions and opportunities for networking, which this year welcomed c.140 attendees at all levels of seniority in the energy sector from students to CEOs.

The sector has changed significantly during the time the event has been on hiatus, which was reflected in the headline topics of the energy transition and artificial intelligence (AI).

WiE was honoured to be joined by three fantastic keynote addresses to kick off the day. Ann Davies, Senior Vice President of Wells at bp opened the session and shared her career journey in the industry. From humble beginnings as the first in her family to go to university, to her first offshore deployment, and on to climbing the management ladder, Ann demonstrated the rewards of hard work, the power of self-belief and the importance of standing up for what's right. Michael Wynne, Vice President at S&P Global Commodity Insights, touched on the importance of believing in your own conviction, how being a disrupter can be a positive in inducing change and how broadening your experiences enables you build a powerful foundation to work from. The session concluded with Amy Challen, Global Head of Artificial Intelligence at Shell, who shared her diverse journey into AI. Amy shared her experiences in what is a rapidly evolving field, she talked about how problems can benefit from multiple approaches and the importance of collaboration to achieve the best outcomes.

Following a mid-morning coffee and networking break, we re-convened in LSBU's fantastic auditorium for an inspiring panel session, chaired by Vince Pizzoni, an energy mentoring champion well known for his role as an ambassador in the energy space. The panel comprised Rebecca Clayton, ESG Lead at NEO; Helen Povey, Senior Geologist at Ørsted; Marta Puig Alenyà, CCS Subsurface Manager at Perenco; and Mounia Attiga, Chair of Lean-in North Africa, Leaders of Energy.

Following a networking lunch, the afternoon kicked off with a session run by The Lab22, Scotland's only science lab for children, which seeks to support and champion science, technology, engineering and maths (STEM) from an early age. In this section we learned about the importance of engaging children from a young age in STEM, to not only develop skills in these fields, but to also grow and foster enthusiasm for the subjects.

The afternoon comprised two rounds of workshops.

- Delegates were able to select from the following:
- ESG and biodiversity in the energy sector: Dr Rachel Gavey, Sustain:ableQuo vadis petroleum industry?
- Navigating a sector in a state of flux: Dr Arndt Peterhansel, TRACS International
- Introduction to AI for an energy industry in transition: Ines Cecilio, SLB
- Coaching fundamentals: Helen Taylor, Copper Row Coaching

Empowering tomorrow... continued

- Returning to STEM: Anouska Carling, STEM Returners
- Energy transition careers chat: speed dating career advice: Sarah Burke, Odgers Berndtson; Solape Akinola, Shell; Christopher Banks, SLB; and Vince Pizzoni.

The day was wrapped up by **Christopher Banks, SLB**, who provided a masterclass on Unlocking Your Power. Chris talked us through visualisation techniques, giving us an overview on how to develop our self-awareness through mindfulness techniques, explaining how these methods can help build emotional intelligence and resilience in the workplace. The conference concluded on a positive note with a final group picture!

Throughout the day, a buzz filled the corridors of LSBU, with smiling faces and enthusiastic conversations. Our first event post-covid illustrated the importance of being able to meet, to speak and to network in person. Old connections were re-energised, new friendships and partnerships were welcomed, and many wise words were shared. We look forward to welcoming everyone once again next year and building on the success of this years' event.



The SPE WiE Committee would like to extend our thanks to LSBU, who kindly hosted us for the day. We are also grateful to, and would like to thank our event sponsors: bp, NEO Energy, S&P Global Commodity Insights, CNOOC, The Lab22, TRACS International and Trident Energy. This fantastic event wouldn't have happened without their generosity. If you are interested in sponsoring next year's SPE WiE event, please get in touch with the committee on spe.londonwie@gmail.com



SPE Brazil: Seminario de Seguranca Operacional Offshore/Offshore Operational Safety Seminar





SPE Brazil: Seminario de Seguranca Operacional... continued













Real-time Well Status Prediction Using AI Techniques for Accurate Rate Allocation

Abstract

Knowing well operating conditions can help to allocate the rate accurately; however, there are several factors that govern the well status such as wellhead or downhole temperature and pressures. In this study, artificial intelligence techniques will be used to estimate and predict well status using combination of surface and subsurface parameters in offshore areas.

Artificial intelligence (AI) techniques have proven their robustness in tackling petroleum engineering problems. Several techniques can be customized to what each problem requires in terms of accuracy and utilization. In this paper, four Machine Learning algorithms (ML) were used to estimate and then predict well operating status. The four algorithms were Gradient Boosting Machine (GBM), Random Forest (RF), Decision Tree (DecT), and Support Vector Machine (SVM). Surface parameters were fed into each model to estimate well operating status. Data were sub-categorized based on well type. Upstream wellhead pressure, downstream wellhead pressure, choke valve position and upstream wellhead temperature were used as features to create each model. Moreover, a prediction model was developed to specify well status at specific circumstances.

The four Machine Learning (ML) algorithms were utilized with datasets covering tens of gas wells. The ML models were optimized in terms of their unique parameters for better results. Random Forest (RF) proved to provide better results with least average absolute relative error and accuracy of 99% between actual and predicted wel status although the other two methods gave reasonable errors. Additionally, the selected model was integrated with a real-time dashboard along with all attainable well parameters. Also, accuracy of the rate allocation was achieved after considering the well status from the selected model including all wells. The prediction model demonstrated acceptable results when comparing to the actual well operating status considering the optimization runs for each dataset.

The well status prediction model can assist in monitoring well performance proactively by studying the relationship between well parameters which can further enhance the rate allocation process. Also, this can help with identifying opportunities for well profitability and maximizing revenue by avoiding production loss.

Authors: Mohammad Al Kadem, Abdulrahman Alajmi, Najmul Ansari, and Mohammed Alali, Saudi Aramco. Copyright 2024, Society of Petroleum Engineers DOI 10.2118/220686-MS

Importance of Well Status Determination

The main driver in oil and gas industry is the produced fluids from the wells. These produced fluids subsequently are used for multiple purposes in the industry for revenue generation, energy generation and many other uses. Therefore, knowing the well operating conditions is crucial to ensure proper rate allocation of these fluids.

Determining the well operating status contributes to many important aspects of the well production management. One aspect is enabling the capability to allocate the rate from oil and gas wells accurately and enable proper reservoir fluid depletion strategies management. A second major consideration is well integrity which accounts for the safe conditions of the well as well as the nearby personnel while in the production process.

Furthermore, other important factors that require knowing well operation status includes enabling flow assurance studies/assessments and providing understanding of well lifecycle and healthiness. Furthermore, oil and gas fields' production management can involve many complexities and consideration to ensure successful operations. The sheer large amount of production wells is one such important consideration

requiring considerable tracking to ensure proper conformance with reservoir depletion strategies. Hence, well status prediction model can assist in monitoring well performance proactively by studying the relationship between well parameters which can further enhance the rate allocation process. Also, this can help with identifying opportunities for well profitability and maximizing revenue by avoiding production loss.

Affecting Parameters on Well Operating Status

The accuracy of predicting well operating status relies on the appropriate selection of suitable and robust parameters that are directly related to the wel operating status. Additionally, it is preferable to limit the selection of the parameters to the most important ones in order to avoid unnecessary increase in the complexity of the model. Several well parameters are available to be used in the machine learning model; those parameters are obtained from many surface and subsurface gauges installed on the well. In general, wells equipped with surface gauges are more popular compared to the wells equipped with subsurface gauges, therefore, it is recommended to use surface parameters only to generate a model that can be generalized on the majority of the wells. The parameters and a detailed description of their purpose are discussed below:

Choke Valve Upstream Pressure / Downstream Pressure

The benefit of utilizing the pressure is that it gives almost instant indication as the pressure readings change rapidly after altering the well condition. Upstream pressure is measured before the choke while the downstream pressure is measured after it. Using only one of the pressure gauges alone might give inaccurate predictions since both gauges are exposed to the back pressure coming from other wells connected to the same flowline. This means that the flowline will have a pressure most of the time which might trick the model, if only one gauge is used, to predict that the well is producing while it is not. During the production, there is a difference between the two pressure readings which are caused by the pressure drop across the choke. In contrast, during shut-in period there will be no flow across the choke, hence, the pressure will be almost the same for both upstream and downstream gauges. Therefore, having both upstream and downstream pressures gives a direct indication of the well operating status.

Choke Valve Upstream Temperature / Downstream Temperature

Those two parameters do not provide direct and instant indication of the well operating status compared to the pressure. However, they provide a delayed indication which is used to confirm the operating status of the well. The temperature of the flowing hydrocarbons is usually greater than the temperature of the surrounding atmosphere. Hence, the gauges will give consistent reading of high temperature during flowing period. However, after shutting the well the hydrocarbons inside the pipes will start to cool down to the ambient temperature which confirms the prediction. Those two parameters perform better in high temperature wells since the difference between the flowing temperature and the shut-in temperature is high.

Choke Valve Position

Choke valve position refers to the choke opening percentage where 100% means fully open and 0% means fully close. Therefore, whenever the reading of choke position is zero the model should predict the well status to be shut-in. However, it is important to note that this parameter doesn't necessary indicates a flowing well whenever the reading is not 0%. This can be attributed to the fact that the well can be shut-in by closing previous valves while keeping the choke open.

Used Machine Learning Algorithms

Machine Learning (ML) represents one of the most exciting fields in the world of Industrial Revolution (IR) 4.0 because of its impact on industry within the domains of images, text, audio, natural language processing, predictive analytics and decision-making systems. It took years of continuous research and new findings to make this revolution possible (Ciaburro & Jannace, 2021). Most of this research is behind algorithm design,

which in turn led to a large number and significant variation of machine learning algorithms. The paper is keen on studying seven (7) of the most prominent machine learning algorithms: linear regression, logistic regression, random forest, decision tree, support vector machines, Gradient Boosting Machine and artificial neural networks by determining their definitions, their main properties and the meanings of these properties; determining the degree of accuracy in each algorithm; exploring their advantages and disadvantages.

Linear Regression

Linear regression is one of the simplest and most widely used algorithms. Given one or more input variables x, it predicts a continuous quantitative target variable, y. Linear regression is used for prediction tasks when the relationship between the input and the target variable is deemed linear (Sarker, 2021). More precisely, it looks 'for the line that best fits the data' (in technical terms: for the line with the smallest prediction-error in a quadratic sense). With linear regression, you can decide on the purchasing price of a property, forecast sales in three months' time, or try to identify patterns in financial data.

Despite its simplicity, linear regression has many desirable properties: it is fairly easy to calculate the relative weight of the inputs, to understand the behavior of the model, as well as to efficiently compute and update the models in real time. However, linear regression makes several strong assumptions: it posits that the relationship between input and target variables is a linear relationship, which is not always the case in the real world. Linear regression is also highly sensitive to outliers, that is, data points that can hinder the model to sufficiently work.

Logistic Regression (LR)

Logistic regression, a cousin of linear regression, is a supervised machine learning algorithm used for binary classification problems. It models the probability of a binary response based on one or more input variables by estimating the parameters that best fit the data to a logistic curve. Logistic regression is particularly useful in scenarios such as credit risk assessment, email spam detection, and disease diagnosis, where the goal is to classify instances into one of two categories.

Among its many strengths is a general approach to handle both continuous and categorical input variables ease of interpretation of the coefficents, called log odds ratio, which – once one determines the base probability – allows analysts to understand the effect of each input variable on the outcome; simplicity of application, and wide applicability; given its generalized linear model approach, one can immediately run multiple analysis techniques on the same situation (Mahesh, 2020). Of course, logistic regression is only robust under the assumption of linearity between the input variables and the log odds ratio when that is not the case. Furthermore, logistic regression is vulnerable to outliers and cases of imbalanced data.

Random Forest (RF)

Random forest, an ensemble learning algorithm, takes a different approach by combining multiple decision trees to make predictions. It operates by constructing multiple decision trees from randomly sampled subsets of the training data and features, and outputting the class that is the mode of the classes (classification) or the mean prediction (regression) of the individual trees (Mahesh, 2020). This ensemble approach makes random forest robust to noise and outliers, and enables it to capture non-linear and complex relationships between input and target variables.

One of the key advantages of random forest is its ability to handle high-dimensional data and a large number of input variables, making it suitable for applications such as genomic data analysis and image recognition. It also provides feature importance measures, which can be used for feature selection and gaining insights into the most influential variables. However, random forest can be computationally expensive to train, especially for large datasets, and may require careful tuning of hyperparameters to achieve optimal performance.

Decision Tree (DecT)

Decision Tree (DecT) is one of the most popular machine learning algorithms. It can be used in either regression or classification ML problem types. DecT is a non-parametric supervised learning algorithm. It is a tree that consists of a root node, branches, internal nodes, and leaf nodes. The way that the decision tree works by starting at the root from the top, then asking the best questions to look for the most important feature, then the tree starts to branchout looking for an answer, and finally the process continues to repeat by asking more questions.

The decision tree algorithm can perform well if the features are correlated. However, the model is subject to overfitting, especially when there is a noise in the data. Also, DecT is sensitive to outliers i.e. it affects building the tree. Additionally, it is preferred to use DecT when having small data set as the model could overfit and become uncertain (Saini, 2021).

Support Vector Machines (SVMs)

Support vector machines (SVMs) are a powerful class of supervised machine learning algorithms used for both classification and regression problems. SVMs operate by finding the optimal hyperplane that maximizes the margin between the classes in the input space, effectively separating the classes as much as possible (Ciaburro & lannace, 2021). This approach makes SVMs particularly effective for high- dimensional data and non-linear problems, as they can map the input data into a higher-dimensional feature space using kernel functions.

A notable strength of SVMs is their resistance to overfitting and their robustness to generalize to new data, even when data for training is quite limited. In addition, SVMs produce explanatory models in the form of support vectors that explain the selected decision boundaries, thus allowing for interpretable methods (such as fraud detection, DNA sequence classification) and applications in the biomedical domain (Dhar et al., 2021). On the other hand, SVMs are prone to scaling issues and can be sensitive to the selection of kernel functions and hyperparameters, and for large datasets SVMs can be computationally costly.

Gradient Boosting Machine (GBM)

Gradient Boosting (GB) is a machine learning boosting. It is a composite model where it helps to minimize the prediction error when the best possible next model merged with the previous resulted models. GBM creates a strong model after learning from each weak model to reduce the mean squared error. This machine works by generating a powerful learner from the previous model' weak learners by using weak classifier.

One of the key advantages of Gradient Boosting Machine is that the sample distribution is not affected by GBM. In other words, new sampled distribution is not required for machine training as they are trained using the residual mistakes of the powerful learner. Moreover, there are several tuning alternatives of hyperparameter to be able in optimizing the loss functions and make them adaptable. Additionally, GBM does not require data pre-processing and it also handles missing data (Hendricks, 2024).

Artificial Neural Networks (ANNs)

Artificial neural networks (ANNs) are a class of machine learning algorithms inspired by the structure and function of biological neural networks. ANNs consist of multiple layers of interconnected nodes (neurons) that process input data, learn from examples, and make predictions or decisions. These networks can learn complex non-linear relationships between input and output data, making them powerful tools for tasks such as image and speech recognition, natural language processing, and predictive analytics.

Furthermore, ANNs are very well-suited to handle high-dimensional data and can therefore be applied to a wide range problem, such as classification, regression, and pattern recognition. Another strength of ANNs

is their ability tot generalize to new, previously unseen data if trained well. However, ANNs are computationally expensive to train, in particular for large networks and datasets, can suffer from overfitting without specific regularizing techniques, and their learned internal representations can be hard to interpret.

In conclusion, each of these machine learning algorithms has its unique strengths, properties, and applications. Linear regression and logistic regression are simple and efficient algorithms suitable for linearly separable problems, while random forest, support vector machines, and artificial neural networks are more powerful tools capable of handling non-linear and complex relationships. The choice of algorithm ultimately depends on the specific problem at hand, the nature of the data, and the desired trade-off between accuracy, interpretability, and computational complexity. As machine learning continues to evolve and find applications in an ever-increasing number of domains, it is crucial for researchers, data scientists, and practitioners to have a deep understanding of these algorithms, their properties, and their limitations. Only by mastering these tools can we unlock their full potential and drive innovation across various fields, from healthcare and finance to environmental sciences and beyond.

Best Performing Model

This experiment aimed to develop a reliable predictive model for well operating status using the collected data from real-time sensors at wells. We tested four ML algorithms, which were Gradient Boosting Machine (GBM), Support Vector Machine (SVM), Random Forest (rF), and Decision Tree (decT) algorithms to classify real-time well operating status. The dataset comprised over 203,163 rows collected over more than a year (175,866 Operating records and 27,297 Shut-in records). Various parameters were collected, including Choke Valve Position, Choke Valve Upstream Pressure, Choke Valve Downstream Pressure, Choke Valve Upstream Temperature, and Historical Operating Status.

The data was biased towards operating status and suffered from multi-collinearity, a statistical phenomenon where there is a strong correlation between two or more independent variables, making it difficult to identify the relationship between inputs and output. The data needed extensive cleaning and balancing. After applying various cleaning techniques, feature engineering, and collinearity tests, we balanced the data using over-sampling and under-sampling techniques, resulting in 101,997 Shut-In records and 101,166 Operating records in our training dataset.

To determine the best performing model for predicting well status, each model was evaluated based on its accuracy using a confusion matrix. Models were also cross-checked using other measures like Precision, Recall, and Area Under the Curve (AUC) for a comprehensive evaluation of accuracy. The Random Forest model emerged as the top performer with the highest mean accuracy.

Based on the performance, Random Forest was selected and was further evaluated using a confusion matrix on the testing data. The results were as follows (Table 2):

Descriptive Statistics	Minimum	1 st Quartile	Median	Mean	3 rd Quartile	Maximum	NA's
GBM	0.9813656	0.9821576	0.9831599	0.9830585	0.9836334	0.9853737	0
SVM	0.9744762	0.9762692	0.9769355	0.9769527	0.9774809	0.9793263	0
rF	0.9969062	0.9972753	0.9974685	0.9975178	0.9978026	0.9981718	0
decT	0.9722261	0.9741566	0.9758824	0.9758980	0.9770770	0.9797497	0

Table 1—Accuracy of each ML algorithm (Number of resamples = 30)

Reference							
Prediction	Operating	Shut-in					
Operating	30,244	28					
Shut-in	105	30,571					
	Î.						
Accuracy (Acc)	0.9978						
95% Confidence Interval (CI)	(0.9974, 0.9982)						
No Information Rate (NIR)	0.5021						
P-Value (Acc > NIR)	< 2.2e-16						
Kappa	0.9956						
Mcnemar's Test P-Value	4.397e-11						
Sensitivity	0.9965						
Specificity	0.9991						
True Positive Predicted Value	0.9991						
True Negative Predicted Value	0.9966						
Prevalence	0.4979						
Detection Rate	0.4962						
Balanced Accuracy	0.9978						

Table 2—Confusion Matrix and Statistics

Some key definitions of the obtained metrics:

Accuracy: Measures the overall correctness of the model. Here, it indicates that 99.78 % of the predictions were correct using confusion matrix.

Confidence Interval (CI): The range within which the true accuracy is expected to lie with 95% confidence. It suggests that the accuracy of the model will likely be between 99.74% and 99.82%.

Sensitivity: Also known as True Positive Rate, it measures the proportion of actual positives (Operating) correctly identified by the model. A sensitivity of 0.9965 indicates that 99.65% of operating statuses were correctly predicted.

Specificity: Also known as True Negative Rate, it measures the proportion of actual negatives (Shut-in) correctly identified by the model. A specificity of 0.9991 indicates that 99.91% of shut-in statuses werecorrectly predicted.

Balanced Accuracy: The average of sensitivity and specificity, providing an overall measure of model performance. Here, it is 0.9978, indicating balanced performance across both classes.

No Information Rate (NIR): Of the observed classes, it represents the greatest percentage.

P-Value: It can be described as the likelihood that there will be no impact or variation.

Kappa, or Cohen's Kappa: It is a statistical metric that evaluates, after adjusting for chance, the degree of agreement between the expected and observed classifications. It takes precision into account that is higher than what would be predicted by pure chance.

Prevalence: Out of all the observations, this value shows the number of true or positive cases that actually happened.

Detection Rate or True Positive Rate: It is the percentage of impacted cases that get a positive prediction.

The Random Forest model demonstrated exceptional accuracy and reliability in predicting well status, with minimal mis-classifications. This robust performance makes it an ideal choice for operational deployment to enhance decision-making processes regarding well status management. The predictive model will help in timely interventions, reducing downtime and maintenance costs, and optimizing the overall efficiency of reservoir management.

This detailed analysis underscores the importance of data cleaning, balancing, and thorough model evaluation in achieving high predictive accuracy, ensuring that the model can reliably assist in real-time operational decisions.

Well Operating Status Dashboard

After completing the model, a dashboard was developed. The resulting dashboard is comprised of three main tabs. The main tab contains the "Daily Predicted Well Status" (Figure 1).



Figure 1—Well Status Prediction (Daily) Dashboard

This tab incorporates three parts. The first part includes the summary of the number of wells and their operation status for a given field including:

1. A box containing the total number of wells for the specific field evaluated by the system.

2. A subsection for comparison of the operating status of wells based on the Database existing entry which requires manual updates.

3. A subsection for the predicted wells status for the number of Operating (green) and Shut-in well (red)

By reviewing this section in the dashboard, it enables viewing the well status from the database and compare with the predicted results. Thus, allowing proper reflection and update of the database well status for further analysis.

The second part of this section shows the all wells Real time predicted Well Operating Status (WOS). The list of all wells in the field are identified by color codes based on their real-time daily status by colors, green for operating and red for shut-in.

The third part under the "Daily Predicted Well Status" is the Well Operating Status part. This part shows the status by date for the list of wells in the field by the same color-coding as in the previous parts, where green category for operating during that specific date and red category for shut-in during the specified date.

Prediction Accuracy

The accuracy of the model was used as an evaluation metric and was examined on 26 wells for almost two weeks by comparing the predicted status with the daily reported actual well status. This period included several events such as shutting-in wells for a single or several days and then flowing them again. The model predicted the well status attaining around 99% accuracy. This suggests that the model is robust in identifying

the well status with high confidence, therefore, it can be used for several purposes such as production allocation.

Uncertainty Sources

It can be noticed that the model predicted the well status with high accuracy, however, in some instances the model provided inaccurate predictions. After investigating those cases, it was found that inaccurate predictions occurred mainly because of two reasons. The first reason is that the model was missing one or more input variables. For example, in one sample point the model had no pressure inputs, therefore, the model predicted the status without using any pressure data which introduced uncertainty to the model that led to inaccurate shut in prediction while in reality the well is producing. The other reason behind having inaccurate predictions is the low number of data points for a single day. For instance, one well was shut-in for a short period during early morning hours and then it was put back to production for the rest of the day, however, the model predicted that the well was shut-in for the whole day because the reported data points were at the shut-in period. This means that the model can inaccurately predict the well status if the needed parameters are not completely available, or when the data frequency is not sufficient. This issue can be resolved by ensuring that the model is fed with the required parameters at a sufficient frequency.

Recent developments in Machine Learning (ML) algorithms and technologies paved the way for further efficiency in many sectors including the oil and gas industry, specifically, well monitoring. The application of the Machine Learning (ML) in well operating status prediction has led to efficiently optimizing the rate allocation process ensuring accuracy of the recorded data and saving engineering manhours through the reflection of real-time and daily predicted status data from the dashboard. Moreover, the prediction for the well status has greatly enhanced the monitoring process to understand the wells contributing to production and the reservoir depletion strategy. Additionally, the benefit of this dashboard is more prominent when handling a large number of wells.

Conclusions

• The well status prediction model resulted an accuracy of 99% when comparing with actual well operating status.

• Inaccurate predictions are mainly due to features availability and amount of data used.

• Several machine learning techniques were used however Random Forest technique was found to be the most accurate technique.

• An interactive dashboard was created to monitor well operating status on daily basis to assist engineers optimizing the rate allocation process.

References

Ciaburro, G., & Iannace, G. (2021). Machine learning-based algorithms to knowledge extraction from time series data: A review. *Data*, **6**(6), 55.

Dhar, S., Guo, J., Liu, J., Tripathi, S., Kurup, U., & Shah, M. (2021). A survey of on-device machine learning: An algorithm and learning theory perspective. *ACM Transactions on Internet of Things*, **2**(3), 1–49.

Hendricks, R. (2024). What is the advantage of gradient boosting?. Retrieved from https://deepchecks.com/ question/what-is-the-advantage-of-gradient-boosting/# on June 3, 2024

Mahesh, B. (2020). Machine learning algorithms-a review. *International Journal of Science and Research* (*IJSR*). [*Internet*], **9**(1), 381–386.

Saini, A. (2021). *What is Decision Tree?* [A Step-by-Step Guide]. Retrieved from https:// www.analyticsvidhya.com/blog/2021/08/decision-tree-algorithm/ on June 3, 2024

Sarker, I. H. (2021). Machine learning: Algorithms, real-world applications and research directions. *SN computer science*, **2**(3), 160.

EVENTS

SPE events calendar – local and international

LOCAL – UK

February 13, 2025 (London, England) The non-stop driller – save time and tools! Key points:

- Save rig time with continuous circulation
- Temperature control, keep expensive BHAs cool
- Case histories, including MPD, ERD, HPHT and geothermal wells
- Proven stuck pipe prevention method
- The safest, user friendly and cost-effective system on the market

The speaker is Chris Lawrence, NSD/QSHE supervisor, ADRILLTECH

More information: SPE London

September 2-5, 2025 (Aberdeen, Scotland) SPE Offshore Europe Conference & Exhibition

The transition to a sustainable energy future depends on our industry. SPE Offshore Europe helps the offshore energy value chain to accelerate the transition to a better energy future by uniting the power of expertise, knowledge and innovative technology to drive progress. OE is a platform for collaboration, progress and results, designed by the industry for the industry. We set our sights on the next frontier: mapping the journey to a sustainable, better energy future.

More information: SPE Offshore Europe

INTERNATIONAL

February 04-06, 2025 (New Orleans, USA) SPE Hydraulic Fracturing Technology Conference and Exhibition

This highly anticipated event will convene industry pioneers from around the world to explore groundbreaking developments and best practices in hydraulic fracturing.

This event offers an unparalleled opportunity to connect with influential professionals, gain insights into emerging trends, explore the latest technologies and shape your career through exceptional networking opportunities. More information: **SPE conference**

March 04-06, 2025 (Stavanger, Norway) SPE/IADC International Drilling Conference and Exhibition

With unrivalled technical content on strategies, discussions on drilling advancements, and and exploration of cutting-edge technology, this is a must-attend event for all drilling professionals. It is developed by the industry for the industry and is the perfect forum to learn, network, and showcase. It brings together operator companies, contractor firms, and service companies to address challenges and deliver improved performance. More information: **SPE drilling conference**

April 09-10, 2025 (Galveston, Texas, USA)

SPE International Conference on Oilfield Chemistry Attendees can expect to be immersed in the forefront of innovation as the event unveils the latest advancements in chemical technologies spanning drilling and completions, production and operations, and reservoir management. With over five decades of industry evolution, participants will have the opportunity to witness firsthand the remarkable strides in oilfield chemistry. Don't miss this chance to shape the future of the industry!

More information: Conference Texas 2025

May 12-14, 2025 (Oman) Oman Petroleum and Energy Show

Oman Petroleum & Energy Show (OPES) is the only event in Oman that serves the entire oil, gas, and energy industry. Under the patronage of the Ministry of Energy and Minerals (MoEM), OPES provides an effective business and networking platform, serving as a key meeting point for energy professionals, oil and gas companies, policy and decision makers, and stakeholders. At the SPE Conference, top experts will discuss new challenges and opportunities in the oil and gas sector. More information: **Oman Petroleum and Energy**

For a complete listing of all events on the SPE Global Events Calendar: spe.org/en/events/calendar/ And, for more information about SPE training courses, calls for papers, and opportunities for SPE London sponsorship: SPE London

ADMINISTRATIVE

Meet the Team - please see the SPE London website

The Society of Petroleum Engineers (SPE) is a not-for-profit professional association whose more than 140,600 members in 144 countries are engaged in oil and gas exploration and production. The SPE London board oversees the SPE London activities including our evening programme and other events. Our different committees have specific focus for the members including Young Professionals, Women in Energy, Net Zero, and associated student chapters. As well as engineers who make up our core, we also welcome qualifications in geology, geophysics, earth science, environment, health and safety, mathematics, information technology, as well as management and economics.





Past Chai n Dizayee



urer: Farid Hadiamar







Elizaveta Poliakova













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Carolina Coll

Net Zero Chair: Max Richards

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SPE policy on AI-generated content in publications

SPE Policy on AI-Generated Content in Publications

The SPE Board has approved a new policy allowing AI-generated content to be used within SPE publications under specific conditions.

Al-assisted language tools (such as ChatGPT) have gained widespread attention recently, particularly for their capability to assist in drafting scientific papers. While these tools have the potential to enhance the efficiency and speed of academic and technical writing, the ethics and best practices for their use are still evolving. These tools may generate useful information and content but are also prone to errors and inconsistencies. **The SPE Board has approved a new policy for authors who use Al language tools** to generate content for their papers. The policy states that Al-generated content may be used within SPE publications but under specific conditions.

• Al language tools may not be listed as an author. The Al tool cannot sign publishing agreements or transfers of copyright.

• Any AI-generated content that is used within a manuscript should be thoroughly vetted, fact checked, and disclosed.

• If AI language tools are used within a manuscript, their use should be clearly explained within the methodology or acknowledgment section of the paper. If AI-generated content is included within a manuscript without an explanation, this can be grounds for rejection of the work at the discretion of SPE and may result in a code of conduct review.

• The authors of the manuscript will be held responsible for any errors, inconsistencies, incorrect references, plagiarism, or misleading content included from the AI tool.

It is important to note that technology for AI language tools is advancing rapidly. SPE plans to periodically review and update this policy to ensure its relevance and effectiveness. Any modifications to the policy will be communicated transparently and in a timely manner.



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