



2024

Urja Varta

Collaborate • Innovate • Synergize

Date: 11-12 July 2024

Venue: Bharat Mandapam, New Delhi

Foreword

Dear Patron,

It is my distinct honor and pleasure to welcome you all to **UrjaVarta 2024**, a collaborative endeavor organized by Directorate General of Hydrocarbon (DGH). This event marks a significant milestone in our ongoing efforts to advance India's energy sector and harness the full potential of our hydrocarbon resources.

India's position as the third-largest energy consumer globally underscores the critical importance of the Exploration and Production (E&P) sector in driving our economic growth and ensuring energy security. With escalating energy demands and progressive policies, the opportunities within the upstream sector are immense and promising. UrjaVarta 2024 is poised to become a cornerstone event, fostering collaboration, innovation, and strategic investments.

The theme of UrjaVarta 2024, **"Collaborate, Innovate, Synergize,"** reflects our commitment to create a dynamic platform where industry leaders, policymakers, and experts can converge to share insights, discuss challenges, and explore innovative solutions. The conclave will feature a rich agenda of insightful sessions, an exhibition zone showcasing the latest advancements, and numerous networking opportunities designed to forge meaningful partnerships.

The agenda of the conclave is thoughtfully curated to address the most pressing issues and emerging trends in the upstream sector, aiming to provide attendees with a comprehensive understanding of the landscape and future directions.

On behalf of Directorate General of Hydrocarbon, I welcome all the speakers and participants, to engage actively, share insights, and explore collaborative opportunities. Your support and engagement are vital to the success of this conclave and to the broader mission of advancing our energy sector.

We are confident that UrjaVarta 2024 will serve as a catalyst for transformative change, driving innovation and excellence in the upstream sector. Together, let us embark on this journey of discovery, innovation, and progress for the success of our industry and prosperous energy future for India.



Dr. Pallavi Jain Govil, IAS

Director General

Directorate General of Hydrocarbon (DGH)

Ministry of Petroleum and Natural Gas

Speakers

Dignitaries



Shri Hardeep Singh Puri
Hon'ble Minister of Petroleum
and Natural Gas



Shri Suresh Gopi
Hon'ble Minister of State Petroleum
and Natural Gas and the Ministry of Tourism



Mr. Pankaj Jain
Secretary
Ministry of Petroleum
and Natural Gas



Mr. Praveen Mal Khanooja
Additional Secretary
Ministry of Petroleum
and Natural Gas



Dr. Pallavi Jain Govil
Director General (DG)
Directorate General of
Hydrocarbons (DGH)



Ms. Varsha Sinha
Secretary
Oil Industry Development
Board



Mr. Dinesh Dayanand Jagdale
Joint Secretary
Ministry of New and Renewable
Energy (MNRE)



Mr. Sujit Kumar Bajpayee
Joint Secretary
Ministry of Environment,
Forest & Climate Change
(MoEFCC)



Mr. Arun Kumar Singh
Chairman
Oil and Natural Gas
Corporation
Limited (ONGC)



Dr. Ranjit Rath
Chairman & Managing Director
Oil India Limited (OIL)



Ms. Barnali Baruah Tokhi
Managing Director
Bharat Petro Resources
Limited (BPRL)



Mr. Anish De
Partner and Global Head
ENRC
KPMG International



Mr. Kartikeya Dube
Country Head - India
bp



Mr. Pankaj Kalra
CEO
Essar Oil and Gas Exploration
and Production Limited



Mr. Steeve Moore
Deputy CEO
Oil & Gas, Vedanta Limited



Ms. Sushma Rawat
Director (Exploration)
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. Pankaj Kumar
Director (Production)
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. O.P. Singh
Director (T & FS)
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. Sanjay Kumar
Director Marketing
GAIL (India) Limited



Ms. Rashmi Govil
Director (HR)
Indian Oil Corporation
Limited (IOCL)



Mr. Jim White
Executive Director
Society of Exploration
Geophysicists



Mr. David Hume
Domain Expert
University of Houston



Mr. Rajesh K Mendiratta
MD and CEO
Indian Gas Exchange
Limited (IGX)



Mr. Ajit Kumar Thakur
CEO
Indradhanush Gas Grid
Limited (IGGL)



Mr. Anil Bhatia
VP and MD
Emerson India



Mr. Neeraj Sethi
Area Director,
India and Bangladesh,
Baker Hughes



Mr. Ashutosh Kumar
Chief Operating Officer (COO)
Oilmax Energy
Private Limited



Mr. Pankaj Goswami
Director (Operations)
Oil India Limited (OIL)



Mr. Saloma Yomdo
Executive Director
Oil India Limited (OIL)



Mr. Bishwanath Ghosh
Director (Exploration)
Vedanta Limited



Dr. Hemanta Sarma
Professor
University of Calgary



Mr. Ranajit Banerjee
Advisor
HDFC Bank Limited



Ms. Kaumudi Sharma
Deputy Director,
Department of Economic Affairs,
Ministry of Finance



Mr. S. Roychaudhary
Director
Selan Exploration
Technology Limited



Mr. Deepak Agarwal
Director Sales and Marketing
Schlumberger



Mr. K Raghavan
Chief Technical Officer,
Hindustan Oil Exploration
Company Limited



Mr. Mandeep Narang
Director-Operations
Vedanta Limited



Mr. Ashish Verma
Global Account Director
Schlumberger(SLB)



Mr. Arun Mittal
Executive Director
Oil Industry Safety
Directorate (OISD)



Mr. Ajay Dixit
Executive Director
Corporate HSE,
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. Manish Maheshwari
Executive Chairman
Invenire Energy Private
Limited



Mr. Atul Patni
Head Digital
Vedanta Limited



Mr. Dustin Fife
Head of Subsurface Group
Reliance Industries
Limited



Mr. Chitwan Garg
Divisional Country Manager
Schlumberger



Ms. Moyalama Kromah
Head Technical Solutions
bp



Ms. Pomila Jaspal
Ex-Director (Finance)
Oil and Natural Gas
Corporation Limited (ONGC)



Ms. Mandira Jain
Head-HSE
Schlumberger (SLB)



Mr. Anurag Sharma
Ex-Director
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. S. K. Moitra
Ex-Director
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. T. K. Sen Gupta
Ex-Director
Oil and Natural Gas
Corporation Limited (ONGC)



Mr. John Chapman
Regional Service
Manager - APAC
Halliburton



Mr. Rajesh Kumar Srivastava
Country Head
Aperion Management



Dr. Manas Kumar Sharma
Ex- Director
Oil India Limited (OIL)



Dr. P. Chandrasekaran
Ex- Director
Oil India Limited (OIL)



Ms. Hitesh Sachdeva
Partner
KPMG India



Mr. N.K. Bharali
Ex-Director
Oil India Limited (OIL)



Mr. Vivek Rahi
Partner
KPMG India



Mr. Tevfik Kaya
Manager New Energy-MENA
Geothermal & CC
Schlumberger



Mr. Sushant Rabra
Partner
KPMG India



Mr. Sanjay Govind Nikoshe
CGM (HSE-CO)
Oil India Limited (OIL)



Mr. Aman Sethi
Director
KPMG India



Dr. Vikram Vishal
Professor
IIT Bombay



Mr. R Shailesh Unnithan
Chief General Manager
PF&S SBU,
State Bank of India



Ms. Swati Garg
Manager
KPMG India



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better,
Drilling
deeper,
Monetizing
faster.**



What is UrjaVarta 2024?

As India's energy sector is progressively moving towards the path of energy transition, energy security serves as a backbone for reliable and continual energy access to 140 crores citizens of India. India is successfully navigating the complexities in global energy market by adopting 4-plank energy security strategy based on increasing Exploration and Production efforts, diversifying supplies, usage of alternate energy sources and moving towards green energy to ensure a sustainable future. India's exploration and production sector continues to play a pivotal role in meeting the nation's energy demands and propelling economic growth. With India striving to boost domestic oil and gas production to satisfy its escalating energy requirements and reduce reliance on imports, stakeholders are exploring innovative strategies across exploration, development and production. The goal is to

attract investments, leverage leading practices, and deploy advanced technologies to unlock the vast potential of its hydrocarbon resources, much of which remains still untapped.

Aligned with the goal, Directorate General of Hydrocarbon (DGH) is delighted to host UrjaVarta 2024, a two-day event designed to serve as a strategic forum for industry operators, policymakers, service providers, experts, think tanks, and academia to exchange knowledge, network, and collaborate towards realizing the full potential of India's upstream hydrocarbon resources in a sustainable manner. This two-day event is focused on the themes that are essential for the resilience and growth of the industry, emphasizing the importance of collaborative efforts, policy incentives, technology and digital solutions, emerging business opportunities, and decarbonization.



Thematic areas for the conclave

Theme -1

Collaboration and Partnerships

In a highly interconnected global economy, the resilience of the upstream sector hinges on the ability to collaborate effectively across various domains. This theme will explore strategies that can energize collaboration between industry, policy makers and other relevant stakeholders to drive implementable and scalable innovations. The sessions within the theme will delve into:

- Exploring avenues for the nation to harness its untapped potential to pioneer new frontiers and emerge as a global leader in exploration.
- Emerging trends, innovative financing models, and the role of financial institutions in driving E&P growth.
- Strategies for effective joint operations and resource sharing.



Theme -2

Technology Innovation

Technological innovation is the cornerstone of progress in the E&P domain. This theme will focus on cutting-edge technologies that are transforming E&P operations, enhancing efficiency, and cost optimization. Specific themes for the discussion would include:

- Insights into innovations in exploration technology such as advanced seismic imaging and data interpretation techniques etc.
- Technical advancements in drilling, covering innovative tools, techniques, and methodologies aimed at optimizing drilling operations.
- New-age technologies specifically tailored for increasing productivity of the field.



Theme -3

Digital Transformation of upstream operations

Digital transformation is revolutionizing the upstream oil and gas sector, driving efficiencies, reducing costs and enabling data-driven decision making. With quantum leap in the technology – low-cost sensors, high data connectivity, faster computing and self-learning capabilities, a holistic approach needs to be adopted to reshape the existing business and operating models to ensure a far-reaching transformational impact. This theme will explore emerging digital technologies and their impact in E&P operations including the following:

- Opportunities in leveraging digital technologies to optimize exploration, drilling production.
- Case studies on the implementation of digital technologies such as AI, IoT, and big data analytics in E&P.
- Demonstrations of digital tools and platforms from startups, academia and industry experts for enhancing operational efficiency.



Theme - 4

Policy and Regulatory incentives

Regulatory frameworks and policy interventions are critical in shaping the business landscape of the upstream sector. The session will explore how the sector is evolving with the current policy framework and explore incentives that can attract investments, drive innovation and enhance ease of doing business in the sector. In particular, it will discuss:

- Policy gaps and recommendations for enhancing E&P outputs.
- International policy and regulatory frameworks and its relevance in Indian context.
- Steps required by the government to improve ease of doing business especially in the statutory approval process.
- Role of regulators to encourage E&P industry collaboration to drive resources, technology and infrastructure sharing.



Theme - 5

Decarbonizing the Upstream Operations

Considering the global trend of moving towards greener fuels in line with the aim of reducing carbon emissions, there is a requirement to greening E&P operations which is crucial for reducing the environmental impact of the upstream sector. This theme will focus on strategies and technologies aimed at minimizing carbon footprints and promoting green practices. In particular, it will discuss:

- Approaches for aligning business strategies with decarbonization goals
- Case studies on successful implementation of sustainable practices in E&P operations
- Role of government institutions in enabling decarbonization including carbon credits, CCUS/CCS, green hydrogen, geothermal etc.
- Global leading E&P practices ensuring reduction of carbon emissions.



Theme - 6

Emerging Investment Opportunities in the Upstream Sector

As the upstream sector evolves, new business opportunities are emerging, driven by market dynamics, technology and digital innovations, and policy shifts. This theme will explore these opportunities, providing insights into investment prospects, market trends, and strategic growth areas. The sessions within the theme will delve into:

- Promising prospects for investment in the E&P sector and policy reforms that enhance ease of doing business.
- Case studies of innovative business models that are succeeding in the upstream sector.
- Insights into attracting and managing investments in the upstream sector.





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AGENDA

UrjaVarta 2024

Date: 11th July 2024, Thursday

Venue: Bharat Mandapam, New Delhi

Inaugural Session	
08:30 AM - 10:30 AM	Registration and Networking
10:30 AM - 10:35 AM	Lighting of the Lamps
10:35 AM - 10:40 AM	Short Documentary on Indian Energy Sector
10:40 AM - 10:45 AM	Welcome Address by the DG, DGH
10:45 AM - 10:50 AM	Launch by Hon'ble Minister, PNG <ul style="list-style-type: none"> Centre for Hydrocarbon Efficiency and New Energy India Hydrocarbon Outlook 2023-24 Handbook for Environmental Guidelines for Upstream
10:50 AM - 11:05 AM	Address by Hon'ble Minister, PNG
11:05 AM - 11:15 AM	Inauguration of Exhibition Gallery and Innovation Centre by Hon'ble Minister, PNG
11:15 AM - 11:45 AM	Networking Tea with Hon'ble Minister, PNG with CXO's
Strategic Summit	
Panel I 11:30 AM - 12:15 PM	Navigating New Frontiers: Unveiling India's Exploration Potential In a rapidly evolving global landscape, where innovation and exploration pave the way for progress, India stands at the threshold of new possibilities. This panel seeks to delve into the theme of "Navigating New Frontiers," focusing specifically on unveiling India's exploration potential across various domains. From technological advancements to scientific endeavors, economic opportunities, and beyond, the panel aims to explore how India can harness its untapped potential to pioneer new frontiers and emerge as a global leader in exploration. Moderator: Mr. Vivek Rahi (Partner, KPMG India) Speakers: <ul style="list-style-type: none"> Mr. Praveen Mal Khanooja (Additional Secretary, Ministry of Petroleum and Natural Gas) Ms. Sushma Rawat (Director-Exploration, Oil and Natural Gas Corporation) Mr. Saloma Yomdo (Executive Director, Oil India Limited) Mr. Bishwanath Ghosh (Director-Exploration, Vedanta Limited) Mr. David Hume (Domain Expert, University of Houston) Mr. Jim White (Executive Director, Society of Exploration Geophysicists)
Panel II 12:15 PM - 01:00 PM	Policy Perspective: Navigating Energy Trilemma In today's complex energy landscape, policymakers face the challenge of balancing three critical objectives: energy security, affordability, and environmental sustainability - known as the energy trilemma. This session aims to explore the policy perspective on navigating this trilemma, ensuring a sustainable and resilient energy future. Moderator: Mr. Anish De (Partner and Global Head ENRC, KPMG International) Speakers: <ul style="list-style-type: none"> Dr. Pallavi Jain Govil (Director General, Directorate General of Hydrocarbon) Mr. Sujit Kumar Bajpayee (Joint Secretary, Ministry of Environment, Forest and Climate Change) Dr. Ranjith Rath (Chairman and Managing Director, Oil India Limited)

	<ul style="list-style-type: none"> • Mr. Steve Moore (Dy. Chief Executing Officer-Oil and Gas, Vedanta Limited) • Mr. Kartikeya Dube (Head of Country, bp Exploration Alpha Limited) • Mr. Arun Kumar Singh (Chairman & CEO, Oil and Natural Gas Corporation Limited)
01:00 PM - 02:00 PM	Networking Lunch
Panel III 02:00 PM – 02:45 PM	<p>Fueling the Future: Strategic Financing in the Energy Sector</p> <p>As the energy sector, particularly upstream oil and gas sector, undergoes rapid transformation driven by increasing capex, technological innovation and climate imperatives, strategic financing plays a pivotal role in shaping its trajectory. The session is curated with an aim to explore the dynamics of strategic financing in the energy sector, focusing on emerging trends, innovative financing models, and the role of financial institutions in driving energy availability and affordability.</p> <p>Moderator: Mr. Hitesh Sachdeva (Partner, KPMG India)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Ms. Kaumudi Sharma (Deputy Director at Indian Ministry of Finance) • Mr. Ranajit Banerjee (Advisor, HDFC Bank Limited) • Mr. Manish Maheswari (Executive Chairman, Invenire Energy Private Limited) • Shri R Shailesh Unnithan (Chief General Manager PF&S SBU, State Bank of India)
Panel IV 02:45 PM – 03:30 PM	<p>Production Enhancement: Challenges and Opportunities</p> <p>This session aims to delve into the current challenges and emerging opportunities in enhancing production within the upstream oil and gas sector. It will provide a platform for industry leaders, experts, and policymakers to discuss innovative solutions, share best practices, and outline strategic initiatives to optimize production efficiency and maximize resource recovery.</p> <p>Moderator: Mr. Vivek Rahi (Partner, KPMG India)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Pankaj Kumar (Director-Production, Oil and Natural Gas Corporation Limited) • Mr. Pankaj Goswami (Director- Operations, Oil India Limited) • Mr. S. Roychaudhury (Director, Selan Exploration Technology Limited) • Mr. Deepak Agarwal (Director – Sales and Marketing Southeast Asia, Schlumberger) • Dr. Hemanta Sarma (Professor, University of Calgary)
Panel V 03:30 PM – 04:15 PM	<p>Developing Gas Markets and Connectivity with Consumers</p> <p>This panel aims to explore the changing dynamics of gas markets, focusing on infrastructure development, market integration, policy frameworks, and consumer engagement. The session will discuss the challenges and opportunities in enhancing gas market connectivity and ensuring a reliable and efficient gas supply to end consumers.</p> <p>Moderator: Mr. Anish De (Partner and Global Head ENRC, KPMG International)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Sanjay Kumar (Director Marketing- GAIL (India) Limited) • Mr. Ajit Kumar Thakur (Chief Executing Officer, Indradhanush Gas Grid Limited) • Mr. Rajesh K Mediratta (Managing Director and Chief Executing Officer, India Gas Exchange Limited) • Mr. Pankaj Kalra (CEO, Essar Oil and Gas Exploration and Production Limited)

<p>Panel VI 04:15 PM- 05:00 PM</p>	<p>Health, Safety and Environment (HSE) in Upstream</p> <p>This session aims to delve into the critical intersection of health, safety, and prosperity within the realm of exploration and production operations. As the energy industry continues to evolve, ensuring the well-being of workers while maximizing operational efficiency and prosperity is of utmost importance. Through insightful presentations, case studies, and expert insights, this session will explore innovative strategies and best practices to foster a culture of safety, enhance occupational health standards, and drive sustainable growth in exploration and production endeavors.</p> <p>Moderator: Mr. Anurag Sharma (Ex-Director Onshore, Oil and Natural Gas Corporation Limited)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Arun Mittal (Executive Director, Oil Industry Safety Directorate) • Ms. Mandira Jain (Country Head-HSE, Schlumberger) • Mr. Ajay Dixit (Executive Director, CHSE, Oil and Natural Gas Corporation Limited) • Mr. Sanjay Govind Nikoshe (Chief General Manager- Head of Corporate HSE, Oil India Limited)
<p>6:30 PM- 8:00 PM</p>	<p>Cultural Programme</p>
<p>8:00 PM Onwards</p>	<p>Networking Dinner</p>
<p>Technical Conference</p>	
<p>Session I 11:30 AM - 12:15 PM</p>	<p>Production Optimization and Enhancement Technologies</p> <p>In the ever-evolving landscape of the oil and gas industry, the adoption of emerging technologies is crucial for maximizing production efficiency, reducing costs, and optimizing asset performance. This session will feature a series of technical presentations by industry experts on cutting-edge technologies specifically tailored for enhancing production of hydrocarbon.</p> <p>Session Chair: Mr. Sanjay Kumar Moitra, Ex-Director Onshore, Oil and Natural Gas Corporation Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Chris Freeman and Mr. Vinod Raghothamarao (GaffneyCline) • Mr. Sunil Rastogi (Sun Petrochemicals Private Limited) • Mr. Adarsh Kumar (Essar Oil and Gas Exploration and Production Limited) • Mr. Aman Saraf (Schlumberger)
<p>Session II 12:15 PM- 01:00 PM</p>	<p>Advancement in Drilling Technologies</p> <p>Drilling technology plays a pivotal role in the exploration and extraction of hydrocarbon resources, driving efficiency, safety, and cost-effectiveness in the oil and gas industry. This session will feature presentations by industry experts on recent technical advancements in drilling, covering innovative tools, techniques, and methodologies aimed at optimizing drilling operations.</p> <p>Session Chair: Mr. Anurag Sharma, Ex-Director Onshore, Oil and Natural Gas Corporation Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Md Imtiaz (Oil and Natural Gas Corporation Limited) • Mr. Dheeraj Kapoor, Mr. Akash Tyagi and Mr. Pramit Chakraborty (Halliburton) • Mr. Satheesh Srinivasan (Schlumberger) • Mr. Md. Sameer (Oil India Limited)
<p>01:00 PM- 02:00 PM</p>	<p>Networking Lunch</p>

Technical Conference	
<p>Session III 02:00 PM– 02:45 PM</p>	<p>Decommissioning Best Practices</p> <p>As oil and gas fields reach the end of their productive lives, decommissioning becomes a critical aspect of sustainable resource management and environmental stewardship. This session will feature presentations by industry experts on the future of decommissioning oil and gas wells, focusing on strategies, technologies, and regulatory considerations for safe and cost-effective decommissioning operations.</p> <p>Session Chair: Mr. T.K Sengupta, Ex-Director Offshore, Oil and Natural Gas Corporation Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Rajagopal Mahalingam and Mr. Udhayasankar (Shell) • Mr. Gurjot Singh (Oceaneering International Limited) • Mr. Amit Jain, Mr. Praveen Bhat and Mr. Rachit Agarwal (Oil and Natural Gas Corporation Limited) • Mr. Keshab Baishya (Directorate General of Hydrocarbons)
<p>Session IV 02:45 PM – 03:30 PM</p>	<p>Unconventional Energy Sources: Potential and Challenges</p> <p>Unconventional energy sources, such as Tight oil and gas, CBM, Shale Oil and Gas, Gas Hydrates etc. are gaining traction as optional resources to traditional fossil fuels. This panel will explore the potential and challenges associated with these energy sources.</p> <p>Session Chair: Mr. Dustin Fife, Head-Subsurface Group, Reliance Industries Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Ryan Clerico, Mr. Riho Kruuv and Mr. Mohammed Layachi (Enefit Outotec Technology and Eesti Energia AS) • Mr. Troyee Dasgupta, Mr. Dipanjan Maiti, Mr. Adarsh Kumar and Mr. Karan Raj, (Essar Oil and Gas Exploration and Production Limited) • Mr. Rajeev Upadhyaya, Mr. Saurabh Datta Gupta, Mr. Ashutosh Kumara, Mr. Raj Kirana, Mr. Vinay Kumar Rajaka (IIT-Indian School of Mines) • Mr. Jagadish Chand and Mr. Bibhu Parida (Reliance Industries Limited)
Technical Conference	
<p>Session V 03:30 PM– 04:15 PM</p>	<p>Energizing Role of Artificial Intelligence (AI) and Machine Learning (ML) in E&P</p> <p>Artificial Intelligence (AI) and Machine Learning (ML) are transforming the oil industry, optimizing processes, reducing costs, and enhancing decision-making. This panel will explore how these technologies are reshaping oil production.</p> <p>Session Chair: Dr. P. Chandrasekaran, Ex-Director, Oil India Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Nirbhay Kumar Mishra, Mr. Aaheli Bhattacharjee, Mr. Deepesh Khandelwal, Mr. Nakul Varma, Mr. Vaibhav Deshpande, Ms. Nandhini D, Ms. Tejashwini, Ms. Nandita Gussain and Ms. Meenu Gupta (Schlumberger) • Mr. Umang Nagpal, Mr. Ayush Kumar and Mr. Santosh Dhubia (Oil and Natural Gas Corporation Limited) • Mr. Arun Babu Nalamara, Mr. VR Sundar, Mr. Manabesh Chowdhury, Mr. Pinakadhar Mahapatra (SETPL) • Mr. Bappa Mukherjee, Mr. Kalachand Sain (Wadia Institute of Himalayan Geology)

Session VI

04:15 PM- 05:00 PM

Opportunities and Challenges in Emerging Indian Offshore Basins

India offshore basins offers significant opportunities due to their untapped hydrocarbon reserves which underscores the need for a balanced approach to maximize the potential. This session will delve into how these opportunities can be harnessed while addressing the inherent challenges, paving the way for resilient and thriving offshore energy sector in India.

Session Chair: Mr. David Hume, University of Houston

Presentors:

- Mr. Subodh Notiyal, Verity Agar (TGS)
- Mr. Soumen Paul, Mr. Sivaprabha S., Mr. Ujjwal Nandi, Sonu, Mr. Sanjay Goswami, Mr. D C Pant, (Oil and Natural Gas Corporation Limited)
- Ms. Rachaita Sen, Mr. Dibyendu Chatterjee, Ms. Madhumita Jana, Ms. Moumita Sengupta, Ms. Shakti Jain, Ms. Monosvita Chaliha, Mr. Kondal Reddy (Vedanta Limited)
- Ms. K.B Bhavya (Oil and Natural Gas Corporation Limited)

Date: 12th July 2024, Friday

Venue: Bharat Mandapam, New Delhi

Strategic Summit	
<p>Spotlight Session by DGH 10:00 AM – 10:45 AM</p>	<p>Emerging Opportunities for Investments in E&P Sector</p> <p>The exploration and production (E&P) sector remains pivotal in meeting global energy demands, and with evolving market dynamics and policy reforms, new opportunities for investment continue to emerge. This session will delve into the promising prospects for investment in the E&P sector, focusing on new blocks on offer and policy reforms that enhance ease of doing business.</p> <p>Moderator: Ms. Neha Bhagat (Directorate Generate of Hydrocarbons)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Presentation by Mr. Gautam Sinha (Advisor-Strategy and Planning) on policy reforms for ease of doing business • Presentation by Dr. Kaustav Nag (Additional Director General (Exploration)) on exploration opportunities in Indian basin • Presentation by Mr. Sachiv Kumar (Additional Director General (Development)) Opportunities on DSF and CBM fields • Presentation by Ms. Pooja Verma (DGH) on enhancing efficiency in clearances related to environment: A case study of DGH
<p>Panel VII 10:45 AM- 11:30 AM</p>	<p>Decarbonizing E&P: Challenges and Charting the Path Forward</p> <p>As the world transitions towards a low-carbon future, decarbonizing the exploration and production (E&P) sector is imperative to support the government of India in realizing net zero 2070 goal and mitigate the impact of climate change. This session will focus on the challenges and opportunities associated with decarbonizing E&P operations, with a particular emphasis on usage of Carbon Capture and Utilization Storage (CCUS) technology, hydrogen and renewable energy etc. while charting the path forward towards sustainable energy practices.</p> <p>Moderator: Mr. Anish De (Partner and Global Head ENRC, KPMG International)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. Dinesh Dayanand Jagdale (Joint Secretary, Ministry of New and Renewable Energy) • Mr. Neeraj Sethi (Area Director, Baker Hughes Oilfield Services India Private Limited) • Mr. Ashish Verma (Clean Energy, Schlumberger) • Dr. Vikram Vishal (Professor, Indian Institute of Technology Bombay)
<p>Panel VIII 11:30 AM – 12:15 PM</p>	<p>Empowering Industry Landscape: Collaborative Resource Sharing</p> <p>Collaborative resource sharing between large and small oil and gas producers presents a unique opportunity to optimize resource utilization, enhance operational efficiency, and foster industry collaboration. This session will explore the potential benefits, challenges, and best practices associated with collaborative resource sharing initiatives in the oil and gas industry.</p> <p>Moderator: Mr. Aman Sethi (Director, KPMG India)</p> <p>Speakers:</p> <ul style="list-style-type: none"> • Mr. R K Srivastava (Country Head, Apeiron Management) • Mr. Ashutosh Kumar (Chief Operating Officer, Oilmax Energy Private Limited) • Ms. Moyalama Kromah (Head Technical Solutions, bp Exploration Alpha Limited) • Mr. K Raghavan (Chief Technical Officer, Hindustan Oil Exploration Company Limited) • Mr. Mandeep Narang (Director-Operations, Vedanta Limited)

<p>Panel IX 12:15 PM – 1:00 PM</p>	<p>Women in Oil and Gas sector</p> <p>The session aims to bring spotlight to the critical role of women in the oil and gas industry, with a focus on exploration and production (E&P). This panel will explore the challenges, successes, and future opportunities for women in oil and gas sector.</p> <p>Moderator: Ms. Swati Garg (Manager, KPMG India)</p> <p>Speakers:</p> <ul style="list-style-type: none"> Ms. Varsha Sinha (Secretary, Oil Industry Development Board) Ms. Barnali Baruah Tokhi (Managing Director, Bharat PetroResources Limited) Ms. Rashmi Govil (Director HR, Indian Oil Corporation Limited) Ms. Pomila Jaspal (Ex-Director Finance, Oil and Natural Gas Corporation Limited)
<p>01:00 PM- 02:00 PM</p>	<p>Networking Lunch</p>
<p>02:00 PM – 02:30 PM</p>	<p>Address by Hon’ble Minister of State Shri Suresh Gopi</p>
<p>Panel X 02:15 PM – 03:00 PM</p>	<p>Digital Transformation in Upstream Operations</p> <p>The upstream sector of the oil and gas industry is undergoing a profound transformation driven by digital technologies, paving the way for enhanced efficiency, productivity, and decision-making capabilities. This session will delve into the various aspects of digital transformation in upstream operations, exploring the latest trends, challenges, and opportunities in leveraging digital technologies to optimize exploration, production, and reservoir management activities such as IoT-enabled smart sensors for equipment monitoring, AI-powered predictive maintenance systems, blockchain for transparent supply chain management, and cloud computing for data storage and analysis.</p> <p>Moderator: Mr. Sushant Rabra (Partner, KPMG India)</p> <p>Speakers:</p> <ul style="list-style-type: none"> Mr. O.P. Singh (Director (T&FS), Oil and Natural Gas Corporation Limited) Mr. Atul Patni (Head Digital, Vedanta Limited) Mr. Anil Bhatia (Vice President and Managing Director, Emerson India) Mr. John Chapman (Regional Service Manager, APAC, Halliburton) Mr. Chitwan Garg (Divisional Country Manager, Schlumberger)
<p>Valedictory</p>	
<p>03:00 PM – 03:15 PM</p>	<p>Remarks by Secretary, MoPNG</p>
<p>Appreciation for Exemplary Performance 03:15 PM – 03:45 PM</p>	<p>This session will highlight the achievements made in the following thematic areas.</p> <ol style="list-style-type: none"> Asset/Blocks Health, Safety and Environment (HSE) Energy Efficiency and Innovation Small Fields Technical Papers
<p>Closing Ceremony 03:45 PM – 04:00 PM</p>	<p>Here we end the event with a closing ceremony highlighting the review of day one and day two with a final thank you and farewell message, by ADG (Coordination) Mr. Akash Goel encouraging attendees to stay connected and engaged until the next gathering.</p>

Technical Conference	
<p>Session VII 10:00 AM – 10:45 AM</p>	<p>Advances in Subsea Technologies</p> <p>Subsea technologies are critical for offshore oil and gas exploration, renewable energy installations, and underwater infrastructure. This panel will explore recent advances in subsea technologies, highlighting innovations and their impact on the industry.</p> <p>Session Chair: Mr. T.K Sengupta, Ex-Director Offshore, Oil and Natural Gas Corporation Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Hari Srivastava and Amit Musale (Reliance Industries Limited) • Mr. Chirag Jayswal (Oceaneering International Limited) • Mr. Chinna Rao Gorli (Oil and Natural Gas Corporation Limited)
<p>Session VIII 10:45 AM – 11:30 AM</p>	<p>Unlocking Potential: Revival of Non-flowing Wells</p> <p>Reviving non-flowing oil wells, also known as “shut-in”, “sick” or “abandoned” wells, presents a significant opportunity to increase oil production. This panel will explore the methods, technologies, and economic implications of revitalizing these wells.</p> <p>Session Chair: Mr. N.K Bharali, Ex-Director, Oil India Limited</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Shahjan Bukhari (Kiri Energy) • Mr. Amit Saxena, Dr. Shivanjali Sharma (RGIPT) • Mr. Vipin Gupta (Manan Oilfield Services) • Ms. Beryl Audrey and Ms. Shreya Singh (Schlumberger)
<p>Session IX 11:30 AM – 12:15 PM</p>	<p>Towards Net Zero: New Energy Sources</p> <p>As the world transitions towards a net-zero carbon emissions future, the exploration and adoption of new energy sources are crucial. This panel will explore emerging energy sources that have the potential to contribute to achieving net-zero emissions targets.</p> <p>Session Chair: Mr. Tevik Kaya, Manager New Energy-MENA Geothermal & CCS, Schlumberger</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Prof. Birendra Jha (University of Southern California) • Mr. Tejaswini Gautam, Mr. Anirbid Sircar and Ms. Kriti Yadav (PDEU & Patna University) • Ms. Partha Roy (Sun Petrochemicals Private Limited) • Mr. Tevfik Kaya, Mr. Shubh Srivastava and Mr. Attakan Janpidok (Schlumberger)
Technical Conference	
<p>Session X 12:15 PM – 01:00 PM</p>	<p>Advances in Reservoir and Well Management</p> <p>Effective reservoir and well management are essential for optimizing oil and gas production, maximizing recovery rates, and ensuring operational efficiency. This panel will explore recent advancements in reservoir and well management practices and technologies.</p> <p>Session Chair: Dr. Hemanta Sarma, University of Calgary</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Pankaj Kumar, Mr. Akhtar Uddin, Mr. Ahmed and Mr. Ranjit Dutta (Oil India Limited) • Mr. Anurag Misra, Mr. Akash Damani, Mr. Vishal Ranjan, Mr. Alok Kumar Sharma and Mr. Burhanuddin Khuzema Alirajpurwala (Vedanta Limited) • Mr. Rahul DCruz, Mr. Shashank Narayan, Mr. Dinesh Choudhary and Mr. Mayank Kumar (Schlumberger) • Mr. Pradhan Maheswar, Mr. Pathak Poonam, Mr. Prasad SR and Mr. Ram Binay (Oil and Natural Gas Corporation Limited)

01:00 - 02:00 PM	Networking Lunch
<p>Session XI 02:15 PM - 03:00 PM</p>	<p>Advancements in Geophysical Technologies for Oil and Gas Exploration</p> <p>India upstream sector is evolving with introduction of advanced technologies ensuring strong economic growth and energy security. This session will delve into the transformative impact of cutting-edge geophysical methods on exploration and production of hydrocarbons apprising its critical role in addressing challenges of modern oil and gas exploration.</p> <p>Session Chair: Dr. Manas K. Sharma, Ex-Director Oil India Limited (OIL)</p> <p>Presentors:</p> <ul style="list-style-type: none"> • Mr. Ashutosh Verma, Ms. Madhurima Katiyar, Mr. Amardeep, Mr. Alok Rao, Mr. Mrinmoy Sharma and Ms. Sonali Baba (Oil and Natural Gas Corporation Limited) • Mr. Nasimudeen Nedeer, Ms. Moumita Dubey Chakravorty and Mr. Debakanta Biswal (Adani Welspun Exploration Limited) • Prof. Rajesh Nair (IIT-Madras) • Mr. Sanjiv Kalita (Invenire Energy Private Limited)

Exhibition Gallery

Date: 11 - 12 July 2024,

Venue: Bharat Mandapam, New Delhi

The Exhibition Gallery will showcase technical papers from various stakeholders - Industry, Service Providers and Academia, to present a holistic point of view on the following themes.

Production Optimization and Enhancement Technologies

Advancement in Drilling Technologies

Decommissioning Best Practices

Unconventional Energy Sources: Potential and Challenges

Energizing Role of Artificial Intelligence (AI) and Machine Learning (ML) in E&P

Advances in Reservoir and Well Management

Advances in Subsea Technologies

Towards Net Zero: New Energy Sources

Unlocking Potential: Revival of Non-flowing Wells

Opportunities and Challenges in Emerging Indian Offshore Basins

Advancements in Geophysical Technologies for Oil and Gas Exploration

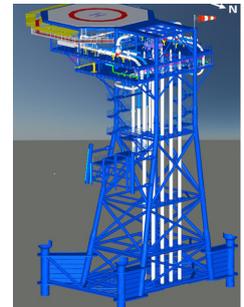
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 (8th/9th/10th Floor, ATL Corporate Park, Saki Vihar Road, Powai, Mumbai - 400072, India)



- Sun Petrochemicals Pvt. Ltd. (SunPetro), an emerging E&P company engaged in crude oil production since 2014.
- SunPetro has a mix of strong team of industry stalwarts with proven track record in onshore, deepwater and ultra shallow water and has young enthusiastic professional team.
- Currently operating ten E & P Assets having more than 4400 sq. kms with 100% participating interest. The cumulative production potential from the four producing fields is more than 12,000 BOEPD.
- Carried out three Green Field developments and currently working on new offshore development projects. Successfully revived depleted Hazira field.
- With Innovation & Excellence centric culture, SunPetro strives to be safety leader and has a stringent HSE policy with Zero LTI since inception.
- Awarded as “Emerging Company of the Year” by Asia Business Leader Awards, 21st Edition, “Best Innovative Company of the Year” by Asian Leadership Awards in 2022 and two prestigious awards from FIPI in 2023.
- Strong environment friendly. Planted more than 2,80,000 trees in its on land operational areas & planting more than thousand trees on daily basis Implemented zero gas flaring and installed 1 MW solar power plant to minimise carbon footprints. Maintaining kitchen garden in all its asset
- To carry out Exploration & Development work on fast-track basis, SunPetro is getting fabricated a Cylindrical Barge for easy maneuvering in high current & tidal conditions which will help in installation of Hybrid platform in ultra shallow water field for drilling of wells by onshore rig in offshore. Also purchased offshore rig for drilling of wells on smart platform.
- Developed 60 innovations (12 patented) and implemented in the fields.



What to expect?



Strategic Summit

Featuring critical dialogues including high-level panels, leadership presentations, and spotlight sessions, hosting speakers focusing on key strategic priorities and exploring the key role that upstream oil & gas sector in India will play in shaping the future of energy.



Technical Conference

Offering invaluable technical expertise across various breakaway sessions on latest innovations, industry leading practices and technology advancements that enhance Oil & Gas exploration, drilling and production efficiency.



Innovation Centre

Dedicated platform for both domestic and international energy businesses to network, showcase their innovative products and services, and explore new opportunities in the energy sector.



Executive Lounge

Exclusive arena for government officials, business leaders and industry experts, fostering productive connections.



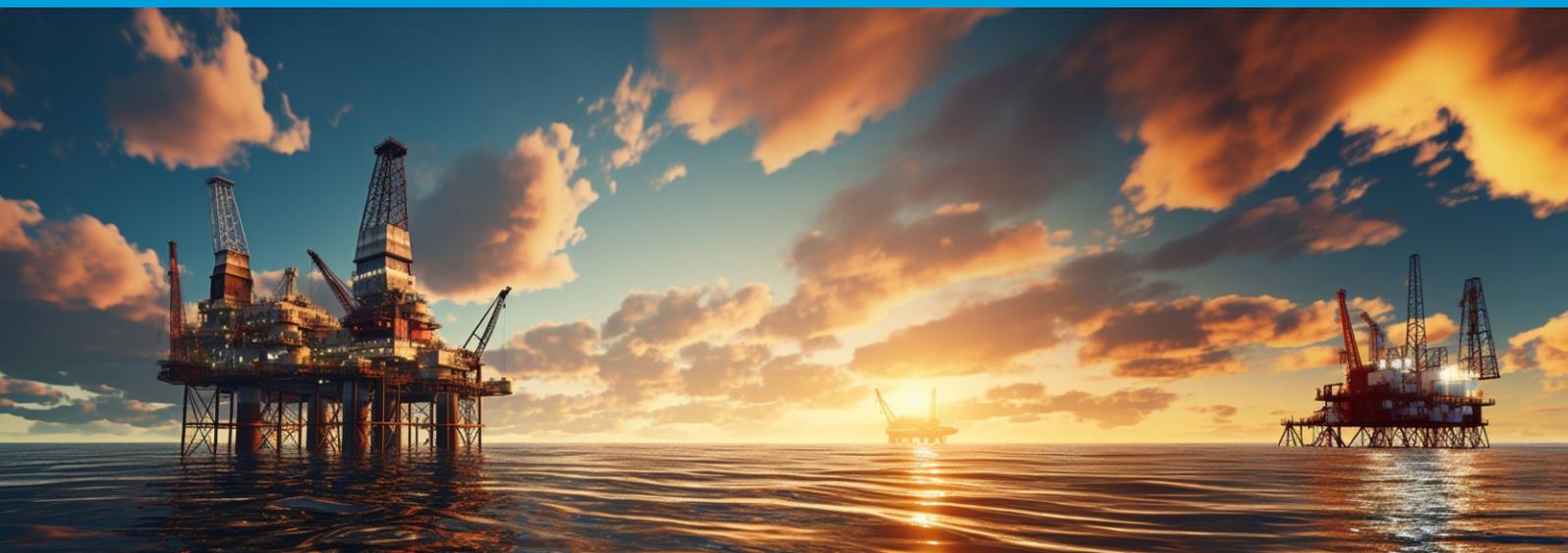
Exhibition Gallery

Demonstration of technical abstracts (poster presentation) representing new-age solutions in upstream sector by start-up, academia and inventors.

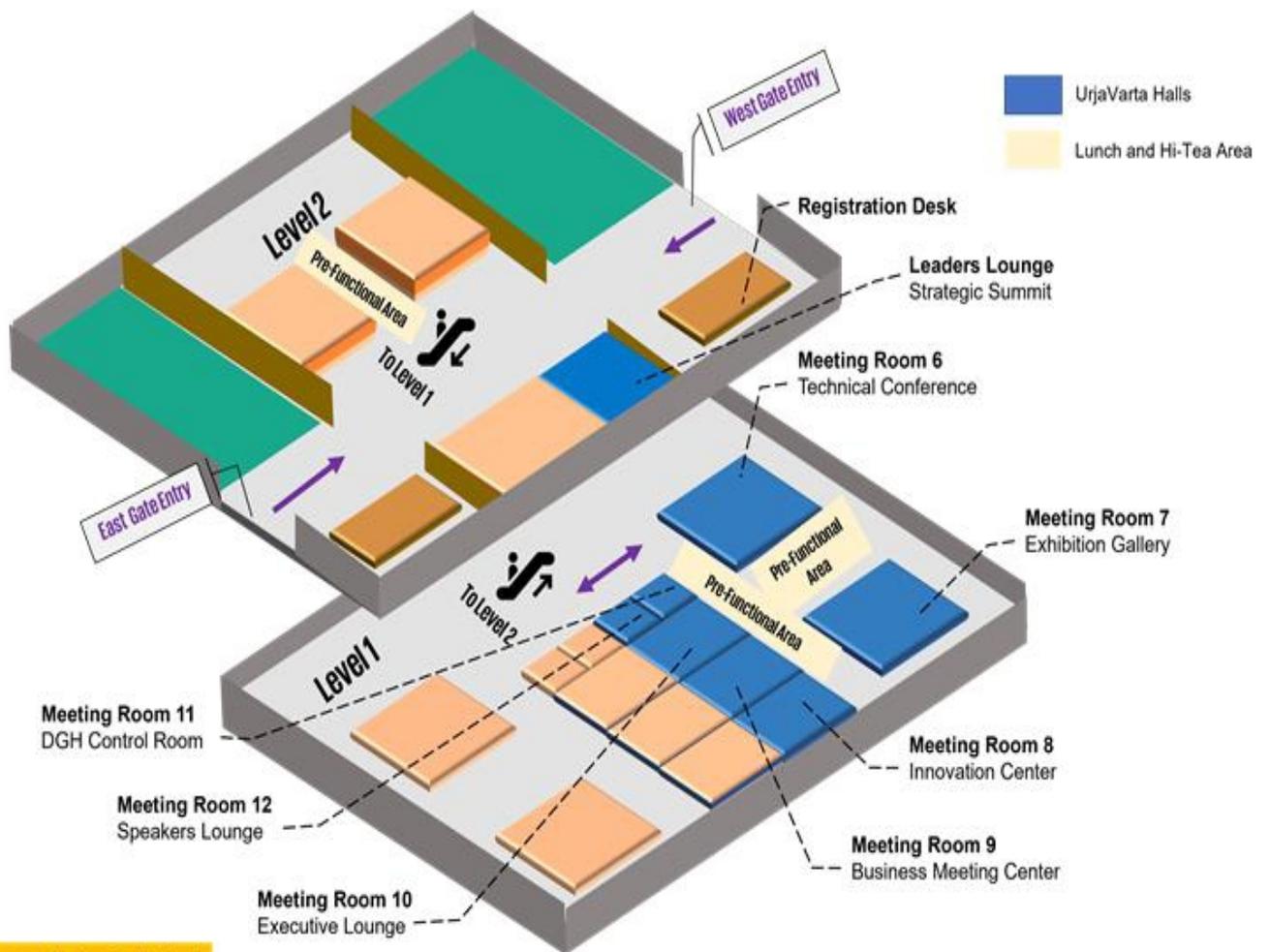


Meet and Greet Zone

Dedicated pavilion and meeting rooms for networking and engaging stakeholders across energy sector.



Layout



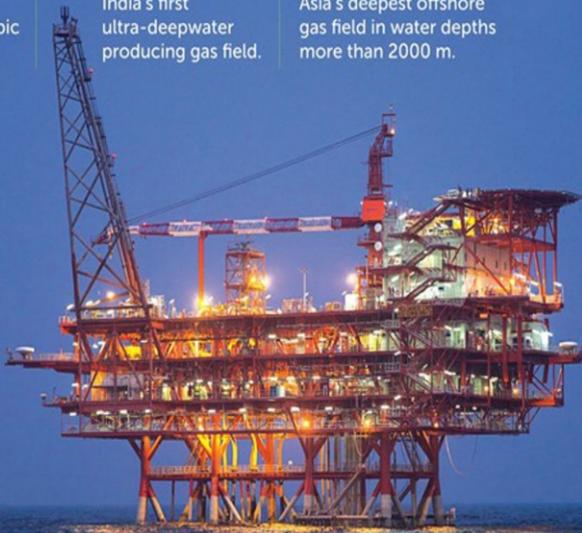
*Please note conclave entry will be from Gate Number 7

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Compendium of Abstracts

Theme:**Production Optimization and Enhancement Technologies****Abstract Title:** Mature Fields Optimisation**Author:** Chris Freeman and Vinod Raghothamarao**Organization:** GaffneyCline

Abstract: There are many angles to be considered when describing a field as mature. An oil field can be considered as mature when its production rate has significantly declined and/ or when it is close to reaching its economic limit. A field might also be considered mature when it has been in production for many years and has depleted its primary and secondary recovery. Consequently, facilities and technology at mature fields could be old. However, far from being diminishing assets, these mature fields offer one of our most important opportunities to extract further oil and gas resources to meet future energy demands. While the world hydrocarbon demand is estimated to increase by approximately 1.5% per year, the number and size distribution of new discoveries are declining, whereas mature fields are more predictable (less risk and less uncertainty). Mature fields are also seen as attractive in uncertain times, given the benefits of regular, reliable cashflows.

Gaffney, Cline recognizes through direct and extensive experience the typical needs of mature fields and the significance of fit for purpose models and technically appropriate solutions for such fields. The achievement of optimally profitable operations is particularly challenging in a low oil price environment; many projects are currently stalled due to weak forward economics. However, even if commodity prices are weak or flat, mature fields can be managed to improve the fiscal position by either reducing costs or increasing production.

Mature fields, many in the secondary or tertiary production phases, account for over 70% of the World's oil and gas production. Considering, the average recovery factor being circa 70% for gas and circa 35% for oil, innovative methodologies, combining new techniques and technologies, are proving that revitalization activities can be economical, and thereby increasing ultimate recovery by 20% or more. The development of these mature assets is significant to the global economy. Simply boosting the recovery factor of the World's existing oil fields by 1% would provide for two to three years of worldwide consumption.

The challenges for production optimization of mature fields span the whole spectrum from field dynamics, facilities and their constraints as well as permitting and economics. A fully integrated approach to oil and gas project work, across all disciplines involved in the evaluation, is crucial to mature fields optimization. Almost all operations can be improved. Most operators focus on the subsurface heavily, but facilities also dictate achievable rates, possibly to a greater degree than the subsurface in many cases.

Furthermore, appropriate evaluation of mature assets requires a judicious mixture of classical approaches and new technologies as the key for creating the opportunity for new life for mature reservoirs.

GaffneyCline will briefly describe the techniques to optimize production from mature fields providing examples from its international consultancy work including in India such as Mumbai High etc.

Abstract Title: Optimising and augmenting Production through Initiatives, Innovation and Development**Author:** Sunil Rastogi**Organization:** Sun Petrochemicals Pvt. Ltd. (SunPetro)

Abstract: SunPetro, a privately held company promoted by Directors of Sun Pharmaceuticals have entered in Oil & Gas business in 2014 with a few experienced and experts Oil & Gas professionals of the industry. The company has taken over few non-performing Oil field Assets which have either never produced inspite of best efforts by earlier operators or approved for the process of abandonment. The focus and objective of the team was to produce from those challenging difficult fields using innovative and unique technologies.

The first set of small fields were Baola & Modhera, discovered by ONGC but due to its high viscous crude condition (comes under unconventional hydrocarbon category) and challenging conditions of mobility and unconsolidated reservoirs neither ONGC nor M/S IPL could produce it.

SunPetro introduced a unique technology of Chemical Injection based on Ukrainian MPCT technology and put back both the fields on production in less than 6 months of take over spending only 1.8 Million USD. Next was Hazira Field partly onshore and offshore, to be abandoned by NIKO Resources was another challenging field. After ensuring integrity of equipment and asset and introducing many innovative workover both in onshore and offshore (including rigless workover) and other innovative cost effective measures, the field again started producing Oil & Gas and became profitable.

Bhaskar oil field, the largest of all was taken over by SunPetro and with innovative approach for development based on data review, building up new reservoir model, new development drilling and implementation of many inhouse innovations started contributing significant Oil & Gas and SunPetro is now the fifth largest Oil Producer due to its presence.

To begin with SunPetro acquired Baola & Modhera fields having very heavy oil. Though the fields were discovered decades ago but had never produced any oil. Quickly sourcing and implementing innovative MPTC technology from Ukraine & other inhouse innovations suitable for these fields, SunPetro was able to flow wells within six months of acquiring. Both fields are producing Heavy Crude Oil past 8 years. Total production gain from zero to 0.21MM bbls till 31.3.24

Next step was to acquire Hazira field which was approved for abandonment from 1st Oct 2017 onwards due to economically unsustainable and declining low production. SunPetro analysed all available data with zeal to bring every hydrocarbon molecule to surface and was able to not only arrest the decline but was also able to increase production marginally and additionally through restructuring & innovative approach, the operations turned around. Field is currently producing Oil and gas and operations are economically viable even after seven years of acquisition and near abandonment. Next in line was acquisition of Bhaskar field in 2018 having 5.5million barrels of reserves and anticipated peak production of 3100 bopd. With few newly drilled wells, new data was acquired, new model was developed and reserve was found to be four times i.e 23.20 million barrels which was vetted by D&M. Field was put on production in 2019 using EPSs. Since then, 17 new wells are drilled, and production facilities were developed during tough Covid years and processing facilities were put on operations in March 2022. Another highlight of field is laying of approx. 60 km crude oil evacuation pipeline line to IOCL facility at Bareja near Ahmedabad in record time of 8 month. Concurrent facilities development with implementation of many inhouse innovations

which resulted in for cost and energy efficiency. Facilities were developed considering all safety requirements and to provide clean and green environment for work. Since start of production field has already produced 5.24 million barrels of oil till last financial year and currently producing over 7000 bopd.

Abstract Title: Reduced Rod-tubing Wear and Run Time Increment with Modified Completions in Progressive Cavity Pumped CBM Wells

Author: Adarsh Kumar and Karan Raj

Organization: Essar Oil and Gas Exploration Pvt. Limited (EOGEPL)

Abstract: In conventional rod-driven progressing cavity pumped wells, the issue of rod/tubing wear has always been a concern; especially in CBM wells where the fluid is 100% water which lacks the usual lubricity of oil, combined with the production of coal fines. Adding to the complexity of the problem is the eccentricity of the progressing cavity pump rotor, the rod string completion used, and the production tubing ran. Also in deviated wells due to having high contact loading creates problem. Although all of these together can provide the “perfect storm” for ongoing rod and tubing problems, a proper evaluation of the complete system whereby both the pump, completion and operating parameters are optimized can drastically reduce the occurrence of rod/tubing wear and extend overall run times. This paper will share case studies whereby completions both prior to and after which the pump model, operating parameters and completion practices are evaluated, run times documented and failure mechanisms evaluated to compare and contrast the before and after results of optimizing the total progressing cavity pumping system and the effectivity of the changes made. This paper also calculates the contact loading at each point for the analysis of rod guide optimization in DLS section. This paper will share the tubing design selection above Progressive Cavity pump as it is the most prone area for Hole in Tubing due to eccentric nature of Progressive Cavity Pump. In order to support the data shared within this work, industry accepted software results will be shared the results of which will provide clear evidence that the modified completions proposed here can and will result in reduced wear, increased run times, and holistically a greater reduction in NPT (Non-Production Time). Although this work is in CBM applications, it will be applicable all rod-driven PC pumped wells.

Abstract Title: Deliquifying & Reviving Gas fields With Velocity String: Coiled Tubing Deployed Future-ready Completion Solution

Author: Aman Saraf

Organization: Schlumberger

Abstract: The “A” gas field in Western India is a tight, highly laminated retrograde gas condensate reservoir. Many wells have started liquid loading and producing intermittently due to reservoir pressure depletion which restricts ultimate recovery. This document talks about a novel way of restoring stable production and increase ultimate recovery by means of Deliquification of the bottom zones by coiled tubing deployed rigless selective completion solution. Shut in Gradient Survey were done with Slickline to check reservoir pressure build up and confirm access till target depth. Thereafter, CTU was RIH with velocity String and was deployed via Packer type anchoring mechanism along with completion string, this ensured no changes to surface X-Mas tree was needed. Completion installed above the VS consisted of a SSD and a nipple profile which allowed for multiple flow path which is through the VS, from both VS and VS-Tubing Annulus and through VS Tubing Annulus. Entire operation was done in a live well.

Velocity String: VS was successfully implemented in 7 wells (3 Nos - 1.75” OD, 4 Nos - 2” OD), resulting in sustained production gain of 100%. 2. Uptime of wells increased to 100% during flowback via Surface Well Test post Velocity String Installation. 3. Based on successful execution and results, client plans to deploy this technology on a field level in more than -37 wells. 4. No HSE and SQ incidents observed during the project, this was a highly complex operation with PCE stack height of -100ft. 5. The average per well cost of installation for customer is approx. 0.20 MMUSD vs high cost of changing completion by a rig (1 MMUSD approx.). Various other methods which included Automated Stop/ Start techniques, continuous foam injection via capillary string were tried in the field. Post VS Installation, it was observed that VS has the best advantage in terms of production and net recovery from the reservoir. During VS Installation, complex operational contingencies were resolved, this will provide a direct reference for such operations to be done in any other part of the world.

Abstract Title: Leveraging Process Digital Twin for Enhanced Operations in Onshore Oil and Gas Facilities

Author: Amita Borad and Rajeshree Rathod

Organization: Vedanta Limited, Cairn Oil and Gas

Abstract: The oil and gas industry has been witnessing a paradigm shift towards digitalization to improve operational efficiency and asset performance within the safe operating limits. Among the emerging digital technologies, Process Digital Twin (PDT) stands out as a promising approach for onshore facilities. This abstract highlights the significance of PDT in the context of onshore oil and gas facilities, outlining its key components, methodology and benefits. PDT creates a virtual replica of oil and gas facility processes, integrating real-time sensor data, analytics, and simulations. It mirrors operations to enhance understanding of facility’s behavior, enabling predictive maintenance, process optimization, and quick decision-making. PDT identifies inefficiencies, bottlenecks, and hazards, improving operational efficiency by monitoring real-time parameters like temperature, flow, and pressure. Furthermore, PDT serves as a valuable tool for training and simulation purposes, allowing operators to simulate various scenarios and test control strategies without impacting the actual operations. This contributes to improved safety, as operators can identify and mitigate risks in a controlled environment. In Cairn, as a result of PDT optimization runs, multiple optimization opportunities are identified, like fuel gas optimization, flare reduction, slug catcher pressure optimization, heat exchanger efficiency improvement, HCDP due point temperature optimization etc. The suggested setpoints given by digital twin model are implemented in plant and that has resulted in revenue optimization of \$4.89M which includes oil production increase of 98 BOPD & a fuel gas optimization of 0.16 MMSCFD. In conclusion, Process Digital Twin offers immense potential for onshore oil and gas facilities to enhance operational performance, safety, and sustainability. By leveraging real-time data analytics and simulation capabilities, PDT enables operators to make informed decisions, optimize processes, and adapt to dynamic operating conditions effectively. This abstract highlights how integrating real-time parameters with process digital twin advances beyond standard offline digital twins, offering novel capabilities for process optimization, while considering present facility condition and plant dynamics.

Abstract Title: Oceanering Riserless Light Well Intervention System (RLWI)

Author: Ripandeep Singh (Sr. Design Engineer) and Chandan Gupta (Design Engineer)

Organization: Oceanering International Inc.

Abstract: Conventional approach to perform hydraulic or mechanical interventions involves

connecting the wells to the rig by a column of risers. This approach is very time consuming and costly due to the equipment required for variation in depth. To aid in the efforts of improving cost and time saving across operations, Oceaneering has developed RLWI solutions for downhole intervention, well stimulation, flowline remediation, and plug/abandonment of subsea wells. Our RLWI equipment is rated to work at subsea depths of 10,000 ft, an industry leading figure. Oceaneering has pioneered the development of the industry's first subsea riserless stimulation system which has performed more than 20 successful campaigns across the world. One of our RLWI systems, IRIS, provides diverse functionality via its interchangeable wireline tool string capability. It is capable of being field configured to run slickline or e-line to meet the demands of various well conditions and applications. All IRIS and customer control functions are managed via the system's dedicated vessel deployed umbilical and electrical down-line (EDL). It is deployable from a range of hosts including dynamically positioned multi-purpose service vessels (MPSVs) and mobile offshore drilling units (MODUs). Also, it is fully ROV compatible. The systems can be used to perform a variety of downhole light well interventions on both horizontal and vertical trees. Our systems have achieved the following milestones:

- Multiple industry depth records in subsea intervention including successfully intervening in 8,200 fsw / 2,600 msw in the Gulf of Mexico.
- IRIS has successfully delivered with high reliability in riserless wireline runs with slickline and up to 5/16" electric line at pressures of up to 8,600 psi.
- IRIS supports deployment of intervention tools including wireline tractors, milling tools, logging tools, and tubing punch/perf tool.
- Dynamic wire sealing at record depths is supported by a pressure control head using our patented Oceaneering grease delivery system.

Oceaneering's RLWI system provides customers with optimized and efficient solutions for Light Well Interventions Operations. This field proven technology has delivered industry-first results in deep-water applications. Our equipment has been operational in fields of Angola and Gulf of Mexico since 2017 and has huge potential in performing multiple intervention task in east coast of India.

Abstract Title: Challenges with existing PCP completion and selection of alternate artificial lift mode for deviated wells with casing pinching issues

Author: Kshitij Ramprasad Vijayvargia and Ankit Garg

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: This paper investigates the root causes of progressive cavity pump (PCP) failures in an onshore oil field in India, focusing on high-viscosity crude, unconsolidated sand, and medium flow rates. The methodology includes a comprehensive analysis of factors contributing to tubing and rod failures in PCP systems, such as mechanical stresses, wear, corrosion etc. The study identified several key factors contributing to PCP failures, including mechanical stresses, wear, and corrosion of tubing and rods, as well as casing pinching caused by tectonic movements. This study contributes valuable insights into the root causes of PCP failures and practical recommendations for enhancing PCP run life.

Abstract Title: Pulse Plasma-Based Shockwave Technology for Oil and Gas Industry: A Review

Author: Raghavendra Maddirala, Rajat Jain, Himangshu Kakati and Rohit Shukla

Organization: Indian Institute of Petroleum and Energy

Abstract: The primary objective of this review is to provide a comprehensive overview of pulse plasma-based shockwave technology and its application in the oil and gas industry. This review synthesizes information from multiple studies on laboratory experiments, field trials, and theoretical analyses that have investigated the use of pulse plasma-based shockwave technology. The application of pulse plasma-based shockwave technology in the oil and gas industry has yielded promising results. Pulse Plasma-Based Shockwave Technology (PPBSWT) is distinguished by its ability to generate high-intensity shockwaves without chemical additives or high-pressure fluids.

Abstract Title: Importance of Implementing Radial Drilling Technology for Enhancing Recovery from Producing Oil Fields-An Analysis

Author: Yashrakshita and Jai Prakash Kohar

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Radial Drilling (RD) is an economic, environment friendly technique to drill numerous

micro diameter lateral horizontal wells from different levels of an existing well in depleted/damaged reservoirs. In this paper emphasis has been given to review and analyze the published literatures and case studies from India and abroad to understand the process of radial drilling technology, its advantages, overcoming its limitation, its usage in the recovery of left out crude oil from exiting reservoirs. Premature shut-in of wells due to various problems like adverse reservoir characteristics, formation damage (skin), non-availability of land etc. is an increasing problem in the E&P sector. In most of such cases, the remaining resources are likely to be abandoned in view of failure to re-establish the production of the field. The motivation is thus to develop technologies for retrieving production from such wells. One of these new technologies is radial/Jet drilling. After review analysis of various case studies published in reputed International Journals, it has been observed that RD could

definitely improve the recovery from Oil Fields. The paper also provides ways to implement RD to producing oil & gas fields before implementing the expensive IOR-EOR methods and also an analysis of its economic feasibility. The Indian prospects of Radial Drilling technique has also been analysed and recommendations has been given based upon the possibility of implementing in the depleted fields of India. After review analysis of various case studies published in reputed International Journals, it has been observed that RD could definitely improve the recovery from Oil Fields. The paper also provides ways to implement RD to producing oil & gas fields before implementing the expensive IOR-EOR methods and also an analysis of its economic feasibility. The Indian prospects of Radial Drilling technique has also been analysed and recommendations has been given based upon the possibility of implementing in the depleted fields of India.

Theme:

Advancement in Drilling Technologies

Abstract Title: Screen Pulse Enhanced Recovery System

Author: Satheesh Srinivasan

Organization: Schlumberger (WCE-MI SWACO)

Abstract:

- Scope and Objective
- Reduce the drilling waste.
- Increase dryness of the drilling cuttings.
- Reduce the cost on waste disposal.
- Reduce the drilling fluids cost due to loss on mud through cuttings.
- Net reduction in Co₂ emission.
- Enhanced HSE profile.

Approach and Methodology

1. Separating the fluid from the cuttings. This combined with MI SWACO's DURAFLO High-capacity, long-life composite shaker screens providing dramatically lower retention on cutting.
2. Screen pulse transmits pulsating vacuum on the discard end of the shaker screen resulting in recovery of drilling fluids and reduce mud on cuttings on the solids.
3. The system increases the volume of recovered fluid and provides significantly dryer cuttings. Dryer cuttings mean less weight and lower volume for trucking and disposal cost for operations specially while working with SOBM drilling fluids, resulting in reduction in Co₂ emission.
4. These benefits will provide the customer with a reduction in operational cost and non-productive time, as well as an enhanced HSE profile.

Results:

- Screen pulse was installed to NOV-Brandt VSM 300 shale shakers.
- Screen pulse resulted in recovery of 1384 barrels of drilling fluid by saving approximately USD 520 million.

- Observations:
- Screen pulse can effectively reduce the operator cost on drilling fluids and reduction in waste generation for final disposal.
- Screen pulse do not require any electricity requirement

Abstract Title: Inaugural application of digital expandable underreamer for successful enlargement of slim hole in Assam field: A case study

Author: Md. Sameer

Organization: Oil India Limited (OIL)

Abstract: This abstract presents a case study on utilization of digital expandable underreamer at one of the deepest wells in Assam field, for enlarging 6" slim hole section. It showcases procedures adopted to run and operate the tool, and its impact on overcoming operational challenges and improving drilling performance. Hole enlargement is often necessary in deep wells to run additional casings/liner to isolate the unstable formation. However, enlarging a slim hole poses several challenges such as increased risk of hole collapse, hydraulics issues, vibrations etc. In this abstract, the learnings from successful use of digital expandable underreamer at Location: X within the Assam field, for enlarging 6" hole to 7-1/4" hole section, are presented. Its features, such as the ability to send real-time commands for blade activation/deactivation and to communicate blade positions, which were extremely instrumental in overcoming the challenges associated with slim hole enlargement has also been demonstrated. In this case study, the hole enlargement was conducted in two steps in order to minimize the operational complexity, considering exploratory nature of the well and unstable downhole formations. In the first step, a 6" hole section was drilled using a LWD BHA coupled with Mudc motor from 5453 m to 5720 m. In the second step, the digital underreamer was used for enlarging 6" slim hole section to 7.1/4" hole section. The time taken for drilling 6" hole section was 192 hours, while the subsequent hole enlargement took 64 hours. The use of digital underreamer and adoption of two step hole enlargement process

effectively addressed string vibration, stick slip and torque & drag issues, and also reduced the operating period (BRT) of underreamer. Moreover, it has also successfully mitigated the downhole complications such as stuck pipe, severe string vibrations, lost-in-hole incidents, commonly observed in offset wells. The successful hole enlargement also facilitated effective recording of high end wireline logs in 7-1/4" open hole section. Furthermore, it also allowed smooth landing of 5" Liner, followed by successful cementation job. The CBL-VDL log demonstrated a good cement bond. This case study presents the first use of digital underreamer in Assam field, leading to successful completion of a deep well of depth 5720 m with downhole temperature exceeding 100° C. The outcomes of this study contribute valuable insights to the literature, particularly regarding utilization of advanced expandable underreamer technology in slim hole and deep wells drilling applications.

Abstract Title: Deliver the Best Production Potential by Drilling laterals in existing depleted wells using Coiled Tubing Drilling Technology
Author: Madhurjya Dehingia

Organization: Schlumberger

Abstract: Drilling laterals to gain maximum production out of existing wells is frequently done by workover rigs as it is relatively cheaper compared to drilling new wells. However, the maximum production is seldom achieved when laterals are drilled in depleted wells due to losses during drilling. Stimulation and nitrogen lift is then required to put the well back in production. Underbalanced coiled tubing drilling helps to overcome the challenge as drilling is done without losses to the formation. Cost saving can be performed because the operating cost which is usually spent on normal wells for well stimulation can be reduced. Coil tubing can be used to perform operations in live well. Coil tubing with wireline cable can be used to drill laterals in existing wells with limited hole sizes. As coil tubing cannot be rotated, the bottom hole assembly consists of elements which gives direction and rotates while drilling. The hole size that can be drilled depends upon the wellbore cleanout efficiency for a selected coil tubing size. The returns along with cuttings are taken through the choke and the cuttings are separated in the shaker. Manipulation of choke can be done to adjust the downhole pressure in live condition. This eliminates the need of changing mud weight which is done during conventional drilling when unexpected pressures are observed. Coiled tubing can be run through tubing sizes of 4.5-in to perform laterals in higher OD laterals. Coiled tubing drilling can be done at a

higher dogleg severity which results in maximum reservoir contact. Multiple countries like Saudi Arabia, UAE, Malaysia, Alaska, Kuwait performed pilot coil tubing drilling projects and then have expanded to larger scale. The main contribution is to avoid fluid damage during drilling operation in mature depleted reservoirs and to steer better reservoir quality with improved reservoir contact.

As conclusion the main advantages of coiled tubing drilling are as below:

- Prevent a high level of drill-in fluid invasion and damage under conventional drilling due to low reservoir pressure.
- Avoid the possibility of differential sticking as well as loss of circulation due to high overbalance caused by conventional drilling.
- Eliminate the need of the costly mud systems and their disposals.
- Change direction if needed to contact more pay, increase the rate of penetration (ROP), etc.
- Perform open hole sidetracks quickly, easily, and often with high build rates.
- Reduce unit cost by delivering higher gas producers with shorter operation time. Eliminate post workover stimulation, thereby reduce overall well cost.

India has multiple depleted fields where laterals are drilled to bypass the formation damage. However, losses are observed during conventional drilling which makes it difficult for the well to flow at the maximum potential without acid stimulation and nitrogen lift. Under such conditions advanced drilling technologies such as underbalanced coil tubing drilling is a technology that brings value and can add to much needed production enhancement from the existing brown fields.

Abstract Title: An investigative report on the effect of Iron oxide nano particles in water-based drilling fluids

Author: J.S Gupta, Dr Viswanadh Nalla, N Kathiravan, M Chozhan and M Suresh

Organization: Regional Geoscience Laboratory Cauvery Basin

Abstract: The main objective of this work is to explore HTHP properties of water-based drilling fluids containing Iron Oxide (Fe₂O₃) nanoparticles for the reduction of formation damage. In this study, KCl-PHPA-Polymer water based mud system was taken as base mud and Fe₂O₃ NPs was used at different concentrations (0.0085-

0.015%) to study the effect on the rheological and filtration properties of base mud after hot rolling at higher temperature (100°C, 500 psi) for 16 hrs. This study is based on laboratory experiment work, where KCl-PHPA-Polymer water base mud was formulated at ambient temperature conditions. The Chemicals used were all ONGC approved for drilling operations. The Iron oxide nanoparticle was procured, and 2% Bentonite Gel was prepared in tap water and allowed to age for 24 hrs. Nano mud was made by following the base mud procedure followed by adding nano and thoroughly mixing in Hamilton Beach Mixture. PH was adjusted to 9.5 with caustic soda for both muds after addition of all the additives. The results of API filtrate loss (ambient temperature & at 100 °C, 500 psi) and filter cake characterization along with the changes in the Rheological properties of drilling fluids containing various concentrations (0.0085 to 0.015%) of NPs have been measured. Addition of 0.0090% w/v Iron oxide results in an improvement in the filtrate volume by 6.38% compared to the base fluid. And a significant improvement of 9.61% after hot rolling at 120°C for 16 hrs and taking HTHP F/L (100°C & 500 psi). Previous studies have not explored the effects of such low concentrations (0.009% w/v) of Fe₂O₃ nano. Additionally, scanning electron microscopy (SEM) images revealed a thin and compact filter cake formation compared to the conventional mud, indicating potential reduction in formation damage and increased hydrocarbon production. A better quality filter cake and efficient control over water loss would ensure the following aspects: less tendency of differential sticking. lower torque and drag during drilling and tripping operation. better probability to carry out open hole logging without any complication. less pump pressure, so less annular pressure loss, less ecd and more safety window for mud weight. better casing lowering and cementation job. less formation damage, ensuring more production rates.

Abstract Title: Case Study: Tripura Asset has put its Exploratory Well back on track after Recovering complete fish by spotting Enzyme pill

Author: Md Imtiaz

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: ONGC Onshore field of North East India is known for various drilling complications due to complex geology. String stuck- up are normally released by conventional methods as per SOP's issued by IDT Dehradun. Use of Enzyme to release the stuck string was used for the first time in India. Enzyme is a concentrated High Temperature stable

microbial carbohydrazes, Amylase and Cellulose System. Enzyme job was hence planned on the assumption that it would dissolve filter cake and thereby reduce surface area of contact and thereby releasing any differential stuck up. Enzymes provide an excellent alternative to harsh chemical treatments in high temperature formations, with their controlled reaction with the mudcake, mild chemical nature, better health and safety.

Abstract Title: Application of Internet of Things (IoT) in Reducing NPT & Improving Drilling Operational Efficiency

Author: Dheeraj Kapoor, Akash Tyagi and Pramit Chakraborty

Organization: Halliburton

Abstract: Over its long history, the O&G industry has faced considerable challenges and invested a large amount in the processes of exploration, production, recovery, and transportation. This review paper discusses the realm of the Internet of Things (IoT), its applications, and its role in reducing non-productive drilling time. Furthermore, this paper focuses on elucidating the effects of different IoT advancements and their reduction of non-productive drilling time within the O&G industry. The objective of the review paper is to mitigate the NPT by applying IoT during drilling operation. The review study demonstrate the implementation of IoT and current trends.

Abstract Title: Performance Evaluation of Graphene Oxide Nanosheets to Improve HPHT Wellbore Integrity by Using as an Additive in Oil Well Cement Slurry

Author: Mohd Shahzar and Amit Saxena

Organization: Rajiv Gandhi Institute of Petroleum Technology, Jais, Amethi

Abstract: The study improves Class G cement's properties for oil well cementing under high-pressure and high-temperature (HPHT) conditions using graphene oxide nanosheets (GO-NS) as an additive. Cement slurries were formulated with GO-NS (0.0025-0.01 wt% BWOC), water-to-cement ratio of 0.44, and 2 wt% BWOC CaCl₂ accelerator. Compressive strength was monitored via ultrasonic analysis at 100°C. Adding graphene oxide nanosheets (GO-NS) to cement slurries significantly enhances their performance across multiple parameters. Mechanically, the compressive strength sees a marked increase. This study contributes novel insights into applying graphene

oxide nanosheets as an effective additive for improving oil-well integrity under HPHT conditions, enabling enhanced wellbore integrity

Abstract Title: Initiatives by DGH to promote safety in the E&P industry

Author: Neyazuddin Md and and Gopal Bansal

Organization: Directorate General of Hydrocarbons (DGH)

Abstract: To appraise the house regarding

- High-Level Committee Recommendations on Baghjan and Tauktae.
- Initiatives for Training & Capacity Building for small & medium field operators.
- Initiatives for Emergency control & response.
- Audits: External Safety Audits and Organizational audits
- Initiative for action-oriented weather and ocean forecast for offshore

- Inputs to various expert committees: - Revision of Petroleum & Natural Gas (Safety in Offshore Operations) Rules, 2008, etc.

Approach and Methodology

The initiatives taken by DGH to promote safety in the E&P industry are based on recommendations of High- Level Committee on Baghjan and Tauktae.

Results, Observations, and Conclusion

Some key results are

- The active participation of small and medium field operators in training and capacity-building sessions
- Increasing compliance with OISD ESA observations by small and medium field operators and inputs by DGH in safety matters
- Signing of MoU by Cairn-Vedanta with ONGC to deal with crisis management and blowouts.

Potential value addition

The potential value add is to promote awareness among the audience regarding Level Committee (HLC) recommendations on Baghjan and Tauktae incidents and promotion of safety culture in the E&P industry.

Theme:

Decommissioning Best Practices

Abstract Title: Evolution of the Decommissioning frameworks and Maturation of Supply chain for the Decommissioning projects in India

Author: Rajagopal Mahalingam and Udhayasankar
Organization: BG Exploration and Production India Limited (A subsidiary of Shell Plc)

Abstract:

Scope and Objective:

Evolution of regulatory framework for the country to the sanction of the Decommissioning plan after objective and transparent comparative assessment process to select the execution strategy for the Tapti decommissioning project.

Development of supply chain for the decommissioning market in India to meet the industry standards on technical, infrastructure and safety culture.

Bidding & award under an intent based Scope of work and risk-based terms & conditions

Approach and Methodology

Constitute a committee with the Regulator and industry player to independently develop the decommissioning framework following the international standards and best practices to suit the Indian context.

Comparative assessment was adopted to objectively evaluate the decommissioning options through various criteria involving right stakeholder at the early phase for effective decision making for the executable decommissioning strategies.

Early mover strategy was employed to garner the interest in the Indian decommissioning market to address the weak supply chain, especially dismantling and disposal yards. Expression of Interest floated early time with rigorous evaluation to understand the market offering, appetite, and contractors' capabilities (infrastructure and safety culture) to cater the decommissioning needs.

Listen to marketing intelligence and respond with the most appropriate contracting strategy. Risk owned by the party best placed to manage the same. Define the "What" and leave the "How" to the Contractor(s). Risk based definition and oversight of the scope in sync with "Mode of Operation."

Result and Observation

Once production is ceased, it would be ideal to decommission the facilities at the earliest opportunities to avoid the cost escalation as market is rapidly changing as the time progress. A joint committee formed to address the immediate need of the framework for the decommissioning project. After framework was developed, comparative assessment collaboratively performed involving the right regulators and independent experts to select the right concept for the topsides, jackets, and pipelines. The approval process and associated timeline has significantly reduced as result of the collaborative efforts. It can be replicated in any policy / regulation development to maximize the value for both Government and industry bodies / players.

Like the policy development, maturing the supply chain for any businesses is critical for success. As result of early market research helped us to recognize the infrastructure needs for the decommissioning, Contractor's capabilities, permit requirement and mindset change from conventional development to demolition projects. Contracting strategy rightly defined with clear responsibility matrix for the effective management of interfaces. Thorough evaluation conducted for various yards in India to shortlist the potential yards that may be considered during execution. Gap closure plan was jointly prepared with each yard to work on the deficits to make them available for healthy competition to maximize the value for the Decommissioning Industry.

An intent-based ITT enabled the Contractors to optimize the cost, resources, and methodology for the safe and robust execution as 'how to do' has left to the market and exploring synergies (e.g., mob and demob / bundling the project activities with other operators).

Potential value-add enabled by the abstract in providing novel or additional information to the existing application or literature

- Redefine the external stakeholder's engagement – Shift to a collaborative mode.
- Redefined the front-end loading for Decommissioning project vis-à-vis Development project

Abstract Title: Best practices to tackle challenges in decommissioning of floating structures in offshore Oil and Gas industry. Author: Gurjot Singh

Organization: Oceaneering Internafional Inc

Abstract:

The objective of the abstract is to share the best practices that can be followed for decommissioning of floating structures in offshore fields focusing specifically on Single Point Moorings (SPMs) & Catenary Anchored Leg Mooring (CALM) Buoys, and Mid Water Buoyancy Tank (MWBTs). This scope explains the potential challenges involved in such offshore projects with examples from real-life decommissioning projects executed by Oceaneering.

The approach to any decommissioning project starts with a comprehensive study on the functionality of the structures to be decommissioned and its connecting upstream / downstream assets.

Same is the case for floating structures like CALM buoys where the relevant field layout study is performed to determine the subsea asset locations, mooring connections, current condition of operating valves, and its structural integrity, including components such as lifting pad eyes etc.

Methodology is then divided into several task plans:

1. Flushing / Cleaning of the entire system to ensure the system is hydrocarbon free
2. Disconnection sequencing / method of Submarine Hoses and Floating Hoses
3. Recovery methods or temporary wet parking of the hoses and CALM Buoy
4. Towing to nearest port and making necessary arrangements for final decommissioning

In addition to these optimized task plans, having experienced Saturation Diving workforce for execution is highly essential to these kinds of operations.

Based on adoption of methodology mentioned above, below are some of the achieved outcomes of the execution:

1. **Flushing & Cleaning procedure:** Since CALM buoys are temporary storage containers for the production fluid extracted from seabed, a proper flushing and cleaning procedure was developed to prevent spillage of any Hydrocarbons into the sea during disconnection.

2. **Release of tension in the mooring lines / pipelines:**

Majority of these jobs involve manual intervention with divers for different types of flange disconnections, sometimes even cutting of heavy chains or flowlines. Engineered procedures / sequence of activities were developed to ensure the safe execution of the scope. This is critical to avoid any incidents / accidents due to uncontrolled movement or swinging loads which can cause severe equipment damage, crew injuries or even death.

3. **Rigging points inspection of the CALM Buoy & MWBT:**

This is also a highly critical aspect to be considered for safe execution of the recovery / abandonment operations. As these structures are in humid offshore environment, there are high chances of corrosion on the complete body. Therefore, a proper inspection / assessment was conducted for all the lifting points / pad eyes on the structure before deeming them fit for utilization during the operations.

4. **Weather forecast for critical operations:**

During engineering phase itself, weather / sea conditions were given due consideration and detailed activity sequencing was chalked out as per different possible sea states. Also, the offshore working vessel parameters and weather limitations was accounted for this analysis. For example, majority of the CALM Buoys are secured in their position with 6 mooring chains around the buoy. There can be multiple sequences to disconnect these 6 lines but current direction was checked on the day of execution to select the final sequence.

5. **Regulatory compliance:**

Majority of the decommissioning operations require proper permissions / guidelines from the governing / regulatory authority in the corresponding offshore jurisdiction area. These were completed in advance for several things like abandoning anchor chains down to seabed permanently.

As per article published on World Economic Forum's website in April 2024, there are around 12000 offshore installations around the world and many of these are near the end of their service life. Oil and gas companies will be initiating several projects to decommission these installations in near future. Therefore, there is immense requirement to outline the best practices that can be followed for safe execution of these decommissioning activities in a sustainable manner and without any negative impact to the environment.

The detailed presentation will highlight these best practices to increase the awareness level across the industry. Also, it is worth to note that

majority of these installations are quite old and may not be ROV (Remotely Operated Vehicles) friendly, therefore Oceaneering provides a highly experienced diving workforce along with complete diving set-up which is inevitable for any kind of decommissioning activities.

Abstract Title: Development of best practices for decommissioning of fixed offshore platforms in Indian Western offshore Author: Amit Jain, Praveen Bhat and Rachit Agarwal

Organization: Oil and Natural Gas Corporation Limited

Abstract: ONGC discovered Mumbai High field in 1974 and installed its first offshore platform in the year 1976. Presently, ONGC is operating with more than 330 fixed steel platforms in water depths ranging between 25-90m. Some of the existing fields have matured over a period of time, resulting in decline of productivity, even after employing usage of Improved Oil Recovery (IOR)/Enhanced Oil Recovery (EOR) techniques, and thus the offshore facilities will eventually be required to be decommissioned post cessation of production in a cost effective and environmentally safe manner.

Major decommissioning practices includes engineering & planning, well plugging and abandonment, neutralization of contamination, disconnection & disposal of pipeline, removal

of conductors, removal of topside structure & substructure (jacket) and site clearance. This paper discusses the various decommissioning practices suitable for Indian Western oil field like complete removal, partial removal including Rig to reef conversion by tow-&-place, topple-in-place & partial removal/topping of jacket structure for assuring adequate clear path for safe navigation & shipping and re-use/alternative use of offshore structures.

Considering that the decommissioning projects may have huge financial implications, it is important to have advance planning and execution methodology to be set in place to avoid various pitfalls during execution of decommissioning. The major components determining the decommissioning cost are well plugging and abandonment, mobilization & demobilization of HLV, removal of conductors, removal of topside structure & substructure (jacket) and material disposal. The paper also emphasizes for continuous engagements to be held with regulators, operators, consultants, and executing contractors.

In the ever-evolving energy landscape, the paper discusses the best possible decommissioning practices which can be adopted for Indian fixed offshore platform. As ONGC and Indian energy sector has embarked upon the journey of offshore decommissioning with on-going execution of Tapti Part B facilities decommissioning project, a brief overview of offshore decommissioning of platforms and pipelines has been discussed along with highlighting the main enablers for offshore decommissioning in India.

Theme:

Unconventional Energy Sources : Potential and Challenges

Abstract Title: Optimizing implementation and evaluating the risks and challenges of CO₂ - ECBMR (Enhanced Coal Bed Methane Recovery) pilot in Gondwana coalfield through a pre-feasibility study

Author: Priyanka Gupta

Organization: ONGC, CBM Asset, Bokaro

Abstract: CO₂ - ECBMR involves the capture of CO₂ and its storage into unmineable coal seams, while enhancing the primary recovery of CBM. It provides the two-fold benefit of carbon sequestration as well as increased CBM production offsetting the cost of Carbon Capture and Storage (CCS).

In this study, a methodology has been proposed for reservoir management through core studies, developing numerical model and its validation. Further, a pre-feasibility study for evaluation of existing coalfields has been done through screening criteria established through analogous pilot projects across the world. Finally, the risks and challenges involved in implementation of pilot project for CO₂-ECBMR have been evaluated and methods for its mitigation are proposed. Perhaps the least well understood aspect of CO₂-ECBMR are reservoir management and injection operations which would best optimize the outcomes of the process with least deformations or alterations of the existing reservoir and surface facilities. In this study, numerical simulations have been employed to understand the hydraulic field and mechanical alterations exhibited in during core studies [1,2,3]. Numerical model at a micro-scale (core-based) has been developed which can be validated. A methodology has been proposed to extrapolate the micro-scale observations at a macro-scale numerical model. This shall be helpful since the macro-scale (reservoir-based) model remains invalidated due to lack of any previous pilot tests in the Gondwana field and this extrapolation shall provide confidence for pilot implementation.

A pre-feasibility study also has been carried out encapsulating the learnings from analogous pilot projects across the world - mainly in San Juan Basin of USA [4] and South Qinshui Basin of China [5]. A matrix has been formulated based on key technical and commercial screening criteria recommended by International Energy Agency (IEA) for successful application of CO₂-ECBMR

[4], comparing East Bokaro Coalfield and Jharia Coalfield.

Through literature survey, several risks and challenges like permeability reduction, geo-chemical alterations, structural complexities, challenges of well integrity, CO₂ monitoring and containment - have been analyzed discussed; further mitigation plan has been proposed. A flowchart based systematic methodology has been developed for optimizing injection operations and reservoir management. Starting from the initial parameters of coal core, formation water chemistry and gas composition, the methodology suggests to conduct core-scale experiments of CO₂ saturation to study the alteration of physico-mechanical and chemical parameters. Subsequently, a micro-scale core-based model shall be developed, to conduct numerical simulation of hydro-chemical-mechanical physics and validate the model along with a sensitivity analysis with respect to experimental parameters. Conclusively, the study provides a systematic way of planning a pilot project for CO₂-ECBMR gathering learnings from analogues, numerical simulations and a detailed analysis of risks and challenges, focusing on two blocks of the Gondwana coalfield - namely East Bokaro and Jharia. Perhaps the least well understood aspect of CO₂-ECBMR are reservoir management and injection operations which would best optimize the outcomes of the process. The study has precisely addressed this problem by proposing a systematic method of model validation, conducting pre-feasibility study for Gondwana coal-fields and understanding the risks and challenges pertaining to these fields.

The results of the pre-feasibility study as per the key criteria of IEA Report [4], listing details of geology, CO₂ supplies and gas demand. It may noted from the table that East Bokaro field is a better candidate for CO₂-ECBMR, especially considering pipeline and plant infrastructure. The risks and challenges in implementation of CO₂-ECBMR and how they may be mitigated. Various methods of injection have been suggested as solutions to the issues addressed.

Abstract Title: Expert resource assessment

enables geothermal power plant developer to seal 20-year contract for sale of electricity: A Case Study from North America, OnshoreAuthor:Shubh Srivastava, Attakan Janpidok, Tefvik Kaya

Organization: Schlumberger

Abstract: Before committing to purchase electric power from a new geothermal plant for a 20-year period, the buyer wanted independent verification of resource potential. Using advanced in-depth analysis and proprietary techniques, GeothermEx™ geothermal consulting services confirmed project viability and the projected decline rate with a confidence level >90%, enabling execution of the power purchase agreement (PPA). A leading geothermal project developer acquired acreage in North America that was near numerous operating geothermal projects. Moreover, indications of an underlying geothermal system had been discovered during mineral exploration more than a decade ago, when shallow wells (200-ft to 300-ft deep) encountered temperatures >200 degF. However, there was no surface manifestation of geothermal activity, such as hot springs or fumaroles, in the acquired area—it was a blind prospect.

Over the next 5 years, the developer conducted an extensive exploration campaign that included in-depth reservoir evaluation, drilling for cores, and drilling several deep, full-size commercial wells. A 29-day production-injection test in the full-size wells demonstrated high flow capacities and a stable production temperature. Preliminary reservoir modeling supported the proposed development of a power plant with a capacity of 15–16 MW for a 20-year project. As a result, commercial drilling operations continued, and all necessary field requirements were completed for a projected plant startup by the end of the following year. During negotiations for a 20-year PPA, however, the buyer requested verification of the sustainable resource capacity by independent third-party experts. Based on an extensive global track record and proven excellence, GeothermEx services by SLB were selected for the data review. Estimating reservoir temperature

Following a study of the available geochemical analyses of reservoir fluid, geothermometric calculations yielded fluid temperatures in the range 264–269 degF, consistent with observed temperatures in the main production zone. As input to the probabilistic heat-in-place estimates, GeothermEx services estimated average reservoir temperatures to lie between 255 degF and 275 degF, with a most likely value of 265 degF. This range accounts for the potential contributions of deeper, hotter fluids as well as the slightly cooler, shallow zones noted during the long-term

production-injection flow test.

Estimating reservoir thickness. Many of the static wellbore temperature surveys display a relatively high shallow geothermal gradient—approaching the maximum temperature in the first 300 ft of measured depth (MD)—followed by an isothermal profile to TD. In the deepest well, the isothermal zone extends across more than 2,200 ft before transitioning to a deeper, hotter zone that extends another 1,500 ft.

Using these observations and empirically derived estimates of typical thickness for geothermal projects in similar geologic environments, the minimum, maximum, and most likely reservoir thicknesses were estimated.

Estimating reservoir area

First, the temperature distribution 6.5 ft below the surface was analyzed. Although very shallow and susceptible to dynamics in the local hydrogeology, these data provide a frame of reference for estimating the areal extent of the deeper reservoir. For example, the 70-degF and 75-degF contour lines on these data encompass approximately 6 mi² and 3 mi², respectively.

Temperature contours were also estimated at approximately 1,000-ft MD—which is more representative of the productive reservoir—using the inferred initial-state distribution of reservoir temperatures interpreted from static wellbore temperature surveys. The potential resource area represented by the 260-degF isotherm is approximately 2 mi²; it indicates the minimum resource area since hotter temperatures are observed in deeper parts of the reservoir. The inferred 230-degF isotherm encompasses nearly 6 mi². Because of the lack of spatial coverage at this depth and inherent uncertainty in the inferred temperature distribution, GeothermEx services estimated the reservoir area to lie in the range of 2–4 mi², with 3 mi² the most likely value.

Confirming resource viability

With the key inputs reasonably bounded, the probabilistic heat-in-place calculations were carried out with the addition of a number of other parameters, whose assumed values were based on typical observed ranges. The analysis corroborated with a confidence level >90% that the required power output could be sustained from the reservoir. A study of available flow test data indicated that the wells could reasonably be expected to operate at the production and injection rates required for the proposed power plant.

The PPA terms under discussion required a power output in the first year equal to at least 95% of nominal capacity and subsequently declining by 0.5% annually for the 20-year duration of the

agreement. GeothermEx services estimated that this decline would be equivalent to a temperature decrease of about 0.5 degF per year, assuming a constant flow rate of geothermal

fluid. Based on other geothermal projects in similar geologic environments and comparable separation between production and injection wells, the projected 0.5% annual decline was deemed reasonable. With all concerns addressed, the PPA was signed and sealed to the mutual satisfaction of both parties. From the suite of geotechnical data provided by the developer, the focus was on the following elements:

- drilling logs and well pressure and temperature surveys
- geochemical analyses of resource fluid samples
- geophysical surveys (e.g., magnetotelluric, magnetic, and gravity)
- area-wide survey of shallow temperatures (at a depth of about 6.5 ft)
- short-term flow tests of individual wells
- long-term production-injection test (29-day duration)
- preliminary numerical modeling results.

This review was used to estimate resource characteristics for a probabilistic analysis of sustainable power capacity, based on a volumetric heat-in-place approach. Of the various inputs required for the technique, reservoir temperature, thickness, and area are the most critical. Plant performance: Since the plant came online, its average output has significantly exceeded nominal capacity. The high permeability and shallow reservoir depth compensate for the relatively low production temperature, enabling economic and sustained development of the resource. These results were supported by a new in-depth study conducted about 20 months later by GeothermEx services personnel. The latter study, encompassing nine production and five injection wells, was part of a due diligence review for another PPA related to a second plant in the field, which was due to come online soon. Analysis of flow capacities and temperatures (based on demonstrated performance for the first plant and production tests in new wells for the second) confirmed that the reservoir could support more than the nominal output of the two plants. Calibrated resistance temperature detector (RTD) thermometers showed that the plant inlet temperature had declined less than the estimated 0.5 degF per year, while reservoir pressures also showed little or no change. Results of tracer testing indicated a hydraulic connection between the injection and production areas, which is beneficial from the perspective of supporting

reservoir pressures. Moreover, based on the speed and magnitude of the tracer response, the risk of cooling due to injection is low. Finally, review of a reservoir simulation confirmed relatively modest temperature and pressure declines over the next 20 years, unlikely to have a significant impact on plant performance. Given the large amount of spare capacity available from existing wells, GeothermEx services estimated with 90% confidence level that the plants would maintain the required output for the duration of the agreement.

Abstract Title: A preliminary study of quantification of CO₂ sequestration potential and associated incremental methane recovery from Jharia Coalbed Methane (CBM) field considering the flow dynamics that prevail in CBM reservoirs.

Author: Rajeev Upadhyay, Saurabh Datta Gupta, Ashutosh Kumar, Raj Kiran and Vinay Kumar Rajak

Organization : Subsurface Energy and Storage Systems Lab, Indian Institute of Technology (Indian School of Mines) Dhanbad

Abstract: The amount of gas sorbed on the coal matrix depends on its partial pressure in the cleats, not total pressure. Thus, methane gas can be released from a coalbed methane (CBM) reservoir by reduction of partial pressure through injection of a foreign gas. Production of coal gas (methane) by reduction of partial pressure is termed Enhanced Coalbed Methane (ECBM) Recovery. When CO₂ is used as injectant, CBM reservoirs become potential source for CO₂ sequestration too. Therefore, CO₂ sequestration in CBM reservoirs is not only a method of emission reduction, but also a method of increasing methane recovery from CBM wells. Though significant research efforts have been devoted to developing the CO₂-ECBM technology in countries like, USA, Canada, China, Japan, and Australia, the application of technology is yet to be tested in Indian CBM fields. There have been few studies conducted to quantify the storage potential of Coal seams of India, but these studies are confined to simplistic volumetric estimations with no consideration of flow dynamics in CBM reservoirs that drives the methane recovery. The combined effects of pressure-dependent diffusivity, time-dependent desorption, and multicomponent sorption in a two-phase flowing CBM well makes the flow dynamics in CBM reservoirs complex. Injection of CO₂ in CBM reservoirs with simultaneous production of methane will involve additional complexities related to matrix swelling and shrinkage effects leading to change of porosity and permeability of CBM reservoir. These phenomena will impact the flow dynamics

within CBM reservoirs. For realistic estimation of CO₂ storage potential of CBM reservoirs and associated incremental methane recovery, it is essential that coal geology and petrology driven volumetrics be confirmed and validated with flow dynamics driven quantification of CO₂ storage potential and incremental methane recovery. This paper aims to integrate the existing knowledge of Indian CBM fields and present a mathematical model based computational approach to quantify the incremental recovery of methane when CO₂ sequestration is implemented in CBM reservoirs. The study will demonstrate the methodological approach in Jharia CBM field, though the workflow can be replicated in other coal fields of India for a comprehensive ECBM study for all CBM fields of India.

Abstract Title: Optimizing Frac Design in CBM Wells using results from Geomechanics and Mini Frac tests: A Case Study from Bokaro CBM Block

Author: Rohan Kumar

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Hydraulic Fracturing (HF) is a pre-requisite for producing Methane gas from CBM Wells due to low permeability. CBM frac design depends upon various data such as Reservoir, Completion, Drilling etc. Sonic data acquired from CBM wells serve as the cornerstone for constructing a 1-dimensional geo-mechanical model, illuminating pivotal parameters such as Young's Modulus, Poisson's Ratio, Stress etc. Geo-mechanical data, harnessed through 1-D modeling, serve as the cornerstone for developing a customized frac simulation tailored for precise fracture placements. Findings derived from the case study offer invaluable guidelines for tailoring HF designs across diverse scenarios, including varying well depths, degrees of tortuosity, and geological characteristics.

Abstract Title: Linking Fracture Orientation with Inclined Well Trajectory to Evaluate Production Performance in CBM Reservoir

Author: Abir Banerjee, Sameer Bakshi, Ramchandra Soren, Anupam Banerjee, Pradipta Mitra, Nawin Lugun and Alope Das

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: The objective is to generate fracture

network maps in coal seams using resistivity image logs and to establish the relationship between fracture orientation and fast shear wave propagation direction. In the study area, resistivity image log in 15 wells, sonic log in 04 wells, inclined well's production data and cumulative active seam thickness in 33 wells were available. The fracture network map of 5 individual coal seams was obtained. In each map, it was observed that fracture orientation varies laterally across the block. Linking fracture orientation with inclined well trajectory in Coalbed Methane (CBM) reservoir shows that well passing across the fracture reflects higher gas production efficiency compared to the well.

Abstract Title: Oil Shale Co-Pyrolysis - A New Solution for the Circular Economy and Energy Security

Author: Ryan Clerico, Riho Kruuv and Mohammed Layachi

Organization: Enefit Outotec Technology and Eesti Energia AS

Abstract: The retorting of oil shale has long been fundamental to Estonia's energy industry. Decades of research and development efforts have led to Enefit Technology. In response to environmental limitations within the European Union, including CO₂ taxes and a push to transition away from fossil fuels, Enefit has strategically adopted the transition to chemical industries. Until recently, retorting oil shale posed economic challenges. However, advancements in technology and the co-pyrolysis of waste materials have led to increased production of shale oil. India's untouched oil shale reserves present an opportunity for leveraging unconventional extraction through Enefit Technology. By tapping into these resources, India can diversify its energy portfolio.

Abstract Title: Coal Bed Methane (CBM) Production Enhancement: Integration of Subsurface understanding and recent technological advancements - A Case study

Author: Jagadish Chand and Bibhu Parida

Organization: Reliance Industries Ltd. Exploration and Production

Abstract: Understanding of key CBM properties has big influence on well producibility. While the CBM reservoir properties plays a critical role in determining the gas recovery from the

coal reservoirs, there are recent technological advancements which if integrated with proper understanding of subsurface, can not only enhance and accelerate gas production but also advance the process of gas recovery dramatically. In this study, all such technologies along with the methodologies to acquire the required subsurface understanding for successful execution in Sohagpur CBM blocks are discussed. With an objective to enhance gas production, new technologies were adopted in Sohagpur CBM block which includes in-seam lateral drilling, under balance drilling, use of Down Hole Gauge (DHG) and improvised downhole completion assembly. To facilitate in getting the desired results, enhanced the sub-surface understanding by acquiring robust data through field and empirical methods e.g. cleat orientation, reservoir pressure, water production estimation etc. The multilateral wells are successfully drilled and are being continuously produced with less downtime. The productivity of the wells becomes multifold with respect to vertical fracked wells and gas recovery could be enhanced upto ~80%. These new and improvised methods/technologies could also be applied to both low permeability and deeper coals of Indian basins for productivity enhancement.

Abstract Title: Exploration of Deeper Coal bed reservoirs and optimisation of hydrofracturing design for optimum production

Author: Troyee Dasgupta, Dipanjan Maiti, Adarsh Kumar and Karan Raj

Organization: Essar Oil & Gas Exploration and Production Ltd.

Abstract: Deeper coal seams are generally matured and has better gas content and saturation. Accordingly, though the wells targeting deeper seams often gives early gas break out but fails to achieve sustained pressure. Core desorption, adsorption, geo-mechanical data were studied to understand the potentiality of deeper coal seams (>1200m). Shear sonic anisotropy data gave insight about cleat geometry, density etc. Core data of deeper seams shows variation in gas content from (8 to 12g/cc) and gas saturation (>95%). However, fluid injectivity data reveals deeper seams to be of low permeability (0.2-0.8mD). Combining core and petrophysical analysis, it is possible to identify the potentiality of deeper coal seams. In order to enhance & sustained CBM production in these tighter system would be necessary.

Abstract Title: Harnessing Unconventional Energy

Source: A Case Study of Quantifying Hydrocarbon Potential in Indian Gondwana Shale Using Image Processing Algorithms

Author: Umang Nagpal, Piyush Sarkar and Swarandeeep Sahoo

Organization: Oil and Natural Gas Corporation Limited (ONGC), Rajiv Gandhi Institute of Petroleum Technology (RGIPT), Indian School of Mines (ISM)

Abstract: Globalization has sharply increased energy demands, putting pressure on conventional resources, which alone cannot meet future needs. Therefore, harnessing unconventional sources like shale has become vital alternative. In this paper, a novel analysis of Fractal dimensions (FD) and Betti numbers was performed for Indian Gondwana Shale sample to quantify a parameter for hydrocarbon storage and estimate the number of flow channels by implementing our image processing model on Micro CTs images of Shale core sample. Current understanding of these India's potential shale gas reserves is limited, with early-stage studies and inherit heterogeneity of the shale sample, laboratory core analysis becomes a challenge. In this paper, we try to tackle this challenge by doing a quantitative analysis of 2D and 3D fractal dimensions of pores, grains and interfaces for West Bokaro basin shale, using the box-counting method. An image segmentation algorithm was applied to label different pore and grain subclusters, and subsequently analysis of FD was carried on each of them.

We implemented a novel application of Betti numbers and calculated the possible flow channels. The quantitative characterization of complexity in pore geometry is important in understanding the transport and storage potential of unconventional rock such as shale. The results of this study can be used to model the elastic properties of reservoir rock. The FD of grains was found to be greater than the FD of the pore-grain interfaces, while the FD of pores was found to be minimum. Moreover, the FD value close to three suggests that the shale structure is complex and hence responsible for the difficulties in predicting the petrophysical properties. Consequently, we also observed how the FD of both pores and grains was majorly controlled by the largest subcluster, and during fluid intrusion we observed a significant decrease in the FD of pores. Larger pore subclusters with larger FD values were observed, which suggests that the connecting pathways will be more complex and will also have a maximum possibility of containing a fluid. After observing estimating topological parameters, our model chooses a rock with a larger zero Betti number and a larger difference of first Betti number predicting the maximum possibility of hydrocarbon content and fluid movement along

with maximum flow channels in unconventional energy sources like Shale. To validate our code, we replicated results from synthetic datasets by X. Li et al. and Y. Li et al., achieving 99% and 100% accuracy, respectively. The model discussed in this paper is very novel and never been implemented

in the domain of Rock physics. By using our model and deploying our image processing algorithms on Micro CTs of Shale sample, one can easily quantify which core sample would have highest potential for Hydrocarbon.



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Theme:**Energizing Role of Artificial Intelligence(AI) and Machine Learning (ML) in E&P**

Abstract Title: Super Resolution Seismic Imaging and Inversion through Deep Information Maximization: A Case Study of the Chandon Field

Author: Mannat Khanna, Narendra Verma, Abhimanyu Yadav, Dip Nanda, Vinay Bhardwaj, Tapas Mitra, Siddhant Pattanaik and Nipul Seervi

Organization: Rezlytix Technologies

Abstract: High-resolution seismic imaging is vital for reservoir characterization and hydrocarbon exploration. However, challenges such as low resolution and limited bandwidth hinder accurate subsurface imaging. Our study introduces a novel generative deep learning-based methodology aimed at achieving high-resolution seismic imaging and inversion capabilities, focusing on the Chandon Field in the Northern Carnarvon Basin, NW Australia. A meticulous workflow was deployed, integrating outputs from multiple deep neural networks and machine learning models to obtain high-resolution seismic data along with a high-resolution static rock property model. A 3D structural model is also built to be used as an interpreted constraint. The deep information maximization algorithm is based on a generative deep learning architecture, it is trained in a semi-supervised manner using the preconditioned well data and seismic data as input along with the structural model. The super resolution outputs are achieved by simulating the forward and inverse modelling process through the combination of deep learning networks. Our approach yielded super-resolution seismic and acoustic impedance models with 1.5x information content, extending frequency bandwidth by 1 octave from 60 to 120 Hz. This enabled detailed interpretation, revealing previously unresolved stratigraphic and structural elements such as complex thin-bed depositional geometries, as well as addressing the challenges in mapping lateral facies continuity. The deep information maximization algorithm offers a robust methodology for enhancing rock property models, facilitating refined geological interpretations and informed decision-making in hydrocarbon exploration and reservoir management. This study introduces a novel approach leveraging generative artificial intelligence to combine well and seismic data, enhancing resolution for detailed subsurface

characterization. The super-resolution outputs enable better integration of seismic-derived information into 3D reservoir and geomechanical models, addressing existing challenges in resolution limitations.

Abstract Title: Innovative Workflow for Converting 2D Seismic Lines to 3D Seismic Volume-A Case Study

Author: Vasudev Bansal, Hemanshu Thusiar and Satyesh Bhandari

Organization: Sun Petrochemicals Pvt. Ltd. (SunPetro)

Abstract: Conventionally 2D Seismic data were used for identifying hydrocarbon plays through structural /stratigraphic interpretation and narrow down the areas for 3D Seismic data acquisition. Interpretation of 2D Seismic data generally provides reasonable confidence for mapping subsurface boundaries. However, the interpretation varies from one interpreter to another and requires extensive experience. 3D Seismic data plays an important role for a journey from play to prospect and minimizes interpretation related uncertainty.

Acquisition of 3D Seismic data is a challenge in certain areas due to logistical constraints. A workflow has been designed to convert 2D Seismic to 3D Seismic volume using various statistical techniques. The 3D Seismic volume created from 2D Seismic data is economic and quick way to improve upon seismic interpretation and understanding the reservoir.

The methodology includes the use of conditioned seismic data which is to be converted and storing them into point data set with its attributes for each corresponding sample of the 3D model.

Converted point data set then exported to a 3D grid covering entire study area for transformation using statistical methods and regional trends to compute grid value away from the known data points, followed by best-fit interpolation scheme to populate seismic properties three-dimensionally using fast computing machines, satisfying the

conditions of statistical parameters. The 3D Seismic volume was then further subjected to additional processing steps to improve the quality. As a pilot case, a 3D Seismic volume was generated using twelve 2D Seismic lines in a 2x3 km grid covering an area of about 75 sq. km. However, this workflow can also work with larger separation between 2D lines. However, the quality of generated 3D volume may vary. The 3D Seismic volume thus created can be visualized in inline, crossline & time-slice. The orientation of 3D volume in this case was N-S direction and not in the direction of 2D lines. Therefore, the validation of resulted 3D seismic volume was done by reconstructing a 2D line from 3D seismic volume along the original 2D line. It was observed on comparison that both matches very well. Various seismic attributes maps (coherency, seismic amplitude) can also be generated to analyze the subsurface geology, which was not possible with the help of 2D Seismic lines. A good computer processing speed is required for this workflow as it involves extensive computation, depending on density of 2D lines and desired 3D geometry. 3D Seismic volume generated with the workflow discussed here can be best used for structural interpretation and also for the attribute analysis to an extent. In the absence of field 3D seismic data, it provides more confidence on interpretation in comparison to 2D interpretation. However, quantitative interpretation for reservoir characterization will require field 3D seismic. This workflow has an economic merit as it saves huge cost of 3D seismic acquisition if some regional & reconnaissance evaluation is required.

Abstract Title: First ever production enhancement from India's western offshore Assets through digitalization of well and network flowlines monitoring and analysis through AI-ML based workflows.

Author: Nirbhay Kumar Mishra, Aaheli Bhattacharjee, Deepesh Khandelwal, Nakul Varma, Vaibhav Deshpande, Nandhini D, Tejashwini, Nandita Gussain and Meenu Gupta

Organization: Schlumberger

Abstract: First ever production enhancement from India's western offshore Assets through digitalization of well and network flowlines monitoring and analysis through AI-ML based workflows. To meet the mounting energy demands of India, client has taken a digital transformation initiative to extract actionable items from large volumes of production data generated from their day-to-day brown field operations. The initiative aims for a cost-effective enhanced oil production from their mature oil and gas fields.

Digital production management is one such digital initiative to create a digital twin of brown oilfield by integrating wells and flowline network into one, end user visualization dashboard to be used for monitoring, analysis, and decision making. One of the most trailblazing innovations in this project is the workflows for wells and network level optimizations. It commits to address challenges client face in their day-to-day operations, major ones being, planning Stimulation Jobs, manually modelling well and network with new test data, plan sorties to unmanned platforms, manage data from multiple sources. Workflow implementation through Avocet has introduced the capabilities of Avocet to the customer to use an user friendly interface making it a preferred platform for clients technical team as well as higher management to monitor and analyze production.

Abstract Title: Machine Learning Assisted Reservoir Characterization in Bakrol Field, Cambay Basin, India: An Integrated Study leading to Multi-fold Increase in Production

Author: Arun Babu Nalamara, VR Sundar, Manabesh Chowdhury and Pinakadhar Mahapatra

Organization: Selan Exploration Technology Private Limited

Abstract: The objective of the paper is to demonstrate the approach implemented in Bakrol Field, Cambay Basin India for a machine learning (AI & ML) assisted property modelling technique coupled with advanced seismic attributes. This study aims to enhance reservoir characterization in the Bakrol field using Digital Technologies. The objective is to increase the accuracy in predicting reservoir properties in the field, intern increase the production from the field. Bakrol field is a producing oil field in the Cambay Basin, measuring 36km² of area in prolific Cambay Basin. There are 29 wells drilled in this field and Kalol-VIII & Kalol-IX are the main producing reservoir. The K-VIII and K-IX reservoirs are low permeable and heterogenous in nature. Identifying the suitable drilling location is challenging in this field.

To overcome this challenge, advanced machine learning models has been applied, specifically Convolutional Neural Networks (CNN) and Transformer models, incorporating 3D seismic data and well logs from 22 wells. The workflow involved well to seismic tie, comprehensive data cleaning, model training with well logs and seismic attributes. This workflow leads to direct prediction of well log characteristics such as Gamma Ray, Resistivity, Neutron Porosity, Density, and Sonic Log. The model's performance was

validated using blind wells, demonstrating high accuracy and reliability. The machine learning models achieved significant accuracy, with the CNN model reaching 78% for Density and 71% for Resistivity. The Transformer model enhanced the frequency multiple times. This approach enabled the successful prediction of well logs, improved reservoir characterization, and facilitated the drilling of six successful new wells in previously undeveloped areas. The integration of ML models led to a threefold increase in production volume and a strategic shift in development philosophy. The study underscores the transformative potential of machine learning in optimizing production and reservoir management in Bakrol field. Historically, most works have been focused on unsupervised machine learning approaches such as facies classification or Self-Organizing Maps (SoM) techniques. This study introduces supervised learning with high accuracy, marking a significant advancement. This work demonstrates substantial improvements in predicting reservoir properties, providing a novel and more accurate approach compared to traditional unsupervised methods.

Abstract Title: GARBH: An Indigenous Seismic Data Processing Software

Author: Ashutosh Kumar and Ankit Kumar

Organization: Caliche

Abstract: High-resolution and consistent subsurface imaging is one of the six grand challenges for the petroleum industry. Traditional methods face obstacles due to iterative processes. Conventional seismic data processing involves numerous steps, such as resampling, navigation merging, trace decimation, static correction, spherical correction, velocity analysis, denoising etc.

The objective of seismic data processing is to infer subsurface information visually for insightful decision-making. The software is in continuous development and the results are visibly acceptable. By leveraging GANs, our approach offers a revolutionary solution to subsurface imaging challenges, promising significant improvements in efficiency and accuracy for the petroleum industry.

Abstract Title: AI ML for drilling hazard mitigation

Author: Dr Sunil Kumar Khare

Organization: PTRE TRANS AI Private Limited

Abstract: Our study presents a novel method for application of artificial intelligence (AI) and machine learning (ML) for drilling optimization, and reduction of NPT and downtime in drilling operations. The real time data is transferred to WITSML server on which an ML algorithm module is run to detect anomalous trend of drilling variables (parameters). While manually monitoring drilling operations in real time, it is difficult to assess the drilling hazard from minor variation in trends of several variables. This automated solution enables early detection of drilling hazards from real time drilling data with minimal human inputs. All stakeholders are notified and in time corrective measures.

Abstract Title: Optimizing Seismic Facies Analysis in E&P using Machine Learning Techniques

Author: Umang Nagpal, Ayush Kumar and Santosh Dhubia

Organization: Oil and Natural Gas Corporation Limited (ONGC), Indian Oil Corporation Limited (IOCL) and Gujarat Energy Research and Management Institute (GERMI)

Abstract: To manage the growing data in the E&P sector, machine learning methods, particularly unsupervised classification techniques, have become crucial. Seismic interpretation, is a vital part of oil and gas exploration. The dataset for this study comes from the Penobscot and F3 Block 3D seismic survey. We developed a Python code to read inline, xline, and time slices of the seismic data. The resulting noise-free seismic image served as input for the SOM and GTM algorithm, allowing us to divide the seismic section into multiple clusters (16, 64, 144, and 256) for inline and zslice. The algorithm developed in this paper, is tested and validated by comparing results from Napoli et al. (2021) and Silva et al. (2019), hence this model can be confidently used in production.

Theme:

Opportunities and Challenges in Emerging Indian Offshore Basins

Abstract Title: East India seismic database generation and utilization for regional interpretation and Gross Depositional Environment (GDE) mapping.

Author: Subodh Notiyal and Verity Agar

Organization: TGS

Abstract: Objective of this paper is to go through the process of generating a conforming 2D and 3D seismic databases in the offshore East Coast of India utilizing legacy 2D data and then combining it with well data for regional interpretation including Gross Depositional Environment (GDE) mapping.

Across offshore East India, a wealth of vintage 2D seismic data was available from the NDR-DGH. In 2021 TGS used over 250,000km of the 2D data and the 'structurally conformable interpolation' method also known as 2Dcubed to generate a 3D volume. This technique requires all the input 2D data from several legacy surveys to be matched for phase, time and amplitude and then transformed into 3D. This seismic data in combination with data from over 60 wells allowed for a detailed regional interpretation, including comprehensive well and seismic interpretation, stratigraphic framework setup and regional GDE mapping for various intervals.

This workflow provided a high-quality matched and merged 2D and regional 3D seismic volume of over the area 550,000 km². A consist database of interpreted products from 60 wells was also generated. These datasets allowed large-scale seismic interpretation and associated well interpretation. Using the seismic data, it was possible to interpret well tops to be consistent across the basins, in some instances this altered the tops from the existing interpretation by many 100's of meters. These interpretations and the associated amplitude maps, isochron, and detailed lithological well interpretations allow the generation of regional GDE maps which help describe the geological evolution and sedimentary history within the region. Regionally time-accurate horizons can be used to generate more accurate 3D basin models with more accurate timing for trap formation and potential hydrocarbon

generation. Mapping of time continuous horizons in conjunction with the 85-degree ridge helps to better understand the timing of the various features along the ridge.

Data available in a consistent database can have a huge time savings for companies in performing regional interpretation. Mapping of the full of the East India Continental Margin allows a better understanding of the timing of the collision and its impact on sediment fill, and paleo water depth. This helps understand periods where sands may be transported further into the basin.

Abstract Title: Evidence for Stretched Continental Crust in Northwestern Indian Deep Offshore: Opportunity for Hydrocarbon Exploration

Author: K.B. Bhavya

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: The nature of the crust in the northwestern Indian deep offshore has been long debated, and the Continent Ocean Boundary (COB) is enigmatic. The seismic and well data and gravity and magnetic data were used for integrated interpretation and modelling in the area. In the deep offshore area from the Indus to Girnar Fracture zone, the faults and structures follow the same trend as the onland area. The study suggests that the COB may be south of the Laxmi Ridge. A stretched continental crust has a higher potential for thermal maturation than an oceanic crust.

Abstract Title: FPSO Redeployment: Opportunities and Challenges in emerging India offshore basins

Author: Ashish Kumar Minocha

Organization: Invenire Energy Pvt Ltd

Abstract: FPSO (Floating Production Storage and Offloading) vessel extracts crude oil and natural gas offshore. This technology offers the industry

a versatile processing facility that can link directly to well. Structured approach that addresses technical, economic, and operational aspects to redeploy FPSOs to marginal field to maximize production and profitability in different offshore fields. It is observed:

A)FPSO Redeployment has given better performance in marginal fields.

B)Short field life, geopolitical uncertainties, reservoir uncertainties makes FPSO leasing and redeployment

FPSO Redeployment could be attractive even at the end of field life as door to leasing asset to the next field owner is always open.

Abstract Title: Exploration opportunities in Andaman Back-arc basin, India

Author: Soumen Paul, Sivaprabha S., Ujjwal Nandi, Sonu, Sanjay Goswami and D C Pant

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Here we investigate and present the unique hydrocarbon exploration opportunity currently presented by the Andaman Back-arc basin, India. This study integrates the existing data base along with the newly acquired seismic data to understand the various hydrocarbon plays present in the area. Our study reveals number of exploration opportunities remains to be probed in back-arc sector. Recently Govt. of India decided to clear large swath of no-go areas for exploration. Synthesis of all the G&G data within a regional framework enabled us to perceive the hydrocarbon prospectivity of the area better, which was not available earlier.

Abstract Title: Ensuring Security in Offshore Energy: Challenges and Strategic Solutions

Author: Lt.Swati

Organization: Directorate General of Hydrocarbon (DGH)

Abstract: This paper explores the security challenges faced by India's offshore oil and gas industry, vital for the country's energy security and economic growth. It examines threats such as terrorism, cyberattacks etc. The paper conducts a review of existing literature and data on offshore security, complemented by an analysis of notable incidents and established security frameworks.

Findings indicate a multitude of security challenges for India's offshore sector, including physical threats like terrorism, cyber vulnerabilities, and environmental risks such as oil spills. This paper provides valuable new insights by addressing the unique security challenges in India's offshore exploration and production (E&P) sector.

Abstract Title: Exploring Biogenic Hydrocarbon Prospectivity in West Andaman Offshore Region: Geological Approaches and Findings

Author: Arijit Sahu, Soumen Deshmukh, Deep Chandra Pant, Sanjoy Goswami and Suchismita Saha

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: From exploration standpoint, Andaman Islands and the adjacent offshore region lying east of Sunda subduction trench have always tempted the operators chasing the hints of hydrocarbon liberating. The methodology integrates geological inputs from distant DSDP/IODP wells in and around Ninety East Ridge, 2D/3D seismic data interpretation, advanced geophysical analysis, and geological modelling. The West Andaman Offshore region exhibits promising biogenic hydrocarbon potential, particularly within Mio-Pliocene sedimentary sequences. This abstract contributes novel insights into the biogenic hydrocarbon potential of the West Andaman Offshore region, enhancing current understanding through a comprehensive geological and geophysical aspects.

Abstract Title: Recent Mahanadi Offshore Discovery: Opportunities and Challenges

Author: Kallol Maity, Priyajit Ghosh, Amit Kumar, Swagatam Swain, Sanjoy Goswami and D C Pant

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Unique efforts made in Mahanadi offshore leading to two recent discoveries viz. "Utkal" & "Konark" for play opening as well as play extension in OALP Block. The stratigraphically controlled geological set-up in a shelf-slope regime of the Mahanadi basin broadly indicate presence of slope-controlled channel system in the Neogene stratigraphic sequence. The two recent Neogene discoveries in Mahanadi offshore has opened up large corridor for delineation and appraisal of Pliocene channel complexes in the

sector that holds significant potential. Due the stratigraphic nature of entrapment in the aforesaid discoveries, unique efforts were made through

G&G data analysis along with multi attribute study to capture the channel delineation.



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Theme:

Unlocking Potential: Revival of Non-flowing Wells

Abstract Title: Production Revival & optimization by Rigless installation of new gas lift system

Author: Shashi Ranjan Kumar and H S Chadda

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Western offshore field of ONGC India is mature field producing since 1974. The field have around 852 oil flowing strings and almost 95% wells are on gas lift. The alternative, which is Kinley Insert check valve installation by slickline is not only economical but also technically less risky and best way for optimizing gas lift for enhancing the production. The results so far have been 100 percent success in production increase. Total liquid and oil gain from 12 strings were around 1400 BLPD and 490 BOPD respectively.

Abstract Title: Reviving Non Flowing Wells by Decoding Low Resistivity Low Contrast Mandhali Sands: A Case Study from Jotana Field of ONGC Mehsana

Author: Suman Saurabh

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: The Paper will showcase how by analytical analogy from open hole logs of the nearby oil wells & use of available Nuclear Magnetic Resonance logs in far away exploratory wells. Analytical analogy from nearby wells, revisiting of old conventional open hole logs using different cross plot methods, digging data of Formation-Evaluation reports & historical core studies done.

Results:

10 vintage sick wells (Sick>10 years)in which all conventional oil producing sands were exploited were put on production.

Identification of Low Resistivity Low Contrast pay zones in Mandhali Sands of Cambay Basin has opened a new area of study. Same pay zones can also be established in different fields of Cambay Basin

Abstract Title: Unlocking Potential: Revival of Non-producing field of Bhandut

Author: Shahjan Bukhari

Organization: Kiri and Company Logistics Pvt. Ltd.

Abstract: Bhandut field (Area 6.1 sq.m) is located near the city of Surat in Gujarat. The Field was discovered in 1976 by ONGC. A PSC amendment agreement has been executed on 12th April 2021 and 100% participation. A holistic approach and methodology were implemented starting with existing wells integrity test and detailed reservoir studies was carried out by GERMI. Based on results, we carried out extensive Work. The result has been very encouraging as we brought nonproducing field into producing field with a very short span of time with aggressive Workover and drilling new wells and reached peak production. Need a holistic approach and detailed reservoir studies for unlocking potential from the non-productive small fields.

Abstract Title: Microwave-Assisted Mobilization of Viscous Crude Oil for Improved Oil Recovery and Flow Assurance Applications: A Study on Lab-to-Field Approach

Author: Amit Saxena and Shivanjali Sharma

Organization: Rajiv Gandhi Institute of Petroleum Technology

Abstract: This study aims to investigate the efficacy of microwave-assisted techniques for improving oil recovery and flow assurance in viscous crude oil reservoirs through extensive laboratory experiments. Initial characterization experiments determined crude oil density, API gravity, UV-visible absorption, total acid number, and sandstone core porosity. Microwave treatment enhanced oil recovery by up to 21.32% for lighter crude oil. GC-MS analysis revealed the cracking of heavier hydrocarbons into lighter components, reducing viscosity. This research delves into the potential of microwave irradiation to revolutionize heavy crude oil recovery. Reducing viscosity and facilitating gravity segregation offers a novel approach.

Abstract Title: Realizing Locked In Potential (LIP) Through Idle Well Restoration (IWR): Strategy & Framework - Case Study From South East Asia

Author: Vipin Gupta

Organization: Manan Oilfield Services Private Limited

Abstract: The Paper will cover Strategies and Framework for effective implementation of Idle Well Restoration program in oil and gas assets to enhance production and improve recoveries in oil and gas assets. Well selection process and stake holder management are the core areas that play the most important part in success of the out come. It is given that success ration will be low and sustainability poor. The paper showcases the successful journey of an oil and gas asset in South-East Asia where both these challenges were overcome to result in effectively reducing the absolute numbers of the idle wells. Wells, singularly hold the most important portfolio in the life of the oil or gas asset. They also are the biggest component of the total investment in the project.

Abstract Title: Unlocking Hidden Production Potentials through an Integrated Rigless Intervention Approach in South East Asia

Author: Beryl Audrey and Shreya Singh

Organization: Schlumberger

Abstract: A multidisciplinary, fully integrated end-to-end approach was implemented in different fields in Southeast Asia. This included data gathering; techno-commercial portfolio ranking of best candidate well etc. Through the deployment of a multi-discipline team, all wells initially went through production potential review during the candidate screening. Well rate cut-off is used to screen through the candidate well. These case studies are located offshore: Casestudy1 involves ~500 idle strings in shallow water environment, whereas casestudy2 has ~30 wells (idle and active) in deepwater environment. Rigless production enhancement initiatives still remain relevant in today's oil and gas landscape as it is considered low cost and low carbon footprint in comparison to drilling new wells.

Abstract Title: Integration of Reservoir Data to Unlock bypassed oil in a brown field-A case study from South Sumatra Basin, Indonesia

Author: Bulleyya Chowdary

Organization: Invenire Energy

Abstract: An analytical approach to identify undrained zone in the clastic brown field. A clastic sequence does not show any visible shale break in between which suggest no vertical compartmentation. Initial production is taken from upper part of the reservoir based on the understanding of dynamic connectivity between middle and lower part of the reservoir. In the present case study, a bypassed zone has been discovered, located in lower part of a vertically stacked reservoir, with no visible vertically barrier in conventional wireline logs and seismic data. To unlock hydrocarbon potential, a wholistic approach is required with an integration of multi-disciplinary domains for targeting the right spot in the reservoir which are otherwise unexploited.

Abstract Title: Application of Novel Sand Agglomeration technique to curb Sand Control Issue in Western Offshore Field, India

Author: Aman Saraf, Madhurjya Dehingia, Shashank Narayan , Saurav Kumar, Arpit Agarwal, Sharad Goenka, Saurabh Badhe, Akshay Laheja

Organization: Schlumberger and Vedanta

Abstract: Well A in western offshore is an oil producer, however due to continuous decline in reservoir pressure, choke sizes were increased gradually ultimately leading to sand ingress in the well and ceasing it to flow. A novel technique of sand agglomeration which is non damaging to the formation was proposed to curb sand ingress in the well. Post review, SLB was awarded this job and was called in for deployment. Reservoir Data of the well was analyzed, followed by lab tests of sand sample with Agglomeration chemicals to analyze the efficacy of the treatment and arrive at final recipe. 1.75" Coiled Tubing was deployed for Sand Cleanout. Post cleanout, Injectivity tests with 2% KCl brine was done. Sand Agglomeration treatment was then bullheaded from surface and well was shut for 24hrs to ensure sand agglomeration is achieved. Nitrogen Assisted flow back with CT was done for ~ 3 days, after achieving ~ continuous oil at surface CT was again RIH till TD to check for sand ingress. 1st Sand Agglomeration treatment in India was successfully executed, no sand was observed during flowback, CT tag confirmed no shallow held up confirming no sand ingress inside the wellbore. During Nitrogen assisted flowback, continuous and stable oil production was achieved.

Initial flowback needs to be done at very low drawdown and once stable parameters are achieved at constant ~ Bottomhole pressure for

extended amount of time, choke size is increased in minimal amounts to achieve Maximum Sand Free Rate.

Sand Agglomeration was successfully deployed in an offshore well to allow sand free production without any completion changes, no significant reduction in permeability is observed. Significant increase in Maximum Sand Free Rate is achieved with gradual and controlled increase of drawdown pressure.

This technique serves as an alternative option in cases where completion changes are not effective or possible, since the chemistry is reversible, formations do not undergo any permanent damage or reduction in regain permeability, as observed in

the cases of resin treatment. Treatment can also be applied to long length of intervals and in tight formations of upto - 1mD easily and effectively compared to resin type of treatment.

This was the 1st successful application of Sand agglomeration technique in India. With a wider application range in terms of treating longer perforation Length and formation with lower permeability along with non damaging properties, it is a cost effective and efficient alternative for addressing sand control issues compared to conventional completion changeover or resin based treatments. Treatment can be done by bull-heading from surface, reducing equipment footprint, making it suitable for offshore deployment.

Theme:

Advancement in Subsea Technology

Abstract Title: Next-Generation Subsea Pumping Technology: Efficiency and Reliability in the Sea

Author: Pallav Mehra and Abhineet Gupta

Organization: Oceaneering International Inc.

Abstract: This abstract discusses the innovative subsea chemical storage, pumping, and injection technology developed and qualified by Oceaneering. Traditionally, pressurized chemicals are stored and injected from topside facilities, requiring significant deck space and costly umbilical for transport to injection points. The new Subsea Pumping Technology (SPT) system addresses these challenges with a scalable and modular design, enhancing efficiency and reducing costs. Oceaneering's SPT revolutionizes chemical storage and injection in offshore operations. This approach reduces the need for extensive topside infrastructure, minimizes environmental impact, defer CAPEX, and enhances efficiency. The technology's flexibility and cost-effectiveness make it a crucial advancement for modern offshore oil and gas extraction, streamlining operations and significantly improving overall productivity. The presentation will showcase the technology, the development and qualification process. The technology has achieved TRL Level-4/6 qualified. The concepts are already proven via testing in tanks, simulating the sea environment. Various components have also undergone accelerated testing for sustainability for long subsea deployment durations. The equipment also underwent hyperbaric testing to ensure it can sustain sea pressure. Through the presentation audience shall:

- Gain a deep understanding of the latest advancements in subsea pumping technology, which has the potential to transform offshore operations.
- Learn how these technologies enhance operational efficiency and safety by reducing the need for extensive topside infrastructure and minimizing environmental impact.
- Discover ways to cut costs using scalable and modular subsea systems, reducing the reliance on expensive umbilical and requirements for deck space.

- Understand the modularity and scalability of these systems, offering adaptable solutions for various offshore scenarios and challenges.

Abstract Title: Retrieval Augmented Generation Agent for E&P Business

Author: Dipayan Baidya and Prashant Bisoi

Organization: Reliance Industries Ltd. Exploration and Production

Abstract:

Scope & Objective:

- The RIL E&P is monetizing estimated resources of 3 TCFe in 3 complex deepwater/ultra-deepwater fields – R-Cluster, Satellite Cluster & MJ, located in KGD6 Block off the east coast of India.
- The complex nature of the business requires a high level of instrumentation in the fields. The sensors generate time series data at high frequency. The emphasis on safety and processes generates a lot of business documents.
- This data and documents repository if not utilized will lie idle and shall be of no use to the organization
- Hence, the requirement of a system that quickly enables searching through the repository and generating insights.

Approach:

- The RAG agent utilizes multiple technologies to enable efficient and effective interaction and insight generation.
- Speech-to-Text (STT) model is used to convert the audio input into text.
- Conversion of Input into query embeddings for efficient semantic search of data/document in vector space.

- The searched data/document chunks are utilized by the Large Language Model (LLM) model to generate insights
- The generated insights in text format is converted into audio format using Text to Speech (TTS) Model
- A digital avatar makes the interaction more human-like understanding facial expressions and emotions.
- Engineering Challenges: Engineering, Procurement and fabrication challenges for long lead items to meet the project schedule
- Environmental Challenges: Challenge of High currents, cyclones during the execution of installation of pipelines, umbilical and subsea structures.
- Unavailability of Right of Use and installation of onshore umbilical section during monsoon season.

Result & Observations:

The Agent enables rapid insight generation, reducing the Decision Turn-Around Time (TAT). With the explosion of data/documents in corporate storage, there is even more need for efficient search algorithms. The usage of embeddings for semantic search in vector space has made the search effective and efficient. Pre-trained transformer-based Large language models are good at understanding the data and making inferences based on the user query and the searched data chunks. Standard speech-to-text models are not good at oil and gas terminologies and need to be separately handled in code. Dependence on SME knowledge has been decreased using such RAG agents. The RAG Agent helps in decreasing the Decision cycle time. The agent shall be used for the training of recruits and information augmentation for business users.

Abstract Title: Vashishta & S1 development project - Challenges and Lessons learnt in offshore Installation of Subsea Structures in adverse weather conditions

Author: Rishi Katiyar

Organization: Directorate General of Hydrocarbons (DGH)

Abstract: This paper is about the challenges faced and mitigation steps taken in offshore installation package which consist of engineering, supply, and installation of a series of pipeline end terminations (PLETs) and in-line tee structures (ILTs), a pipeline end manifold structure (PLEM), rigid jumpers, about 50 km of umbilicals, 93 km of 14-in. dual rigid pipelines extending from the shallow water shoreline to a maximum water depth of 700 m within 18 months of project schedule.

The Paper will discuss the following main Challenges:

- Timeline Challenges project execution time of 20 months with a limited weather window of 4 months for installation works.

- Communication, SIMOPS and interface challenges to meet the project schedule.

This paper will discuss in detail the challenges faced during the project planning, execution and installation works. The project work was divided into different work packages such as Subsea Production System (SPS) package, Onshore Terminal package, Offshore installation package, drilling & completion package. Every package involved multiple vendors and stakeholders hence, a transparent and effective communication means was a must. The effective utilization of technology like the ONGCs in-house OPMAC system to coordinate, interact and keep track of project interfaces and documentation helped to easily track events.

The timeline challenge was the biggest of the hurdles faced by the project, given the nature and scale of the developments required. Also, the limited weather window of only 4 months for carrying out the installation of about 50 kms of umbilical, 93 kms of 14-inch dual pipeline, and subsea structures including PLEM, multiple PLETs, manifolds and ILTs. The challenges of high sea currents even in fair weather season given another opportunity to devise some innovative approach to meet the timeline. The difficulty in obtaining the Right of Use (ROU) for installation of onshore section of umbilical created another challenge which was resolved with an innovative approach.

This paper includes many challenges and issues i.e. limited weather window, uneven sea surface with steep slopes, high currents in cyclone prone eastern offshore of India and how innovative approaches, effective interface management, coordination of different groups and effective project monitoring and scheduling helped ONGC to complete the project with minimum time and cost impact by completing the major subsea installation works in a single offshore campaign.

Abstract Title: Drilling and Completion of Deep-Water Project (R-Cluster) in East Coast, India- A Case Study

Author: Hari Srivastava and Amit Musale

Organization: Reliance Industries limited, Petroleum E&P

Abstract: The case study includes risk, challenges and mitigation measures taken, various optimizations, best practices, and learnings to make the deep-water drilling and completions project successful.

Deepwater drilling operations pose several challenges due to Hostile environment, High Sea currents, complex wellbore conditions, Narrow pore pressure and fracture gradient margin, well control, multiple casing strings due to low margins, erratic torque and drag, BHA vibration, high surge, and swab pressures etc.

Normally, these challenges lead to increase in cost and make the project uneconomical. Hence, there is no room for error and the performance of drilling & completion operations must be accurate.

Reliance had recently delivered its three deep water projects in east coast which is contributing to nearly 30% of India's gas production.

The Drilling campaign started in mid-2018, COVID-19 pandemic severely affected the operations in terms of personal and logistics, very limited mobility due to lock down and strict administrative and medical controls, however the drilling campaign was successfully completed in Nov 2023, maintaining highest standard of safety, with more than 5 years without LTIR.

In the current case study, R-Cluster Project, which was one of the three projects delivered recently, will be demonstrated. The project consists of drilling and completing 6 deep water wells with a savings of ~11days/well and within 5% of NPT.

Various drilling and completions risks are evaluated and mitigation measures like 24X7 Real time monitoring, pre-drill and Post Drill analysis, learnings and best practices, Alternate path Sand Screen System, QA/QC, certifications, verifications, and validations at various stages (including third party validations to ensure safe and efficient well construction).

The discussion includes risk, challenges and mitigation measures taken, various optimizations, best practices, and learnings to make the project successful.

The project was delivered successfully with savings of ~11 days/well and within 5% NPT. Demonstration of various elements and factors considered to make the deep-water drilling and completions project successful.

Abstract Title: Managing late-life subsea assets with an integrated approach: Leveraging advanced technologies including Subsea Robotics and Remote Operations.

Author: Chirag Jayswal

Organization: Oceaneering International Inc.

Abstract: This abstract explores the use of an integrated approach leveraging remote operations and advanced subsea robotics for the maintenance and operations of aging subsea assets. The primary objective is to highlight innovative methods and technologies that enhance efficiency and reduce costs and emissions associated with late-life asset management. The study utilizes a comprehensive methodology involving case histories and real-world applications of inspection, maintenance, and repair (IMR) programs. Key processes include leveraging subsea robotics, remote operations, and advanced technologies like photogrammetry and 3D modeling. The approach focuses on proactive rather than reactive maintenance, incorporating machine learning and AI to digitize and streamline data collection and reporting. Case histories demonstrate that integrated IMR programs on aging assets can identify production-stopping issues before they occur, significantly reducing vessel days by completing varied inspection tasks simultaneously with other operations. This approach also lowers emissions and mitigates risks associated with mobilization and personnel deployment. The shift from reactive to proactive maintenance is crucial for maximizing the productivity of assets through to their decommissioning phase. Innovations such as advanced subsea robotics and remote operations have proven to improve data collection and decision-making processes while reducing

the carbon footprint. The implementation of machine learning and AI for risk-based inspection has enabled more accurate and efficient fitness-for-service assessments, leading to tailored inspection and intervention programs that address potential failures and anomalies.

This abstract provides novel insights into the application of advanced technologies and integrated methodologies for subsea asset management, offering significant improvements in efficiency, cost reduction, and environmental impact. It contributes to the existing literature by demonstrating the benefits of a holistic, technology-driven approach to late-life asset maintenance.

Abstract Title: Flow Assurance Strategies in Indian Deep waters

Author: Chinna Rao Gorli

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: This study evaluated the wax fouling potential of crude oils from Deep water block, developed by ONGC, in India. The objective of this study was to identify the risks associated with paraffin and to provide a suitable Product to mitigate these risks. A comprehensive series of laboratory experiments were conducted using standard methods ASTM D5853 for the pour point, ASTM D-7169 for crude distillation, UOP 46-85 for wax content, and a rheometer for viscosity, wax appearance temperature, and yield strength measurements. Cold Finger (MCF-10) Equipment was used to assess the inhibition efficiency of PPDs. The oils presented substantial flow assurance challenges because of their high wax content, which ranged from 24% to 27.5%, pour point

between 36°C and 39°C, Viscosity, yield strength (>5300 to 3400 Pa), WAT was around 54°C to 57°C, and low seabed temperature ranging from 4°C to 10°C. The results demonstrated significant variability in the effectiveness of PPDs, which was influenced by factors such as the chemical composition of the crude oil and the concentration of the depressants.

The findings indicate that specific PPDs can substantially lower the pour point from 9°C to 21°C, the wax inhibition efficiency by 40% to 70%, the viscosity reduced by 62% to 72%, and the yield point decreased by 116 to 246 Pa. Oil production from this field began on the first week of January 2024. To reach the pour point of 18°C, the PPD dosage is optimized. From field B, we currently produce 12000 barrels of oil per day, but this will increase to 45000 barrels daily upon the inclusion of fields A and C, equating to 7% of our overall oil and gas yield.

Keywords: Wax content, Pour point, Cold finger, Rheometer, Wax Appearance Temperature (WAT), PPD (pour point depressant).

Theme:

Towards Net Zero : New Energy Sources

Abstract Title: Hybrid Solar-Geothermal Energy Systems for Sustainable Hydrogen Production and Carbon-Free Fuel Utilization

Author: Tejaswini Gautam, Anirbid Sircar and Kriti Yadav

Organization: Pandit Deendayal Energy University, Gandhinagar and Department of Geology, Patna University, Patna, India

Abstract: In Gujarat, sixteen geothermal exploration sites have been found, with the Saurashtra and Central regions having numerous geothermal hotspots and hot springs. The geothermal area in Unai, 100 kilometers from the Cambay Basin, is notable for its tremendous heat flow and hot water springs, particularly at the Unai Mata Temple. The area, which ranges in elevation from 10 to 55 meters, is bordered by thick forests and hillocks covered with Deccan Trap rock formations dating from the Late Cretaceous to Early Eocene periods. As Unai develops, the rising demand for electricity and space heating/cooling can be supplied by harvesting geothermal energy via the Organic Rankine Cycle (ORC), supporting sustainable energy options for the region. This study focuses on the design and installation of a solar-geothermal hybrid power station in Unai, Gujarat, that use the Organic Rankine Cycle (ORC). The performance of ORC depends on the working fluids like R-134a, R-245fa, etc. In terms of independent power generation, geothermal energy in Gujarat, which has a medium-low enthalpy, frequently falls short. This study suggests a hybrid system that combines geothermal and solar thermal energy to increase energy output. The ORC, chosen for its efficiency with low-enthalpy sources, will be augmented with solar concentrators to increase heat input. Geophysical surveys, such as seismic, gravity, magnetic, and electrical resistivity approaches, are used to better understand the subsurface geology and locate possible geothermal zones. The amalgamation of data from these surveys indicates the existence of geothermal resources in Unai. Previous research suggested that this place was chosen because of its high heat flow and the existence of hot springs. The proposed system will incorporate geothermal wells, heat exchangers, insulated storage tanks, feed pumps, and evacuated tube collectors. The ORC unit will

produce electricity by utilizing geothermal and sun thermal energy. This electricity will then power an electrolytic cell, which will split water into hydrogen and oxygen, producing green hydrogen, a clean and adaptable energy carrier. The hybrid system not only improves power generating efficiency, but it also uses renewable energy to make green hydrogen, helping to accelerate the transition to a sustainable energy future. The objective of this research is to recreate the successful technique used in Dholera, Gujarat, and handle rising electricity consumption and space heating/cooling needs in emerging areas like as Unai. This integrated strategy offers a potential solution for maximizing low-enthalpy geothermal resources, encouraging renewable energy use, and developing green hydrogen production. Geothermal wells, heat exchangers, insulated storage tanks, feed pumps, evacuated tube collectors, ORC units, consoles, cooling towers, air handling systems, and commercial electrolytic cells are among the most important components. Renewable energy, which is critical for decreasing greenhouse gas emissions and addressing climate change, is regenerated faster than it is consumed. Geothermal energy, which harnesses the Earth's heat, is efficient for both power generation and direct usage. Hybridizing geothermal and solar energy improves efficiency, especially in Organic Rankine Cycle (ORC) systems that convert low-temperature heat into electricity. The generated electricity can then be used to manufacture green hydrogen through electrolysis, providing a clean energy source. This hybridized approach of geothermal and solar energy, and then storing the generated hydrogen promotes sustainability and significantly contributes to achieving net-zero carbon emissions.

The objective of this study includes:

- Exploratory survey for locating geothermal hotspots at Unai, Gujarat, India.
- To analyze the collected geothermal water samples for compatibility with power plant instruments.
- To set up a small-scale organic Rankine cycle-based solar thermal and geothermal power generation plant.

- To set up a Hydrogen storage unit for storing the hydrogen generated by the electrolysis of water using the electricity generated by the Organic Rankine Cycle (ORC).
- To utilize the obtained oxygen in the aeration of wastewater in the activated sludge process or in aquaculture.

The primary goal of this research is to find geothermal springs and define the aquifer fluids and subsurface structures in the study region. This will be accomplished by a variety of geophysical surveys, including seismic, magnetic, gravity, magneto telluric, and electrical resistivity. By integrating data from different geophysical survey methods, a subsurface model can be created to anticipate the presence of geothermal reservoir. Drilling will be carried out using geophysical data, and geochemical analysis will be used to assess the parameters of geothermal fluids, such as temperature, origin, and flow direction. Several plots, such as Wilcox and Durov, can be made to determine the suitability of geothermal water for irrigation or potability purpose. The study will develop and build an integrated solar-geothermal system based on the Organic Rankine Cycle (ORC) to generate electricity. The ORC uses geothermal heat to generate power, with solar energy adding to the system's efficiency by increasing the temperature even in low enthalpy zones. This hybrid system will then power an electrolytic process to extract green hydrogen from geothermal water. The electrolytic chamber, which is equipped with innovative electrodes and electrocatalysts, will aid in the water-splitting reaction, resulting in hydrogen and oxygen. The hydrogen produced will be stored and utilized, contributing to sustainable energy solutions and net-zero carbon emissions. The oxygen can be further utilized in aquaculture or treatment of wastewater. The methodology includes: Geophysical exploration including the gravity, magnetic, magneto- telluric and electrical resistivity.

- Drilling of well for extraction of geothermal water from the subsurface.
- Geochemical analysis of the Geothermal water obtained from the drilled well for the determination of pH, temperature, origin, flow rate, etc.
- Set up of hybridized solar- geothermal Organic Rankine Cycle (ORC) for power generation.
- Utilization of power generated from ORC for the electrolysis of Geothermal water.
- Generation of Hydrogen by electrolysis utilizing the geothermal water which includes Design of novel electrodes, electrocatalyst for

water splitting reaction, Experimental setup of electrolytic chamber and Working of the Production unit of green hydrogen

- Storage of generated Hydrogen in storage tank situated in the Geo- park established in Unai, Gujarat.

The study will successfully show power generation from geothermal energy, an unconventional and renewable energy source with zero carbon footprint. This energy is harvested through the Organic Rankine Cycle (ORC) and combined with solar energy using solar concentrators to increase power output. This hybrid system uses the generated electricity to split geothermal water, resulting in production of green hydrogen and oxygen. The hydrogen produced can be used in automobile hydrogen stations, while the oxygen byproduct can be sent to hospitals during critical emergencies. Additionally, this research can further be utilized to meet the region's electrical demands, demonstrating considerable thermodynamic and economic benefits.

Abstract Title: Towards Net Zero – New Energy Sources

Author: Partha Roy

Organization: Sun Petrochemicals Private Limited (SunPetro)

Abstract: Simultaneous production of hydrocarbon resources for meeting the growing energy demand of the nation along with exploitation of available renewable energies viz. Tidal, Wind & Solar Energies for generation of electric power is a smart concept for reducing the carbon footprint in E&P business and also to achieve Net Zero goals. This unique approach coupled with various innovations implemented by SunPetro for E&P operations has vindicated company's objective towards ensuring sustainability. As a prudent Oil & Gas operator, the various green initiatives adopted by SunPetro has been playing a vital role to meet the target of net-zero carbon emissions future. To achieve the target of net-zero carbon emissions future, following unique approaches have been adopted, executed and implemented by SunPetro:

- a. Around fifty (50) innovations implemented so far across the E&P business out of which few have been patented.
- b. Introduction of zero gas flaring at all sites.
- c. Exploitation of available renewable energies like Solar, Wind & Tidal in offshore for generation of power to meet the demand.

- d. Vigorous plantation taken up for carbon capture maintaining the local flora and fauna.
- e. Use of energy saving equipment at process plants.
- f. Commissioning of state-of-the-art inhouse system for Five R's – refuse, reduce, reuse, recycle and repurpose.

The outcome of various innovations taken up by SunPetro for E&P operations is remarkably superb in terms of improving operational efficiency, cost saving and reducing the carbon footprint. Green power generated from inhouse solar power plant has reduced the consumption of electricity from national grid leading to less overall carbon emission. Innovations implemented for production operations has led to substantial reduction of OPEX on day-to-day basis. Company's waste management approach is towards completion of the carbon cycle. Moreover, for exploiting the abundant renewable energies available near offshore areas, various competent agencies are being approached for an effective implementation. Experts from premier national institutes are being roped in for continuous improvement of various ongoing as well as upcoming development activities.

These out of box approaches not only helped SunPetro to achieve several industry benchmarks but also created examples for other E&P operators worldwide. SunPetro's various green initiatives thus lead the company's journey towards a sustainable future while fulfilling the requirements of growing energy demand of the nation. The various innovations taken up by SunPetro have set a green E&P business model for other operators. Without compromising with the business goal, the actions towards sustainability are to ensure net-zero carbon emissions in E&P business. Engagement of experts and premier institutes are meant for SunPetro's commitment towards innovations in new clean energy sources and value added inclusivity. It also helps in bridging the gaps among various stakeholders for overall development of the nation. E&P business is guaranteed with sustainability at SunPetro with the ultimate goal of achieving the net-zero carbon emissions future.

Abstract Title: Holistic Geothermal Solution: Merging Subsurface and Surface Expertise to Optimize Geothermal Plant Design and Execution

Author: Tevfik Kaya, Shubh Srivastava and Attakan Janpidok

Organization: Schlumberger

Abstract: SLB collaborated with Yerka Electricity Generation Co. to provide an end-to-end service necessary for the successful exploration and development of the Mount Ida geothermal project, a key project in Turkey's priority efforts to diversify its energy mix for electricity generation from renewable sources. The multi-integrated approach included geothermal resource assessment, geophysical resistivity surveying and interpretation, well targeting and design, wellfield development, drilling engineering, local and remote drilling support and troubleshooting, cementing, mud services, drill bits, fishing, mud logging, coiled tubing for well stimulation, well testing services and reservoir characterization, numerical reservoir modeling, and downhole pumps (ESPs). In recent years, the Turkish government has prioritized energy security as one of the key pillars of its energy strategy. Part of the country's efforts toward this end involve diversifying its energy mix for electricity generation from renewable sources, including geothermal. While Turkey is rich in this resource, much of its geothermal potential has yet to be developed. One of Turkey's latest geothermal projects to reach its commercial operating date is Yerka Electricity Generation Co.'s Mount Ida Geothermal Power Plant (GPP) located near the village of Tuzla in Çanakkale Province. The plant, commissioned in April, generates 12 megawatts electric (MWe), increasing the total installed geothermal capacity in the country to 1.613 gigawatts electric (GWe). Yerka's objective for the Mount Ida project was to economically develop the geothermal resources within its license area to add a reliable source of renewable electricity generation to the regional grid. Because this was Yerka's first geothermal installation, however, it faced several unknowns and chose to seek support from domain experts who could help bring the project online on time and on budget while developing the full capacity of the resource. In 2015 Yerka began working with GeothermEx, a SLB company and multidisciplinary geothermal consulting and services firm. Over the course of the installation, GeothermEx worked closely with the Yerka team, providing technical support for resource capacity assessment, drilling and well construction, reservoir evaluation and risk characterization, well intervention and stimulation, and operational performance monitoring for artificial lift services. Southwestern Turkey is a region of anomalously high heat flow that developed as a result of crustal thinning in an area of tectonic extension of the earth's crust, in association with continental convergence. The Tuzla area is part of this region, where the regional background temperature gradient is elevated to economic levels; this gradient allows for elevated temperatures to be encountered during drilling, even in the absence of strong hydrothermal convection. Beneath the tertiary cover in the Tuzla

area is a metamorphic basement made up of Paleozoic marbles, schists and ophiolites. Wells drilled in the Mount Ida license show alternating marbles and schists beneath ophiolites to the bottom of the well. In each of Yerka's wells that encounter basement rock, marbles host the primary zones of fluid production and continue beyond total depth of these wells, indicating that these marbles are sufficiently widespread and thick enough to be targeted for production across the Mount Ida license.

Characterizing the asset

Detailed resource characterization is a crucial first step for any geothermal development. At the start of the Mount Ida project, key features of the geothermal resource were characterized, including the distribution of subsurface temperatures, the characteristics of geological horizons and structures that control fluid flow, and the capacity of the resource. This was essential to determining suitability of the resource for development and defining risks. Design of the drilling program for the Mount Ida project relied on this clear understanding of subsurface conditions. The detailed planning for drilling and completing the wells was vital for production and injection performance, and therefore the long-term operational stability of the project.

Drilling and Testing

Yerka began its drilling campaign in 2016 and has successfully completed eight full diameter deep wells in the Mount Ida license. With Geotherm Ex's guidance, Yerka conducted two interference tests in 2017 to characterize the interwell connections and overall behavior of the field under production and injection loads. These tests showed that production and injection anywhere in the field were visible as pressure responses in all wells. This indicated that wells in the Mount Ida area are suitably interconnected, and injection can be expected to support production reservoir pressures, though the connections between wells were small enough to avoid cooling of production by injection. As an example, the figure below shows the pressure responses from the second interference test, with production and/or injection in Yerka-1 and Yerka-6, and monitoring of downhole pressure in Yerka-3, Yerka-4, and Yerka-5.

Coiled tubing for stimulation and pumped production

All the full-diameter wells drilled in the Mount Ida field were stimulated via acidizing with a coiled-tubing unit (CTU). Based on comparisons of pre- and post-acidizing production capacity, wells have shown marked improvement from this stimulation. Results of acid stimulations via a CTU indicate that

each treated well realized a significant increase in measured well productivity or injectivity values, with each well achieving a commercial value of 19 tons/hr-bar or better. Well survey and test data have indicated that artificial lift is required for each production well to maintain steady production rates and provide a greater measure of operational control. Four of SLB's REDA Hotline high-temperature electric submersible pump systems (ESPs) were installed in October and December 2020. These systems currently produce an average of 260 tons/hr per well at 126 C. The produced fluid is allowed to boil in the column pipe above the ESPs. The ESP design incorporates the use of a downhole scale inhibitor to avoid scaling above the pumps and in the surface facilities. Individual well capacities were markedly improved by acidizing following initial drilling and completion. Well testing indicated that the project has sufficient production and injection capacity for a geothermal plant with an estimated capacity of 12 MWe gross, exceeding Yerka's initial capacity expectations of 10 MWe. Yerka relies on ESPs to achieve the required flow rates for geofluid production, which would not otherwise be possible without pumping. Results of interference and individual well testing confirmed that all wells in the Mount Ida license are hydraulically connected, but the amount of pressure interference between wells is small, indicating good resource suitability for the intended production scenario. Geothermal projects have a great potential to supply base-load power 24/7 as a regional solution utilizing readily accessible energy right below our feet. At a levelized cost of operations, geothermal is comparable to the cost of solar or wind renewables energy source coupled with energy storage—which is necessary to guarantee the reliability of these renewables sources that is inherent in geothermal energy sources. As Turkey continues to diversify its energy mix for electrical generation from renewable sources, projects such as the Mount Ida GPP will be increasingly valuable to help the country close the gap toward becoming more energy secure. Every geothermal project faces the challenges implicit to subsurface resource exploration and development.

Successful projects require risk characterization and multidisciplinary experienced geoscience and engineering expertise to bring projects online economically and to maintain their productivity over terms of 20 years or more for commercial success. Mount Ida Geothermal Power Plant project is one of the successful case studies demonstrating the value of multi-integrated services for geothermal power generation. The holistic approach of the SLB end-to-end solution combines the integration of subsurface and surface capabilities. This enabled the Mount Ida project to be built respecting the power generation capacity, maximizing efficiency,

and reducing unnecessary costs. This approach is one that can be applied effectively to geothermal projects anywhere in the world.

Abstract Title: DGH's Tryst with Net Zero: Bio-fuel's Pivotal Role on Platter

Author: Dr. Ritesh Mittal

Organization: Engineers India Limited (EIL)

Abstract: Global Oil & Gas sector being major Greenhouse Gas emitter is grappling with multitude of competing pressures for emission reductions. This market dynamics necessitates delicate balance between growing needs of emerging economies & addressing environmental concerns. For India, Diversification of Energy Basket, Strategizing Carbon Neutral technologies & International-Climate-Change Paris Agreement under UNFCCC, COP are critical drivers to promulgate advanced Bio-fuels offering opportunities on platter to Decarbonize Oil & Gas. Bio-fuel holds paramount opportunity as India is primarily an agro-economy with varied cropping pattern generating annual surplus of 165MT of ligno-cellulosic biomass residues (Rice Husk, Sugarcane Bagasse, Corn Cob, Cotton Stalk, Coconut Waste, Millet Waste, Corn Cob, Bamboo etc.) across states, varied geographical topography & five climate zones. Present paper critically reviews Carbon Negative Technologies with in-situ integration of Bio-Refineries with existing Refineries to optimize existing infrastructure of Plant Utilities & land footprint. Promotion of 2G-Ethanol for EBP (Ethanol Blending Program) to meet 20% benchmark, Facilitating Bio-ATF SAF (Sustainable Aviation Fuel) plants for CORSIA second phase regime post 2025 with India as Bio-fuel Refuelling hub for Trans-Asian flights, BDAI/FSSAI's promoted Bio-Diesel from UCO (Used Cooking Oil), MNRE's facilitated National Green Hydrogen Mission (NGHM-2023) for Green Hydrogen from Biomass, Addressing Economic viability of Bio-Refineries with Lignin Valorization & Co-Production of Bio-VACs (Value Added platform Chemicals) are worth analyzing. Simultaneous strengthening of DeepTech Sunrise Biofuel Advanced Technologies/ Products like Drop in Fuels, Biomass Thermo-Chemical Pyrolysis, Bio-oil Hydro-De-Oxygenation (HDO), Green Nano-Cellulosic-Bio-Products (NCBP) derived from Cellulosic Nano-fibers & Nano-crystals are discussed. NCBP holds prudent role in upstream & downstream of Oil & Gas. In upstream, unique rheological properties of Nano-cellulose fluid helps in Enhanced Oil Recovery (EOR) due to modification of viscosity & flow behavior of reservoir fluids, improve oil recovery

rates, filtration control, lubricity, enhance stability, reduced friction & mitigate wellbore instability of drilling fluids. In downstream arena, NCBP is used in biodegradable corrosion-resistant coatings, Bio-sensors due to high surface area & ability to be functionalized with specific biomolecules for sensitive futuristic Bio-ETPs, novel Energy Storage Products like Bio-Dielectric Materials, Bio-Supercapacitors & Bio-Nanogenerators for Green Hydrogen. Few Policy initiatives like Encouraging 2G Viability Gap funding via PM-JIVAN (Pradhan Mantri - Jaiv Indhan Vaatavaran Anukool faisal avshesh Nivaaran) Yojna, Decentralizing Bio-CNG plants via SATAT are mentioned.

This paper aims to establish that implementation of Advanced Bio-Refineries with Scaled Development, Cost-Effectiveness & Compatibility with existing processes plays prudent role in integrating Bio-fuels in Oil & Gas Sector. Hope this compilation will create lots of Interest/ Synergy amongst Industrialist, Researcher & Environmentalist & Practicing Engineers active in Bio-Fuels & Bio-derived products towards meeting Net Zero goal in Upstream & Downstream of Indian Oil & Gas Industry Post G-20 & Global Bio-fuel Alliance.

Abstract Title: Collaboration of Geothermal Energy + CCUS + CBM + Helium Extraction: A New Approach towards Net Zero

Author: Ramesh Satla

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: India set an ambitious target of achieving NetZero by 2070 and Energy Companies like ONGC have set targets to achieve NetZero by 2038. Whereas, in the total energy spectrum, the share of new, renewable & green energy is very minuscule. Hence, to achieve NetZero, it is proposed to collaborate the Geothermal Energy + CCUS + CBM + Helium Extraction. Thus, our scope and objective is to study such collaboration & integration to achieve NetZero. Manuguru Geothermal Field in Pranahita Godavari Basin is an ideal field for this integration where Helium is also releasing. This Gondwana Sedimentary Basin consists of Coal which is used in to thermal & heavy water plants from-where CO₂ will be separated & compressed by using the geothermal energy and transported through corrosion protected pipelines & injected to geothermal reservoir where CO₂ captures heat and comes to surface in supercritical state which will run Brayton Thermodynamic cycle to generate Power. The excess CO₂ will be injected through CCUS process to Coal Seams where CO₂ adsorbed by replacing CBM which will be extracted.

Manuguru GTF holds 122 MWe for 20 Years spread in 19 Sq.Km area with Geothermal Gradient of 60 °C/km and reservoir temperature of 175 - 215 °C at 2 - 2.5 km depth that can be commercially utilized for both electrical & non-electrical applications. The River Godavari is feeding the reservoir through deep seated faults, making it an everlasting geothermal system. Geothermal manifestation occurring due to basement highs and continuous neo-tectonic adjustments at geological tri-junction of Bastar-Dharwar Cratons & Palvancha neck as it is evident from frequent tremors of ≤ 4 magnitude on Richter scale. Due to radio-active decay from high grade granite-gneiss basement rock, Helium Gas (19197 ppm) is releasing which could be commercially extracted as India is importing 100% Helium. Since supercritical point of CO₂ (30.978 °C & 1070 PSI) is very less than the that of water (374 °C & 3210 PSI) and thermal expansion of CO₂ is around 40% more than the water vapor and hence more work done in Brayton thermodynamic cycle by using sCO₂ as working fluid for geothermal power generation. CBM could be extracted by injection of the CO₂ into coal seams and CO₂ permanently sequestered in the geological formations through CCUS mechanism. This kind of collocation is attempted first time in-which Geothermal Energy + CCUS + CBM + Helium Extraction is integrated to achieve net zero targets wherein a clean energy source i.e. geothermal energy is used for capturing of the pollution, separation of CO₂, its liquefaction & transportation from Coal fired thermal power plant & heavy water plant to geothermal sites and sCO₂ as work fluid improves 40% efficiency in power generation in Brayton thermodynamic cycle.

Abstract Title: Decarbonizing Offshore Energy - Technological advances for Floating Production Systems

Author: Tejas Mankar, Aidan Cheong and Subhojyoti Lahiri

Organization: Shapoorji Pallonji Energy Private Limited

Abstract: This abstract provides an overview of India's current energy landscape, its transition towards a more sustainable future through cleaner energy sources, and the contribution of Shapoorji Pallonji Energy in this transformation. India's energy production is primarily coal-based, contributing 77.01%, with electricity from hydro, nuclear, and other renewable energy sources making up 7.58%, and natural gas accounting for 6.83%. With a rapidly growing population, the energy demand in the Indian subcontinent is projected to double from 37 EJ to 73 EJ by 2050, positioning it as

the world's second-largest energy consumer. The potential for renewable power generation is estimated at 2,109,654 MW, with significant contributions from solar (35.5%), wind (55.2%), and hydro (6.3%). As the demand escalates, the contribution of fossil fuels to the energy mix is expected to decrease, albeit marginally compared to the rest of the world, with fossil fuels projected to supply 48% of energy in 2050. To achieve India's net-zero target by 2070, a substantial increase in the share of renewables in the energy mix is imperative. The Indian government's strong commitment to net-zero emissions by 2070 is evident in initiatives like increasing the renewable energy capacity target to 450 GW by 2030, augmenting funding for the National Hydrogen Mission, and amending the Energy Conservation Bill (2022). These initiatives, coupled with foreign direct investment, are propelling the transition. However, achieving the 2070 net-zero target is challenging. The region's annual energy-related CO₂ emissions are expected to increase by 32% by 2050. Despite growth in solar and wind power, the Indian Subcontinent is projected to account for 21% of global energy-related emissions by 2050. The Shapoorji Pallonji Group has made significant contributions to global sustainability efforts, such as delivering one of the largest Solar EPC projects. Shapoorji Pallonji Energy's recent project - FPSO Armada Sterling V, which is India's largest, can produce close to 3 MMSCMD natural gas and is equipped with solutions to significantly reduce GHG emissions. Their ongoing newbuild FPSO project - 'Sterling Streamline' can cater to more advanced greenification solutions such as combined cycle gas turbines and carbon capture modules to further reduce GHG emissions. This analysis aims to explore the challenges and opportunities in the energy transition outlook for India. It underscores the need for India to enhance electrification efforts using cleaner and renewable energies such as natural gas, hydrogen, solar, wind, and nuclear as opposed to coal. While India has made strides towards a sustainable energy future, more needs to be done to achieve net-zero emissions by 2070. As India stands at the cusp of a major energy transition, the role of companies like Shapoorji Pallonji Energy in driving innovation and sustainability will be pivotal in shaping a greener, more sustainable future.

Abstract Title: Abandoned Mine Methane (AMM) Reduction and Utilization - The way forward for sustainable transition

Author: Shri Sachiv Kumar (ADG-D) .Shri R K Jain (HoD-MFUC) and Shri Trilok Nath (Dy Manager, CP)

Organization: Directorate General of Hydrocarbons (DGH)

Abstract: Abandoned coal mines in India, rendered inactive due to economic, engineering, or geological reasons, pose significant environmental, health, safety, and economic challenges. According to the International Energy Agency's 2024 Global Methane Tracker, India's coal mines emitted 2.8 million tonnes of methane in 2023 (200 % of country's CBM Production) which is more than triple the 0.8 million tonnes officially reported to the UNFCCC in 2019. This discrepancy underscores the urgent need for improved methane measurement methods. Methane emissions from coal mining in India are thus a critical environmental concern. Monitoring and capturing methane emissions from abandoned mines is essential to address greenhouse gas emissions and associated safety hazards. Abandoned Mine Methane (AMM) is a major contributor to coal fires globally (Kim, 2011; Song & Kuenzer, 2014). However, the methane remaining in unworked coal, de-stressed by former longwall mining operations, represents a significant clean energy resource. Recovery and utilization of AMM can offer socio-economic benefits, including technology development and job creation. This paper explores various methods to reduce and utilize AMM, analyzing mitigation techniques within a broader policy framework. It suggests policy guidelines necessary to promote AMM mitigation and utilization as an integrated

approach. Furthermore, it highlights the regulatory barriers in India that hinder the development of AMM projects and calls for effective and sustainable policies to curb AMM emissions.

Abstract Title: Valorising waste emissions for generation of Sustainable Fuels and Chemicals via Novel Gas Fermentation Technology

Author: Vineet Bakshi

Organization: LanzaTech

Abstract: To showcase a novel technology which can valorize the waste gas streams/ Co-CO₂ rich streams into sustainable fuels and Chemicals, thereby helping operating companies lower their emissions. Authors would like to showcase a technology having running commercial references of transforming the carbon molecules within waste gases via novel gas fermentation technology. Through case studies, it would be shown that the technology provides a huge opportunity to add value to the existing Complex by production of Ethanol, which can safely be blended into the gasoline. Producing sustainable fuels through biochemical pathway can play a significant role in providing a higher degree of national energy security in an environment friendly, cost-effective and sustainable manner.

Theme:**Advances in Reservoir and Well Management**

Abstract Title: Unlocking unconsolidated reservoirs through chemical agglomeration treatments.

Author: Rahul DCruz, Shashank Narayan, Dinesh Choudhary and Mayank Kumar

Organization: Schlumberger

Abstract: This abstract presents the results of a sand agglomeration treatment in unconsolidated reservoirs using a sand-agglomerating chemical that alters zeta potential. Implemented in the Cambay Offshore and Kumchai fields of Assam, this technique showed promising results. The objective is to demonstrate the methodology, effectiveness, and potential benefits of this treatment in enhancing reservoir stability and productivity. The treatment involved a detailed pre-treatment analysis, followed by the controlled injection of the chemical into the reservoir. The chemical alters the zeta potential of sand particles, promoting agglomeration and reducing sand mobility. Post-treatment, surface measurements were used to evaluate changes in sand production rates and reservoir performance, ensuring a comprehensive assessment of the treatment's efficacy. The implementation of the sand agglomeration treatment resulted in a significant reduction in sand production, which minimized equipment erosion and blockage issues. Enhanced reservoir stability was observed due to the agglomerated sand particles. Oil and gas production rates remained stable or improved, indicating no adverse effects on reservoir permeability. The treatment proved effective in managing sand production in unconsolidated reservoirs, with positive outcomes supporting the potential for wider application of this technology. This abstract contributes to existing literature by showcasing the practical implementation and benefits of zeta potential-based sand agglomeration, offering a detailed and replicable methodology for improved reservoir management.

Abstract Title: Integrated approach for Improving Reservoir Management and unlocking the Bypassed reserves: A case study for a Mature Carbonate Reservoir of Mumbai Offshore

Author: Pradhan Maheswar*, Pathak Poonam, Prasad SR and Ram Binay

Organization: Institute of Reservoir Studies (IRS), Oil and Natural Gas Corporation Limited (ONGC)

Abstract: This paper presents a case study to address the bypassed oil to improve production and ultimate recovery with an integrated approach of novel classical reservoir engineering and reservoir simulation applied in brownfield of western offshore. The methodology includes application of classical reservoir engineering approach, performance analysis, interwell tracer surveys, streamline analysis from simulation model and reservoir simulation to quantify further IOR opportunities. Performance analysis was carried out to identify production-injection conformance and areas showing less sweep efficiency. Streamlines gave a good indication of preferential water movement in line with results of inter well tracer survey. Further, PLT indicated that water has mostly gone into lower layers of M3 reservoir because of permeability contrast in this multi-layered carbonates. To capture better understanding of reservoir anisotropy, static model was revised. With historical production of more than 40 years and almost 350 active strings, a reasonably good history match was obtained in dynamic simulation. Further, it was felt necessary to probe additional hydrocarbon accumulation in shallower reservoirs also to augment production. Based on the study, development scheme was formulated and 12 well inputs were drilled from 2 new offshore platforms to target reservoir (M3) and simultaneously probe extension of shallower reservoir (M1).

After well completion, 11 new wells initially tested with average oil rate of more than 600 bopd/string with low water cut in M3 reservoir. Additionally, it established presence of oil accumulation in M1 reservoir also beyond oil estimation limit. Subsequently, 3 inputs were drilled in M1 reservoir which resulted in incremental oil gain of about 1000 bopd. In summary, the integrated methodology adopted is a quick fit approach in mature field development to meet IOR objectives of improving recovery with additional reserves for further field growth.

Abstract Title: Optimization of Flow Dynamics and Hydrocarbon Potential through Reservoir Well Log Data and 3D Transient Numerical Modelling

Author: Tanmoy Chetia, Supriya Halder, Pallavi Banerjee Chattopadhyay and A D Sarath Kumar

Organization: IIT Roorkee

Abstract: This research paper delves into the optimization of fluid flow dynamics and hydrocarbon potential within reservoirs by employing a combination of reservoir well log data analysis and 3D transient numerical modelling. The intricate interplay between fluid flow, porous media properties, and clay content is explored to understand its influence on reservoir behaviour. By investigating the pressure-dependent permeability, this study emphasizes the need to depart from the conventional assumption of constant permeability for accurate reservoir management. Initial analyses involve clay concentration assessments and geo-mechanical characterizations utilizing well logs, laying the foundation for subsequent mathematical modelling. Employing COMSOL Multiphysics Software and Darcy's law-based time-dependent subsurface flow module, fluid flow simulations are conducted to gain insights into efficient oil extraction concerning reservoir architecture, porosity, and permeability. Data has been obtained from two wells of Ankleshwar oil field, India. Cores from these wells have analyzed using helium porosimeter and capillary pressure apparatus. Porosity and permeability values have been used for modelling Fluid flow in COMSOL MULTIPHYSICS. Outcomes of this research reveal compelling insights into reservoir behaviour and CO₂ sequestration effects. The study demonstrates the direct impact of clay content on fluid flow dynamics, such as a Vshale of 0.250 at 1046m depth in Well A, correlating with reduced permeability (100.00 md) and a dl.U of 0.73685 mm/day. Pressure-dependent permeability is evident in tight formations, as seen by a permeability of 100.00 md at 12.78% porosity in Well B, resulting in dl.U of 0.3034 mm/day. Furthermore, the study unveils the intricacies of reservoir management, as permeability variations challenge the conventional assumptions. Point 6 in Well A, with 21.664% porosity, 32.59 md permeability, and dl.U of 0.49849mm/day, defies the notion of constant permeability. Subtle yet impactful CO₂ injection effects are suggested by Point 3 in Well B, with 21.109% porosity and dl.U of 0.5201mm/day, indicating potential alterations in fluid flow dynamics. The research also identifies an optimal drawdown rate for maximum production, demonstrated by Point 7 in Well A, with 25.55% porosity, 335.72 md permeability, and dl.U of 1.01859 mm/day. Incorporating spatial disparities, the study delves into spatial fluid flow differences

within wells, as shown by dl.U values ranging from 549.71 mm/day to 65.70 mm/day in Well A. It also highlights the significance of integrating reservoir well log data and 3D transient numerical modelling to optimize fluid flow dynamics and hydrocarbon potential. The heterogeneity introduced by changing clay content underscores the inadequacy of treating reservoirs as uniform entities. This study underscores the importance of accounting for permeability variation in reservoir management, offering valuable insights for effective extraction planning.

Abstract Title: H₂S in Petroleum System – Origin, Challenges and the Operational Mitigations

Author: Rakesh Roshan Rana, Sakshi Sharma, Gulshan Kumar and Vaibhav Sharma

Organization: Indian Oil Corporation Limited

Abstract: Hydrogen sulphide is a poisonous and polluting substance that poses significant risks to health and environment. It increases engineering costs due to its corrosive nature in exploration and development equipment and transportation logistics. This work reviews the geological and non-geological conditions responsible for H₂S in petroleum system, existing technologies for scavenging and its challenges. Current work gives a checklist to probe probability of H₂S. A detailed review has been done to analyze the geological conditions responsible for Hydrogen Sulphide (H₂S) and the respective mechanisms responsible for reservoir souring. Experimental work as well as in-situ characterization of source rock has been included to understand chemical reactions involved in hydrogen sulphide production in different stage of source rock maturation, hydrocarbon generation as well as during its exploitation. We have also investigated some of the existing technologies for scavenging hydrogen sulphide and the challenges there in. Early diagenesis of source rock involves organic matter and aqueous species reactions which produces primary sulphur in petroleum system. In anoxic environment, anaerobic microbes reduce sulphates ions, from marine water, originating hydrogen sulphide. Siliciclastic depositional environment contains dissolved iron species which reacts with hydrogen sulphide and produces pyrite, low sulphur kerogen and hydrocarbon. However, in non-clastic system low dissolved iron inhibits removal of hydrogen sulphide and resulting excess sulphide into kerogen. Mostly, 4 types of mechanism have been found responsible for hydrogen sulphide generation (1) thermal cracking of kerogen, (2) Thermochemical Sulphate Reduction (3) decomposition of organic sulphate additives in fracturing fluids, (4) Bacterial

Sulphate Reduction. The H₂S % in one of the UAE Unconventional wells are found to have relation with the a) Qty of Pyrite present and b) amount of hyfrac fluid injected. The subject discusses in details of the origin and mitigation. Some scavenging technology is based on the crude oil and process properties, such as (1) water soluble- used in crude oil distillation units and refinery process equipment, (2) oil soluble- used for heavy oils and residues and (3) metal based scavengers- used in drilling applications. Such review work can be helpful in oil and gas industry as a checklist to design a well with appropriate sour grade materials so that operation objectives are not compromised, and huge cost associated with remedial activities can be avoided. Fast kinetics of in situ bacterial reduction of drilling fluid and sulphate generation can also be used as remedial measure during exploration and production in wells.

Abstract Title: Fluid characterization through acoustic studies on core samples in low contrast reservoirs of north of Gandhar and Jambusar area of Cambay Basin

Author: Parmod Kumar, Parama Nand, S S Khanna and Mrs. Beena Jhaldiyal

Organization: Keshava Deva Malaviya Institute of Petroleum Exploration (KDMIPE) ONGC

Abstract: In clean reservoirs, type of fluid can be identified with reasonable accuracy from log analysis but their identification becomes difficult in complex and heterogeneous reservoirs. In such a scenario acoustic studies on core samples may provide a very effective mean to characterize the type of fluid; as the fluids present in the pore space of reservoir rock are known to have significant influence on acoustic parameters. The present study shows a methodology to characterize the fluid nature through acoustic studies on core samples. The acoustic studies have been carried out on core plugs of heterogeneous reservoirs of Hazad sand reservoirs of Gandhar and Jambusar fields. All the core samples were cleaned to remove hydrocarbons and salts by soxhlation process. After soxhlation process all core samples were dried at a temperature of 600 centigrade. Next, the porosity, grain density and bulk density of individual core plugs were determined. The compressional wave velocity (V_p) and shear wave velocity (V_s) were measured at different confining pressures with different fluid namely, air, brine and oil. Study was carried out on the core samples in three stages (1) In first stage, measurements were made on dry core plugs, (2) the measurements were made on core plugs saturated with brine of 20 gpl salinity, (3) in the third stage samples were saturated with

crude oil. The detailed analysis on the core plugs reveal the influence of different fluids (i.e. air, oil and brine) on acoustic properties. The velocity measurements versus pressure for air, oil & brine saturated sandstone show that the P-wave velocity at 'air' is lower than the oil saturated velocity, which is still lower than the velocity when rock is saturated with brine. The analysis of the variation of V_p/V_s with the confining pressure shows an increase in V_p/V_s ratio at 1000 psi from air saturated to brine saturated while this variation is very less from air to oil. When V_p/V_s ratio is plotted against acoustic impedance, it is seen that brine zone has high V_p/V_s ratio & high acoustic impedance as compared to gas saturated zone. This cross plot show better fluid identification along the impedance axis. The study has established ranges of V_p/V_s ratio and Poisson's ratio for gas, oil and water bearing zone. The results have been validated with the available DSI log data and production testing data. The transform generated through Cross plot of V_p and V_s of different fluid at reservoir confining pressure will be very helpful in complex reservoir where characterization of fluids become difficult from logs and where DSI log data not available. Cross-plot between V_p/V_s ratio and travel time of compressional wave (DTCO) has been made against hydrocarbon bearing, shaly and water bearing reservoirs. The average values of S_w were computed from corresponding S_{xo} values. An increase of in V_p at 3500 psi has been observed in brine saturated samples against oil saturated samples which implies that acoustic log can be used as fluid indicator.

The present work has led to a better understanding of core derived acoustic parameters vis-a-vis reservoir fluids. The study concludes that reservoir fluids namely gas, oil, water can affect the acoustic parameters such as V_p, V_s, V_p/V_s ratio, Poisson's Ratio and acoustic impedance in different ways. These changes in acoustic parameters can be used to identify the fluid type. The approach, as shown in this study, can be an enabling factor in identifying suitable hydrocarbon bearing prospects for future exploration.

Abstract Title: Advanced geomechanical modeling for optimizing well location and well control during CO₂ storage and enhanced hydrocarbon recovery

Author: Birendra Jha

Organization: University of Southern California

Abstract: The coupling between flow and geomechanics determines the stress, pressure and fluid distribution in reservoirs via changes in the porosity, permeability, compressibility,

and fault/fracture activation. We developed advanced meshing, multiphysics simulation, and AI modeling capabilities to resolve the interplay between geologic structure, petrophysical heterogeneity, stress and fluid distribution. We tested the framework on a CO₂ storage case study to determine the optimal well injection rates in a reservoir with uncertain and heterogeneous rock properties (Figure 1b). Multiphysics modeling offers promise for both mature and new fields. Increasing production from mature fields requires an increase in the field's capacity for injection, disposal, and storage.

Abstract Title: Evaluating Carbonated Water Injection (CWI) for Enhanced Oil Recovery (EOR) in the Upper Assam Basin

Author: Pankaj Kumar, Akhtar Uddin Ahmed and Ranjit Dutta

Organization: Oil India Limited

Abstract: This paper summarizes the prospect of Carbonated water injection (CWI) as an EOR and subsequent CO₂ sequestration from an Indian mature oil field in Assam through laboratory and reservoir modelling. Dynamic reservoir simulations using a high-resolution geocellular model successfully matched 34 years of production data with a commercial simulator. Various development scenarios and CWI EOR modelling. Carbonated water injection (CWI) is a promising enhanced oil recovery (EOR) technique where dissolved CO₂ transfers to the oil phase, improving oil mobility and causing oil swelling. The success of Carbonated Water Injection (CWI) in India will not only boost oil production through enhanced oil recovery (EOR) but also helps to reduce the carbon footprint.

Abstract Title: AVO modelling for Quantitative interpretation of porosity in high impedance gas sand : A case study from Offshore Cauvery basin.

Author: Vllkrishnaveni Emani

Organization: Oil and Natural Gas Corporation Limited

Abstract: Modelling of effective porosity in high impedance reservoir for quantitative interpretation. Fluid replacement modelling done to see the effect of porosity in reservoir. Tight reservoir which is showing high impedance and high Vp/Vs because of very low porosity which is difficult to identify on seismic section. This case study was carried out in high impedance sand in cauvery basin.

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Theme:**Advancement in Geophysical Technologies for Oil and Gas Exploration**

Abstract Title: Integrated Seismic inversion study and facies modelling for effective delineation and de-risking of a gas field: A case study from Mumbai offshore basin

Author: Nasimudeen Nedeer, Moumita Dubey Chakravorty/Debakanta Biswal

Organization: Adani Welspun Exploration Ltd.

Abstract: Establishing lateral extent and continuity of deltaic channel architecture beyond well control is critical to successfully appraise and develop a gas field. Daman reservoir sands are distributary channel fills deposited in NE-SW orientation. The major challenge in terms of reservoir characterization is limited data availability. The results of the elastic deterministic inversion (e.g. V_p/V_s) showed good fit between predicted and measured well logs. Inversion outputs to control population of lithofacies away from wells proved to be highly effective in reservoir characterization.

Abstract Title: Accelerating Subsurface Imaging: Integrating Deep Neural Networks with Full-Waveform Inversion

Author: Prof. Rajesh Nair

Organization: Indian Institute of Technology Madras

Abstract: The scope of this research encompasses the integration of deep neural networks (DNNs) with full-waveform inversion (FWI) to enhance subsurface imaging. The approach integrates deep neural networks (DNNs) with full-waveform inversion (FWI) to enhance seismic subsurface imaging. Initially, synthetic seismic datasets are generated to train the DNN. Results and The integration of deep neural networks (DNNs) with full-waveform inversion (FWI) has shown significant improvements in both computational efficiency and inversion accuracy. The integration of deep neural networks with full-waveform inversion introduces a novel methodology that significantly enhances computational efficiency

and accuracy in subsurface imaging.

Abstract Title: Reservoir characterization of carbonate reservoir using multi attribute analysis

Author: Sanjiv Kalita

Organization: Invenire Energy Private Limited

Abstract: The present study focuses on using collective geophysical interpretation techniques in the characterization of carbonate reservoirs with limited geophysical data. The lateral variation of the average porosity of a carbonate reservoir is the key to reservoir characterization. For the development of fields under the DSF Bid round, having limited geophysical data, locating possible sweet spots for the initial development wells.

Abstract Title: Enhanced Lithology Discrimination and Reservoir Characterization in the Aishwariya Field using Multi-Attribute Rock Physics Models

Author: R Malavika, Kondal Reddy

Organization: Cairn Oil and Gas, Vedanta Ltd.

Abstract: Aishwarya field is in Barmer basin in Rajasthan, India. It is the second biggest oil discovery in Barmer basin. To date, 115 wells have been drilled. The current study is based on rock physics analysis, which operates across multiple domains to understand the discrimination of lithology and fluid content. The current study is based on rock physics analysis, which operates across multiple domains to understand the discrimination of lithology and fluid content. The initial cross plots revealed that Fatehgarh rocks are sensitive to Density, AI, PR and V_p/V_s . After multiple iterations, AI - PR cross plot domain was chosen as it shows maximum separation. This enhanced lithology discrimination using combined attributes such as Acoustic Impedance and Poisson Ratio facilitates a better understanding of reservoir quality.

Abstract Title: Identification of fine depositional patterns and subtle stratigraphic plays by Seismic Data Reprocessing and Diffraction Imaging

Author: Umang Sundriyal, Sudhir Chauhan

Organization: Bharat PetroResources Ltd (BPRL)

Abstract: Seismic Reprocessing (PSTM/PSDM and Diffraction Imaging) of the vintage data has brought out finer depositional elements present in the Kalol Formation. 3D seismic acquisition was done in three different vintages with similar acquisition parameters. However, all the data sets were different in terms of phase, frequency and S/N ratio. Reprocessing mitigated issues related to variable mis-ties along the legacy survey boundaries, improved S/N ratio and frequency content, enhanced fault imaging and normalized amplitude values. Object oriented Reprocessing of the seismic data brings out sizable improvements in terms of vertical resolution (Frequency content), phase and definition of discontinuities.

Abstract Title: Basement fracture characterization using AVAZ-VVAZ for basement play in South Assam shelf

Author: Ashutosh Verma, Madhurima Katiyar, Amardeep, Alok Rao, Mrinmoy Sharma and Sonali Baba

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Basement fracture characterization using VVAZ and AVAZ techniques has been attempted to understand the orientation and intensity of contributing fractures in Khoraghat-Nambar and Borholla fields of Upper Assam South Block. The results of pre stack seismic attribute show that there is consistency about fracture orientation in between FMI and VVAZ. The fracture parallel to SHmax direction are conductive and open in general. These fractures are likely to play major role as conduits of hydrocarbon in the Basement as found in wells KH-A, KH-B, DP-A. It has been observed that the hydrocarbon bearing wells (KH-A, KH-B and KHAz) in the Khoraghat field predominantly have NE-SW fractures which may be contributing to enhance the secondary porosity of the Basement reservoir . Based upon the relationship between conductive fractures and SHMax direction, the fracture aperture size is relatively good and varying from 0.02 to 0.9cm, wherever the fractures are parallel or sub parallel

to SHmax direction whereas the fractures are parallel to Shmin direction the fractures aperture size are relatively poor (0.002-01) as has been observed in KH-C & 0.001-0.003 in KH-D wells. Therefore, the NE-SW oriented fractures are open and conductive in nature and acting as major conduits of hydrocarbon in Basement towards Khoraghat field.

Abstract Title: Angle domain Wavelet stretch correction with high fidelity AVO

Author: Biva sharma, V.L.L Krishnaveni and M.Sudhakar

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Broad frequency spectrum is a key requisite for high resolution imaging which ensures accurate interpretation. Major reason for loss of frequencies in far angle during imaging is wavelet stretch with offset which causes introduction of low frequencies in far offset. This wavelet stretch is non stationary in time in offset domain. Hence a single operator is not suitable for the whole trace. It also reduces the resolution of the stack and alters the AVO gradient giving false AVO analysis. The dominance of low frequencies in far angle stack brings out brightening of amplitude which leads to false AVO interpretation. In this paper we have tested a method where we have achieved frequency spectrum enhancement in the far offset by estimating a de-stretch operator in angle domain where the stretch is stationary, while preserving the AVO attributes. The de-stretch operator is obtained with a common reference angle containing broad frequency spectrum. The operator is stationary over time and is robustly implemented by a Weiner-Levison method. With the increase of frequency in higher angles, the gathers can be used for higher order AVO analysis and density inversion.

Abstract Title: Analysis of hydrocarbon prospectively in the unexplored open acreage area in matured Cambay Basin: a key study carried out in east of Gandhar field leading to first onland OALP (CB-ONHP-2021/2) discovery.

Author: Sabyasachi Khan, Neha Bajpai, Purnima Pathakr

Organization: Oil and Natural Gas Corporation Limited (ONGC)

Abstract: Analysis of hydrocarbon prospectively in OALP block CB-ONHP-2021/2 in east of Gandhar field in Narmada-Broach block of Cambay Basin was the focus of the study. The objective of the study was to identify the prospective locales/ locations for hydrocarbon exploration.

Based on old 3D seismic data and other geological & geophysical data generated during the exploration & development of surrounding areas of the OALP block, first well W-1 was drilled which was found to be hydrocarbon bearing in one zone & hydrocarbon indication in other zone. After this success, new 3D seismic data were acquired, processed, interpreted and carried out number of attribute analysis using eight numbers of wireline sonic well log & eleven numbers of RPM well data to know the extension of the reservoir facies. Seismic attribute study in this area is very much challenging due to thin nature of the reservoir facies.

Based on old 3D seismic data and other geological & geophysical data generated during the exploration & development of surrounding areas of the OALP block, first well W-1 was drilled which was found to be hydrocarbon bearing in one zone & hydrocarbon indication in other zone. After this success, new 3D seismic data were acquired, processed, interpreted and carried out number of attribute analysis using eight numbers of wireline sonic well log & eleven numbers of RPM well data to know the extension of the reservoir facies. Seismic attribute study in this area is very much challenging due to thin nature of the reservoir facies.

Hydrocarbon exploration in highly explored basin like Cambay Basin, especially like Narmada-Broach block is very much challenging. However, critical analysis of available G & G data, upgraded interpretation software and un-biased knowledge led the maiden onland success in the open acreage areas.

Abstract Title: Enhancing Efficiency in Clearances related to Environment: A Case Study of the Directorate General of Hydrocarbons' Proactive Monitoring Approach.

Author: Pooja Verma
Organization: Directorate General of Hydrocarbons

Session: SPECIAL CATEGORY - DGH

Abstract: Green clearances are crucial for initiating E&P activities in the hydrocarbon sector, ensuring that environmental, forest, and CRZ considerations are thoroughly evaluated. Adhering to stringent

regulations allows companies to mitigate adverse ecological impacts and promote sustainable practices. However, obtaining these clearances is often time-consuming, delaying site work and resulting in financial losses.

In light of these challenges, a comprehensive monitoring initiative led by the Environment Division of the DGH has made significant advancements in streamlining environmental, forest, and CRZ-related clearances. This proactive approach has resulted in a notable reduction in processing times and a substantial increase in the number of proposals efficiently resolved by the competent authority. Enhanced monitoring mechanisms have ensured that environmental compliance is maintained while facilitating expedited clearances, fostering a more efficient and responsive regulatory framework. This case study illustrates the DGH's role in facilitating green clearances, highlighting the significance of statutory approvals in the oil and gas sector for sustainable development.

This paper examines historical clearance application delays and compares them with the current situation in the oil and gas sector. It highlights the key reasons for delays at various stages of processing environmental, forest, and wildlife clearances. By analyzing five-year clearance data (from April 1, 2015, to October 30, 2020) from the PARIVESH portal of MoEFCC and the time taken, key areas resulting in delays were identified. Subsequently, suggested and implemented measures by DGH to address these issues are discussed. The report includes a detailed process flowchart, an analysis of statutory timelines vs. actual time taken at different levels, key findings, and recommendations for further streamlining the processes.

This paper highlights key areas causing delays in environmental clearances, such as public hearings and compensatory afforestation for forest clearance. It demonstrates that, with DGH's facilitation, numerous clearance-related proposals in the oil and gas sector have been resolved over the past two years. Additionally, the paper includes the latest notification issued by the MoEFCC, which aims to streamline these processes for the benefit of the oil and gas sector. It also discusses DGH's methodologies, outcomes achieved, and implications for future environmental governance and project execution in the hydrocarbon sector.



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