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SPE International

Kingdom of Saudi Arabia Section

BALANCING GROWTH & SUSTAINABILITY

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JULY 2022 ISSUE

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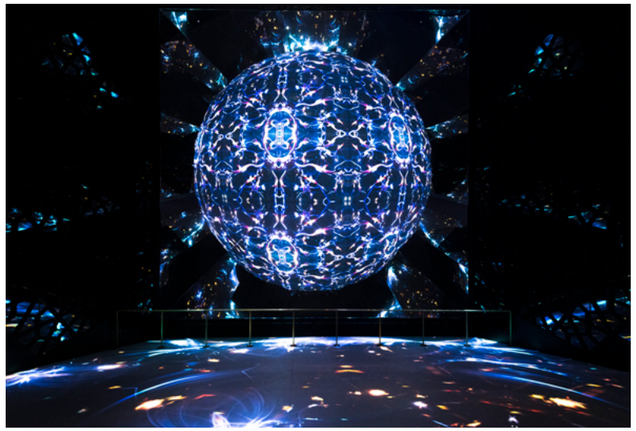

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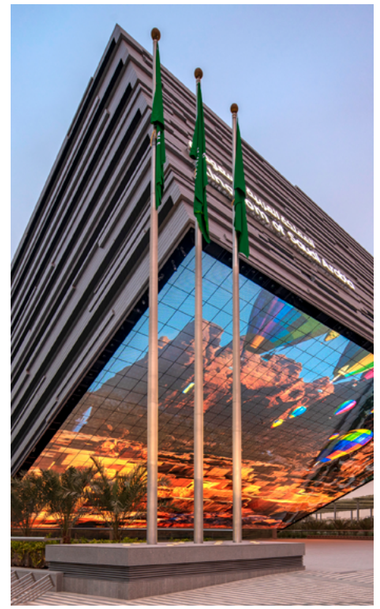

Letters from

THE EDITOR-IN-CHIEF

Dear reader,

In recent years, the term sustainability has increasingly floated across the ether, becoming a strategic priority for companies and countries. Discussions about the future of the oil and gas industry have become enmeshed globally, with international policies and corporate strategies calling for IOCs and NOCs to reduce carbon emissions. Despite the growing roll-out of net-zero pledges and policies supporting carbon abatement solutions and technologies by energy companies, the movement towards sustainability predates the 21st century. It has roots in social and economic reform, conservationism, and cultural practices. In this issue of SandRose, we explore multiple facets of sustainability, contextualizing within the oil and gas industry, looking at technological innovations addressing sustainable development goals, and looking beyond the industry, investigating sustainable design in arts, architecture, and social development. Furthermore, the theme of this issue is "Balancing Growth & Sustainability," recognizing that true sustainable development calls for balancing the need for economic growth with environmental preservation and social equity.

In this edition of SandRose, we celebrate some significant milestones for the SPE-KSA section and community. SPE-KSA is proud to have been awarded the SPE 2022 section excellence award for its wide variety of programs and for sustaining and growing memberships to continue to be the largest section in the world. In addition, SPE-KSA wishes to recognize and congratulate all members who have been awarded SPE regional awards. After a two-year hiatus, the section is proud to celebrate the return of the Technical & Professional Programs (T&PP) Dinner Meeting featuring Mr. Khalid Al-Dabbagh, Chairman of the Board of Directors of SABIC, and Saudi Aramco board member. Also, between May and July 2022, the section held the Young Professional's (YP) "Unconventional Leader" boot camp and the first T&PP and D&I committee NMO session on "Capitalizing on Mentorship Opportunities" with Dr. Sarah Ghaleb. We are also excited to highlight the Student Outreach team's tremendous outreach initiatives targeting high school students and university chapters.

Finally, I would like to thank Weatherford for sponsoring this issue. Your support and partnership are instrumental to our success. I would also like to recognize the efforts and dedication of SandRose contributors and the editorial team. We always look for talented writers and artists to feature in future issues. Contact us for feedback or contributions at ***sandrose@spe-ksa.org*** SR

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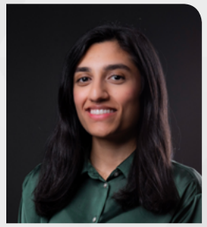

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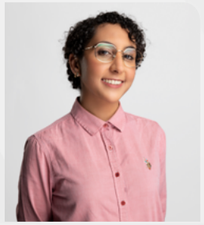

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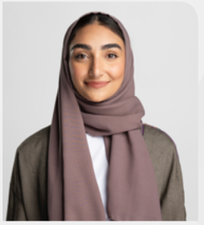

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Letters from SPE-KSA CHAIRMAN

Dear reader,

Over the past year, the SPE-KSA team and section volunteers have worked tirelessly to continue the excellent foundation set by previous SPE-KSA teams by expanding multiple flagship programs and introducing a set of new activities. Now, we are proud to say that we have reaped the benefit of this commitment as the culmination of these efforts which has led the SPE-KSA section to be awarded the renowned SPE Section Excellence Award for the 15th consecutive year, an achievement unparalleled by others. The SPE Section Excellence Award is presented to the top sections which have accomplished an admirable level of success. In addition to that, the SPE-KSA section has also had multiple member regional and international award winners recognizing the accomplishments and the successes of its members.

In this issue of SandRose Magazine, we proudly document key moments from the 2022 Inaugural Technical and Professional Programs (T&PP) Dinner Meeting under the theme of "Overcoming Challenges in Difficult Times," with Mr. Khalid Al-Dabbagh, Chairman of the Board of Directors of SABIC and Board Member in the Saudi Aramco Board of Directors. In his address, Mr. Al-Dabbagh spoke about the role of professional societies such as SPE in bridging technical knowledge with financial and commercial acumen of its members. He also demonstrated the importance of integrating the two skillsets by sharing his experience in leading Saudi Aramco's IPO, the success of which led the company to become the largest publicly listed company in history. Tying into the theme of this issue of SandRose, "Balancing Growth and Sustainability," he also emphasized the critical role of professional societies in galvanizing members to develop efficient and innovative solutions to address industry challenges and meet ESG priorities. Professional societies such as SPE are ultimately a part of the solution in paving the way toward a more sustainable future.

As chairman of SPE-KSA, I am proud of the efforts of current SPE-KSA members and volunteers in facilitating the triumphant return of the SPE-KSA T&PP Dinner Meeting, and look forward to the many dinners we have ahead of us. I would also like to congratulate SPE-KSA awardees for their exceptional service and professional and technical contributions to the society. Finally, I would like to thank SPE-KSA leaders, members, and volunteers for their commitment and dedication to the society, which has led us to win fifteen consecutive Section Excellence Awards. SR

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SPE-KSA PROUD MOMENTS

SPE-KSA section has been awarded the **SPE 2022 Section Excellence Award**

Saudi Aramco's Southern Area Oil Operations has won the **2022 Distinguished Corporate Service Award**

King Fahd University of Petroleum has won the **2022 SPE Presidential Award for Outstanding Student Chapter**

2022 REGIONAL AWARDS RECIPIENTS

Saad Al-Mutairi
Sustainability and Stewardship in the Oil and Gas Industry

Muhammad Arsalan
Completions Optimization and Technology

Hasan Nooruddin
Data Science and Engineering Analytics

Nasreddine Hammou
Formation Evaluation

Karam Al-Yateem
Health, Safety and Environment

Amr M Zhran
Productions and Operattions

Hasan Al Mubarak
Projects, Facilities and Construction

Cenk Temizel
Reservoir Description and Dynamics

Mohamed Mahmoud
Distinguised Achievment Award for Petroleum Engineering Faculty

Eyad Al Ali
Regional Public Service

Mohammed Almuslem
Young Professional Member Outstanding Service

Nour Baqader
Regional Service

Balancing Growth and Sustainability:

Contextualizing Sustainability in the Oil & Gas Industry

By SandRose Editorial Team

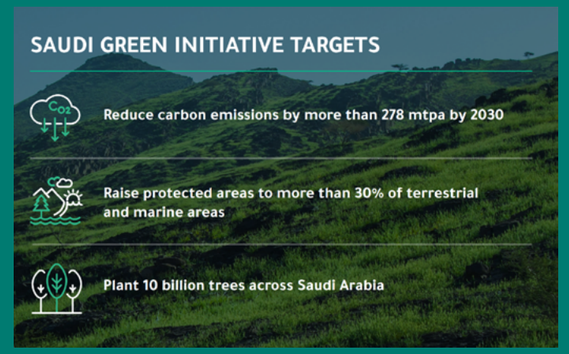
As the impacts of climate change become more pressing, countries have come together to ratify international policies and implement technologies evolving climate action and accelerating plans to decarbonize society and make way for a more sustainable future for humanity. The oil and gas industry has taken on the mantle by pledging to achieve net-zero emissions in operations and investing in low-carbon products and carbon abatement solutions. Although the pace of action and investment has been scaling up rapidly in recent years, sustainability has long been a critical priority for the oil and gas industry. However, many critics claim that balancing growth and sustainability in the oil and gas industry is unattainable. In this article, we explore the definition of sustainability in the context of the oil and gas industry, the current state of affairs, industry challenges, and the future outlook.

HISTORICAL PERSPECTIVE

Although the concept of sustainability has been launched into the forefront of public and corporate priorities in the last few decades, the term's origin precedes this period. The term "sustainability" first appeared in our lexicon in the early 18th century when used in a German forestry guidebook. In this context, the term was used to refer to "sustaining the yield", in which the guidebook warned against harvesting more than the forest could reproduce in a given amount of time. The term gained traction in a 1987 UN report, "Our Common Future," also known as the Brundtland Report. In the report, Sustainability is communicated as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." Since then, the term has been applied to various contexts, including business and social continuity, although it most often refers to environmental stewardship. Defining and incorporating "sustainability" is essential in setting policies and legal frameworks on global, national, and individual levels.

THE INTRODUCTION OF UN SUSTAINABLE DEVELOPMENT GOALS AND THE PARIS AGREEMENT

In September 2015, over 193 countries of the UN General Assembly ratified the 2030 Development Agenda, which outlined 17 Sustainable Development Goals (SDGs). The SDGs outline 17 interconnected global actionable goals with the mission of creating a "blueprint to achieve a better and more sustainable future for all people and the world by 2030". The SDGs acknowledge climate action as a key priority, given its ability to threaten all aspects of sustainability. The Paris Agreement, ratified in 2015, is essential for achieving goal 13, "Climate Action," and creates a roadmap to meet this goal by reducing emissions and strengthening our resilience and adaptive capacity to climate-related threats. The primary goal of this Paris Agreement is to limit global temperature rise to well below 2° C. This would be achieved through each government's submission of independently decided nationally determined contributions (NDCs). Since then, even more, ambitious plans have been set by many governments and corporations to achieve net zero, meaning that the sum total of emissions would be neutral. Saudi Arabia is among the countries to ratify the Paris Agreement, pleading to reduce carbon emissions by 130 million tonnes of CO2 by 2030. However, since then, the Kingdom introduced the landmark Saudi Green Initiative to remove 278 million tonnes of CO2, more than double the original target. The first wave of SGI reforms introduced more than 60 initiatives supported by over SAR 700 billion investment to contribute to the growth of the green economy. SGI has also been expanded to a regional level with the introduction of the Middle East Green Initiative to scale up climate commitment through regional collaboration.



OIL AND GAS COMPANIES AT THE FOREFRONT OF CLIMATE ACTION

A seismic shift within the industry has already occurred, with many International Oil Companies (IOCs) such as Shell, BP, and Total committing to net zero targets by 2050 while rebranding themselves as integrated energy companies. In 2014, 12 companies from the oil and gas industry joined forces to create the Oil & Gas Climate Initiative (OGCI), a CEO-led initiative with a mandate to "accelerate the reduction of greenhouse gas emissions in full support of the Paris Agreement and its aims." OGCI is led by Saudi Aramco and consists of IOCs and NOCs such as BP, Chevron, CNPC, Eni, Equinor, ExxonMobil, Occidental, Petrobras,

Repsol, Shell, and Total, representing 30% of global operated oil and gas production. OGCI members developed a baseline of aggregated upstream oil and gas operations emissions of 24 kg CO2e/boe and pledged to reduce collective methane intensity by 9%.

The image above shows CEOs from the Oil and Gas Climate Initiative (OGCI) member companies and organizations

THE CURRENT STATE OF AFFAIRS

Historically, the oil and gas industry has been committed to sustainability in its operations. However, evolving government climate policies and changing investment strategies by major organizations are creating urgency for oil and gas companies to reduce emissions further. While hydrocarbons will continue to dominate the global energy mix, oil and gas companies will not only need to adopt integrated sustainability strategies that appeal to investors but also identify opportunities in a low-carbon economy to remain competitive.

OPPORTUNITIES IN A LOW-CARBON ECONOMY

With the growing number of innovations and demand for low-carbon products, investing in low-carbon solutions are becoming increasingly attractive to investors. Most opportunities in the low-carbon economy can be found in the following areas:

Carbon Capture Solutions

Development of technologies to capture and sequester hydrocarbons (DAC, CC&S, BECCS, Microalgae, and natural sinks)

Mobility

Formulation of low-carbon fuels and automotive materials, promoting shared mobility and public transport and developing intelligent transport systems.

Energy Efficiency Solutions

Innovations and technologies to improve energy efficiency include advanced materials and smart grids.

Sustainable Built-Environment

Constructing sustainable buildings and communities that are circular, and designed using low-carbon materials and methods.

Renewables

Investment in alternative energy sources such as wind, solar power, hydrogen, and geothermal resources.

Industrial Decarbonization

Building a greener future for the manufacturing and industrial sectors. It can involve employing energy efficiency solutions or coupling industrial processes with CCS.

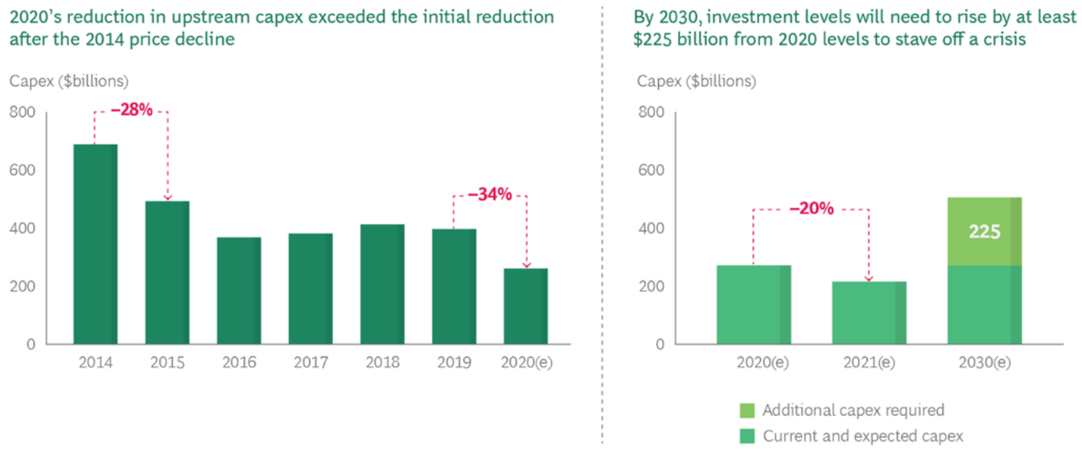
INVESTMENTS IN THE ENERGY INDUSTRY IN A POST-PANDEMIC WORLD

While the investment opportunities in the low-carbon economy are plentiful; the Covid pandemic has significantly slowed progress toward sustainable energy goals even as renewables continue to gain ground. Recently, a report by the International Energy Forum (IEF) indicated that in 2021 upstream investments were at $341 billion. In stark contrast, the last peak of upstream investment seen in 2014 was $779 billion, which marks a decrease of about 56%. Sharp reductions in economic activities have also impacted the renewable sector due to major delays in renewable energy supply chains, especially as governments have redirected finances to economic relief. The results of the strain on renewables have shown that they haven't matured nearly enough just yet to become a reliable energy source. The lack of investments in the upstream is particularly alarming and could lead to a rise in the frequency of price shocks, result in wider energy poverty, and further galvanize fuel switching to more polluting energy sources such as wood and coal, further delaying the energy transition.

> ***Two years in a row of large and abrupt underinvestment in oil and gas development is a recipe for higher prices and volatility later this decade. More frequent boom-bust cycles will harm consumers and producers recovering from COVID, set back UN Climate and Sustainable Development Goals, and threaten global security***
>
> ***- Joseph McMonigle, Secretary General of the IEF.***

The result of a mismanaged global economy and misdirected investments has led to underinvestment in the energy needed today and is threatening to slow the expansion of key clean energy technologies.

Exhibit 1 - The Risk of Peak Investment in Oil and Gas Is Significant



Sources: IEA; Rystad; BCG analysis.

Note: The 2030 estimated figures assume that demand will return in the 2022 time period. (e) = estimated.

KINGDOM EFFORTS

In the face of economic uncertainty, the Kingdom has long acknowledged the need to reduce its dependence on hydrocarbons and diversify the country's economy away from non-renewable resources while strategically leveraging hydrocarbons to improve sustainability and maximize the value of the hydrocarbon chain. Within the Saudi energy industry, this calls for optimizing the national energy mix to include renewable resources such as wind and solar power and developing atomic and hydrogen energy within the Saudi energy industry. A plethora of programs have already been implemented to promote energy efficiency and sustainability:

Hydrocarbon Demand Sustainability Program (HDSP)

Focuses on developing research and innovations to replace traditional material with innovative material created from hydrocarbons while improving the sustainability and the added value of the current hydrocarbon supply chain.

Circular Carbon Economy Program (CCEP)

Introduced during the Kingdom's presidency of the G20 focuses on enforcing a holistic framework to combat climate change through the reduction and abatement of carbon emissions.

PIF Voluntary Carbon Market for MENA Region

Introduced in March of 2022, PIF to develop a Voluntary Carbon Market (VCM) to be established in 2023 to supply, purchase and trade carbon credits.

National Renewable Energy Program (NREP)

As outlined in Vision 2030, the NREP aims to increase the share of renewables in the Kingdom to occupy 50% of the national energy mix by 2050. The renewable expansion will include solar energy, wind energy, and hydrogen.

FUTURE OPPORTUNITIES AND CHALLENGES

The oil and gas industry is no stranger to significant challenges, with a track record of showing resilience and determination in the face of new obstacles. The most recent evidence of this has been the global response of companies and countries when faced with plunging demand during the pandemic. With that being said, the industry is now facing one of its most significant challenges ever, one that has been brewing in the background even before the pandemic. Many understandably believe that this challenge is in meeting the ambition of the different net zero initiatives and pledges. Arguably, there is a far greater challenge that the industry faces. The challenge of the short and medium-term, within the timeframe of 2025 and 2035, respectively. This challenge is how the industry will meet the global demand for energy while balancing it with its ambitions to meet the long-term objective of net zero in an orderly fashion. Keeping in mind that different countries have different conditions that must be considered and the different positions of companies within the industry, all of this manifests in the variable timelines, plans, and strategies. In short, this boils down to how the industry can balance expectation and ambition with reality while ensuring no country or community is left behind. Simply put, the goal is reaching each of these aspirations in an orderly way. This entails that the price of goods remains relatively stable and predictable, and quality of life for the majority of the economy continues to improve.

At this stage, many oil and gas companies have formulated, or are developing, a strategy to make their operations sustainable. They focus on transformation, adaptability, and coordination as the three essential strategies to achieve this goal. Energy sustainability has taken on great importance, and the industries are positioning themselves to develop policies that balance profitability with social responsibility. Great strides have been made to help turn the statements of intention into a reality. However, there is still monumental work to be done in developing the next generation of technologies, energy solutions, and policy frameworks to mitigate the impact of greenhouse gases in our atmosphere. The question remains how fast innovation can scale to address these emissions as multiple tracks, including carbon capture, utilization, and storage (CCUS), hydrogen, and alternative energy sources are moving forward in parallel to mitigate these risks. While the topic of balancing growth and sustainability in the context of the oil and gas industry remains controversial in the eyes of critics, it is essential for oil and gas companies to show that they are not on the wrong side of history but on the right side of reality.

SR

Managed Pressure Techniques in Saudi Arabia:

A Partnership That Produces Results

Abdallah Kadadha, *Geozone Business Manager, Weatherford MPD Bahrain and Saudi Arabia*
Carlos O. Iturrios, *MPD Technical Manager, Weatherford MPD Bahrain and Saudi Arabia*

Oil and gas drilling operations are ruled by the challenging nature of the formations they contain. Formations have lower and upper-pressure limits that should not be exceeded while drilling. When the fluid pressure significantly rises above the reservoir pressure (overbalanced drilling), it can damage the reservoir, induce fluid losses, and slow down operations. Inversely, if the pressure dips too low (underbalanced drilling), borehole breakouts, kicks, and hole collapses are not far behind. The remedial actions operators take to offset these changes in pressure do not always succeed and come with increased safety risks to field personnel, additional nonproductive time, and increasing the overall costs.

Fields in the Kingdom of Saudi Arabia are not immune from these challenges, and Saudi Aramco is utilizing Weatherford's techniques of Managed Pressure Drilling (MPD) to mitigate these concerns. MPD enables operations to maintain constant annular pressure, create pressure-tight barriers against drilling hazards, and manage inflow from formations. While the conventional approach uses hydrostatic pressure of heavy drilling mud to manage the wellbore pressure, MPD uses a combination of annular surface pressure, hydrostatic pressure, and annular friction to balance the pressure in the exposed formation.

Despite the decades of successful applications of MPD, the technology has become associated with the "undrillable" wells or as a technique used as a last resort when all other conventional solutions have failed. Recent developments, however, have zeroed in on the idea that managing pressure should not be constrained to the drilling phase of a well or for the most challenging wells.

When integrated as part of a comprehensive well plan, managing pressure becomes a performance-enhancing solution for any type of well classification, including development, directional, multi-laterals, and horizontals, and also for a variety of operations aside from drilling, such as logging, running liner, cementing, coring, and more. When wellbore stability is maintained throughout the entire operation, and the pressure is dynamically altered in the annulus, any operation becomes faster, facing fewer challenges while delivering a more productive well and reducing overall costs and exposure to hazardous risks.

CASE STUDY 1:

Saudi Aramco is aware of the benefits of MPD and understands how incorporating the technology into an overall well plan serves the specific geology of the Kingdom. For example, in a large campaign with wells in an unconventional gas reservoir, Aramco needed to navigate through a drilling mud weight pressure window without halting the drilling before reaching the section total depth (TD) and run a contingency liner. The challenge was maintaining a constant bottom-hole pressure with a lighter mud density to drill through several formations with a variant pressure regime and in a zone with neighboring fracking activities.

In drilling similar wells in the field using conventional technology, the operator was forced to separate two challenging sections by running a 7-in. liner to isolate the first formation beforehand drilling a 5 7/8-in. lateral section. Weatherford's MPD experts recommended using a lighter mud density while drilling the 8 1/2-in. section, maintaining constant bottom-hole pressure while monitoring the well for kicks and losses. The idea was to avoid high overbalance and induced losses using MPD techniques to instantaneously respond to well behavior without increasing the mud density. Engineers evaluated the well during all the operations, optimizing the killing operation and mitigating any overkilling challenges.

The well was successfully drilled to TD, avoiding all kicks and losses by using constant bottom-hole pressure and a lighter mud density. Specifically, the MPD techniques combined two-hole sections and eliminated the need to run a contingency 7-in. liner. Across the 13 wells of this operation, MPD technology saved $450,000 per well, or approximately $5.85 million USD for the entire campaign.

CASE STUDY 2:

The techniques of managing pressure can also be deployed during cementing operations. Aramco needed to manage the Equivalent Circulating Density (ECD) within an ultra-narrow mud weight window in High-Pressure/High-Temperature (HPHT) gas reservoir wells. Experts identified the pore pressure during the drilling phase through a saltwater formation to optimize all the densities for the operation.

To prevent losses, the rig crew installed a Rotating Control Device (RCD) on the wells, creating a closed-loop environment to contain and divert fluids and enable wellbore pressure management. Field personnel conducted a four-stage displacement, adjusting the cement slurry and spacer densities to the lowest possible rate, a step made possible only with the lighter mud associated with MPD. Constant data acquisition integration between the cement unit and the MPD system enabled automatic ECD control.

The pressure was released before reverse circulation, a necessary step to clean the drill pipe of any cement slurry and avoid the chance of the pipe getting stuck. The densities of the mud, slurry, and spacer were designed to generate enough hydrostatic pressure so that the MPD choke was fully open at the end of the cement job. Micromax mud and cement formulations were developed, and real-time mud monitoring systems were adapted to ensure consistent and stable mud conditions at high densities through the MPD and Managed Pressure Cementing (MPC) operations. Accurate hydraulics simulations were verified across the board to ensure densities were within optimum ranges.

The near-balance or slightly underbalanced approach demonstrated the most promising performance among all the methods attempted to cement the liner configuration. The 12-in. hole section was drilled with MPD and a 9 5/8-in. liner was run and cemented with MPC across the over-pressurized zone, with successful and integral results. All losses and kick scenarios were avoided by managing the ECD as per the pore pressure test results.

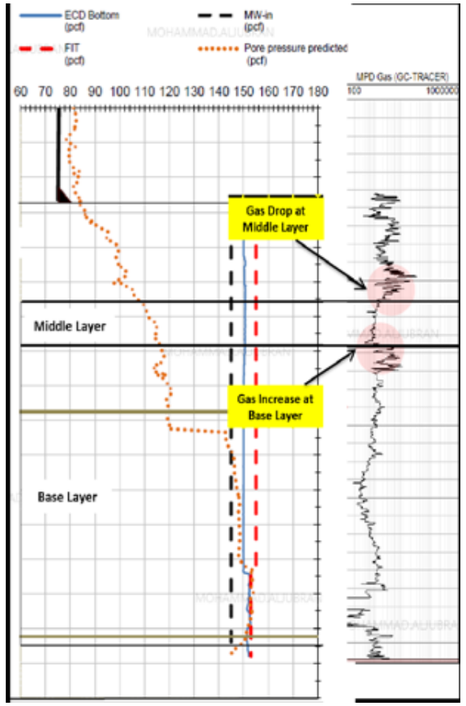


Figure 1: *The chart illustrates the theoretical drilling window with the calculated MPD ECD and the pore pressure prediction curve, confirming the pore pressure prognosis.*

CASE STUDY 3:

MPD techniques also overcome the unique challenges of horizontal drilling. An onshore gas reservoir required a horizontal well toward the minimum stress direction with a total reservoir contact of 4,000 ft (1,219 m). Additional goals for this job included increasing the rate of penetration (ROP) and bit life in the 5 7/8-in. lateral section of the carbonate sandstone formation and delivering the hole gauge in a suitable condition to run the required multi-stage fracturing completion.

With its ability to use a lighter weight mud, drilling with the minimum required ECD, and the ability to maintain constant bottom-hole pressure, MPD techniques proved the optimal choice for this operation. Drilling with a constant bottom-hole pressure would avoid exposing the formation to high differential pressure cycles and the inherent sticking typically experienced with conventional drilling practices in long lateral sections. Additionally, surface backpressure provided the ability to rapidly manipulate the hydrostatic column in case of a hole collapse.

As part of its common practices, Weatherford sent an MPD engineer to the rig site a week before the start of the operation, training the rig crew and other field personnel to ensure a flawless MPD execution. The training paid off, as the entire operation was completed without any safety incidents or nonproductive time (NPT), and it marked the first time an MPD operation drilled toward the minimum stress direction in this reservoir. In addition, the ROP and bit life showed an increase of 30% and 45%, respectively. Subsequent caliper runs showed an average gauge of 6.09 in., a mere 3.5% over-gauge.

The MPD solution enabled Aramco to drill the horizontal well in the optimal fracture placement in the formation, at 16,260 to 19,068 ft (4,956 to 5,811 m). Compared to the conventional results in the offset wells, MPD techniques increased the ROP and saved eight days of rig time, and extended the bit life to eliminate two-bit runs. The optimal in-gauge hole allowed the operator to run a multistage fracturing completion as planned.

TRAINING

Training field personnel proved crucial to this operation and highlighted Weatherford's commitment to its MPD technology to Saudi Aramco. Weatherford introduced its MPD service in the Kingdom over a decade ago and continues to serve Saudi Aramco with the best technologies and expertise in managing pressure. With over 300 wells successfully delivered, Weatherford has enabled Aramco to save over $135 million USD and recently celebrated the milestone of the first 1 million feet using MPD.

Weatherford actively interacts with multiple departments within Saudi Aramco, including the Drilling Technical Department (DTD) and Research and Development (EXPEC ARC). This collaboration created many fruitful projects aiming for a new level of service, delivering customized solutions and educational sessions to optimize field personnel and equipment.

A key component of the partnership was the founding of the first MPD training course for Aramco engineering and operations employees. Featuring the preeminent MPD curriculum in the industry, the MPD course collaborated with Aramco's DTD, Well Control Center, the Well Control Committee, and Weatherford. The course was hosted by Aramco's Well Control Center, covering Advanced Technical Presentations and the sophisticated simulation system, while the equipment introduction portion was featured at Weatherford's Dhahran Facility.

CONCLUSION

The successful training initiative and continued collaborative operations proved that the tools and techniques developed and used for managed pressure drilling could overcome the challenges inherent in horizontal wells. The same is true for streamlining cementing operations, eliminating a contingency liner, or a host of other operations commonly experienced on nearly every type of well. Managed pressure technology is an adaptive, precise, and proactive mean to control the annular pressure profile, ensuring a stable wellbore and avoiding costly surprises across the entire lifecycle of the well.

BIOS

Abdallah Kadadha

Holding a B.Sc. in Petroleum Engineering from Louisiana State University (USA), obtaining Comprehensive experience in MPD field operations. Practical expertise in well control prevention in HPHT, Directional, conventional, and fractured formation wells. Worked in the following regions: USA land /Gulf of Mexico/North Sea, and Saudi Arabia. Obtaining an overall experience of 15 years and currently serving as Geozone Business Manager for Saudi Arabia and Bahrain for Weatherford MPD.

Carlos Iturrios

Carlos has more than 15 years of progressive Oilfield experience in Managed Pressure Drilling Operations, designing and executing operations with single-phase and two-phase drilling fluids, HPHT, LPHT wells, and high-pressure gas wells. His oilfield career started as MPD Field Engineer in Mexico and participating in projects in Latin America; and later transferred to the Middle East, where he fulfilled roles as Operations Coordinator for Gas Operations and Lead MPD Engineer. Currently, he is the MPD Technical Manager for Saudi Arabia *and Bahrain for Weatherford MPD*

REFERENCES

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SR

The SPE Gaia Sustainability Program

Created by our HSE and Sustainability Technical Discipline, the program provides a strategic framework and support system for oil and gas professionals to act in the service of sustainable development empowering those at all levels within organizations to create actions to address the planet's sustainability challenges.

It will also provide space for confident, collective dialogue and resources to help individuals have conversations with others, inside and outside the industry, about the issues and the role of oil and gas in society.

SPE Gaia SUSTAINABILITY PROGRAM

www.gaiahub.org

What is Gaia?

For SPE, the Gaia program is about understanding the dramatic tension created between the parts of the Earth, especially those generated by human life who are dependent upon high-intensity sub-surface energy resources. These resources, which took millions of years to create, have enabled a high quality of life for many. They are also vital to the energy transition which humanity is undertaking today to address the negative impacts of energy consumption and accelerate energy access for all humanity.

SUSTAINABILITY PROGRAMMING FRAMEWORK

1 Priorities

Top sustainable development priorities in focus:

- **Energy Transition** towards net-zero emission targets
- **Regenerate Natural Capital** through technology and partnerships
- **Social Responsibilities** in-line with UN Sustainable Development Goals

2 Pathways

Building on and leveraging our strengths to catalyze desired changes:

- **Innovation** in new markets, business model, techniques, and processes to evolve energy supply
- **Measuring What Matters** for data-driven decisions to drive technology and responsible practices
- **Listening & Communication** to foster engagement and create solutions with customers and stakeholders

3 Principles

To guide programming towards success:

- **Aggregate** efforts for a holistic view through global events and publications
- **Engage** internal and external stakeholders to cultivate trust through knowledge sharing
- **Collaborate** to execute the ambitious and urgent activities necessary to meet sustainability challenges

Ways You Can Get Involved

The SPE Gaia Sustainability Program is being deployed through its online community, through physical and virtual events to collaborate with stakeholders, through inspiring actionable conversations (the Gaia Talks), and through the actions of SPE geographical and technical sections, chapters, and committees as champions of the efforts.

SPE International® Society of Petroleum Engineers

Member Spotlight

In this section, we select a distinguished member of the SPE-KSA community to highlight in each issue.

FAST FACTS

Name: Dr. Ashraf M. Al-Tahini
Job title: Manager of EXPEC Advanced Research Center, Saudi Aramco
SPE involvement: SPE-KSA Technical Symposium Chairperson (2008-2009), SPE-KSA Section Chairman (2010-2011), Chaired multiple SPE technical conferences and workshops, most recently IPTC 2022 and MEOS 2023.

Why did you decide to join the energy industry?
My dad had a huge influence on me getting into the energy industry. He joined Saudi Aramco when he was 14. He was very loyal to the Company, and he valued the Company's impact on the region as a whole, which was reflected on our family. I am also happy that my daughter is following in her father and grandfather's footsteps, as she is currently in the College Continuation Program and studying Petroleum Engineering at the University of Oklahoma. Another factor that influenced me to get into this industry was studying for my bachelor degree at King Fahad University of Petroleum and Minerals (KFUPM), where you can truly sense Saudi Aramco's impact and influence across all parts of the university campus.

What's one thing — either industry/work-related or not — you learned recently?
Leading an R&D organization enables me to learn in an interactive and dynamic environment. Such an atmosphere cannot rest on a static body of knowledge; it is dynamic and creates unique opportunities to gain new knowledge every day from people with focused specialties.

The focus of the company and its future is on sustainability which I am a big advocate of. This domain holds tremendous challenges and opportunities. Given my current role, we have a major role in developing technologies to enable and contribute to the Company's net-zero ambitions by 2050. I believe that SPE International and SPE-KSA is also becoming a major contributor to this area as well, as they have multiple initiatives and events that can prepare future professionals and leaders for a sustainable future.

Is there an achievement or contribution of which you are most proud? Why?
The accomplishments that I am most proud of can be grouped into five main points:

Strategizing the direction of the Upstream research and innovation and accelerating the deployment and commercialization of technologies is clearly articulated through the development of the deployment and commercialization function within EXPEC ARC.

Maximizing and strengthening EXPEC ARC in the area of digital transformation through its latest platform, Digital ARC. Digital ARC integrates digital transformation solutions in one platform. This plays a vital role in providing technologies for our proponents and stakeholders to maximize the benefits of this new digital era and contribute toward accelerating Upstream digital transformation.

Establishing a comprehensive sustainability strategy that supports EXPEC ARC technologies and solutions to enable the Company to meet its net-zero ambitions by 2050.

My services and contributions to SPE resulted in receiving multiple recognitions by the society, both internationally and locally. This began very early in my career in the Energy industry, as I received 2nd place in the 2004 Regional Student Paper contest of Mid Continent and Rocky Mountain Region, Ph.D. Division. I am also proud to receive the 2008 SPE Special Mention Award, 2010 SPE Century Club Award, International Young Member Outstanding Service Award, and Distinguished Member Award in 2018. I also recently received the Distinguished Service Award in 2021.

Appointed as a board member at the World Oil Editorial Advisory Board, a leading source of upstream oil and gas news and technology information. Recently, I was fortunate to have published two articles focusing on Sustainability and highlighting the Company's efforts in this very important domain. I am also proud of being on several SPE committees, such as the Young Member Outstanding Service Award Committee in 2013 and the Outstanding Service Award Committee in 2012-2013.

What does SPE mean to you?
SPE played a crucial part in my career development and networking skills, making it an essential part of me. It has provided me with an excellent platform to excel, both at my technical level and in my career, through participating in conferences, workshops, and leading roles in major SPE events. That really sharpened my technical and managerial skills. SPE has also allowed me to expand my network within the energy community, which created opportunities linked to me personally or to my role within the company. It had a significant impact on my career in Saudi Aramco during my 25 years journey so far.

When you're not working, how do you enjoy spending your time?
During my leisure time, I prefer to read books and credible articles, such as Bloomberg and Reuter, related to our vast energy sector. I focus on the challenges the energy sector face and its economic impact regionally and globally. I enjoy enhancing my living place and seek small-scale home improvement projects. In addition, my childhood hobby was soccer, and it still is my main hobby since I grew up with it. I enjoy watching the teams I support and continuously play with my peers. The sport reminds me of the importance of teamwork, which is an essential skill in the Upstream challenges we face.

How do you define success?

Success is something that will take you beyond where you currently are. It is an essential ingredient that should be embedded in our aspirations in life in general, whether in our careers or even with our families and how we raise our kids. Fortunately, success is something that can be measured. As one of the great management theorists, Peter Drucker, famously said, "You can't manage what you can't measure."

What are you looking forward to in the future?

I look forward to future advancement and pushing sustainability, as well as digital transformation in our industry, where Saudi Aramco is leading in these domains. I am also looking forward to the contributions of our young professionals, who are adding enormous impact to our industry. Talent development is very important to me and close to my heart. I strive and am eager to spend time planning for young professionals in the company or the SPE community to support them as much as possible. It is my utmost pleasure to be one of the contributors to the Company's Young Leaders Advisory Board.

Advice you would give to other SPE members

Take advantage of what SPE has to offer, either internationally or locally. We tend to be very busy and therefore do not have time to participate in extracurricular activities, but participating and volunteering within society, will truly elevate your skillset. I would also like to point out that SPE is not only limited to petroleum engineers. Having members from diverse academic backgrounds is crucial for the success of SPE, especially since SPE-KSA is now the largest SPE section in the world. Therefore, I highly recommend those not from a petroleum engineering background join the SPE community, as it will be rewarding and experience.

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Quote or motto you live by:

Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time."
- Thomas Edison

Staying Cool and Healthy this Summer

By John Hopkins Aramco Healthcare

We tend to forget that the sun's shine and brightness can be quite harmful during warmer months. This summer, make it a goal to adopt healthy habits and surround yourself with people that support and share your health goals

Follow these tips to stay healthy and cool this summer:

Cool Workouts: Hot temperatures can stress the body, so choose water workouts and make a splash as you get fit and strong or get moving indoors with a fun fitness video or DVD.

Hydrate Healthy: Drink plenty of water before, during and after exercise, and limit your and your children's intake of sugary beverages.

Summer Food: At summer gatherings, watch your portion sizes and incorporate healthy foods Add color, variety and flavor to your meals with fruits and vegetables. Eating low-calorie starters helps reduce your calories.

Sleep: The longer summer days allow us to stay up late or take a mid-afternoon nap, which can affect sleep. Sleeping adequate hours and at the same time each night helps you boost your immunity, maintain a healthy weight and reduce your risk for many chronic diseases. Spending time outdoors during the day will help you sleep well at night.

Sunscreen: Wearing sunscreen is one of the best — and easiest — ways to protect your skin's appearance and health at any age. Used regularly, sunscreen helps prevent sunburn, skin cancer and premature aging. For day-to-day use, pick a sunscreen with sun protection factor (SPF) of at least 30. If you spend time outdoors, choose a product with SPF 60 or greater. In reality, most people do not use as much sunscreen as they should, and this higher SPF helps compensate.

How much sunscreen do I need?

To protect your face, neck, arms and legs, you'll need about 1 ounce of sunscreen. Squeezed into your hand, 1 ounce of sunscreen is enough to completely cover your palm.

Make it a goal to adopt healthy habits this summer and surround yourself with people that support and share your health goals

مركز جونز هوبكنز أرامكو الطبي
Johns Hopkins Aramco Healthcare

The Importance of Leveraging IR4.0 Technologies to Reduce GHG: SAOO Leading the Way

By Ensan El-ayoubi and Seham Boulaiyan, Saudi Aramco

INTRODUCTION

Digital transformation is vital to the energy transition, allowing the achievement of substantial business value and helping better manage energy demand. The Fourth Industrial Revolution IR4.0 has allowed for significant developments in the technologies used to optimize operations in an environmentally safe manner. Saudi Aramco's Southern Area Oil Operations (SAOO) – which contains some of the world's largest hydrocarbon producing and processing facilities – has been a leader on this continuous journey towards sustainability. The success of this journey is best exemplified by the 548,000 tons of CO2 emissions SAOO was able to reduce in 2021. SAOO accomplished this feat by establishing a unique and robust Digital Transformation "Modularity-Affinity-Paradigm" strategy that creates a modular business-based digital model to further enhance and enable technology deployment, develop a digital transformation platform that ensures deployment of unique technologies, and supports the upskilling of the SAOO workforce. Given the positive impact of this strategy, it is worth looking at a handful of the IR4.0 technologies SAOO has been employing to reduce greenhouse gas (GHG) emissions.

Among these technologies is a rigorous optimization model that manages the feed to Gas Oil Separation Plants (GOSPs), which resulted in immense cost avoidance. Robotics has also played a vital role in trunk line routine inspections by utilizing an in-line robot that uses a nondestructive testing technique. Cost avoidance of $ 500,000 per trunk line is captured by eliminating traditional routine inspections of buried pipelines. As Advanced Process Control (APC) technology proved to boost efficiency, SAOO utilized it to optimize the operation of stabilization columns, which resulted in tremendous energy savings.

ADVANCED PROCESS CONTROL & SOFT SENSORS

APC has a high degree of agility and responsiveness, which reduces the consumption of resources, and results in reducing emissions and generated waste. SAOO has utilized APC and in-house developed soft sensors to adjust the operation of stabilization columns for superior control and optimization. Its innovative design allows accurate estimation and increases steam and energy savings. This model has also been filed as a patent (Figure 1).

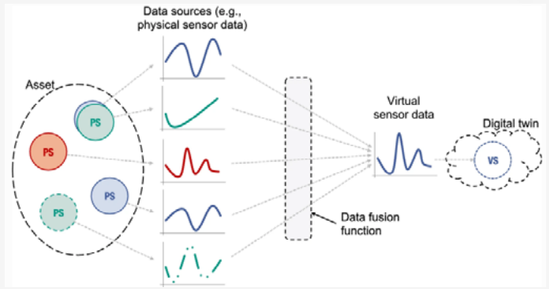

Figure 1: *Soft Sensor Model2*

ULTRASONIC GAS LEAK DETECTION

Early gas leak detection is a crucial part of mitigating damage to the environment. This can be achieved by utilizing a new Ultrasonic Gas Leak Detector that enables timely detection and subsequent repair of leaks without waiting for a Leak Detection And Repair (LDAR) survey to commence. The new detectors used by SAOO (Figure 2) reduced GHG emissions as the magnitude and duration of leaks were significantly reduced. In addition to optimal coverage and detection of gas leaks, hazard mitigation is achieved, protecting life, property, and the environment.

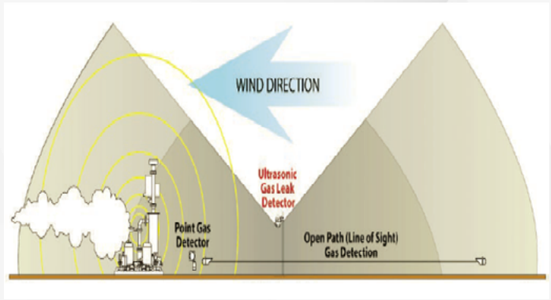

Figure 2: *Ultrasonic Gas Leak Detector3*

ADVANCE ANALYTIC MODEL (AAM)

Several monitoring tools in use adopt a reactive rather than proactive approach, which is costly with a potential for adverse impact on operations. One of the methods SAOO has deployed to counter this is the introduction of the Advance Analytic Model, AAM (Figure 3) for steam and fuel gas consumption. This proactive approach adopts an optimization algorithm to recommend forward-looking operating plans. The advantages include optimizing performance with improved safety, reliability, and fuel savings. Ultimately, operators become better equipped with sound strategies for next-day operations and readiness for all eventualities.

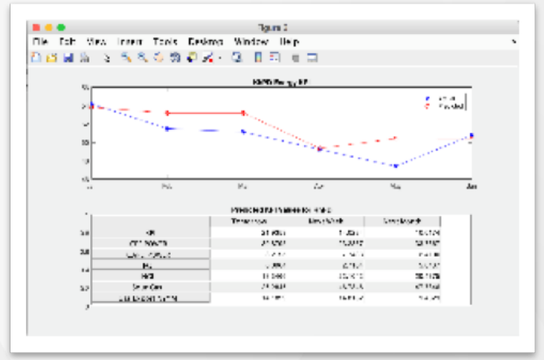

Figure 3: *SAOO Advance Analytic Model*

USE OF DRONES AND ROBOTS

A fully automated operator year-round is no longer a dream but a reality in progress at SAOO. One example is drone technology (Figure 4), with feedback from onboard sensors integrated with a user-friendly platform called ProcessHub, which utilizes preprogrammed routes to navigate the plant. The solution has several advantages, including an advanced video analytics engine to learn, detect and identify abnormalities. This

includes valve position verification, detection of oil leaks and presence of oil in water, and housekeeping. Also, switching manual measurement of emissions to 4IR-based technology reduces fugitive emissions by 30% and saves $150,000 annually.

Figure 4: *Drone-Based Inspection*

Another example of fully automating outside operators' routine activities is the first-of-its-kind in company deployment of Spot (Figure 5), a four-legged robot at one of SAOO's plants. The activities Spot can automate include inspecting for leaks, reading gauges, valves, switch settings, and many more. In addition, the spot comes with a suite of capabilities, including a PTZ camera, computer vision, obstacle avoidance, and various other sensors.

Figure 5: *Spot robot4*

SAOO GHAWAR INTELLIGENCE CENTER

SAOO has additionally made use of process automation to accomplish further energy efficiency. A proper model was developed to manage the feed to Gas-Oil Separation Plants (GOSPs). This multi-GOSP model incorporates each plant's main equipment performance curves and design constraints, as well as the existing transfer and swing lines between plants. Using these optimization models, targets are met in the most cost-effective manner possible, including minimizing energy and chemical consumption. The model incorporates changes in facilities' designs as part of the master plan project implementation. Production distribution was optimized during crude oil demand, achieving significant savings in resources. This powerful model was able to minimize production losses during outages.

SAOO has also introduced a state-of-the-art real-time reporting tool to monitor energy KPIs with the help of an interactive interface. A dashboard linked to the PI system was created to monitor HP Gas Compressors energy KPI, analyze abnormal consumption, and provide proper adjustments to the controllers to reduce consumption rate. Upon detecting abnormalities, the system will pinpoint which facility the root cause and propose corrective actions.

The abovementioned technological advancements are directly connected to the recently inaugurated SAOO centralized collaboration hub, Ghawar Intelligence Center (GIC) (Figure 6). GIC was established in Abqaiq as an integrated engineering and production surveillance "nerve center" for SAOO's IT/OT operations. The center aims to maximize value-creation and return on investment by enabling efficient production and asset management decision-making. In addition, the GIC enabled SAOO to maximize benefits realization from all available key energy innovations and advancements. The result is a collaborative environment where the best possible situational awareness is maintained and prediction and advice are offered.

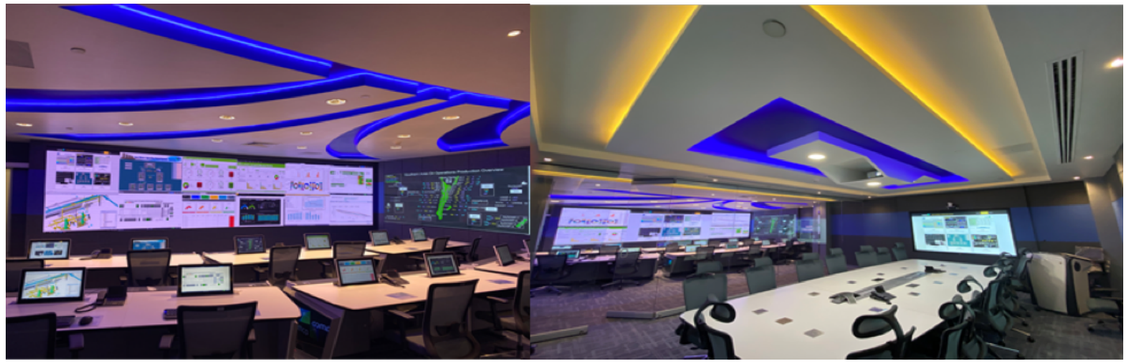

Figure 6: *SAOO centralized collaboration hub Ghawar Intelligence Center (GIC)*

CONCLUSIONS

IR4.0 has given way to a plethora of technological advancements in the field of operation optimization. As the world continues to raise its awareness of the impacts of GHGs, it becomes increasingly more crucial to pursue further developments to match our capabilities. SAOO's vision of excellence is a notable example of how effective forward-thinking mindsets can be. The future of the oil and gas industry is shaping up as a beacon of green energy transformations.

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Sustainable and Green Approach to Oil & Gas Industry: Industrial Biotechnology Perspectives

By Ameerah Bokhari Ph.D. , Petroleum Scientist, Saudi Aramco

INTRODUCTION

To enable a sustainable and circular carbon economy in alignment with corporate and kingdom commitments, a new Bio-based Materials research program was established. This program is directed towards developing novel advanced materials that are sustainable, economical, and environmentally friendly leveraging biotechnology approaches assisted with AI capabilities to resolve a number of critical upstream oil and gas challenges, including H2S mitigation, H2 production, CO2 capture and conversion, and green oilfield chemicals production.

BIOTECHNOLOGY ADVANCEMENTS AND CAPABILITIES

Advances in biotechnology have been rapidly evolving over the past ten years. The pharmaceutical industry has proven the beneficial impact of biotechnology in developing many novel medicines and vaccines to treat and prevent diseases. A great example is the recent COVID-19 vaccine that was developed in a short period and helped the globe to diminish the pandemic. Undoubtedly, biotechnology was central to these advances, enabled by artificial intelligence (AI) and machine learning (ML) tools, progressively offering more development in medicine and opening new opportunities for other industrial sectors such as the oil and gas industry.

Biotechnology includes three main domains that complement each other: biology, technology, and computational analysis. Biology consists of all biological materials we deal with, such as living cells, genetic materials, or their products. The technology domain consists of Next Generation Sequencing technologies (NGS), bioengineering, and biomimetics. NGS is designed to map complicated biological systems and processes translated into "omics data." The latter include metagenomics, genomics, proteomics, and metabolomics, translated into big data analytics. Moreover, bioengineering and biomimetics are helpful tools that create innovative materials for different industrial applications. The third domain is computational analysis (or bioinformatics), which consists of AI and ML tools and capabilities enabling omics big data analysis to decipher the complicated biological systems such as microbial and protein interactions.

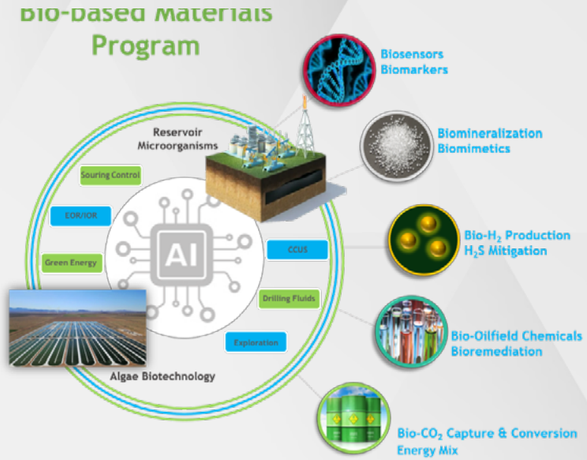


Figure 1: *Applications of Bio-based materials program in the upstream oil & gas industry. The program has been newly established as part of the Advanced Materials Domain in Saudi Aramco's new research center at KAUST.*

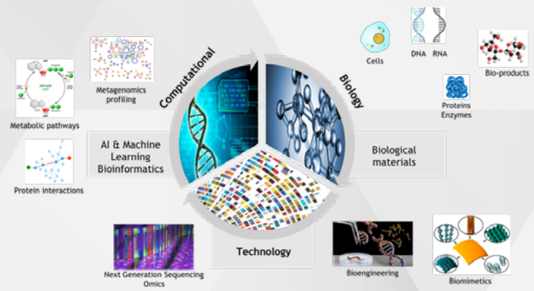


Figure 2: *Biotechnology domains and capabilities in advanced research applications*

INDUSTRIAL BIOTECHNOLOGY

Industrial biotechnology offers new approaches to pollution prevention, resource conservation, and cost reduction while maintaining productivity excellence. Biotechnology has shown great potential in many industrial sectors by developing industrially significant and sustainable bio-based products, including fertilizers, detergents, chemicals, and other materials. Therefore, aligning with our sustainability vision, we identified several potential biotechnological applications that can significantly benefit upstream oil and gas operations, including exploration, drilling operations, H2S reduction and conversion, and enhanced oil recovery.

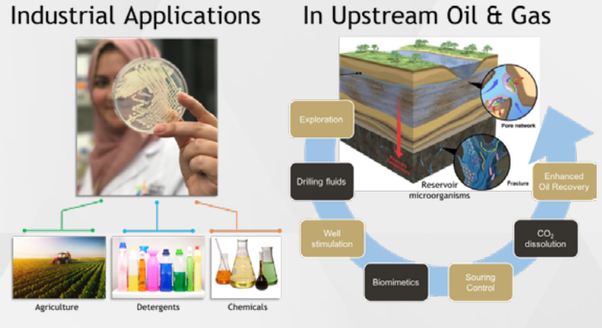


Figure 3: *Industrial applications of biotechnology in different industrial sectors.*

BIOTECHNOLOGY AND ENERGY ADVANCEMENTS

The pressing environmental threats of climate change have been leading to major shifts in the strategy and development of various industrial practices moving towards more sustainable and environmentally friendly solutions. Since fossil fuels continue to play a significant role as the primary energy source worldwide for the following decades, integrating innovative and environmentally friendly solutions is one of the promising routes to support sustainability and net-zero mission in the oil and gas industry.

Oilfield chemicals are key components widely used in the Oil and gas (O&G) exploration and production activities. However, some of these chemicals suffer environmental and economic challenges, including their hazardous impact on the surrounding environments and high treatment and disposal costs. Another critical challenge is that some synthetic

chemicals suffer from instability under extreme reservoir conditions. Thus, better alternatives are increasingly needed.

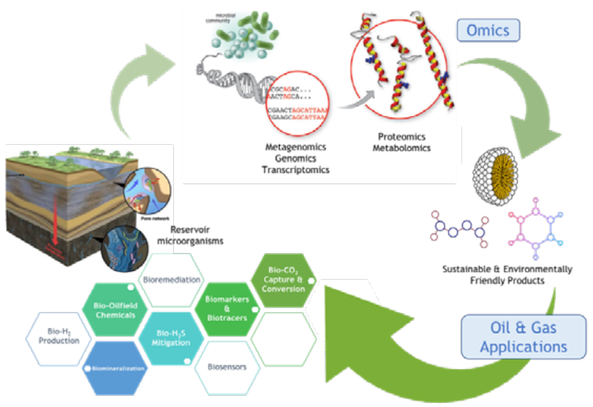


Figure 4: *: Advances in biotechnology enabling promising applications in the oil and gas industry.*

EXTREMOPHILES

One of the promising and novel solutions is bio-based materials and chemicals, which could offer better alternatives to some synthetic oilfield chemicals in terms of economic, environmental consciousness, and sustainability. Additionally, these bio-products could show high efficiency and stability under extreme reservoir conditions, especially when isolated from a special group of microorganisms called extremophiles. These microorganisms naturally inhabit extreme environments, such as oil reservoirs, marine brine pools, and salt lakes. They show great potential to produce vigorous bioproducts and enzymes (extremozymes) due to their versatile metabolic capabilities to thrive in such extreme conditions. Considering the robust chemical properties of these products, they are of great interest to many industrial sectors. They could have great potential for various oil and gas (O&G) applications, including drilling optimization, improving oil recovery, enhancing sweep efficiency, downhole leakage mitigation, and corrosion control and monitoring.

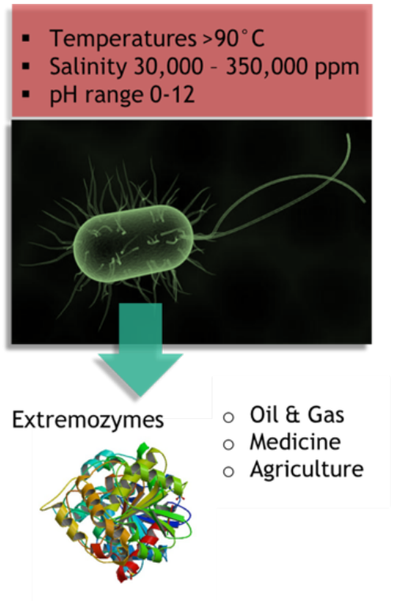


Figure 5: *: Extremophiles and extremozymes are of high interest for many industrial applications due to their robust metabolic capabilities and high efficiency under extreme conditions.*

4IR IN BIOTECHNOLOGY

Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT) have been critical enablers for significant advancements in biotechnology. These advanced tools and capabilities help optimize product quality and experimental conditions through big data analytics, product design, analysis, and prediction.

The use of 4IR capabilities has become a critical capability for biotechnology more than ever. It bridges the gap between data and discoveries in multiple frontiers within the industry by providing new materials, compounds, green bio-based alternatives, enzymes that can catalyze function in extreme conditions, and many other challenges. Bioinformatics is another essential tool that helps in data acquisition, analysis, and interpretation of complex biological data and better assesses its significance for specific applications.

Industrial biotechnology relies heavily on 4IR computational tools and capabilities to manage and provide better predictability of big data, accelerating the design and production of the targeted bio-products and improvements of operational productivity in alignment with the industry's sustainability goals.

BUSINESS IMPACT

Various industrially significant products have been developed and served the industry. Surfactants are one of the common products that researchers developed from reservoir extremophiles and showed successful field trials and promising increase in oil recovery. Bio-polymers are another excellent example of bio-based products that could be useful in several oil and gas applications, such as enhanced oil recovery, corrosion inhibitor, and water mobility control. Biosolvents and bio acids reduce oil viscosity and increase rock porosity and permeability, which helps in enhancing the fluid flow between rock pores, thus enhancing oil recovery. Lipids and biogases could be utilized in energy mixes and advancements, which helps address global energy demand for oil and gas in a much greener approach. These are just a few examples of successful industrial endeavors of bio-products that have been investigated in many research studies and industrial practices.

Furthermore, internationally renowned companies are leading the efforts in this area with many proven positive impacts. These companies leverage biotechnology approaches to produce diverse bio-products for different oil and gas applications. Table 1 shows some bio-products and their applications in oil and gas production activities. Through the bio-based materials program, the industry aims to develop a library collection of local reservoir microorganisms and a library collection of in-house bio-products beneficial for various industrial applications, mainly for the oil and gas industry.

EXAMPLES OF INDUSTRIALLY SIGNIFICANT BIO-PRODUCTS AND THEIR PROMISING APPLICATIONS IN THE OIL & GAS OPERATIONS.

BIO-PRODUCTS	CATEGORY	OILFIELD APPLICATIONS
Rhamnolipids Glycerides Lipopeptides	Bio-surfactant	Enhanced Oil Recovery Improved Oil Recovery Oil emulsification
Acetic acid Propionic Butyrate	Bio-acids	Permeability increase Emulsification Well stimulation Well completion & drilling fluids
Ethanol Acetone Butanol	Bio-solvents	Oil dissolution Viscosity reduction
CO2, CH4, H2	Bio-gases	Re-pressuring reservoir, green energy
Xanthan gum Starch	Bio-polymers	Oil mobility Reservoir fluid mobility control Enhance sweep efficiency Water-based drilling mud formulations
Biomass	Biomass	Selective plugging of high permeable zones Rock wettability alteration Flow conformance promotion H2S reduction

CCE THROUGH ALGAE BIOTECHNOLOGY

Conversion of industrial wastes such as CO2 and wastewater into high-value commodities is a promising approach leveraged by microalgae biotechnology. Microalgae CO2 capture and conversion is an ancient and well-known system where microalgae capture CO2 and water and convert them into high-value commodities through a biological process called photosynthesis. Even though photosynthesis is performed by other phototrophic organisms like terrestrial plants, microalgae's photosynthesis is considered the best for the industry due to microalgae's rapid growth rate and highly efficient photosynthetic performances, and ease of cultivation at scale. It converts CO2 into a range of industrially significant and environmentally friendly products that could benefit several industrial sectors. This approach will immensely contribute to carbon footprint reduction and optimizing hydrocarbons production while enabling sustainability and carbon circularity in the oil and gas industry.

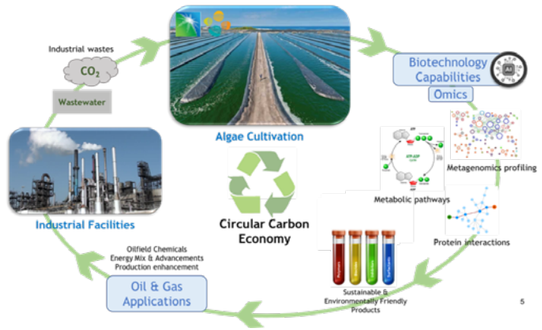


Figure 6: *: Algae biotechnology roadmap for developing sustainable high-value commodities for various upstream and downstream applications while enabling circular carbon economy in the oil & gas industry. This project is in collaboration with internal and external organizations including EPD and KAUST.*

METHODOLOGY

Two utilization approaches are depicted in Figure (6), utilizing two biological systems for the upstream oil and gas operations. The first biological system is for reservoir microorganisms (A) which consists of both in-situ and ex-situ approaches. The in-situ approach refers to the study and application that takes place within the reservoir and field trials. In this approach, reservoir microorganisms are stimulated to produce certain chemicals such as bio-surfactants or bio-polymers, which help monitor reservoir microbial communities for a specific function such as enhancing production or mitigating H2S and souring problems without introducing new microbial species to the reservoir. In this case, the formation of bio-products results from the natural microbiological activity that takes place directly in the reservoir.

The second approach is the ex-situ approach, which is the study and application outside the reservoir or on the surface. In this approach, the production of the desired bio-products happens outside the reservoir, either through isolated reservoir microorganisms or through exogenous bacteria from other resources such as soil and marine. In this case, microorganisms are grown using industrial fermenters; then, the purified bio-products are utilized for different upstream applications. AI and big data analytics are key enablers for both approaches.

For the second biological system (B), the desired bio-products produced through microalgae cultivation. This approach leverages photosynthesis to enable CO2 capture and conversion into the desired oilfield chemicals and biocrude, which could be utilized in the energy mix and advancements. This system involves both in-situ and ex-situ approaches. Using isolated species in algal cultivation for chemical production is considered the ex-situ approach, while utilizing a microalgae consortium to produce biofuels in algae ponds is considered the in-situ approach.

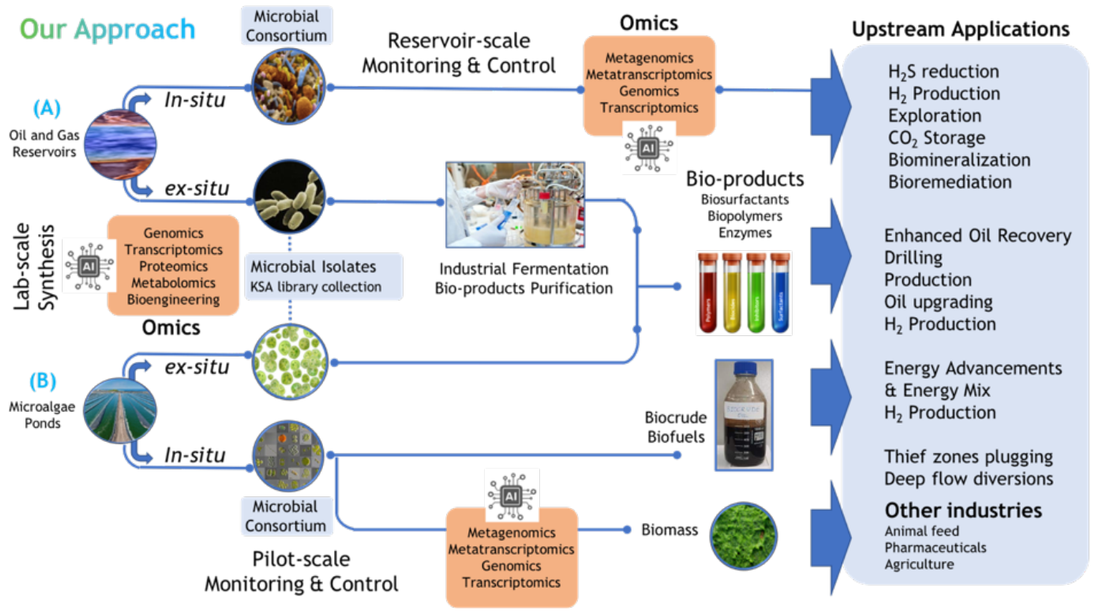


Figure 7: *: Technology approach roadmap applied for two major biological systems, Reservoir microorganisms and microalgae cultivation systems. Both systems utilize in-situ and ex-situ approaches for various upstream applications.*

CONCLUSIONS

The advancements in biotechnology offer promising materials and approaches to support sustainability in the oil and gas industry.

Biotechnology relies heavily on AI and ML tools and capabilities to optimize the processing of biological materials toward improved industrial practices.

International companies are leading the efforts in this area with many proven positive impacts in several industrial applications, including the oil and gas industry.

The bio-based materials generated by this technology are sustainable, environmentally friendly, economical, and function effectively under harsh reservoir conditions.

This project has immense potential for creating novel research discoveries, new industrial practices, and great job opportunities. It involves different disciplines crucial for developing this technology in the fields of science, technology, and engineering. SR

PUBLICATION NAME AND DATE:

Sustainable and Environmentally Friendly Approach to Oilfield Chemicals
IPTC 2022, February 21, 2022

MINDFULNESS ON THE RIG:

An Investigation into the Impact of Mindfulness on Improving Health & Safety of Offshore Oil & Gas Workers

By SandRose Editorial Team
Professor Christiane Spitzmueller, an organizational psychology professor at the University of Houston (UH)

In May of 2022, the SandRose editorial team sat with Professor Christiane Spitzmueller, an organizational psychology professor at the University of Houston (UH), to learn about a study she conducted on improving the well-being of offshore workers through mindfulness exercises. The study was held in collaboration with Rhona Flin, Professor of Business at Robert Gordon University, and Baker Hughes and Diamond Offshore on an offshore platform in the Gulf of Mexico. As a result, professor Sptizmuller and her team developed a "time to refocus toolkit," consisting of short mindfulness exercises. The program was designed to be easily implemented by workers in high-risk environments to improve their well-being. In this article, the SandRose team documents insights from our conversation with Professor Spitzmuller.

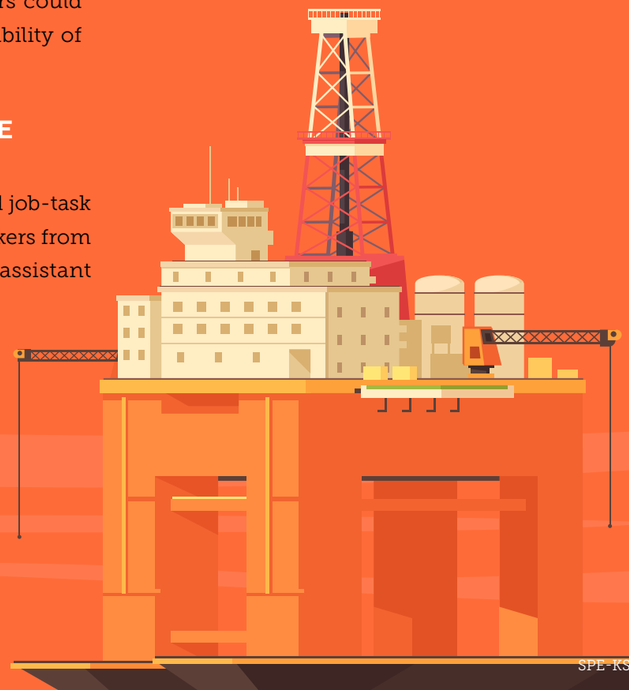
WHAT IS MINDFULNESS?

Mindfulness is the act of being fully immersed in the present moment, observing what is around us in a non-judgmental manner, the opposite of being distracted. The term originated from ancient Buddhist philosophy, is found across all major religions, and has gained traction in western society in the last few decades. There are two aspects of mindfulness: Some people are born with an inclination toward mindfulness, and others aren't. However, psychologists have shown that regardless of your disposition, you can develop and improve your ability to practice mindfulness as you would when training a muscle.

Our work used the concept of mindfulness to develop a toolkit with mindfulness-based practices. However, we found that for the toolkit to succeed, we had to rebrand mindfulness as "time to refocus." Why? We noted that many professionals offshore were less likely to engage in mindfulness practice due to the stigma associated with it, linking it to mainstream yoga or deeming it an alternative intervention. When reframed as "time to refocus," we contextualized it by emphasizing that it has been successfully used in military populations, firefighters, emergency response personnel, and football players. As a result, offshore workers could relate to it more, opening them to the possibility of implementing the techniques provided.

CAN YOU EXPLAIN TO US WHAT THE "TIME TO REFOCUS" TOOLKIT IS?

Before developing the toolkit, we initially did job-task analysis offshore by interviewing many workers from diverse backgrounds: drilling engineers, assistant drilling engineers, and tool-pushers. The interviewees were then asked about situations and tasks with the highest likelihood of distractions and associated risk. They then identified instances where there are large numbers of people presenting an increased risk. Workers also recognized that they are most distracted when they are mentally preoccupied with stresses relating to their personal lives. Based on their responses, the research team developed the appropriate toolkit with exercises to be carried out before undertaking high-risk tasks. The activities were designed to be practiced several times daily to refocus their attention. The activities had to be short and simple to follow, taking at most 2-5 minutes, easily teachable, and limited to five steps. Initially, they started with 10-15 tasks pilot-tested on the offshore workers. Based on the worker's feedback, the toolkit was designed to fit their job requirements and the environment. The toolkit also consisted of posters translated into multiple languages and posted in areas with a higher risk of distraction and break rooms outlining the different exercises. The team also developed numerous short videos for the offshore workers to share, access, and follow.



EXAMPLES OF THE TECHNIQUES INCLUDED IN THE "TIME TO REFOCUS TOOLKIT."

Notice Five Things

Pay attention to what is happening around you with your five senses, what you see, feel, hear, taste, and smell. Spend approximately 30 seconds on each sensation.

Intentional Walking

Focus on every step, focusing on how it feels when your foot touches the ground

Mindful Breathing

Breathe in and breathe out slowly for two minutes until you gain your focus.

HOW DID YOU ENSURE THAT THE OFFSHORE WORKERS COMMITTED TO YOUR PROPOSED EXERCISES?

We tried implementing what we know from organizational psychology on successful organizational training and development interventions. One of the key factors includes management commitment. Workers will always look up to certain members of management, their peers, and their supervisors (e.g., a respected medic or an operational superintendent) and whether they endorse specific initiatives. Therefore, the program was developed to be presented and rolled out by leaders whom workers respect and appreciate creating a buy-in as opposed to psychologists. The selected instructors were able to get workers to commit to the toolkit by presenting the benefits of mindfulness practices, such as improving sleep, general health, and well-being while using testimonials from soldiers and football players to reinforce this. While it was challenging to achieve 100% compliance, an overwhelming number of participants reported significant improvements in performance and overall well-being.

WHY FOCUS ON THE OFFSHORE RIG ENVIRONMENT?

SPE has long supported and carried out research in the area of health and safety within the industry. However, major incidents such as Piper Alpha in 1988 and Deepwater Horizon in 2010, have increased interest in health and safety research in the oil and gas industry. In both incidents, numerous factors limited the time required to refocus and problem-solve due to the high production pressure resulting in catastrophic consequences. The Deepwater Horizon incident resulted in a massive settlement where BP and Transocean contributed 500 million USD into a fund administered by the National Academy of Sciences (NAS) dedicated to improving offshore safety. The NAS fund is the mechanism by which this research was funded.

BASED ON YOUR FINDINGS, WHAT FACTORS CONTRIBUTE TO LOSS OF FOCUS AND PERFORMANCE DECLINE IN OFFSHORE AND ONSHORE ENVIRONMENTS?

Sleep is among the most underrated contributors to our health and well-being. In settings where people are continuously sleep deprived, it is built into the job and is, therefore, a significant risk factor. Another critically underrated factor is mental health. The frequency of anxiety and depression is significantly more common in any work environment than organizations may realize. Another critical factor is safety priority. Often due to operator pressure to meet production targets, workers prioritize production targets over safety. Production targets must be balanced with safety. Neglecting safety leads workers to overlook warning signs that result in major catastrophes.

HOW CAN MINDFULNESS HELP MITIGATE OPERATIONAL CHALLENGES AND IMPROVE HEALTH AND SAFETY?

Mindfulness helps improve people's health and well-being and reduces burnout. When people experience burnout and become cynical about their jobs, they are less likely to comply with safety regulations. In addition, they are less willing and able to be proactive in safe behavior, impacting their personal and process safety. By teaching workers to refocus using mindfulness-based exercises, we reduce health, safety, and operational risks.

WHAT HAVE YOU LEARNED FROM THIS STUDY THAT HAS EXPANDED YOUR UNDERSTANDING OF MINDFULNESS?

A lot of mindfulness studies recommend practicing mindfulness for 45 minutes a day. However, allocating time is challenging for most individuals. In the case of our study with offshore workers, we knew that wasn't feasible. Therefore we shortened the exercises to 2-5 minutes and increased the frequency to several times a day in-between tasks. We were shocked and thrilled to see that over time, when people continue to practice the shortened mindfulness exercises at a reasonably high frequency, we see a similar impact to those who practice for a long duration. Another observation we noted is that the success of the intervention depends on participants' openness to trying new experiences, in this case, openness to practice mindfulness. Therefore, significant time and effort should be dedicated to opening participants up to the possibility of exercising mindfulness in a manner that appeals to them.

WHAT ARE SOME KEY LESSONS FOR ORGANIZATIONS TO CONSIDER?

To ensure the success of mindfulness intervention programs, organizations can implement the following:-

Gain the endorsement and commitment of senior management, and follow it up with a systematic implementation plan.

Modify mindfulness toolkit to the organizational and national culture. When rolling out such programs tailored to the organizational and national culture of the company, assign leaders to teach the interventions and circulate posters or create marketing campaigns.

Teach supervisors to spot warning signs for mental health issues. When these signs are evident, refer employees to an Employee Assistant Program (EAP). SR

Guided Mindfulness Exercises

NOTICE 5 THINGS

Pause for a moment.
Look around and notice five things that you can see.
Listen carefully and notice five things you can hear.
Notice five things you can feel in contact with your body.

FOCUSED WALKING

Begin walking. Bring your attention to the movement involved while walking.
Take note of the details of your pace as you take each deliberate step.
Bring your attention to how your weight shifts as you walk. Notice your whole body moves.
Notice everything around you and take in your surroundings.

THE STOP EXERCISE

Stand up and breathe. Feel the sensation of your feet touching the ground.
Tune into the sensations you feel in our body. Notice any physical sensations or emotions.
Observe your surroundings. Take in anything you see, hear, or smell.
Possibility – ask yourself what is possible in this moment or what is new or a forward step.

SandRoseTechnical Paper Digest

Curated by Nora Hamidaddin, Associate Editor SandRose Magazine

In this section, we curate a number of recommendations for technical papers from subject matter experts on topics relating to their respective disciplines.

SPE International
Kingdom of Saudi Arabia Section

Geosteering, Production Enhancement, Petrophysics

COMPLETIONS INSIGHT IN HIGH ANGLE & HORIZONTAL WELLS

Recommended by Enrico Ferreira, Well Construction Technical Lead – Saudi Arabia, Baker Hughes

El-Gezeery, T., Wessling, S., El-Jeaan, M., Al-Rashedi, M. A., Dzhaykiev, B., Shinde N., Sitinjak, E. S. 2019. Paper SPE-198044-MS presented at the SPE Kuwait Oil & Gas Show and Conference, Mishref, Kuwait, October 2019.

This study is a comprehensive approach that provides an integration workflow of different disciplines (Geology, Petrophysics, Reservoir Engineering, Completions) for high angle and horizontal wells, delivering an interactive analysis of wellbore shape, reservoir heterogeneity, and drainage behavior. This offers a multidisciplinary insight through a fast-paced report to accelerate and optimize lower completions. The paper discusses a case study of a sidetrack well in a sandstone reservoir in Kuwait, with the objective of tapping into inaccessible oil and delaying the water-cut. The completions insight of this sidetrack well successfully delivered an optimized completions design and equal depletion of reservoir bi-zone heterogeneric reservoir.

SPE International
Kingdom of Saudi Arabia Section

Reservoir Simulation, Artificial Intelligence, Machine Learning

AN INTERPRETABLE INTERFLOW SIMULATED GRAPH NEURAL NETWORK FOR RESERVOIR CONNECTIVITY ANALYSIS

Recommended by Hasan Nooruddin, Petroleum Engineering Specialist, Saudi Aramco

Haochen W., Jianfa H., Kai Z., Chuanjin Y., Xiaopeng M., Liming Z., Yongfei Y., Huaqing Z., Jun Y. 2021. Paper SPE-205024-PA published in SPE Journal.

Proper understanding of reservoir connectivity and producer/injector interactions are extremely important for better control of water production and enhanced sweep efficiency. This paper discusses the application of artificial intelligence and machine learning in a very critical area in reservoir management: water conformance control. The paper introduces a new modeling approach in which a special type of neural network – Graph Neural network (GNN) – is applied to extract latent features that reveal reservoir connectivity from historical data, where the computed reservoir connectivity can then be used to suggest the best production mechanism for improved water conformance.

Machine Learning

HOW TO AVOID MACHINE LEARNING PITFALLS: A GUIDE FOR ACADEMIC RESEARCHERS

Recommended by Rasesh Saraiya, Data Scientist, Schlumberger

Michael A. Lones, 2021. Cornell University Document arXiv:2108.02497.

While the paper positions itself towards academics and researchers, the lessons it offers are applicable to anyone starting in the field of machine learning (ML). For instance, geoscientists interested in machine learning require two main skills: learning to use the tools (ML libraries, platforms, etc.) and following the right principles, which may be easy to overlook. To explain these best practices, the author designed a "Do & Don't" style, which lends the paper an informal tone, making it easy to follow along and grasp the main key points. In addition, the contents page may serve as an easy and useful cheat-sheet for those starting a ML project.

Sustainability & H2 Storage

ENABLING LARGE-SCALE HYDROGEN STORAGE IN POROUS MEDIA – THE SCIENTIFIC CHALLENGES

Recommended by Rasesh Saraiya, Data Scientist, Schlumberger

Heinemann N., Alcalde J., Miocic J.M., Hangx S. J. T., Kallmeyer J., Ostertag-Henning C., Hassanpouryouzband A., Thaysen E. M., Strobel G. J., Schmidt-Hattenberger C., Edlmann K., Wilkinson M., Bentham M., Haszeldine R. S., Carbonellb R., and

H2, hydrogen gas, has a great potential as a future energy carrier. As H2 rarely exists naturally, it must be stored for use once it is created, and with H2 storage comes challenges. H2 is a very small molecule and can enter the smallest of spaces. Its small size creates challenges ranging from valve design to seal capacity assessment. Another source of challenge is how easily H2 can interact with other fluids leading to precipitation of minerals; it can dissolve other minerals resulting in H2 loss and H2S creation. Also, microbes love to feast on H2, increasing microbial activity and leading to pore clogging. If interested in the topic of H2 storage, this is the paper to read.

Particulate Solutions

By Abdulaziz Alansari, Enviornmental Engineer, Saudi Aramco

One man's waste is another man's treasure; this is a famous quote making more and more sense to me the more I look into what the world's big energy corporations are doing when dealing with their generated waste. Currently, the global approach is to achieve sustainability in all aspects of our resource consumption habits, hoping to achieve net-zero carbon emissions by 2050. Reaching that magic number 'Zero' is no easy task. In fact, it is a lot more complicated than we expect it to be since it depends heavily on current stages of awareness, technology, feasibility, and cost-effectiveness. It is a step-by-step process that is gradually implemented through smaller-scale applications until it reaches the end goal of achieving a sustainable solution to offset carbon emissions completely.

I was browsing through the Kingdom of Saudi Arabia's air quality index (AQI) and have noticed that the Kingdom's particulate matter (PM 2.5) has a 24-hour average value of about 88 µg/m^3, exceeding the World Health Organization's (WHO) limit of 25µg/m^3 three times and as a result, categorizes Saudi Arabia's climate as 'unhealthy.' As a brief explanation, Particulate Matter (PM), mainly inhalable particulates of 10 microns or less (PM 10) and fine particulate matter of 2.5 microns or less (PM 2.5), is key criteria for air pollutants generated through industrial and natural activities. Moreover, it is a major causal factor for health complications in the exposed population, for instance respiratory infections, irritations, and asthmatic-related illnesses. So, in other words, the fine dust particles we encounter very frequently in the Kingdom of Saudi Arabia are a formation of different-sized particles and are classified as particulate matter. A significant portion of PM 2.5 in Saudi Arabia is mainly due to a high level of anthropogenic carbon-based aerosol contaminants, primarily generated from scope-1 carbon emissions from direct fossil fuel combustion or natural causes such as sandstorms.

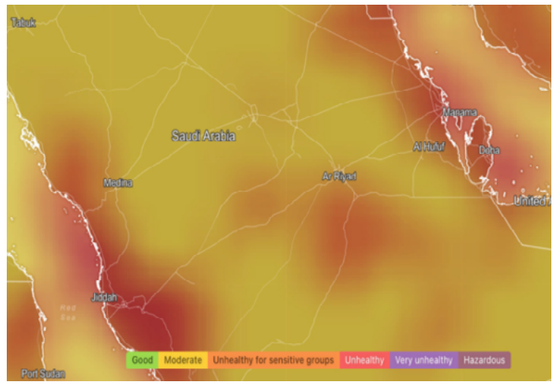


Figure 1: *Saudi Arabia Average Air Quality Index in 2020.*

Several factors are vital for capturing PM 2.5 & PM 10, including the composition and size of these particulates to utilize them in industrial processes. One particular type of particulate matter is called Carbon Black, formed by the incomplete combustion of diesel combustion, coal, and heavy fuel combustion. Complete combustion would turn all carbon in the fuel into carbon dioxide

Figure 2: *Black Carbon (Soot)*

(CO_2). Still, combustion is never completed, and CO_2, carbon monoxide, volatile organic compounds, organic carbon, and black carbon particles are all formed in the process. According to the International Carbon Black Association, the complex mixture of carbon black resulting from incomplete combustion is often referred to as 'Soot,' which is emitted at an average rate of 10 million tonnes/year and contains about 95% pure elemental carbon (ICBA).

The idea that some of these visible contaminants are floating all around us made me wonder whether we can capture significant quantities of PM 2.5 & PM 10 and utilize them as part of product manufacturing technologies. These actions reduce atmospheric exposure to anthropogenic particulate matter, which contributes to the greenhouse gas effect and captures and incorporates PM into industrial-related material manufacturing. These initiatives are mainly to support the Kingdom's efforts in the area of circular carbon economy (CCE) and promote the Kingdom's position towards the Paris Climate Agreement to combat climate change.

Several different types of particulate matter capturing technologies are utilized worldwide to significantly reduce PM 2.5 & PM 10 emission rates from industrial streams based on the common components of the generated particulate matter. Some of the examples that capture devices include but are not limited to the following:

CYCLONES

ELECTROSTATIC PRECIPITATORS (ESP)

BAGHOUSES

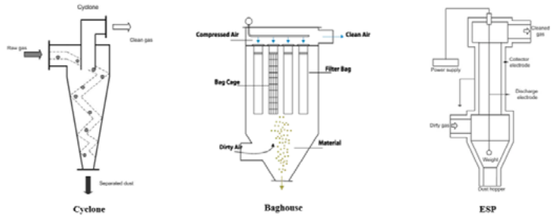


Figure 3: *PM Capture Technologies*

The PM capture equipment varies in capture efficiency based on the captured aerosol's composition and size. After an initial comparison between the air pollution control devices, ESPs are seen as the most suitable approach for capturing carbon black particles at a higher efficiency due to particle composition and size. An electrostatic precipitator, also called electrostatic air cleaner, is a device that uses an electric charge to remove certain impurities—either solid particles or liquid droplets—from air or other gases in smokestacks and other flues. Primarily designed to recover valuable industrial-process materials, electrostatic precipitators are used for air pollution control, particularly for removing harmful particulate matter from waste gases at industrial facilities and power-generating stations. Additionally, without significantly impeding the flow of gases, the precipitator functions by applying energy only to the collected particulate matter. If released into the atmosphere, particulates such as carbon black reduce visibility, can contribute to climate change, and lead to serious health problems, as mentioned previously. Electrostatic precipitators can capture fine particles (i.e., smaller than 2.5 microns [0.0001 inches] in diameter), which are especially dangerous if released because they can be drawn deep into the lungs and trigger inflammatory reactions.

The mechanism of an ESP works by introducing the PM-rich stream to the capture chamber, where it comes into contact with negatively charged metal rods and positively charged metal plates. Therefore, removing particles from a gas stream by using electrical energy to positively or negatively charge particles. The charged particles are then attracted to collector plates carrying the opposite charge. The collected particles may be removed from the collector plates as dry material or through water washing (wet ESPs). The accumulated particulate matter, including carbon black, is captured within the bottom capture chamber and then is usually sent to a landfill for disposal.

The application of such ESP air pollution technologies has proven to be quite beneficial for reducing the emissions generated by the industrial sector by up to 99% capture efficiency, as specified by the US Environmental Protection Agency (EPA). Thus, reducing the overall emissions generated by the targeted waste stream. But why stop there? Part of the circular carbon economy approach is to find innovative approaches to putting such wasteful products into use rather than disposing them in a non-environmental friendly method such as landfills. Several international corporations, namely Cabot, Birla, Tokai, and Orion Engineered Carbons, have begun specializing in carbon black manufacturing. They have created a worldwide market for carbon black-derived products used in various applications for either industrial or commercial use, which include:

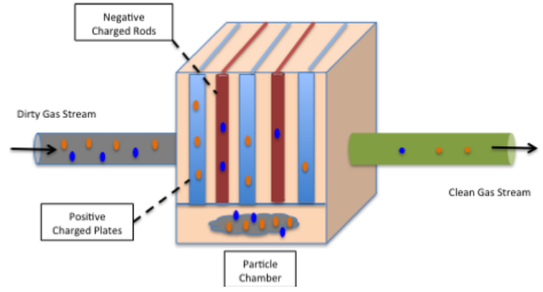


Figure 4: *Electrostatic Precipitator (ESP) (ESP)*

RUBBER TIRES

POLYMERS

INKS & DYES

CARBON FILTERS

CEMENTATION/ASPHALTS

The mentioned products depend on the composition and size of the captured particles and may require further chemical processing to incorporate carbon black into product manufacturing. However, the main goal remains to contribute to the global circular carbon economy by implementing the 4 R's, reduce, reuse, recycle, and remove. All contributing industries should apply a strong global focus to incorporate carbon capture technologies through research, development, and financial investments to decrease the overall emission rates, reduce the rise of the mean global air temperature, and minimize the impact of climate change.

Several tangible benefits can be obtained from capitalizing on particulate matter (carbon black) capture and utilization, including the following selected outcomes:

Reducing PM 2.5 & PM 10 carbon emissions into the atmosphere by removing carbon black emissions of over 80%.

Capitalize on the generated aerosol pollutants by recycling the captured carbon black into manufacturing valuable products. According to a recent analysis by IMARC group, carbon black market is valued at $ 18.2 billion in 2020 and is projected to reach $ 23 billion by 2026.

Reduce the overall global as well as the Kingdom's environmental carbon footprint.

Promote public health by reducing the exposure rate to high concentrations of particulate matter and carbon-based emissions.

The proposed approach for carbon black capture has shown a great potential of being a valuable asset in the global process of reducing anthropogenic emissions, along with the guidelines of the CCE. Furthermore, it promotes offsetting particulate matter emissions and utilizes a waste product into valuable industrial manufacturing for commercial uses. Carbon black capture is just one example out of the thousands of proposed and implemented innovative technologies, whether in the petroleum, chemicals, renewables, desalination, and other sectors with a similar end goal of achieving global energy sustainability. The road toward net-zero emissions is long and challenging but still within our reach, one particulate matter at a time.

SR

Neurodiversity: Embracing the World in Unique Ways

By Ghaida Aljuhani, SPE-KSA Diversity & Inclusion Committee

Embracing differences as individuals enables the diversity in our world to blossom. The contrast and multiple variations of characteristics among the general populace offers a unique asset to our society. The power and value of being diverse is crucial to separate ourselves and stand out in greatness, and it is our role not only as leaders, but as humans, to empower those differences in each other. This empowerment is not limited to simply acknowledging stereotypical characteristics that adhere to a societal norm;it entails embracing those who are different from us, and therefore embracing true neurodiversity.

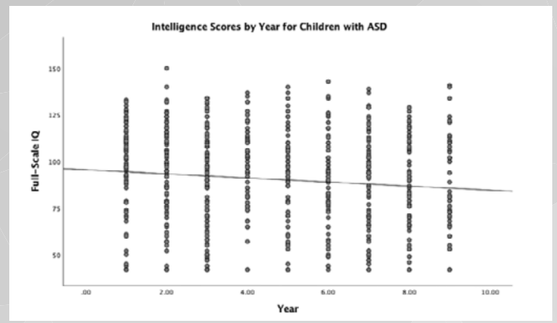
Neurodiversity is the concept that the human brain, and by extension its psyche, is fluid. This means that differences in thinking between people should not be considered as flaws. Examples of neurodiversity include but are not limited to Autism Spectrum Disorder (ASD) and Attention-deficit/Hyperactivity Disorder (ADHD). These neurological differences give rise to creative, innovative, and original ideas preceding competitive advantage and extraordinary value to our society. The term "neurodiversity" was first coined during a social justice movement nearly three decades ago by an Australian sociologist named Judy Singer. She put forth the idea that differences in humans are not deficits, and that there is no such thing as an archetype for thinking or living.

Genomic variations in humans will inevitably result in neurological differences. These differences will continue to be inherited across successive generations, which form the building blocks of neurodiversity. This concept can be extended to incorporate differences that

deviate from the societal mold, such as ASD and ADHD. According to research conducted at Yale University, there is a high proportion of natural selection of positive genetic variants associated with autism when humans evolve. These selected gene variants, as part of humanity's genetic legacy, will grow many abilities, such as exceptional academic achievement, superior memory skills, and high intelligence during adolescence.

Satoshi Tajiri, the creator of a well-known Japanese franchise called Pokémon, is autistic. The creation of Pokémon initially started when Satoshi was at a young age due to his autistic condition leading to his obsession with arcade games and collection of bugs. Currently, Pokémon is an international phenomenon and is extremely influential in the gaming industry. This shows that being on the autism spectrum and being neurologically different is not a barrier to having a distinctive imagination, expression of ideas, and deep focus. Therefore, inclusion of neurodiversity society as a population can lead to significant benefits across the globe in many ways.

However, as a population, we ought to manifest several actions to be inclusive within a neurodiverse society. The change should start with the surrounding environment to fit individuals whose brains are neurologically different. As children diagnosed with ASD's age increases, their intelligence quotient (IQ) stays relatively the same with a little decline over time. This is represented by the scatter plot below. Despite it being a negative regression, ASD individuals have relatively high IQs of above 75.



(A scatter plot representation of intelligence quotient (IQ) vs age for ASD children, Billeiter et al. 2021)

To prevent further decrease of IQ with age and to be inclusive within a neurodiverse society as a population, several essential means should be considered:

Promote awareness and education; establishing activities, programs, and workshops within the community to outreach the importance of neurodiversity. This would, for example, have workers in public locations such as restaurants be aware of the need to reduce the music volume when customers with a neurological disorder experience sensory overload.

Encourage leaders in organizations who are neuro-diverse; this would improve inclusion and representation. In addition, promoting diversity with less discrimination to inspire positive changes in the workplace and future young neurosdiverse employees to be motivated.

Create clear communication means with patient implementation; as individuals with neurological differences have social obstacles, be patient and try a different way of interaction without fully relying on speech such as using sign language and visual illustrations.

Design of suitable areas and public spaces; construct special seating areas to suit neurological needs. Having an interior environment designed for clear wayfinding and assistance to move easily from one place to another.

Provide a flexible working environment and frequent breaks; it would allow neurodivergent individuals to attend specific therapy appointments or work from home according to their preference.

For true inclusion, understanding neurodiversity is essential in the first place. The significance of neurodiversity for the human race will set eyes on the value and beauty in brain differences. Neurodiversity will open doors to opportunities in every way as it naturally comes associated with remarkable skills and astounding gifts. This would embrace our own uniqueness in this world and beyond.

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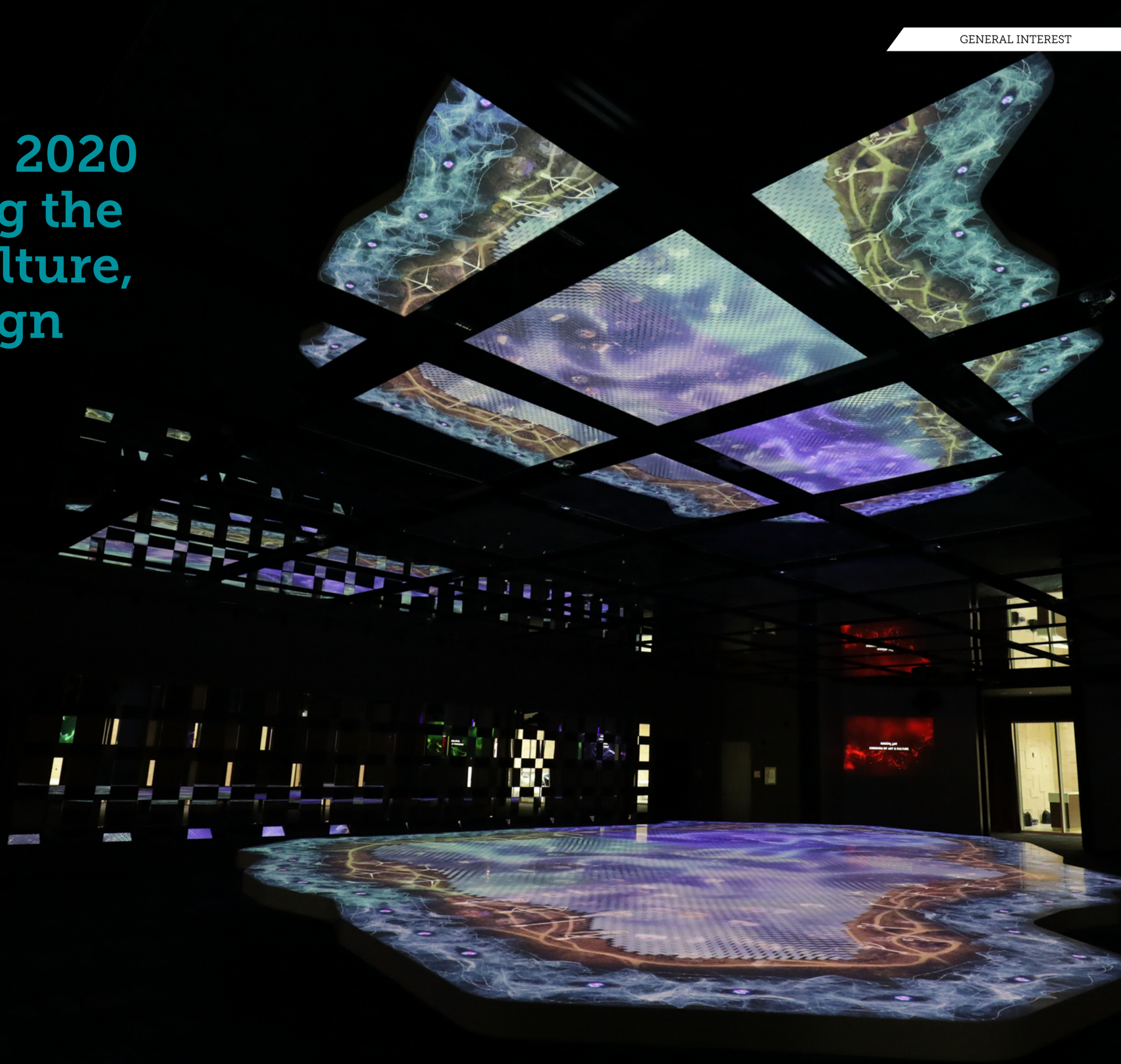
SR

Saudi Pavilion at the 2020 World Expo: Bridging the gap between arts, culture, and sustainable design

By Rahma Abdulal and Yazeed Aldughaither, SandRose Editorial Team

Known as the oldest and largest global event and dating back to 1791, the World Fair, also known as World Expo, is the world's largest international exhibition.It is held every five years, showcasing the unique cultural identity and achievements of participating countries. This grand gathering is dedicated to finding solutions to major world issues and displaying impressive technologies from around the globe by creating an immersive experience for visitors. The latest Expo 2020 was held in Dubai and is the first to be held in the Middle East region. The Expo offers a venue for 192 countries to display and exchange new perspectives, technologies, groundbreaking architecture, and an array of interactive exhibits. The theme of the latest expo was "Connecting Minds, Creating the Future" with three subthemes: "Sustainability, Opportunity, and Mobility," where each pavilion illustrated the themes beautifully and elegantly. With sustainability at the forefront of global issues in recent years, it is no surprise to see it under the spotlight at the World Expo 2020.



One of the most striking pavilions displayed was that belonging to the Kingdom of Saudi Arabia. The building had a sloping structure representing a window to the past and future. It was designed for guests to travel through our beautiful landscape and explore the rich history that is rooted deeply in Saudi culture. The stunning slope-like structure is approximately five stories high and symbolizes Saudi's infinite ambitions.

People, opportunity, nature, and heritage are the four pillars captured in the 13,000-square-meter pavilion. The design has been awarded LEED version 4 Platinum rating from the U.S. Green Building Council (USGBC) – the highest internationally recognized sustainability rating in Leadership in Energy and Environmental Design – placing it among the most sustainable designs in the world. Buildings and designs that are LEED certified are awarded for being leaders in environmentally responsible construction practices, with Platinum being the highest tier of the certifications.

Deepthy K. B., the Regional Director at GBCI Middle East, said, "GBCI is proud to congratulate Saudi Arabia on the LEED v4 for Building Design and Construction NC Platinum Certification of the KSA Pavilion at EXPO 2020 Dubai, a reflection of their true commitment to sustainability. Through LEED Certification, the

"This is is a statement about our readiness to open our hearts and doors to the rest of the world, and to the limitless potential of the Kingdom of Saudi Arabia,"

Hussain Hanbazazah, General Commissioner of the Saudi Pavilion

project team has worked to enhance the experience of over 3 million occupants and visitors to the pavilion, prioritizing public health and comfort while operating the facility". In addition to that, the Pavilion holds three Guinness World Records: the largest interactive lighting floor with around 8,000 LED lights, the longest interactive water feature at 32m, and the largest LED mirror screen display at 1,302.5 sq.m.

The Saudi Pavilion is not the only building or project developed with consideration to sustainable design and architecture and to be LEED certified. Recently, in partnership between Facilities Management, at King Abdullah University of Science and Technology (KAUST), and Community Life, the joint Smart Home project was awarded a LEED Platinum certification and came second with a score of 94 in the global ranking. The smart home represents a prototype for a near-to-net-zero home, reducing its carbon footprint through its energy-efficient design and renewable energy integration. As part of the 2030 vision, Saudi Arabia is also working on several large-scale projects, such as NEOM, which is a city to be powered by renewable energy. In addition, King Salman Energy Park (SPARK) is the first industrial city to receive LEED Silver Level accreditation and is currently under construction. The certification reaffirms our commitment to reducing the city's carbon footprint.

As the World Expo is a venue for people to reconnect and widen their horizons, Saudi Arabia was shining with its breathtaking pavilion showcasing its rich past, diverse culture, and bright future committed to creating a sustainable future for all.

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SPE-KSA Flag Soars in The Himalayas:

Insights on the Everest Base Camp (EBC) Trek

By Yara Alzahid, SPE-KSA Diversity & Inclusion Chairperson

Mt. Everest is the highest mountain in the world, reaching an altitude of (8,849 m). Needless to say, that's one difficult climb. Trekking to the base camp is no easy feat either. It is a journey through some of the most spectacular mountain views and many villages along the way. The Everest Base Camp (EBC) Trek takes anywhere from 9 to 15 days to complete, depending on your route and how well you acclimatize.

In this article, I will cover everything you need to know about the Everest Base Camp (EBC) trek, and I will share with you my personal experience and the benefits of trekking

FAST FACTS ON EVEREST BASE CAMP TREK

Distance: 120 km round-trip from Lukla to Base Camp and back to Lukla

Days required: 10 -12 days

Total Incline: (Undulation) – 6015 m

Total Decline:(Undulation) – 5821 m

Difficulty: It is hard for an average hiker, but the altitude is definitely more difficult to manage.

Guide: Is not required but highly recommended.

Accommodation: Guest Houses, also known as Tea Houses, along the way where you will sleep in a comfortable bed and have access to showers (extra charge) and restaurant facilities. Piece of advice: bring your own sleeping bag and flip flops).

Day 1

It began with an incredible flight from **Kathmandu** to **Lukla Airport**, one of the most famous and scariest airports in the world. The short landing strip is on a downwards slope, not to mention the mountainous terrain surrounding the airport and the high-altitude present dangers due to the impact of low pressure at higher altitudes on the handling of an airplane. All these reasons make Lukla airport amongst the most dangerous airports worldwide. Landing and taking off from the airport was both exhilarating and terrifying. After reaching Lukla in one piece, we trekked a relatively flat trek through the villages and forest to reach **Phakding.**

Day 2

This was when the trek got serious, and we made the climb up to the beautiful village of **Namche Bazaar**, which was a winding climb through the forest. Namche Bazaar is located at an altitude of 3440m inside the Sagarmatha national park, a UNESCO world heritage site. Namche is the last decent stop for trekkers before things start to get difficult. For our bodies to acclimatize to the high altitude, we spent two days at Namche Bazaar.

Day 3

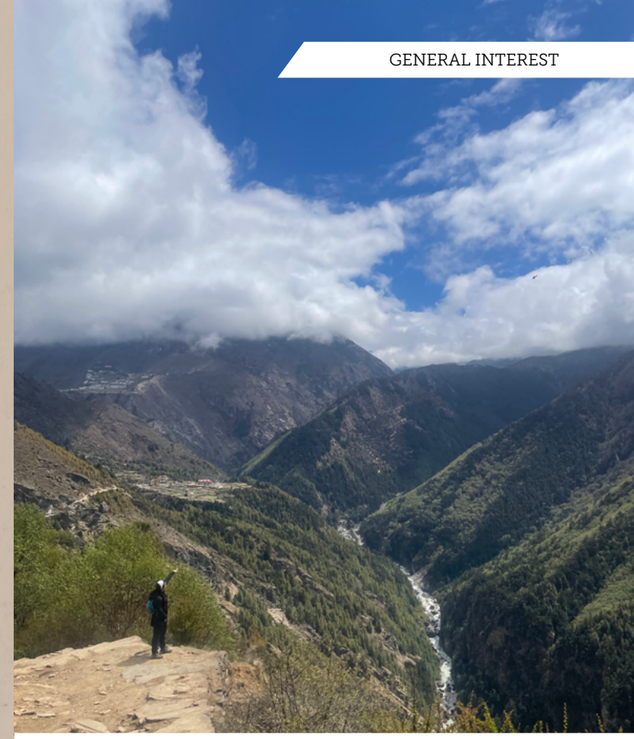
It involved a short trek around Namche for our bodies to keep moving and acclimatize.

Day 4

We trekked from **Namchee to Tengboche**. This was a big day of climbing. Namche Bazaar is 3,440 meters, and Tengboche is 3,860 meters, but the constant undulation on the trail means you will climb almost 800 meters of incline throughout the day. The trek begins by following the valley wall as you get some spectacular views of the Everest mountain range. The path then heads down into the floor of the valley as you lose a lot of elevation, but this elevation is quickly gained as we crossed the river and approached Tengboche, where we spent the night. Waking up and witnessing the beautiful views of the mighty mountain Ama Dablam as well as Lhotse, Nuptse, and the peak of Mount Everest.

Day 5

We headed from **Tengboche to Dingboche.** We trekked through the valley as the glacier river flowed with stunning views of the mountain range. Along the trek, we stopped in the village of **Pangboche** and had amazing views of Ama Dablam mountain. The elevation gain on day five is 700 meters, and the entire journey will take about 5-6 hours at a moderate pace. **Dingboche** is 4,400 meters above sea level. At this point, altitude sickness symptoms started to arise. Symptoms of altitude sickness can include headaches, dizziness, nausea, and shortness of breath. Keep in mind that these symptoms would feel very different from your typical headaches at sea level.



Day 6

This would typically be an acclimatization day, but the group felt pretty good! So we decided to continue the trek from **Dingboche to Lobuche**, the second-highest village on the entire trail. The views throughout this day of the trek were the spectacular Khumba Glacier, which is one of the trip's highlights. The total elevation change for day 6 is 500 meters in altitude, but we climbed for about 600m in total for the day, considering a few downhill sections on the trail. One day 6, I began to suffer from altitude sickness, mainly headache and nausea.

Day 7

The big day is finally here! It was finally time to reach Everest Base Camp. From Lobuche, we trekked up to the village of Gorak Shep, which is the highest village we slept in throughout the trek (5,164 m elevation). The journey to Gorak Shep was a long rocky path with slow elevation gains as we walked next to the Khumbu Glacier. From Gorak Shep, we had a quick lunch (which was very difficult, as I was still suffering from nausea) and finally made our way to Everest Base Camp. The trail continues to be very rocky and alongside the glacier. When we reached base camp (at an elevation of 5,364m), I had an indescribable feeling of contentment mixed with accomplishment and incredible joy. Despite all the challenges getting to EBC, the feeling you get after reaching the endpoint is worth all the pain, both mentally and physically.

EBC was not the end of this trek, we had to trek all the way back to Lukla, which took us 3 days in total.

For the remainder of this article, I chose to focus on how trekking as a sport has truly benefited me. Trekking offers an occasional but repeated dose of happiness (with a sense of achievement), strongly promoting overall well-being. You also develop an appreciation for daily conveniences and the people around you.

Being alone in nature, away from the hustle and buzz of city life, gives you time to self-reflect. We are physically, intellectually, and emotionally questioned. The ability to self-reflect is essential for us to improve our physical, mental, and emotional levels to achieve bigger things. This goes hand-in-hand with many moments of clarity, which I experienced as a trekked through the wilderness, which can significantly improve our decision-making abilities. In some cases, trekking can provide you with answers that agave the power to transform your life. Lastly, being in nature and trekking makes you feel tremendously happy. It can make you realize that true happiness is not a product of amassing things but through having meaningful experiences and gaining an appreciation for life by retreating to nature.

Beyond what I jotted down, what I learned from the EBC trek and being with the amazing group of people is that "Everyone has an Everest quest in them".I hope that my attempt to capture the beauty of EBC and how trekking can positively impact your life encourages you to try trekking one day.

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SandRose Reviews

By Basmah Alotaibi and Dana Dabbousi, Associate Editors SandRose Magazine

In this edition of SandRose Reviews, we'll be covering a wide variety of media exploring sustainability and the importance of cherishing our planet. From how trees influence our existence at large to the design of underground survival shelters. Whether you're reading a book, watching a documentary, or listening to a podcast, we hope to shed some light on the significance of acting now to preserve the natural world. Check out our top picks below!

For future editions, we will be taking 'Recs from our Readers,' so if you'd like to submit your reviews, send them to SandRose for a chance to be included.

Recs from our Readers

We're thrilled to share a variety of multi-topic submissions from our SandRose community. Take this opportunity and dive into the insightful selections from our readers in this edition below.

Books

Nouf Alotaibi,,
Petroleum Engineer

Humankind: A Hopeful History by Rutger Bregman

In this book, Rutger Bregman debates an ancient view that Humankind is dangerous, selfish, and untrustworthy. But what if it isn›t true? Bregman tackles these human nature arguments by examining civilization since the beginning of time and providing a new historical perspective to prove Humankind is evolutionarily wired for kindness and cooperation rather than competition.

Bregman explores how the belief in human generosity and collaboration isn›t merely optimistic—it›s realistic. Consequently, how we view society has enormous implications for how it functions. Believing in the reality of humanity›s kindness and altruism will form the foundation for achieving actual change in society.

Film

Ali Alshuwaikhat,
Petroleum Engineer

La Vita è Bella (1997)

La Vita è Bella, or Life is Beautiful, is an Italian comedy-drama considered amongst the best in Italian and worldwide movie history. This film takes place in the beautiful Tuscan town of Arezzo, where Guido, a simple young man with big dreams, uses his humor, imagination, and joyful, optimistic character to protect his wife and son from World War II tragedy and hide its catastrophic outcomes from them. Like many Italian things, the movie is slow-paced. Still, it will definitely leave you impressed by the powerful acting, inspiring messages, and mesmerizing scenes, with a big smile on your face.

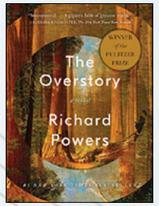
Podcast

Mohammed Bu Hassan,
Engineer

Columbia Energy Exchange

This weekly podcast comes from Columbia University's Center on Global Energy Policy, and it features in-depth conversations with the world's top energy and climate leaders from government, business, academia, and civil society. The episodes explore today's most pressing challenges and opportunities across energy sources, financial markets, climate change, and the increasingly important space of geopolitics of energy. Definitely one of my favorite podcasts on energy and a must for all energy enthusiasts out there.

Books



The Overstory

by Richard Powers

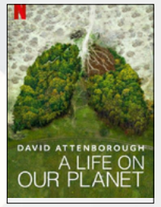
"A chorus of living wood sings to the women: If your mind were only a slightly greener thing, we'd drown you in meaning."

The Overstory is a Pulitzer Prize-winning fictional novel that examines nine characters, each with their backstory and their relationship with the living things we often take for granted, trees that encompass us. Powers does an excellent job of depicting how trees are interwoven into the characters› history and profoundly affect their existence.

Although the characters› lives are intimately painted and skillfully weaved through narratives and time, their human lives remain the «understory.» The Overstory, as the title has it, is the story of the wondrous beings that are trees, the forest ecologies they create, and illustrates the different ways this particular living influences humans so deeply while standing outside of their lives. The nonhuman world-building is filled with imaginative writing engrossing you in the perspective of trees and allowing them to be characters in their own right, inherently deserving of honor and sacrality.

If you enjoyed The Overstory by Richard Powers, you'll enjoy Upstream: Selected Essays by Mary Oliver.

Film



A Life on Our Planet (2020)

"This film is my witness statement and my vision for the future. The story of how we came to make this our greatest mistake and how, if we act now, we can yet put it right."

In A Life on Our Planet, what David Attenborough coins as his "witness statement," Attenborough guides us through "humanity's blind assault on our planet" in his -60year career and throughout his lifetime. The -85minute documentary takes us through an emotional plea to view the natural world through Attenborough's eyes, someone who's treasured it for almost a century and wants us to take care of it after he's gone. The film begins and closes with footage of Attenborough walking through what's left of Chernobyl ruins, symbolizing the catastrophic hubris of human error. Moreover, the magnitude and rapidness of the planet's changing biodiversity in correlation to the span of a single lifetime are perfectly and, more importantly, terrifying visualized by the running tally of the human population and its carbon footprint since Attenborough was a young boy. A Life on Our Planet is a film about deforestation, overfishing, exponential population growth, and other oversights that have led us to the world we live in today.

If you enjoyed A Life on Our Planet, check out Chasing Ice.

Podcasts

%99 Invisible

"People can learn to love anything, but you know, as with any art form, whether it's opera or painting or literature, the more you know about it, the more you'll get out of it, the more you'll appreciate it."

Hosted by award-winning producer Roman Mars, the design podcast %99 Invisible is a show that investigates the history and design process in everyday places that are often overlooked. From underground survival shelters and algorithms to the story behind the famously known song "Who Let the Dogs out" by Baha Men, Mars takes us through a whimsical journey of design. Subjects that may seem mundane are explored through an architectural eye, providing riveting and intriguing dialogue, and leaving you pondering the integrality of frequently disregarded objects for weeks on end. One of many personal favorite episodes is Ep. 372: The Help-Yourself City; it covers informal urbanism and how citizens intervene in their communities, whether for the sake of the general public or only their own.

If you enjoyed %99 Invisible, be sure to give Revisionist History by Malcolm Gladwell a listen.

SPE-KSA's T&PP 2022 Inaugural Dinner Meeting

Overcoming Challenges in Difficult Times: The Story of Saudi Aramco in the Capital Markets with Mr. Khalid H. Al-Dabbagh

Written by Dana Al-Zamil, SPE-KSA T&PP Team Member

On June 22nd, 2022 the SPE-KSA'S Technical and Professional Programs (T&PP) team hosted the first dinner meeting after a two-year hiatus featuring. Mr. Khalid Al-Dabbagh as the keynote speaker and guest of honor. Mr. Al-Dabbagh is the Chairman of the Board of Directors for SABIC, member of the Saudi Aramco Board of Directors and governor on the Board of Governors of the GCC Board Directors Institute.

ABOUT THE SPEAKER

Mr. Al-Dabbagh was the former Saudi Aramco Senior Vice President of the Finance, Strategy & Development business line and Chief Financial officer from 2018 to 2021. Prior to this, he has also held several leadership positions within Saudi Aramco as Financial Controller and Treasurer. In addition, Mr. Al-Dabbagh also served as Chairman of Saudi Aramco Development Company (SADCO), Chairman of the Wisayah Investment Management Company, and as a member of the Board of Directors of Showa Shell Sekiyu K.K., Sadara Chemical Company, ARLANXEO Holding B.V., refining and a chemical Joint Venture in Malaysia and Fujian Refining and Petrochemical Company. He earned a bachelor's degree in Industrial Engineering from the University of Toledo and completed several executive leadership programs, including the Senior Executive Program at the London Business School.

SPE-KSA'S T&PP DINNER MEETING RETURNS ON A HIGH-NOTE

The T&PP Dinner Meeting, held in June of 2022, is the first SPE-KSA dinner to be held in two-years due to restrictions related to the Covid-19 pandemic. The event commenced with a welcome message from Seba Al-Maghlouth, Chairperson of the Technical and Professional Programs Team. Al-Maghlouth's welcome message was then followed by opening remarks from SPE-KSA's Chairman of the Executive Board, Mr. Abdulaziz Al-Nuaim. Mr. Al-Nuaim highlighted SPE-KSA's diverse and growing list of activities which have led the society to win 14 consecutive section excellence awards. The chairman also highlighted the many efforts and accomplishments of SPE-KSA throughout the pandemic, allowing the society to successfully sustain and growth in memberships, thereby tripling the member count in the last ten years . This has led SPE-KSA to become the largest SPE section in the world with over 11,000 members.

REFLECTING ON THE SUCCESS OF THE SAUDI ARAMCO IPO

Mr. Khalid Al-Dabbagh recounted his experience steering the landmark IPO of Saudi Aramco, making it the largest IPO in history. During the meeting, he also focused on the four main challenges faced during the IPO and bond journey: dealing with changes in fiscal regime, addressing investor concerns, managing stakeholders' expectations, and performance benchmarking. Mr. Al-Dabbagh attributes the success of Saudi Aramco to the engineering and technology prowess developed in collaboration with its suppliers and partners. He also highlights the success of Saudi Aramco in managing hydrocarbon resources by following a low depletion approach, thus leading to higher recovery factors, maintaining large fields and allowing room for additional expansion, availing spare capacity providing room for supply flexibility, and finally, leveraging technology as a key differentiator. These factors have collectively led Saudi Aramco to become the world's largest listed company.

REFLECTIONS AND KEY TAKEAWAYS

Mr. Al-Dabbagh emphasized the importance of developing technical and commercial expertise to remain competitive in the capital markets. Reflecting on his experience leading the IPO, and expressed the importance of cultivating the ability to turn challenges into opportunities. To conclude, he also highlighted the role of professional organizations such as SPE-KSA, in developing the next generation of skilled workforce to overcome cost challenges by coupling technical skills with financial acumen and to advance organizations to remain competitive and agile in the face of uncertainty.

SR

To view this recording from this session, scan the QR Code.














SPE KSA Section
GUEST ENTRANCE
VIP ENTRANCE


SPE-KSA's YP Launches the Unconventional Leader Business Insights Boot Camp

Developing the next generation of leaders

Written by Mohammed AlJaafari, Unconventional Leader Participant

As part of the SPE-KSA Young Professional team's effort to develop young professionals, a business insights boot camp titled "Unconventional Leader" was held from the 2nd to the 4th of June 2022 with over 20 participants. The boot camp included more than 27 training hours that consisted of leadership lectures, development activities, and working on a case study assuming the role of a company CEO. The lectures were given on various subjects from leadership skills, corporate finance, accounting, human resources, marketing, and emotional intelligence. While the activities also had participants engage their problem-solving skills in addition to focusing on communications skills such as: building an effective presentation, improvisation, and responding to questions and challenges. The case study presented to particpants centered around a company that was suffering from critical financial decline and low performance, threatening their respective business from going bust. Participants were required to develop an innovative business turnaround strategy assuming the role of a leader. The participants were initially divided into groups presenting their strategy to board members of the company for their endorsement with recommendations to improve the fiscal health of the company, a marketing strategy, and a proposal for organizational restructuring. Overall the SPE-KSA team received positive feedback from participants commenting on the value of the program developed. In the section below, we speak to participants to get their impressions of the boot camp.

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Ali Alshuwaikhat,

Unconventional Leader Participant

HOW WILL THIS BOOT CAMP IMPROVE YOUR WORK?

Over the course of three days, I've put myself in the shoes of a CEO by understanding how leaders think from different aspects and how decisions are consequently being made. Now, I believe that I can improve my performance at work by knowing what is expected from me by my management to align with my organization's strategies and achieve its objectives.

WHAT IS THE MOST VALUABLE LESSON THAT YOU'VE LEARNED AFTER COMPLETING BOOT CAMP?

Among the many lessons I have learned in this boot camp, the one that will stay with me is "Not every manager is a leader," and these two words shouldn't be interchangeable. An effective leader, besides a functional role of a manager that mainly aims to achieve a certain goal, would influence, motivate, and enable his team to contribute and be more productive on individual and group levels.

DO YOU RECOMMEND THIS PROGRAM TO YOUNG PROFESSIONALS?

Absolutely! I would highly encourage all YPs to look out for such unique experiences provided by SPE-KSA and seize the opportunity to gain much more besides leadership skills such as exposure, teamwork, communication with people from different backgrounds within and outside the oil and gas industry,

Dana Al-Tayyib,

Unconventional Leader Participant

WHY DID YOU DECIDE TO ATTEND THE UNCONVENTIONAL LEADER BOOT CAMP?

I was intrigued by having this unique opportunity to take the role of a CEO and nurture my leadership ambitions.

WHAT WAS YOUR FAVORITE PART OF THIS BOOT CAMP?

I enjoyed the different interactive activities that focused on enhancing our public speaking skills. I also enjoyed working on the business case where we dealt with financial statements to make critical business decisions. These hands-on activities authenticate the CEO experience.

SINCE YOU TOOK THE ROLE OF A CEO IN THIS PROGRAM, HOW WAS THAT EXPERIENCE?

This was one of the best unique experiences that I had. Being a CEO in this program gave me a new perspective beyond my daily duties, which helped me understand the great level of responsibilities of a CEO.

HOW DID THE PROGRAM INFLUENCE YOUR LEADERSHIP SKILLS?

I learned from this program that to sharpen your leadership skills, you must implement what you've learned. As young professionals, the best way for us to practice is by volunteering at different committees. Luckily, SPE gives us many volunteering opportunities that can help us grow as leaders

WILL THIS BOOTCAMP HELP FURTHER YOUR CAREER DEVELOPMENT? IF SO, HOW?

Definitely! This program taught me that no matter how excellent and proficient we are, we can always find ways to be better. After completing this program, I became aware of the areas of improvement that deserves more attention to fully reach my potential and achieve my personal career

SPE-KSA T&PP X D&I NMO Series:

Capitalizing on Mentorship Opportunities to Pave Our Careers

Written by Danna Khattab,
SPE-KSA D&I Committee team member

SPE-KSA's Diversity and inclusion committee held its first NMO event on June 29th at Centro Hotel, Al Khobar. The event hosted Dr. Sarah Ghaleb, founder of KEYSS Project, a social innovator leading training, social science research, and evaluation. In addition to business & community development initiatives. The session was moderated by Nawaf Al Dossary, D&I Mentorship program team leader. The session focused on the importance of mentorship, the mentor and mentee's roles, and how different organizations can adopt it.

In this session, Dr. Ghaleb discusses best practices in mentorship, such as:

Carefully pairing mentors and mentees.
Analyzing areas of improvement.
Recognizing the success of mentors and mentees.
Regularly implementing improvements.

In addition, Dr. Ghaleb also outlines how to build successful mentorship programs. Any mentorship program starts by designing the program with the audience and end goal in mind, attracting participants, and matching mentors and mentees based on their profiles. This is followed by setting up check-points and helpful resources along the way and measuring the program's success by measuring the return on investment and the learning impact.

This NMO session was organized in conjunction with SPE-KSA's D&I mentorship program, open to members of the SPE-KSA community. This session represents the first stepping stone towards launching that program. Dr. Sarah Ghaleb managed to have an extremely interactive session filled with curious attendees who answered all their questions by the end of the night.

SR

SPE-KSA Student Outreach

Student Outreach Team Activities Continue across Kingdom's Schools & Universities

By Heba Alsoqair, Maha Alharabi, Ibrahim Almulhim and Ali Alshuwaikhat,Student Outreach Team Members

As part of its dedicated mission to influence, educate, motivate and enrich students' knowledge on the oil and gas industry, SPE-KSA Student Outreach Team continued its remarkable efforts to reach out to both schools and universities by conducting visits to **five different educational institutes** in total across Saudi Arabia over the month of May.

Energy Ambassador Program

Devoted young professionals in Energy Ambassador Program extensively volunteered their time and effort to visit schools and educate future generations about the oil industry, and sustainability and conduct lively discussions with students about the industry, its future, challenges and opportunities, and how they can participate in its success. Despite COVID regulations in schools hindering the team's physical visits during the year, the volunteers' dedicated efforts allowed them to reach **a total of 300 students and faculty** in attendance across the four visits conducted in May. These visits included **KFUPM and Bassam international schools** in the Eastern Province, as well as **Ibn khaldoun and Nab'a Mawahib high schools** in Jeddah encompassing Energy Ambassador Program as well as Energy4Me science experiments.

Abdulrahman Alharbi and Mishal Alsana - KFUPM school

Zakaria alGhamdi - Ibn Khaldoun and Naba' almawahib schools in Jeddah

University Visits

Similarly, Student Outreach members conducted a visit to **Imam Abdulrahman Bin Faisal University**, Computer Science and Information Technology College to deliver an awareness session regarding the SPE-KSA role within the Kingdom as well as the energy industry and how can students benefit from having an SPE membership. The session was well attended by **20+ students,** both physically and virtually, including the Vice Dean of Academic Affairs and Dean of Computer Science and Information Technology College.

The attendees showed tremendous interest in becoming a member of the SPE family. Subsequently, an SPE university chapter is being established within Computer Science and Information Technology College in an effort to build a bridge between the energy industry and the student community.

Positive feedback was received from students and faculty of all schools and universities visited, aiming to capitalize on their learning by considering the possible innovation opportunities in the Energy and sustainability industry as inspiration for their future careers.

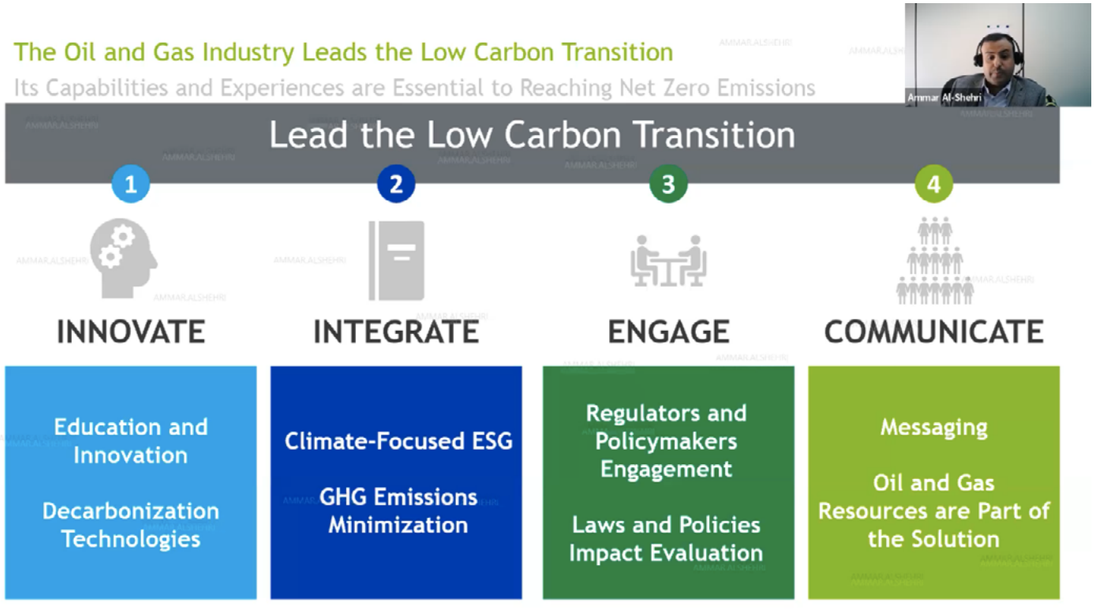
Attendees from IAU awareness sessions

Expand Your Horizon: Meet the Experts Second Session in 2022

Under the theme "Expand your horizon", SPE-KSA University Student Outreach team held the second "Meet the Experts" Event this year virtually on March 22nd 2022 as a continuation of the successful events of the program back in 2021. Meet the experts program provides an avenue for university students and young engineers to explore essential technical and soft skills in the industry by interacting with experts, observing their success, and learning from their experiences.

The event consisted of two sessions: technical and soft skills sessions. During the first session, Dr. Ammar Alshehri, who is the head of the Upstream Carbon Circularity Division at Saudi Aramco, demonstrated the contribution of the oil & gas industry towards sustainability. After that, Mr. Rehman Akthar presented the soft skills session in which he shared simple strategies on communication skills that helped him become a global speaker and an effective presenter. Mr. Akthar is a career counselor at Saudi Aramco and one of the pioneers of the saudi stand-up comedy scene.

Both speakers presented informative and valuable sessions. Besides the discussions occur during the session, some attendees were very enthusiastic about the topics and asked questions through pre-recorded videos. The interaction between the presenters and attendees was great and it contributed to the success of the event. The registration for this event was the highest among all SPE KSA virtual events as it reached more than 130 registrations. SPE University Student Outreach team is committed to conducting more informative sessions that can help students during their academic journey to ensure having a smooth transition into their professional careers.



SPE-KSA University Outreach: 2022 Student Chapters Activities

By Zainab Albaharna, University Student Outreach Member and KFUPM, PMU, and KSU SPE Student Chapter Members

Did you make the most out of your time as a university student? I don't know about you, but I know that SPE-KSA student chapter members have made the best of their time at college in 2022. Not only to build their future, but also to give back to their community. This article will provide an insight into some activities the SPE student chapter members from King Fahad University of Petroleum and Minerals (KFUPM), Prince Mohammed University (PMU), and King Saud University (KSU) have been engaged in.

KFUPM Student Chapter

Starting with the KFUPM student chapter, whose members organized two visits in collaboration with the American Rock Mechanics Association (ARMA). One of the visits was to NOV Company to familiarize students with the bottom hole assembly and drill bit types. The second visit was to Alkhorayef Petroleum Company. Alkhorayef employees gave students a tour to students of the company workshop, showing them oil pumps and wireline logging tools.

KFUPM Student Chapter at NOV Company

"KFUPM won the 2022 Presidential Award for Outstanding Student Chapter, recognizing the top 5% of SPE student chapters' exceptional programs and activities. Congratulations KFUPM! "

KFUPM Student Chapter at Alkhorayef Company

PMU Student Chapter

Another active SPE-KSA student chapter is PMU, which hosted Dr. Feroz Shaik, a PMU College of Engineering professor, on a virtual event titled "Drive Young Minds Towards Research & Innovation" to encourage students and open their minds about the importance and advantages of research. PMU student chapter also visited the Huhtamaki Company, where students witnessed the live process of manufacturing cups and plastics and how the technologies have developed.

PMU Student Chapter at Huhtamaki Company

KSU Student Chapter

Moving west to Riyadh with the KSU student chapter that hosted a few SPE-KSA Student Outreach Team members to deliver a presentation about the oil and gas industry and SPE to students. During the holy month of Ramadan, the KSU student chapter also volunteered with Albir charitable society to distribute food boxes.

Congratulations to all 23 participants from the three student chapters for completing the 2022 IPTC Education Week. As a result of Student Outreach efforts, there has been a significant increase in SPE student members and student chapter activities.

KSU Student Chapter at Albir Charitable Society

KSU Student Chapter with Student Outreach Team Members

The Art of the Night

By: Ghada Alghamdi,
Physics student at Princess Nourah university and astrophotographer.

Astrophotography is a type of photography that specializes in taking pictures of astronomical objects. One of the greatest astronomers has also defined it as "a new birth of knowledge regarding the structure of the universe". The so-called art of the night has been catching the attention of many Astrophotographers or sky hunters, which raises many questions as to why it is receiving all this attention. To understand this, I sat with Anas Almajed an avid astrophotgrapher with over five years of experience in the field.

The Sombrero Galaxy in the constellation Virgo and the Raven, Capturing Photos over the AlDahna Desert *

Anas studied Marketing and Business Management and had always had a keen interest in nature photography. However, the first time he looked up to the stars was approximately a decade ago by chance as he passed a store selling telescopes, which peaked his interest in the field. While observing some celestial bodies in 2018, Almajed was awe-struck by what he had seen and wanted to capture this stellar sight. It was then that he decided to pursue astrophotgraphy.

The Pillars of Creation in the Eagle Nebula, Desert *

To take any photo of the night sky, the conditions of the day, the darkness of sky and location are essential. Wind speed can also impact image quality. Almajed found a spot in AlDahna desert, two-hour drive from Riyadh, that fulfilled all conditions. AlDahna's has a ranking of two on the Bortle scale making it ideal for astronomical observation. The Bortle scale is a scale from one to nine, where nine is the worst and one is the best, relative to the presence of light pollution in the sky. AlDahna's lack of light pollution makes it ideal for Astrophotography. Comparatively Riyadh ranks nine on the Bortle scale due to the high-level of light pollution making it virtually impossible to view any constellations, the Milky Way or any globular structures. Almajed makes the trip to the desert nearly four times a month. Why four? He goes two days at the beginning of the month and two at the end. On the first and last days when the moon is not visible, sunlight reflected from the moon obstructs the view.

THE RED SEA PROJECT

As urban cities continue to grow, I wondered whether astronomical observation was at risk in the Kingdom. However, Anas Almajed did mention the efforts of the Red Sea Development Company in seeking Dark Skies International accreditation to protect and designate areas where artificial light pollution is lowest and astronomical observation is most ideal. The company plans to put the Red Sea Project on the map as one of the world's premier dark-sky reserves.

The project will help increase awareness about astronomy and the dangers sky pollution. The project will also bring attention to the abundance of areas across Saudi Arabia that are perfect for Astrophotography. SR

Tips for potential astrophotographers

Practice Patience:

Approximately 70% to 80% of Almajed's astrophotography trips end up falling through due to technical problems such as equipment failure, lack of internet connection, improper calibration, and sudden change in weather conditions. Ultimately, patience is key. Keep trying, eventually you will find a site that will make it all worthwhile.

Openness to Self-learning

Situation, location, time and experience play a significant role in producing an excellent photo. To fulfill these conditions, you'll get comfortable with self-learning. Start by reading online resources, learning how to read sky maps, enroll in online courses, subscribe to monthly sky guide magazines and learn how to keep track of cosmic events and plan trips and excursions accordingly.

Acquire the Right Equipment

Do your research. Identify the best equipment for your level and visit your local shop and test out what they have. Initially you can start by acquiring binoculars or a beginner telescope that is suited to your needs and preferences. Know what specifications to look for.

Join a local group

There are many groups on social media that organize monthly astronomical observation trips. Connect with more experienced astronomical hobbyist and learn from their experience.

Waxing Gibbous phase where mountains and valleys of the moon can be clearly seen 1

Supermoon is a phenomenon when the moon is at the closest point to earth 1

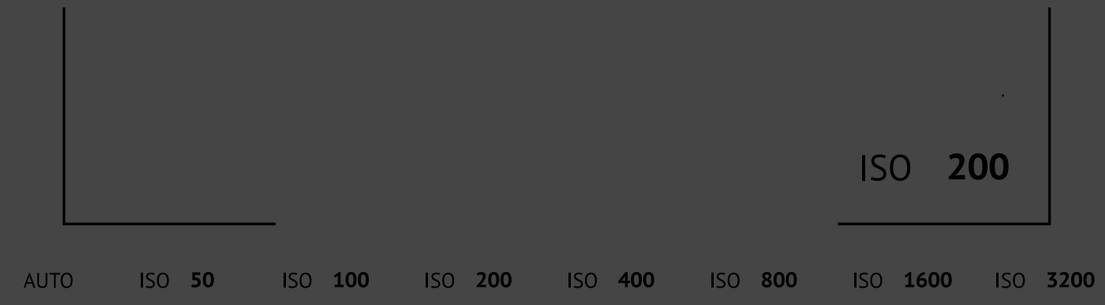
Photos courtesy of Anas Almajed @anas_almajed)
Ghada Alghamdi @supernova_snr)

Sandrose Readers Lens

IN THIS SECTION WE SHARE PHOTO SUBMISSIONS FROM OUR READERS, SHARING THEIR UNIQUE ABILITY TO CAPTURE IMAGES THAT SPEAK TO THEM

" The agricultural valley near the small town of Bani Amr lies in the province of Asir. Here lush green hills with agricultural terraces overlap each other in waves and Jebel Harfa sits in the center of the valley. This beautiful valley is less than an hour's drive from the city of Al Namas and it caught my eye while driving from Al Namas to Al Bahah. "

Imad is a Senior Reservoir Engineer with Gas Reservoir Management Department (GRMD) in Saudi Aramco and an avid traveller of the Kingdom.

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