

ECHO



SPE Suez University Student Chapter Annual Magazine

Issue 14 | Feb 2022



A Robot Takes Over
The Drilling Floor

Workforce Enablement
For The Energy Future

Oil Industry Rebounds In 2021
Forecasters Predict Solid 2022



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Society of Petroleum Engineers
Suez University Student Chapter

Our company

About Us



BGS Energy Services is recognized as one of the leading providers of innovative solutions for Reservoir Management, Drilling Management, Well Services, Process & Pipeline Services, Real-Time Solutions, and Down Hole Motors.

BGS Energy Services pride itself in challenging the norm to produce cost-effective, best-in-class solutions that save downtime and maximize benefits to our customers' value chain from the wellhead out; through eliminated risk and reduced execution time. Our highly motivated workforce is committed to responding quickly and efficiently to customers' requirements, without compromising our unequalled safety record. We specialize in delivering technically and commercially tailored packages for a wide range of disciplines; providing a wholly integrated solution that distinguishes us from other providers.

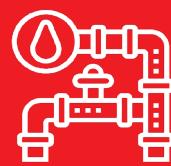
Our Service

What We Offer



GEOLOGY AND GEOPHYSICS

Seismic data , Well data , Reservoir Characterization



Pipeline and Process Services

Process Services , Pipeline Services , Flow Management, HDPE



ENGINEERING, PROJECT MANAGEMENT

Effective management of personnel, equipment, resources, planning...



MANAGED PRESSURE DRILLING

Reduce total well expenditure through mitigation of Non-Productive Time



REAL TIME DATA

Platform incorporates existing analytics packages, multiple data sources



DOWN-HOLE MOTORS

Strong, Responsive, Reliable

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FOREWORD



Beware of Crabs Surrounding You

YOUSSEF ELDEMAIRY

ECHO Chairperson

Once upon a time, there was a man sitting on a fishing dock and watching a pile of living crabs behave in a bucket. While they were squirming at the bottom, every now and then a crab crawled aside to try to reach the top and escape. But every time he approached the cliff, a crab from below rose and pulled him down. Then another crab came up, and again a crab from the bottom dragged him down. In psychology, this behavior is known as «crab mentality», as a way of illustrating the selfish, toxic, and jealous thinking of some group members, who will try to sabotage and hinder the progress of other top members of the group.

Is your environment holding you back? Have you ever felt like a crab in a bucket, trying to get out, only to be dragged down by the people around you? Do you feel like you've succumbed to the crab mentality?

If your answer is "Yes" you must get rid of the Crab Mentality, upgrade your environment, and create a new tribe.

It's not always possible to change your environment, but you can always upgrade it. Reassemble it. Be the architect of it. The transition from the gloom of the shadow to the brightness of the sun.

And the first thing you must do is avoid anyone who does not provide any kind, supportive or empowering energy to your life. To put it another way, get out of bad circles right away and build a new tribe.

Create a new tribe. One that motivates you. That is encouraging. This allows you to totally immerse yourself in your own universe, allowing you to lean into what calls you—what you feel is right for you—and swim in the deep end of the sea, away from where everyone else swims.

- Find one who can help you hone your skills.
- Find one who can help you silence your inner critic so that you can focus on your confident self.
- Look for one that will build you up rather than tear you down.

In the end let me remind you that you're a human, not a crab. You've been gifted with a brain that enables you to think critically. No one can keep you in a confined box except you. Yes, it's difficult to succeed when everyone is trying to bring you down, but it's not impossible and it has been done. If you're a visionary, a dreamer, or someone looking for a better life, start climbing because the constant effort, struggle, and sacrifice will form the wings that will allow you to soar and fly before you know it.

FOREWORD

Would you add value?

MOHAMMED KARAM
ECHO CEO



We, all, were born in a dynamic and changeable environment where nothing stays as it is. Things got changed periodically.

What about you? Did you plan how to face and deal with these changes, in addition to fitting your personality and career path to the future challenges?

The answer is that you face every single day the challenge of being updated and adapted to the surrounding environment. People may be classified into many categories in facing this challenge. Let me highlight two types of them:

- Flexible people who are always trying to adapt and add a new value to the non-ideal atmosphere.
- And others who stay looking astonished if any of the circumstances have been changed. The only effort they exert is looking at others' steps and results and acting like them.

Which one of them are you? I look forward to hearing that you chose to be the one who accepts being in a non-ideal environment, and seeks to create a new inventive solution that would remove an obstacle in peoples' lives! It's all about your mindset.

In the 21st century, if you gaze around you, you will see the world imposes everyone to start planning and thinking how to leave a remarkable fingerprint. If you feel you don't have the ability to add a new value, just remember many of the scientists who were awarded the Nobel Prize started their path by trial & error! After several attempts, they managed to reach their goals to benefit the whole of humanity.

Does that mean a value should be a big revolution in a certain field and must make propaganda, or otherwise it will be considered as having no value? Exactly no! The value can be an infinitesimal improvement in any aspect of peoples' lives. At the moment you benefit anyone, you succeeded to add value!

To conclude, it's all about you to decide whether you will add value or not. The opportunity does always exist, don't miss it!

Dr. Medhat M.Kamal

SPE 2023 President

Medhat (Med) Kamal, who will be the 2023 SPE President, is a Chevron Fellow Emeritus with primary responsibilities including competency development within the company, identification and development of emerging and white-space technology opportunities, and provision of technological advice and counsel to senior management. He formerly was a fellow and leader at the dynamic reservoir characterization group for Chevron Energy Technology Company. Before Chevron he worked for ARCO, Flopetrol Schlumberger, and Amoco. He holds master's and doctorate degrees in petroleum engineering from Stanford University, and a bachelor's degree in petroleum engineering and a master's in engineering from Cairo University.

By/ Merna Tammam



Q1: What are the challenges you faced during your career path? Could you Mention how you overcame them?

As you may imagine, one faces several challenges throughout a career and it is helpful not to allow these challenges to derail one's journey and, if possible, turn them into positive opportunities. Upon graduating from Cairo University, I was drafted to work as a teaching assistant. A requirement for that position at the time was to obtain a master's degree within 5 years and a Doctorate degree within 7 years. Therefore, I decided rather than waiting, I would pursue the first step, a master's degree, at Cairo University and worked hard to complete the work in the minimum time required to obtain such a degree (this was two years at that time). With Allah (SWT) help, I finished my M.Sc. degree in just two years. As it turned out, this was the first graduate degree awarded in petroleum engineering in the Middle East. I obtained a scholarship to complete my graduate studies at Stanford University just in time when the ban on travel was lifted.

Q2: Kindly, could you tell us about your goals for this upcoming season? How Would you sustain the chain of successes within SPE history ?

For more than a century, our business and the field of petroleum engineering have faced and overcome problems. This is quite equivalent to our situation right now. Various scenarios developed by international regulators and major oil and gas organizations shows the need for petroleum products to provide the world with about half of its energy needs for decades to come. To meet these demands, we must continue to improve petroleum engineering technologies. Climate change is likewise a concern for the world, as is the necessity to attain net-zero carbon emissions. This means reducing GHG emissions as much as possible, developing alternative sources of energy, and removing carbon from the atmosphere. Petroleum engineers play a key role in accomplishing all three of these goals. So we need to develop new technologies and abilities for SPE members, so that they will be able to make a sustainable transformation in the energy market.

Q3: Next year, there will be an unprecedented merging between SPE & AAPG. Could you tell us about your expectations for this new step?

This merge simply stills a proposal which won't happen, except if most of the members of each organization approve it. This merge aims to be a place where the energy industry's community of scientists, engineers, and other professionals interact to advance, exchange, and extend knowledge of producing the energy that the world needs in a safe, affordable, and eco-friendly manner, building on the successful historical foundation of both SPE and AAPG's work to produce oil and gas and to responsibly protect the planet we all share for over 100 years.

Q4: We all know that the oil & gas is unstable industry, what is your point of view about the current initiatives of oil companies to widen their scope to include the renewable source as the world now is seeking for the green environment?

I respectfully disagree with the notion that the oil and gas sector is unstable, it is stable in the energy and will continue to be for decades to come. There are false accusations mainly in the political and media, painting us as the only reason for the global warming, which is not true, of course we should do everything in our power to protect and promote the planet for the future generations. Also, as I mentioned before, petroleum engineers and this industry have a major role in facilitating and advancing the prosperous comfortable way of life for all people.

Q5: At the beggining of covid-19 pandemic the price of the petroleum barrel has decreased sharply, then it has increased to 80\$ in October 2021 what is your comments on the oil price curve current and upcoming changes ?

My experience indicate it is not possible to predict the oil price. As it is a commodity whose price should be based on supply and demand: however, there are political and environmental forces which influence the oil prices significantly.

Until October 1973 war that liberated Sinai the price of oil increased. Based on the political situation back then, the price was supposed to be depressed which didn't happen because of other circumstances and calculations. Therefore, for our

industry to stay sustainable, private companies should develop strategies to stay profitable at any cost, the readers also may want to visit the websites of major organization to see how they are planning to navigate in the reality of fluctuating oil price.

Q6: We would like to know your opinion regarding Echo magazine, and your expectations for the upcoming issues and your advice for SPE Suez members?

I am an engineer like most of you, I have only seen one issue of your magazine, so to be honest with you, I won't be able to express my opinion regarding it. However, I can tell you that it is much better than anything we did when I was an undergraduate or a graduate student.

Q7: What is your advice for undergraduates and fresh graduate petroleum students to help them keep up with the new challenges facing the labor market?

Hard work is the main ingredient which enable us to succeed, but it should be directed by doing the right thing. Another important aspect is to keep on learning. Either by following technical publications or benefit from the experiences of others you work with; especially those with more years of service. one of my professors at "Stanford university" (the late Henry J. Ramey, Jr.) advised me that if one focused and listened, he or she should learn from every presentation they attend even if it is in the subject of their expertise, truth to be said: I gained a lot by following this advice. Additional points from my own career and experience are:

1. For the first job accept what is available, even if this is not the ideal position just claim the opportunity you have.
2. Be flexible as things will change and be ready to adapt to anything.
3. perform well and work hard in your job so that whenever there is a change your record track will influence your supervisors to offer you good positions.



Eng. Kamel Al Sawi

President of Kuwait Energy Egypt



By/ Youssef Eldemairy

Q1: Can you tell us about one of the challenges you faced during your journey with Kuwait Energy Egypt?

One of the biggest challenges I faced at Kuwait Energy was the moment when I was nominated as Production Manager at the age of 29 and it was extraordinary to assign someone of this age for this position in the Oil & Gas Industry. Because the challenges vary so do the solutions required. I succeeded in this position to prove that effective leadership doesn't have a minimum age requirement.

Q2: Kuwait Energy Egypt introduced the successful model of optimizing and improving the brownfields in Egypt. How can brownfields leverage the Egyptian petroleum sector from the financial and technical perspective?

I think the analysis of the available old data of the brownfields in the light of the new techniques can reveal a big potential out of these assets. Our operated field is a tangible example of this, where we succeeded to boost the production from this field from 1200 b/d at inception to approximately 8500

b/d and produced approximately 26 million barrels in almost ten years and had 6 discoveries so far. This gives you an indication of the role that the brownfields can play to leverage the Egyptian petroleum sector from the financial and technical perspectives.

Q3: What do you think are the best fiscal terms that could attract investments to brownfields? And what are other ways to increase brownfield investments in the Egyptian petroleum sector?

Most importantly, it must be dynamic and ready to adapt when needed, for the benefit of all parties. It is very necessary to have a database of all brownfields in Egypt with the challenges that are facing each with certain economic cut-offs for the government and to give investors the opportunity to introduce new methods and business models to overcome these problems and to unlock the potential of these abandoned deposits.

“COVID-19 Pandemic has turned digitization from a “nice to have” to a “must have” in order to keep operations running while enjoying health, safety and clean environment.”

Q4: For the second year in a row, KEE wins “The Operational Excellence in Brownfield Award”, how do you see this achievement, and what are your steps to sustain this success?

This award is a representation of our striving for the highest standards in running our business in Egypt and challenges us to continue our journey with the same level of commitment to the Egyptian Oil & Gas industry under the leadership of H. E. Eng. Tarek Al Molla.

Q4: In addition to Kuwait Energy Egypt's significant contributions to community development and sustainable activities, we would like to hear more about the “She Can Scholarship” for women entrepreneurs.

This is the main reason why Kuwait Energy Egypt has conducted the “SHE CAN” Business Scholarship in partnership with the American University in Cairo’s (AUC) School of Continuing Education (SCE), we will enable women entrepreneurs to discover and develop their entrepreneurial talent and to overcome the challenges they face in running their businesses. SHE CAN Business Scholarship is fully funded for three months, with a 60-hour business training program for 50 Egyptian women participants, based in Egypt, aged between 25 to 40.

Q5: We would like to discuss your expectations for the future of the Industry in Egypt especially and in the MENA region in general.

The Oil and Gas Egyptian market is enjoying significant investment internally and from abroad. Globally, the Egyptian market is considered as one of the few economic bright spots & strongest pillars, especially in the Mena region. The Egyptian Industry is so attractive as the margin per barrel is higher than other countries in the region. Coupled with the stable regulatory and fiscal environment, the strong support of the Ministry and government authorities to grow the industry responsibly made Egypt a significant investment spot globally.

Q7: How do you see the digital transformation in the oil and gas industry in Egypt especially after Covid 19 crisis, and what does KEE provide to achieve the transformation in the Egyptian market?

COVID-19 pandemic has created an immediate challenge for many organizations, it has turned

digitization from a “nice to have” to a “must-have” to keep operations running while enjoying health, safety, and a clean environment. As a result, some important decisions had to be made like reducing the number of workers to half capacity in the office and the other half working from home. In addition, our digital capabilities have reached their full potential as we have implemented protocols and technologies that operate remotely wherever possible, reducing crew exposure and providing operational efficiency for our customers.

Q8: Finally, what is your advice for college students to keep up with the ongoing skills demanding job market?

My key advice to every petroleum engineering student is to strengthen their strategic planning and dynamic thinking skills by exposing them to different work experiences. Your academic degree isn’t enough, you must improve yourself, work hard, identify your area of interest, learn more about it, attend training if you can, enhance your online presence, connect with people in the same field, ask them questions, make yourself visible, attend conferences, expand your network, and trust me, opportunities will come, and if it didn’t, create them. You will shine and you will achieve whatever you want if you keep working hard and dreaming more.

Kamel Al Sawi is the President of Kuwait Energy Egypt and the General Manager and Managing Director & Board Member of both Burg Al Arab Petroleum Company and East Abu Sennan Company and Board Member of Petroshahd Joint Ventures Company.

He holds BSC & MSC in Petroleum Engineering from the Suez Canal University and an Executive master's in management (EMIM) from Ashridge University and School of Business, London, UK. He has over 19 years of experience in the oil and gas industry having worked in several challenging positions. He also has a diversified international experience in the different Human Resources aspects. He has previously worked in Oil Search Egypt Limited, Qarun Petroleum Company, and Halliburton, where he held several positions.

Eng. Mostafa Fouad

Global Director at BGS Energy Services



By/Mohammed Karam

Q1: At the beginning of our interview, could you tell us about your career path and the transitions you made till your current position at BGS Energy Service?

I received my BSc in Mining and Petroleum Technologies from Suez Canal University, then traveled to Germany, pursuing a Master's degree in the field of Geophysics and Seismology. Upon returning to Egypt, I joined Halliburton as a field crew member, getting technical knowledge and hands-on experience in various domains of the Oil and Gas industry, including Pipeline and Process Projects, Frac Services and Nitrogen Services. Across this journey, I held several operational and managerial roles in Egypt and internationally, while pursuing my Master's degree in Business Administration and Management from Texas A&M University. My current role as the Global Director for BGS Energy Services is by far the most engaging, challenging and rewarding.

Q2: What are the challenges, that you faced during your career path? Could you share with us your informative experience and mention how you overcame them?

The challenges are numerous, yet one of the valuable lessons I have learned is that all challenging situations and difficult times often result in great and positive changes. The key is to take a step back to view the whole picture, using reason then taking and fulfilling actions.

Q3: Kindly, could you tell us about your subsequent goals? How would you sustain the chain of successes within BGS Energy Service?

Some of the plans, which we are working on include the continuous broadening of our array of services, continue to deliver our unique solutions, satisfying investor needs, maintaining our shiny service quality, and HSE performance and records. We have a great team that follow meticulous

strategies and plans to ensure we attain and increase our successes.

Q4: As the world is going towards the green (energy) environment, what's your expectations about the new role of the Service companies, like BGS? Will this affect their proposed duties in the Energy field?

If you look at any chart displaying information about global energy demand or consumption you'll notice one trend; it's increasing rapidly. You may also notice that fossil fuels as oil and gas provide the largest portion of such demand. Many scientific studies have highlighted the negative impacts on the environment from such use and ruled it unsustainable in its current form and pattern. This calls for rapid & immediate actions within the oil and gas sector as well as other sustainable energy alternatives. Across the globe many goals have been laid out to offset the impact of the current output, optimize consumption, monitor and limit emissions, and ramping up the execution of blue and green energy projects. Oil and gas companies as well as service companies work in and serve the broader energy field; meaning that their role is to maintain providing the world with the energy it needs, regardless of the source. Hence you see adoption and application of sustainable and green technologies by energy companies in their value chain. Agile energy services companies like us at BGS recognize the opportunity that lies within this natural evolution happening in the field.

development, new technology adoption, productivity gains, and efficiency optimization to meet these requirements in the face of urgent challenges. Financial crisis, pandemics, etc.

Q6: We would like to know your opinion about ECHO, your expectations for the following issues and your advice for SPE Suez members ?

ECHO is a great resource for young professionals and students. We look forward to more and more in each chapter; to maintain a bridge between the student's perspective and the energy market status in both Egypt and around the world. Furthermore, my advice for them is to Keep it up.

Q7: The labor Market is truly unstable, because of the sudden challenges in the whole sector. What's your advice for undergraduates and the fresh graduate's petroleum students to keep up with these new challenges and being up to date ?

I want to emphasize the importance of education and gaining knowledge to our young future leaders. Always pursue learning and growth opportunities, ask questions and be keen to know more. By expanding your understanding of things, you get the opportunity to view things in a broader spectrum, you come up with creative solutions and overall add a higher value to yourself and your organization.



Q5: How do you see the future of Oil & Gas industry, especially after the whole collaborations to overcome COVID-19 pandemic through vaccines, and where are the new key opportunities in this industry?

As mentioned before, energy demand will continue to grow with the continuous rising global demand, population, emerging economies, and quality of life. The oil and gas industry has always been an area of great opportunity. There is plenty of room for de-

Eng. Sherif Bayoumy

Managing Director
Schlumberger Egypt, Sudan & East Mediterranean



By/ Youssef Eldemairy - Ahmed Tobar

Q1: Your career journey with Schlumberger passed through many stations. How do you see the importance of diversity in the work environment?

Diversity is a core value for Schlumberger, working in multiple countries with diverse nationalities and gender promotes high performance and an efficient workplace. In terms of business, a diverse workforce reflects a changing world and marketplace bringing high value to the organization; “Our greatest strength is the diversity of our people, and we recognize that differences in thought, creativity, and experiences make us better every day”.

Q2: What is the biggest challenge in the Oil and Gas sector?

I'm very proud to be working for a company that helps its customers minimize uncertainties and improve their results, with top-notch technologies covering the whole lifecycle of the well. We've always aligned efforts with our customers' objectives; they are at the center of everything we do.

to deliver the best results, we combine our unique talents and collective expertise—not just within Schlumberger but by working closely with our suppliers, contractors, and business partners.

Q3: As one of the worldwide oil and gas industry leaders, we would like to discuss your expectations for the future of the industry in Egypt especially and in the MENA region in general.

Egypt is full of opportunities with the presence of small, medium, and larger IOCs. This is a golden opportunity for Schlumberger to work with growing companies, especially for subsurface production enhancement coupled with early production facilities to accelerate the field development phases. Easy exploration belongs to the past, the remaining opportunities are frontier developments, in the Red Sea or Egypt's West Mediterranean, which whenever successful, the returns are high.

“ Egypt has a lot of untapped potential exploration acreages in the Western Desert and offshore in the Mediterranean, Red Sea and Gulf of Suez. ”

Q4: What is the Egyptian Upstream Gateway (EUG)? And how will EUG help the oil and gas sector in Egypt?

The objective is to promote the subsurface potential of the country and attract foreign investment, mainly for exploration. Then utilize this wealth of data to identify production enhancement opportunities in existing assets. Developing and attracting investments requires a digital platform and now for the first-time foreign companies can buy both access and license to Egypt's subsurface information, and analyze it from anywhere, anytime through a digital platform.

In addition, Egypt's first fully digital bid round, represented a key milestone in the Egyptian petroleum sector, as interested bidders were able to fully assess the offered blocks online, without the need to travel during the pandemic. As a EUG member, a company has instant access to the ongoing bid round and virtual data rooms to analyze offered data packages, giving potential bidders early insights in block evaluations. These efforts have been crowned with success to attract new investors to Egypt's upstream business.

Q5: As the world is going forward with the green environment, what are your expectations about the new role of the oil companies?

We are discussing low carbons solutions and green energy with all stakeholders; particularly with the current drive from Egypt and the Ministry to accelerate pilot projects in this field. This creates more opportunities for us to leverage our CCS expertise in country, as we delivered more than 50% of the CCS projects (or carbon capture and storage) in the world.

Q6: How does Schlumberger focus on its responsibilities towards the environment?

Schlumberger is committed to being at the forefront of our industry's shift toward more sustainable energy production—challenging not only ourselves, but also our customers, suppliers and peers to partner on delivering measurable social and environmental progress. Our corporate purpose reit-

erates our commitment to being a more sustainable industry partner. Through strong collaboration with our business partners across our industry, we are committed to making measurable progress in addressing climate change. These efforts will be in and beyond oil and gas, strengthening our commitment to provide customers with innovative energy technologies.

Q7: How do you see the role of companies, especially oil companies, in dealing with global crises like the COVID-19 pandemic, and what steps must be taken by oil companies to avoid heavy financial losses at the crisis times?

Such a crisis is a real pressure test for the world's economy, O&G making no exception. The pandemic also coincided with an unprecedented industry downturn. In this arena, our Schlumberger Safe program was deployed to strengthen and complement our adherence to the Life Savings rules. We have also adjusted our IT systems so they can support our staff able to work remotely, and accompanied all throughout the pandemic with HSE guidance, as well as mental health support. Our Digital capabilities came in full swing as we deployed Remote Operations protocols and technology everywhere possible, reducing the exposure of the crews, delivering operational efficiencies to our clients, and also reducing the carbon footprint of the operations.

Q8: Could you tell us your feedback about ECHO Magazine?

The Magazine is very promising, I feel proud that it is done by the hands of university undergrads; the content and design are well thought out, and the outcome is very good.

Q9: Finally, what is your advice for college students to keep up with the ongoing skills demanding job market?

Be proud to be a part of a high-impact industry such as the O&G. It is also very important that you gain practical knowledge -outside the books- to minimize the gap between academia and the labor market. Be innovative, your ideas count!



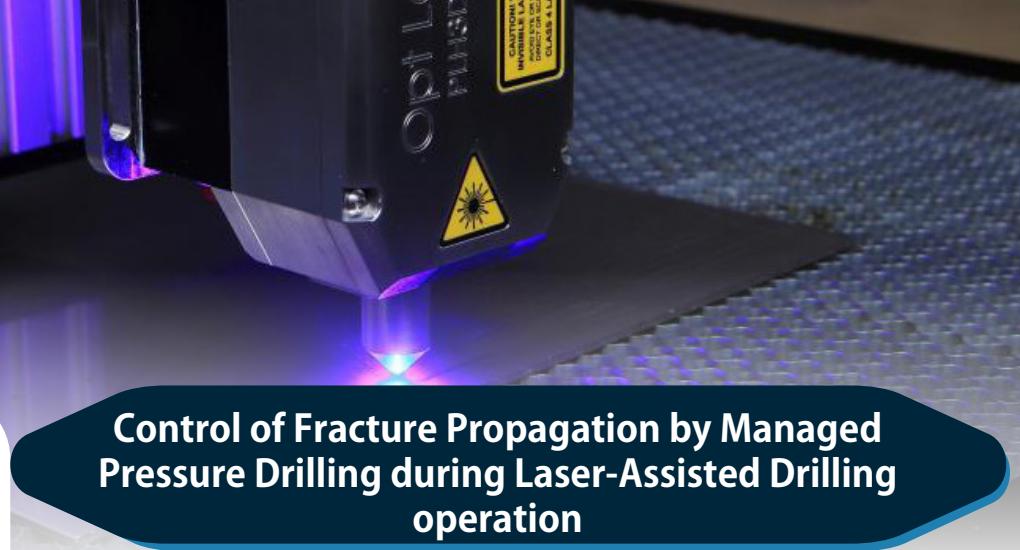
MOHSEN BAZARGAN

He received his doctorate from the Royal Holloway University of London in computational GeoScience. His second doctorate is in Rock Physics/Mechanics from Uppsala University. He has work experience on downhole as well as surface seismic, Downhole and core logging and FlameJet/Plasma/Laser Micro-Tunneling in crystalline rocks

Abstract

The capability level of rotary, as well as first-generation drilling operation, could not be matched for deeply drilling programs. To reach that deep, the increase in drill string length could also cause an additional constraint on hydraulic performance. In this paper, the results of Fiber had been investigated. The disadvantages of using Fiber laser as the main drilling machine are obvious. Some of the important parameters are energy delivery and absorption coefficient. Over the decades of creation, fiber lasers have increased in power from several watts reach to kilowatts.

Also, they have the capability of delivering sufficient rock cutting power via fiber optics.



Control of Fracture Propagation by Managed Pressure Drilling during Laser-Assisted Drilling operation

Introduction:

The use of a laser system could have many advantages in the drilling process, and it just depends on the laser types and laser parameters. Laser-assisted drill bits (LAD), laser-Hydraulic plan, laser-perforation tools in well completion operations, and sidetrack and directional drilling with laser devices are all possible. Also, the experiments indicated that at such high powers, there were some side effects such as an increase in hole depth. The effects include the melting of the rock body and re-melting of separated material, dissolving gas in the lased hole, and fractures propagation which are induced in face of thermal tensions. The interactions on rock samples can weaken the rock strength by generating in-situ thermal stresses which are in the order of magnitude to initiate and propagate fractures.

This weakened rock is then drilled through using normal mechanical drilling techniques and results in faster ROP. This weakness due to fracture propagation makes some problems such as a change in fracture pressure and drilling margin. Managed pressure drilling (MPD) is an effective solution to remove the drilling problems of narrow drilling windows between the pore and fracture pressure. Using this method can manage the bottom hole pressures precisely to avoid any loss and gain condition due to the thermal cracking effects of lasing.

Lasers are available in a variety of shapes and sizes. They are categorized based on several factors:

- Gain medium is solid, liquid, or gas
- Wavelength is in the infrared, visible, or ultraviolet spectral region
- Mode of operation is continuous or pulsed
- Wavelength is fixed or tunable

Discussion and Laboratory Experiments:

Limestone was chosen for these experimental measurements. This sample was collected from the (K2) formation which is a hydrocarbon reservoir located in the Persian Gulf. The measured specification for this sample is shown in **Table 1**. This sample had some mechanical properties which are shown in **Table 2**.

Table 1. Sample Physical Properties

Core	Effective Porosity %	Melting Temperature C	Permeability MD	Thermal Conductivity W/M.K	Bulk Density g/cc
Limestone K2 formation	11	>1500	485	2.25	2.7

Table 2. Rock mechanical properties

Tensile Strength MPa	Length mm	Diameter mm	Maximum Force KN
6.415	55	55	21.7



Figure 1. Limestone Sample before laser irradiation

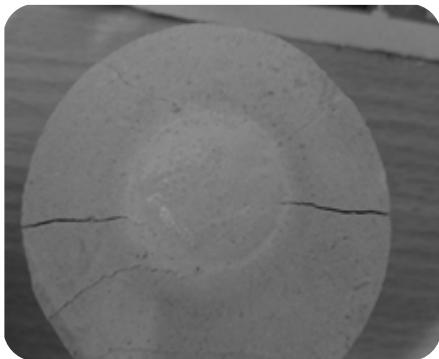


Figure 2. Limestone Sample after laser irradiation

Results show that parts of the samples' surface have interacted with laser-induced temperature to the magnitude that surface was partially melted, and fractures were generated and propagated from the area of first heat faced to all over the rock body.

Numerical Modeling:

As above, for single multi-phase flow based on finite element method, the COMSOL software was used for modeling and analyzing the stress tensor (Thermal & Mechanical) in the rock body and fractures.

Fiber laser used to irradiation to limit limestone samples as intact in simulation for more than one phase. In this section, we consider thermal stress creation and its effect on our specimen during Laser operation. For this reason, we prepare specimens for this experiment with natural cracks and without natural cracks. The stress concentration caused by this heat transfer inside of sample had shown in both fractured and intact rock samples. In this study at the first stage, the 3D simulation for stress was operated. **Figure 3.** Illustrates the thermal and mechanical tension without a crack in limestone that happened in less than 10 seconds and with 950° on its surface.

As it shows in the following images, thermal stresses can be high enough after the time to significantly affect specimens for natural and induced cracks that can force them to propagate also **Figure 4, 5, and 6.** For this

reason, to have a better understanding of downhole pressures during thermally assisted operation we should seriously consider these thermal fractures, their propagation rate, and their direction to predict a better pattern for downhole condition. This propagation starts at 400 C and less than 7 seconds by expansion force in specimens.

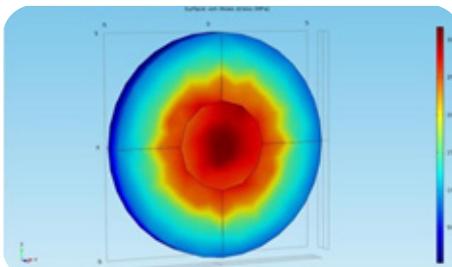


Figure 3. 3D modeling of laser thermal effect in the cylindrical sample

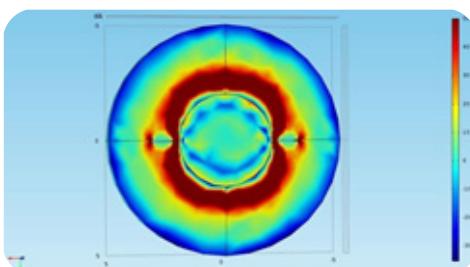


Figure 4. 3D modeling of laser and naturally fractured rock

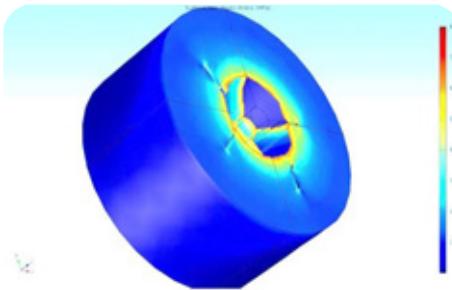


Figure 5. 3D modeling of Laser Fiber interaction to induce temperature to create effective thermal stresses to generate new fractures and propagate the existing ones

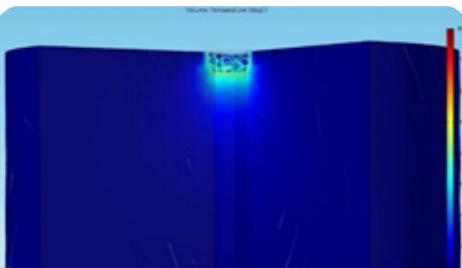


Figure 6. 3D modeling of Laser Fiber interaction to induce temperature to create effective thermal stresses for generating and propagating fractures.

Conclusions:

- Spallation is a rock removal process that utilizes non-contact induced thermal stress to fracture and break the rock and create small fragments before melting the rock.
- The head wave irradiations sent from the machines and incidents on the rocks can be reflected or absorbed.
- Heatwave absorption by the rock is responsible for rock heating, expansion, decomposition, sintering, partial melting, fracturing, and destruction.
- Rock Spalling is the most effective and energy-efficient for continuing long drilling/excavating while melting is more desirable for short drilling/excavating.
- The Spall process requires pretty less specific energy and rock removal is and all of this occurred when the tensile stresses generated due to heat flow given to the rock, become more than the breaking point of the rock.
- The fracturing and propagation start in the rock body from 400C and continues with time till stop the irradiation.
- It shows that the expansion and burst in microstructures are too sensitive to the rate of thermal stress and the size of the laser beam spot.
- The simulations illustrate that mechanism of laser drilling is based on heat transfer and contribution and removing microstructures, during the lasing time and with relation to the power of laser increasing, more thermal stresses were applied hence firstly rock had been compacted in a micro range slightly then expanded more than rock could resist against it.



STEPHEN RASSENFOSS

He is the Emerging Technology Editor for JPT, whose stories cover a range of novel ideas, including those that engineers may find promising but are not sure will work. He also covers other stories including crashes to the outlook for engineers.

Introduction

The work on the drilling floor of the PaceR801 rig revolves around a stout robot methodically picking up sections of pipe and moving them precisely over the drilling center to rapidly connect the pipe.

Jason Gahr, operations manager for unconventional drilling at ExxonMobil, said the research collaboration “demonstrates the ability to optimize drilling using the combined power of robotics, automation, computing, and data.”



A Robot Takes Over the Drilling Floor

Automated drilling today looks like a robot doing all the heavy lifting on a drilling floor. By 2025, there may no longer be anything surprising about it.

In this case, it is a vision of the near future. While the automated drilling floor is new, much of the rest is recently proven technology. Two of the drilling automation programs used—Nabors’ Smart SLIDE and Smart NAV—are already on 30% of the Nabors fleet, said Austin Groover, director of operations for smart products at Nabors. The future of automation depends on how the customers grade the drilling performance. Speed is an obvious, required measure of performance.



Nabors’ PaceR801 automated drilling rig is being used by ExxonMobil to drill wells in the Permian. Source: Nabors.

Are Robots Better?

The R801 is a sign of significant progress on the journey toward fully automated drilling but remains far from the endpoint. Automation has crept into critical drilling functions, from drilling curves to minimizing stick/slip and tripping while connecting pipes.

“The robot and automation can identify what we call ‘odd objects,’ like a bottom hole assembly and get it when needed, said Josh Price, West Texas area manager for Nabors, during a presentation at a recent meeting of the IADC Advanced Rig Technology Committee.

The robot made by Nabors’ Canrig unit can expand its capabilities by choosing from an array of tools, including one that can grip and spin a stand of pipe. It also can handle casing, opening the door for automating

completions as well. There has been little demand for mechanical pipe-handling systems for land rigs because “humans can move fast,” said Paul Pastusek, drilling mechanics advisor for ExxonMobil, while speaking at the ART committee meeting. This has been a barrier to automating pipe handling on land rigs because a mechanized process is needed for automation to take control. Pastusek said the incentive for mechanizing onshore has been low because “making it that fast is hard.”

“We had to get people out of the red zone. He was motivated around that point and a belief in the ability of automation and robotics to consistently deliver top-decile performance every time,” Purvis said.

The two goals are bound together. Getting workers off the rig floor will move people out of a hazardous area. And robotic pipe-handling speed requires a workspace free of humans. A powerful machine programmed to avoid harming people will be slowed by software ensuring it stops before hitting nearby humans, who are prone to unpredictable moves. While there are no people on the drilling floor, the crew there previously will still be working on the rig to perform inspections, maintenance, repairs, and rig moves. Training will be required as rigs get increasingly automated



This automated rig, developed by Huisman, was also designed for rapid moves from well to well. Source: Huisman.

Less Than a Minute!!

So, how fast can Nabors’ automated rig connect pipe? The short answer is: They are not saying. A description of the robot on the Nabors website said it is capable of pipe connection times—from slips to slips—of less than 1 minute. Huisman reported that the rig’s automated tripping system can handle casing at a rate of 1,800 ft/hr after the operator pushes the start button, based on performance data from a test well at a company yard in the Netherlands, said Arthur de Mul, product manager

of modular rigs for Huisman (SPE 199597).

Nabors and ExxonMobil have gone further, using the R801 to drill producing wells. Drillers at the controls are feeling a different form of performance pressure—a growing number of routines required by customers’ evaluations of the best way to manage to drill. Either way, it is hard for workers to consistently execute specific routines over long shifts, day after day. In automated drilling, the human inputs include the drilling plan and the system software. The companies are analyzing drilling performance as they go and making changes driven by their observations. “In terms of the software, we have been learning as well,” Groover said. He said they have been removing some “overengineering” in the control software to improve performance.

Rig of the Future...

The definition of the fully automated rig will evolve. Rigs of the future will vary with technology advances, the evolution of the oil business, and how a list of automation issues are addressed. ExxonMobil is working with four companies that are primary suppliers of automation systems and three other big service companies that supply key components, Pastusek said at the ART committee meeting. “With multiple systems and multiple users, the operator has to be the system integrator.”

In his keynote speech at ART, Willis described the problems faced when trying to interconnect equipment based on different proprietary designs. “When we go to try to buy automation, it’s really hard to get,” Willis said. “We’re largely limited to what’s available from individual drilling contractors. Adding to the confusion, rigs are equipped with various combinations of software and hardware. All of this means that getting an automation system up and running takes time before it becomes possible to begin learning how to use it most effectively. “It takes 9 months to a year to put an automation system in place,” Pastusek said:

Smarter Reactions...

Rigs of the future will need to be designed to accommodate advanced digital data analysis, including adjustments based on analysis using applications provided by customers. “We have certain apps that we want to apply on all of our rigs, so that’s a really important thing to us and it’s something that will be a factor in our rig selection in the future,” Willis said.

Based on its analysis, ExxonMobil lists 150 parameters to be programmed into rigs working for the company, covering everything from the weight on bit while drilling to rate for starting to drill, Pastusek said.



JJ XIAO

He is Senior Petroleum Engineering Consultant working with Saudi Aramco. Prior to joining Saudi Aramco in 2003, he worked at BP-Amoco on multiphase flow, flow assurance and deep-water production engineering. Xiao holds M.S. and Ph.D. degrees in petroleum engineering from the University of Tulsa, Tulsa, OK. He is a member of SPE.

Abstract

This paper describes a new electrical submersible pump (ESP) design concept to overcome the challenges of applications in slim well completions or thru-tubing deployment. The housing of the conventional pump is removed, allowing the pump impellers to have a larger diameter. The impact of this design change on pump hydraulic performance is assessed in this paper.



Housingless ESPs for Slim Completion Wells

Introduction

An electric submersible pump (ESP) system mainly consists of a pump, which is centrifugal, a protector, and a motor. The pump is used to lift well fluids from the downhole to the surface or if at the surface or seabed, transfer fluids from one location to another.

For a centrifugal pump, its performance in terms of flow capacity (Q) and head generation (H) depends on the shaft rotational speed (N), impeller diameter (D) and others. Their inter-dependence is described by affinity laws.

$$\frac{Q_1}{Q_2} = \left(\frac{D_1}{D_2}\right)^3 = \frac{N_1}{N_2}$$

$$\frac{H_1}{H_2} = \left(\frac{D_1}{D_2}\right)^2 = \left(\frac{N_1}{N_2}\right)^2$$

Housingless Pump Concept

Given the restrictive diametrical space in a downhole environment, the use of the radial space needs to be maximized to increase the diameter of the impeller tip, which in turn increases the amount of head that can be developed by the pump per unit pump length.

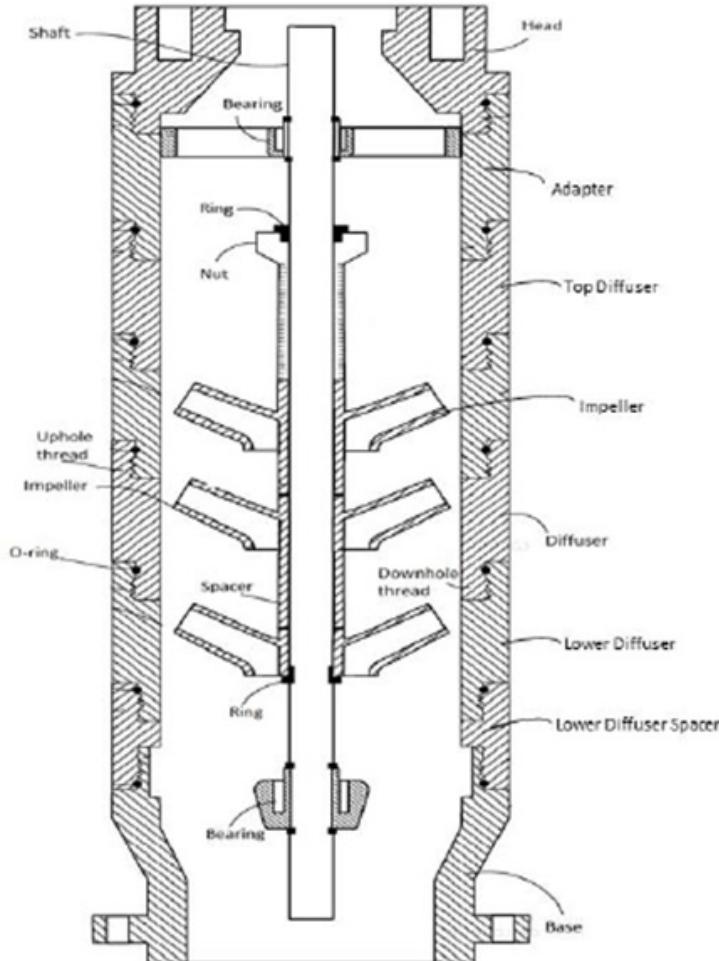
Figure 1 shows the conceptual assembly layout. Some components have been omitted for brevity. In the figure, the pump housing has been removed. The outer diameter of the diffuser has increased to match the previous outer diameter of the housing. The diffuser wall thickness remains the same as before. With such an arrangement, there is additional radial space to increase

the impeller tip diameter.

Pump Assembly

During assembly, with the shaft installed into the pump base bearing, an O-ring is inserted into the required groove on the pump base. The pump base is threaded into the lower diffuser spacer. The lower diffuser O-ring is installed into its groove and threaded into the lower diffuser spacer. The lower

impellers, and/or spacers during their respective sequence in the assembly process. After installing the top diffuser, the corresponding top-most impeller spacer, compression nut and upper two-piece ring are installed to lock all the rotating components onto the shaft. Subsequently, the threaded adapter is installed onto the top diffuser and the pump head torqued into place onto the threaded adapter



two-piece ring, bottom-most impeller, and shaft key (not shown) are installed onto the shaft. An impeller spacer may be installed, if required, otherwise, an O-ring is installed onto the appropriate groove of the next diffuser. The lower section of this next diffuser is threaded into the top section of the lower diffuser. Next, the corresponding impeller and/or spacer are inserted, and so on. The same procedure is repeated for the remaining diffusers,

Pump Performance Assessment

Applying the affinity laws to the conventional and housingless pumps, the increase in calculated flow and head capacity associated with removing the pump housing is provided in Table 2

Table 1-Flow and Head Capacity Increase at constant shaft rotational speed

Conclusion

This paper presents an innovative, housing-less downhole pump for artificial lift applications. With the pump housing removed, the impeller tip diameters are increased. This allows the pump, at the same operating speed as a corresponding conventional pump, to provide more flow capacity and head generation capacity, both desirable to increase well production to the surface. The increase in the head can allow shorter-length pumps to be designed and installed. With the increased pump performance, the operational speed of the pump can be maintained at the conventional pump speed of 3500-4000 rpm. Even if there is a requirement to increase the shaft rotational speed, the increase can still be more moderate, and ultra-high-speed operations may be avoided. Consequently, ESP operational life can be extended, and reliability improved, thereby reducing field operating costs and the likelihood of deferred production.

starting to drill, Pastusek said.

Table 1-Flow and Head Capacity Increase at constant shaft rotational speed

	Conventional Pump Impeller Tip Diameter (in)	Housingless Pump Impeller Tip Diameter (in)	Head Increase	Flow Capacity Increase
538 Series	4.6	5.1	23%	36%
400 Series	3.38	3.88	32%	51%
338 Series	2.638	2.998	29%	46%



TRENT JACOBS

JPT Digital Editor

He has been a journalist & communications specialist for 15 years, most of which have been spent covering the upstream O&G industry. He reports from his hometown of Houston and highlights new trends from the SPE's largest technical conferences in North America, Europe, Middle East, and Asia. Areas of special focus include emerging technologies, advancements in reservoir engineering, and the energy transition.



How a Robotic Revolution Could Replace Hundreds of Thousands of Drillings and Maintenance Roles

Rystad Energy shared details in March 2021 of a new report that suggests the oil and gas industry may see hundreds of thousands of jobs replaced by robotic roustabouts by decade's end. Rystad Energy sees that robots will replace up to 400,000 roles in North America, Europe, and Russia by 2030.

Advanced robotics remains an emerging technology arena for the industry, with limited field deployments. Rystad sees that the expansion of this arena would reduce annual overhead costs by billions of dollars. Robotic drilling systems, one of the more mature components of the oil field's robotic spectrum, are set to reduce average drilling rig crew sizes by 20 to 30%. If these figures are applied to just the US, Rystad estimates a windfall of \$7 billion in labor cost savings. Robots built for inspection, maintenance, and repair (IMR) duties also are seeing a significant uptake in the offshore business.

A Taste of What's to Come

Oslo-based Rystad points to recent deployments of robotics and advanced software that is automating key components of the overall drilling system. The subsea remotely operated vehicle market (ROV), where the potential to eliminate expensive human-operated ROVs and their support vessels have driven the rise of resident ROVs that can work below the waves independently.

- **Kongsberg Maritime's Eelume:** A self-propelled robotic arm that can perform a wide variety of IMR activities.
- **Diamond Offshore's Blowout Preventer (BOP):** A digital twin of the BOP is used to assess the health of its hydraulic and electrical systems.
- **Transocean's safety system:** Wearable tracking devices on all personnel are used to automate safety protocols.

Why are not there yet

While the emergence of robotics in the oil and gas industry seems inevitable, the widespread deployments will take a few years. Robots first need to prove they are truly reliable workers, especially in "complex 3D environments" such as offshore facilities.

One innovation aiming to break past this barrier comes from the renowned robotics developer Boston Dynamics. The firm's commercial inspection bot, described as a "robot dog" and appropriately named Spot, was deployed last year by Aker BP on a facility in the North Sea.

Advanced communication systems are needed to enable human workers to talk effectively to their robotic coworkers.

Rystad says to expect resistance from labor groups seeking to protect their stakeholders from unemployment.



EXPLORING BETTER FUTURE

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Established in 2006, kuwait Energy Egypt is engaged in the onshore upstream oil and gas sector focusing on the investment and operation of oil and natural gas.

We have built a high-quality and diversified portfolio of oil and gas assets in egypt since inception that contributes consistently and significantly in the total level of the oil production of the country.



► Highlights



Four Producing Assets, Three Of Which Are Operated By Kuwait Energy Egypt



Historical Record Of Production Growth And Cash Flow Generation



Water Injection To Maintain Pressure And Achieve Higher Recovery In 3 Fields



Exploration Potential Across All Kuwait Energy Egypt

► Awards

- **PRODUCTION 2018, AMERICAS, SPE-190944-MS** In Challenging Sand Producer Well Handling With Pcp In Eastern Desert, Egypt.
- **PROJECTS 2017, ADIPEC, SPE-188731-MS** In Eas Gas Plant Planning And Construction Challenges.
- **EOG 2019** Operational Excellence Award In Successful Use Of Gas Compression In Western Desert To Reduce Gas Flaring.
- **EGYPS 2019 HSE EXCELLENCE** In Energy Award In Outstanding And Impactful Hse Projects And Programmes.
- **EOG 2021** Operational Excellence Award In Brownfield Award For Renovation Of Area A Field.
- **ISO 14001:2015** Along With 45001 -2018.







LOUIS DESROCHES

Louis is the global director of IoT solutions for process industries at Intel. Desroches is an accomplished executive with more than 40 years of domestic and international experience in all aspects of strategy, planning, corporate business development, mergers and acquisitions, sales and marketing, and operation management gained through multiple assignments covering more than 75 countries.

Most people would agree that society's first challenge is to shift the world toward a new energy paradigm based on technologies that do not contribute to climate change. The global community is committed to transitioning to green energy technologies, and there has been a lot of change in the energy domain lately as a result.



The Energy Sector's Other Challenge: How Digital Technologies Can Help the Oil and Gas Industry Work Toward a Zero-Carbon Future

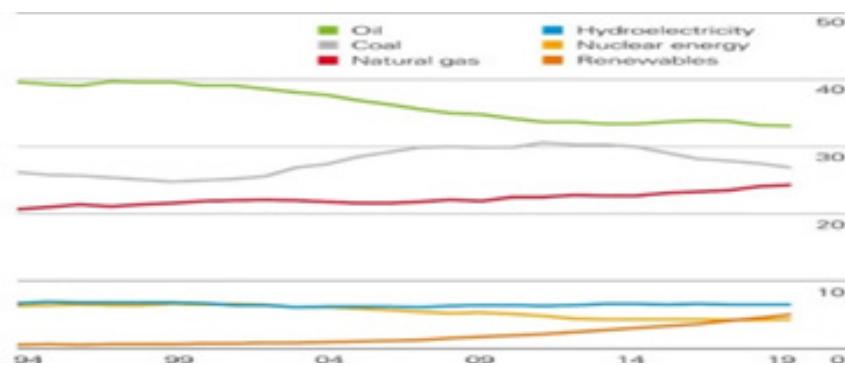


Fig. 1—Percentage share of global primary energy by year. Credit: BP Statistical Review of World Energy 2020.

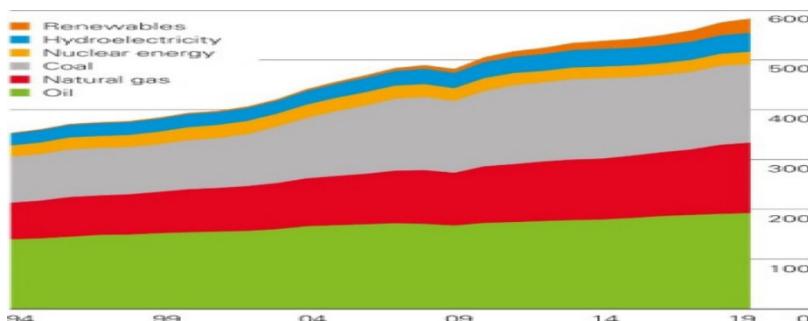


Fig. 2—World consumption of energy by year in exajoules. Credit: BP Statistical Review of World Energy 2020.

The global population is still growing, and living standards in many parts of the world continue to improve—a trend that has historically led to higher per capita rates of energy use. The coming together of these global trends has caused the overall energy consumption of the world to continue growing aggressively.



It gives us a somewhat cooler view of what we have to do now in our efforts: Avoiding new emissions is not enough. “In other words, seeding tomorrow’s renewable energy system and this old, we need to do our best to reduce emissions from current systems just because it strongly suggests that energy sources still exist.

Now, roughly 42% of global greenhouse-gas emissions come from oil and gas. In other words, this 9% is the fraction that the oil and gas industry is positioned to control directly.

Thankfully, however, a few things can be done to make this situation better—and therein lies the energy industry’s other challenge. Most people would agree that society’s first challenge is to shift the world toward a new energy paradigm based on technologies that do not contribute to climate change.

We submit that the following four digital technological developments have the potential to significantly help the oil and gas industry to make progress on this front:

First, the delivery of real-time, systemwide situational awareness has been an objective of the industry for many years, but much of the emphasis of the industry’s smart revolution was on increased production or improving reserves. Now that greenhouse-gas mitigation is a critically important

part of the energy industry, we need to make sure that this design philosophy, which delivered impressive results when our focus was mostly on making more oil and gas, is now re-focused on reducing the sector’s greenhouse-gas emissions.

Second, edge computing also shows potential as a means for reducing greenhouse-gas emissions.

Third, a global data standard known as the Open Footprint Forum has emerged that will make it possible for the industry to work together toward zero emissions.

Fourth, the sector can improve its overall environmental record by choosing computing technologies that are more efficient and vendors that are committed to reducing their carbon footprint, too.

While it is true that the transition to cleaner energy sources has been frustratingly slow, our response to the energy industry’s “other challenge” doesn’t have to be. Through these four technological changes—specifically, continuing the industry’s journey to “smartness,” edge computing, global data standards for measuring emissions, and improvements in the efficiency of digital infrastructure—the oil and gas industry will be able to reduce its greenhouse-gas emissions in the short- to medium-term while we continue to move toward a zero-carbon energy paradigm.

SPEak

SPE Acquires Knowledge is a two-day mega non-technical event presented by SPE Suez offline. It includes group discussions, competitions, sessions, and workshops in various fields such as Digital Marketing, Journalism Career Insight, Data Analysis, HR, Video Making, TV presenting, TOT, and other soft skills presented by +30 specialists.



Criterion

A career development and personal skills magazine, in which different topics are discussed, like career planning, business, AI, entrepreneurship, IoT, digital marketing and soft skills which guide you to your suitable career.



SPE S
Mega P

PACE

Petroleum Arabian Conference and Exhibition is a three-day mega technical event. PACE targets a broader scope of audience, and supported by the most reputable petroleum companies. It includes technical sessions presented by the industry experts, in addition to the competitions that offer the opportunity for winners to get internships in the supportive oil companies.



Petroleum Arabian Conference and Exhibition



Recycling Exhibition

Recycling Exhibition

It is a one-day event initiated by SPE Suez, and represented by the E4ME Team at Suez University.

The main aim of the exhibition is to raise awareness of the duty to conserve natural resources and reduce pollution displaying many recycled models, and there are several posters also shown to focus on global initiatives to raise awareness for recycling were highlighted.

SUEZ
projects



Research School

A 3-month event through which online and offline sessions are held about the basics and principles of researching skills and ethics. At the end of the event, participants are guided by mentors to perform their research.



Chapter Clubs

They are two main projects powered by SPE Suez, and focus in the technical and non-technical sides to clarify the students' background and enriching them with the required soft and hard skills in the labour market.

Skills
club



MISTY KHAN

Senior Manager- Strategy & Consulting, Energy



TOMMY OGDEN

Senior Manager- Strategy & Consulting, Energy



HERVE WILCZYNSKI

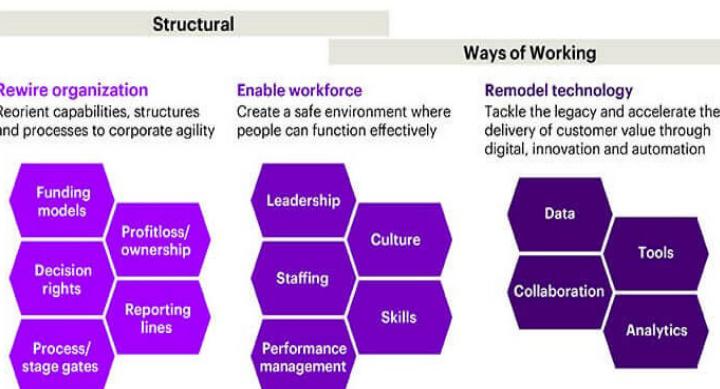
Managing Director – Strategy & Consulting, Energy
Upstream Lead



Workforce Enablement for The Energy Future

I've closed my last post by explaining why energy companies need to look for insights on how to overcome agility barriers, as shown in the Honeycomb chart below. Some barriers are structural in nature. Some are operational. And some barriers that prevent workers from reaching their full potential span both. What we are working on today is this crossing set of human resources development challenges.

Barriers to agility



Lessons from an “outsider”

Creating and encouraging a culture of agility can be a challenge for established / traditional industries. Fortunately, there are many examples of companies doing just that, including Microsoft. Incorporates agility while allowing employees to focus on cultural change.

Prior to transforming its organizational culture, Microsoft experienced growing pains like other companies, including the proliferation of silos. Energy companies face a similar situation.

Honor your past

“Transformation,” means changing from one state to another. It’s rarely about starting over from scratch. It’s about building on your legacy to create something better, more resilient, and ultimately more valuable. Microsoft’s transformation involved capitalizing on its legacy of deep functional expertise in software engineering and problem-solving capabilities and shifting from a siloed culture to focus on the enterprise vision. To get there, its technology leaders committed to a new set of guiding principles:

1. Connecting outcomes to the vision and clearly prioritizing problem-solving based on data
2. Placing user experiences at the center of the design process with practices such as Design Thinking, DevOps, and Agile.
3. Building capabilities within role-specific disciplines—eschewing silos in favor of depth and breadth in multiple areas.
4. Investing in core platforms and systems to drive engineering productivity and set the foundation for speed and agility.
5. Using data and insights to continually assess, refine and prioritize the approach, ensuring that goals and achievements are aligned with the vision.

A new and valuable revenue stream in cloud computing through the Azure platform and a digitally transformed company challenging the traditional orthodoxies of IT operations. Oil companies are pros at developing deep technical skills to enhance production and operations. Rather, it’s how to realize global workflow enhancements through effective cross-functional scaling.

Embrace a purpose-driven mission

Again, Microsoft provides insights for energy companies looking to reinvent themselves through adopting an effective “why” their workforce can get behind. Microsoft’s mission statement is to “empower every person and every organization on the planet to

achieve more”. The statement not only addresses the aspirations and needs of all people but also aligns the enterprise to a common vision. Clearly articulating the “why” and working a purpose-driven mission into day-to-day operations can be a catalyst for finding/retaining talent.

You can’t fake it

Microsoft was committed to having everyone in the organization live its new mission. However, the right performance management metrics are instrumental in driving the right behaviors. Here are the three metrics upon which Microsoft employees are measured:



1. Your impact

What contributions have you made towards your individual goals?



2. How you impact the work of others

What did you contribute to others’ work?



3. How you leverage the work of others

How did you make use of, or build upon, what others contributed?

Management teams in energy companies have often been incented to maximize performance within their siloed organizations (e. g., development and completions teams are rewarded for getting wells in place on time and under budget, regardless of future production impact). If the right performance measures are in place, managers would recognize that taking a hit in areas that may have hurt them in the past will benefit the enterprise in the future.

Enable your workforce to enable your future

To accomplish that goal and compete in the coming years, energy companies need to become more agile, responsive, and purpose-driven organizations. Honoring your past, embracing a purpose-driven mission, and backing up your claims are the building blocks of a cultural zeitgeist change that will ultimately prove to be a fiscally responsible decision. In our next blog, we’ll take a closer look at the structural barrier of “Rewiring the Organization” and show how modifying the enterprise’s core structures, processes and capabilities can augment the cultural shifts described above to further promote agility across the organization.



ALEX MILLS

Alex is the former President of the Texas Alliance of Energy Producers.

Covid-19 was a major factor in the decline of demand for energy in 2020 and it sent shock waves throughout the oil and natural gas industry. ExxonMobil's stock rose from 47 in January 2021 to 71 this week. Chevron's stock rose from 92 a year ago to 127 this week. EOG Resources, based in Houston, witnessed its stock increase from 60 to 102, and Pioneer Natural Resources, based in Irving, experienced similar growth from 115 a year ago to 204 on Wednesday.

OIL



OIL



Oil Industry Rebounds in 2021; Forecasters Predict Solid 2022

The newspaper reported in its January 8-9 edition the S&P 500 Energy sector had the largest gain of any sector at 10. 62% followed by Nymex natural gas at 4. 99% and Nymex crude oil at 4. 91%.

The Texas Oil & Gas Association reports during the fiscal year 2021 the state and local governments received \$15. 8 billion in taxes and royalties, an increase of about 20%.

Chevron's stock rose from 92 a year ago to 127 this week. The newspaper reported in its January 8-9 edition the S&P 500 Energy sector had the largest gain of any sector at 10. 62% followed by Nymex natural gas at 4. 99% and Nymex crude oil at 4.

91%. The Texas Oil & Gas Association reports during the fiscal year 2021 the state and local governments received \$15. 8 billion in taxes and royalties, an increase of about 20%. And the Energy Information Administration reported this week crude oil and natural gas prices should remain strong in 2022 as global demand rises.

"Global oil consumption outpaced oil production for the six consecutive quarters ending with the fourth quarter of 2021, which has led to persistent withdrawals from global oil inventories and significant increases in crude oil prices," EIA stated in its Short-Term Energy Outlook released Jan. 11. EIA forecasts Brent crude oil will average \$75, and West Texas Intermediate will average \$71 in 2022.

"U. S. crude oil production in 2021 averaged 1. 1 million b/d lower than the annual record high of 12. 3 million b/d set in 2019.

We expect annual average U. S crude oil production will increase to 11. 8 million b/d in 2022 and to 12. 4 million b/d in 2023."

EIA stated.



2-DAY EVENT

**+30 SPEAKERS
+200 ATTENDEES**



+ 15 TALKS



**2 PANEL DISCUSSIONS
+15 VARIOUS FIELDS**

+12 WORKSHOPS



MAHMOUD EL HUSSEINY

He is a drilling Engineer and Rig Supervisor at the Egyptian Natural Gas Holding Company (EGAS). His roles included supervising work over operations in the Gulf of Suez and drilling operations in the Nile Delta. He holds a BSc and master's degrees of Science in Petroleum Engineering, and a master's degree in Business Management.

Abstract

In the Deepwater of the Mediterranean of Egypt, a gas field has been producing for a few years. Water broke through in one well, thus, we must drill a new well to compensate for the reduction in production. Years of production led to pressure depletion, which makes it difficult to drill this well conventionally. In this study, we will discuss the combination of MPD and wellbore strengthening (WS). This study discusses the application of a novel combination of MPD and WS.



The Innovative Integration of Wellbore Strengthening and Managed-Pressure Drilling Redraw the Line Between Undrillable and Drillable - Case Study from Offshore Mediterranean Deepwater

Drilling Plan for the 12.25" × 13.5" Section

The plan is to drill the 12.25" × 13.5" hole across regressed Serravallian sands without back pressure, stop drilling, and perform static stress caging, respectively. In addition, perform open hole formation integrity test (OH) FIT across the regressed Serravallian sands, followed by raising the mud weight (MW) to be able to drill the pressure ramp formation.

Drilling Plan for the 8.5" × 9.5" Section

After years of production, the reservoir section is depleted. Thus, the plan is to use MPD with heavy stress caging plan. First, dynamically stress-caging the hole during drilling. Then at the hole section TD, spot a static stress cage pill and pull out of the hole to run a 7 5/8" liner.

Wellbore Strengthening and Managed Pressure Drilling

This section discusses the basics of WS and MPD. In addition, it specifies what we will use from the subcategories of each technique.

Wellbore strengthening

WS is an artificial way to increase the pressure-bearing ability of the formation.

Wellbore Strengthening theories:

Three major theories explain the WS mechanism. The theory we used is:

- **Stress Cage theory: By plugging the fracture near the well-bore (fracture mouth) using loss-prevention material (LPM).**

Constant Bottom-hole Pressure (CBHP) Technique

The Constant Bottom-hole Pressure technique is one of the MPD variants. Often referred to as regular MPD.

There are different modes of this method:

- **Annular-Pressure Control Mode (AP)**
- **Connection Mode "C"**
- **Surface Back-Pressure Mode (SBP)**
- **None Mode**

Drilling the 12.25" x 13.5" Hole Section

Drilling in this section involves two stages: conventional drilling of the regressed sands, followed by the

use of MPD at the lower part of this section to drill the pressure ramp. We loaded the active mud system with stress-cage material. We loaded the active mud system with stress-cage material. We used the MPD in annular pressure control mode while drilling from 5448 to 5584 m. MPD connections were made using "C" mode.

The MWW got narrower. This section's final depth was at 5658.8 m MD.

Drilling 8.5 x 9.5" and 7 5/8" liner Cementing

Drilling 8.5" x 9.5" Hole

We drilled this hole-section eventless to the depth of 5964.5 m using MPD and WS. We used the MPD in annular pressure control mode to maintain 14.5 ppg ESD/ECD. The MW was 14.4 ppg and the rest was applied using SBP.

Due to the high depletion of the reservoir, faster connections in this section were desired, and as the MPD

The crew were more familiar with SBP mode than with the C mode, we decided to conduct MPD connections using SBP mode.

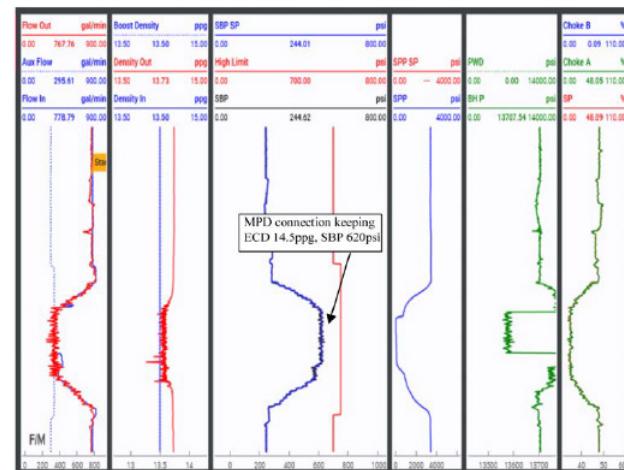
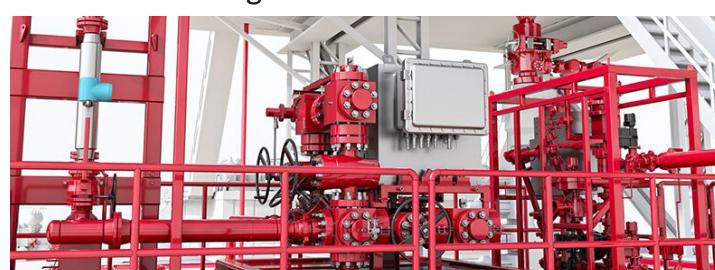


Figure 1—Performing MPD Connection in SBP mode by ramp table keeping ECD of 14.5ppg, SBP 620psi.

The transition from MPD to conventional drilling using heavy riser pill

We used 350 bbl. of heavy riser pill of 19.5 ppg to control the well after removing the SBP. We closed the blow-out preventer and displaced the pill in the riser. We monitored the well for 15 mins (the well was static), opened the blow-out preventer, and pull out of the hole with the bottom hole assembly to the surface to run the liner.

Run & cement 7 5/8" liner

The cement job was challenging since good zonal isolation was imperative to achieve the required reservoir productivity. Moreover, the reservoir was depleted and had a high risk of losses during cementing.

Conclusions

The Integration of wellbore strengthening (WS), and managed pressure drilling (MPD) was successful.

Drilling the 12.25" x 13.5" hole section

- Reduced the ECD
- Mitigated potential good control issues
- Enabled the displacement of the heavy stress cage pill while keeping the BHP constant

8.5" x 9.5" hole section

- Reduced the ECD
- The liner was RIH with MPD system online and managed pressure cementing was performed successfully.
- Decreased the risk of differential sticking



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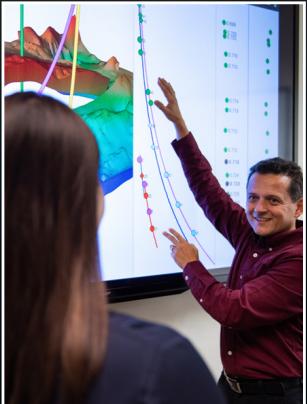


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