Volume 44
August
2021

Petroleum Today

IS THIS THE END OF OPEC?

EGYPT, IRAQ, AND JORDAN: A NEW PARTNERSHIP 30 YEARS IN THE MAKING?

TECHNOLOGY APPLICATIONS

TALENT & TECHNOLOGY

INDUSTRY AT A GLANCE

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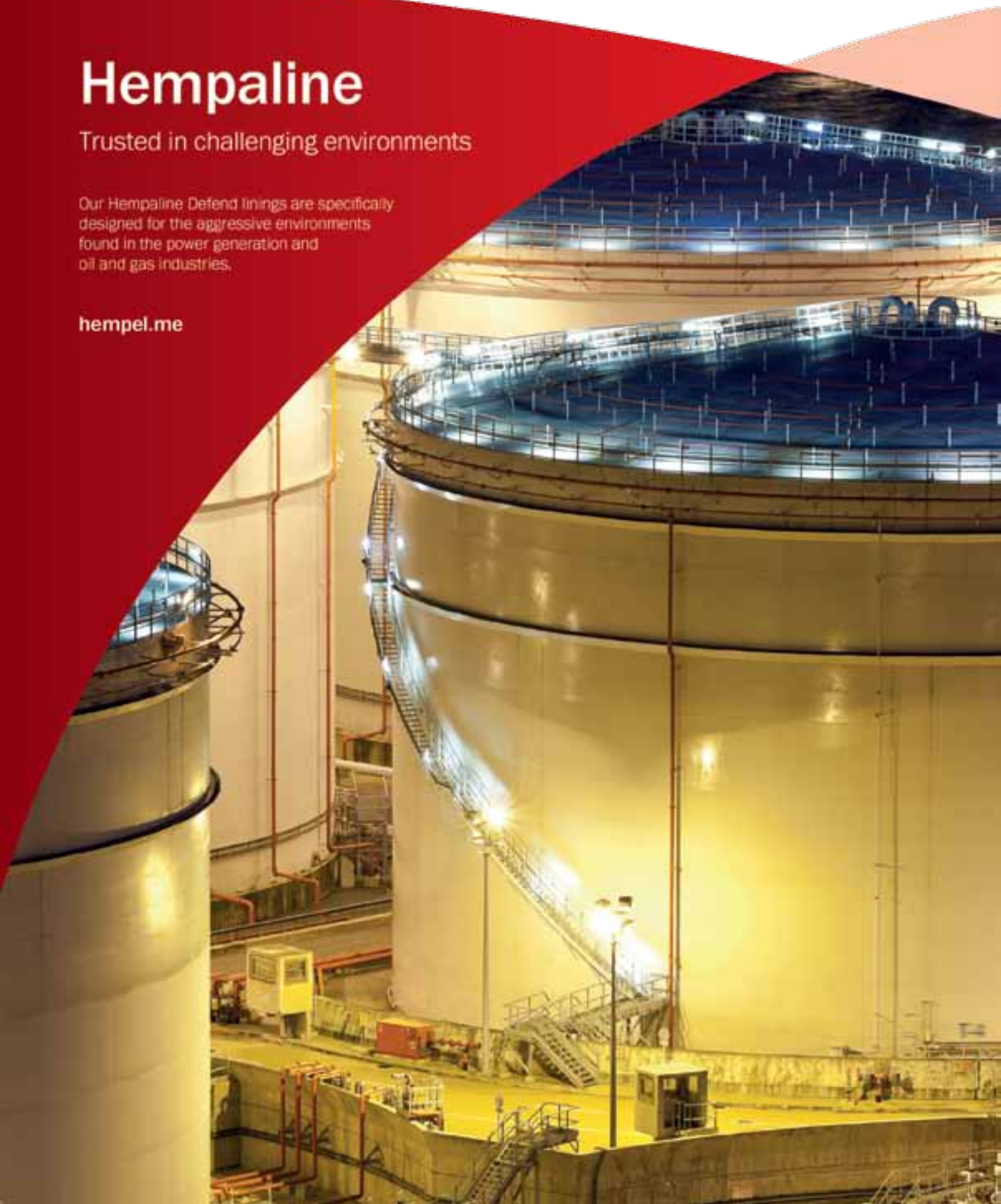

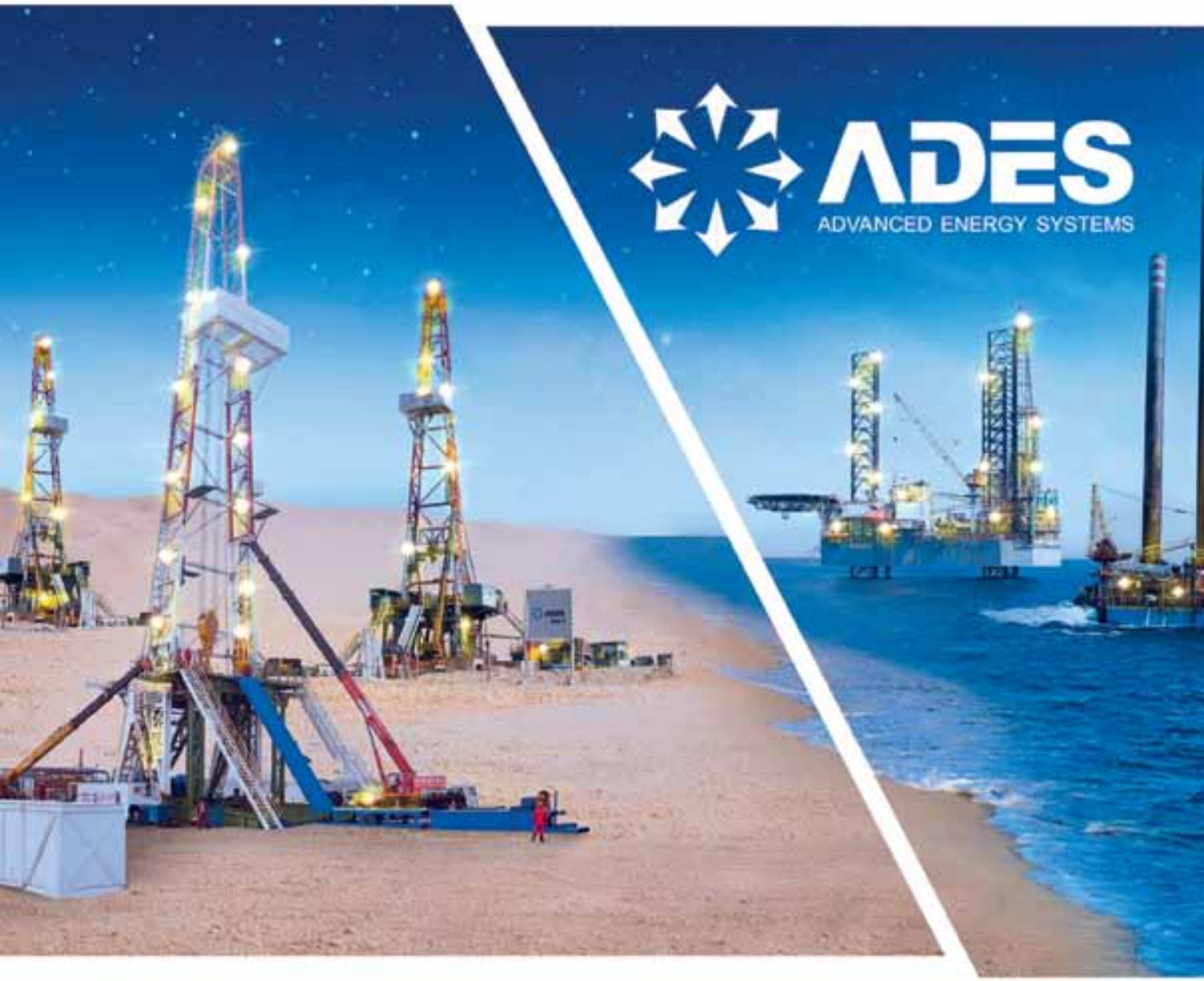

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Petroleum Today

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Cybersecurity
the Forever Problem

Fool me once, shame on you - fool me twice, shame on me. That is an adage that often alerts us to the dangers of knowing and yet not mitigating the repercussions of risk.

And with the resurgence of cyber-attacks globally, it's a wakeup call to cyber readiness.

Back to 2020 cyberattack that resulted in the theft of 1 terabyte of information from Saudi Aramco & the recent cyberattack on Colonial Pipeline's IT system has thrust a spotlight on the oil and gas industry cybersecurity.

In any industry, companies face the prospect of contamination of data in the form of ransomware, data breaches, and intellectual property theft. These risks are magnified in the oil and gas industry due to the political and economic impact of disruptions and highly volatile processes.

What this means for organizations is that their boards should assess the full spectrum of risk from prevention to detection as a business risk and have a plan in place to execute when an attack occurs. The investment required may be far less than the increasingly exorbitant ransom fees and the costs associated with the theft or destruction of data and disruption to the business

In the end, greetings to you, Egypt has pride and dignity

Petroleum Today

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- Camera system is installed for monitoring the test and observing any leakage.
- Internal video borescope for inspection internal parts.
- Wide range of items tested by FMS (Manual Valves, Pipelines, blow out preventers, vessels, etc)

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We undertakes Inspection, Overhaul, Testing and Certification of all types of Pressure Relief Valves , pressure switches, pilot relief valves) with high accuracy equipment likeVentil test unit , Haskel gas boosters , pressure sensors) FMS carries out these jobs according to procedures developed 'In House' conforming to the requirements of BS EN ISO : 2013, 4126 API-527, API-598 and API 576 standards.

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Objective:
Air blowing services as an efficient way to remove construction debris, loose rust, liquids, and other contaminants from process piping.

Application processes:

- Air Flushing for piping diameters less than 6".
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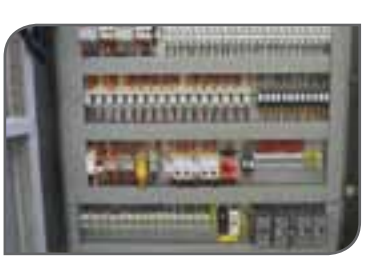

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- Calibration for pressure recorder (Renting and repair).
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- Calibration for silo tanks weight indicator systems.
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- Calibration for torque devices with different kind and ranges.
- Calibration for all kind of pressure and temperature transmitters and transducers.

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Equally applicable to new build modules as well as existing plant , good flange management can provide a single point source of all information relating to the history, make up or any other relevant details relating to all flanges within a system.

Applications:

- Used during engineering construction, commissioning and shutdowns
- Flange break register during shutdown and maintenance

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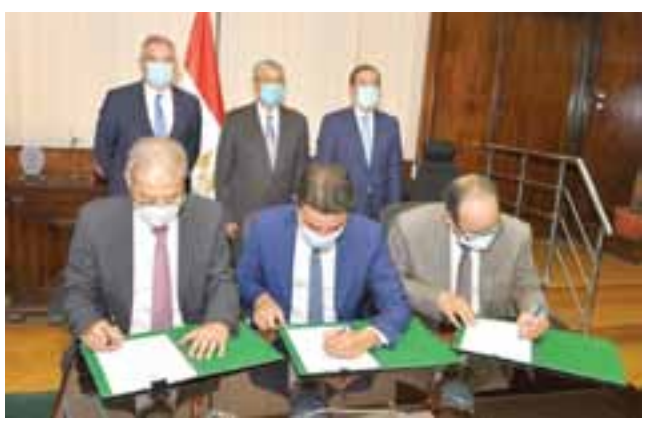
EGYPT NEWS

Egypt, Bechtel Ink Two Agreements for Largest Petrochemicals Complex in Africa

Minister of Petroleum and Mineral Resources, Tarek ElMolla, witnessed the signing of two agreements between Egypt's oil and gas sector and the US company Bechtel.The two agreements focused on the basic engineering and designing works as well as forming the coalition that will be responsible for executing the Red Sea petrochemical complex, located in Ain Sokhna's economic zone.The complex will be the biggest petrochemical project in Egypt and Africa with total investments of $7.5 billion.The project includes a complex for producing added-value petroleum and petrochemical products, such as polyethylene, polypropylene, Polyester, and ship fuel as well as other products that will meet the demands of the local and export markets.

Eni Signs Hydrogen Deal with Egypt

Eni has signed a memorandum of understanding (MoU) on producing hydrogen in Egypt with Egyptian Natural Gas Holding Company (EGAS) and Egyptian Electricity Holding Company (EEHC). The companies will carry out a joint study on producing renewable energy powered green hydrogen. They will also work on blue hydrogen. This involves reforming natural gas and capturing the resulting CO^2, in this instance in depleted natural gas fields.The study will also consider domestic hydrogen use and export options.



Enap Sipetrol Plans More Investments In Egypt

Eng. Tarek El-Molla met with H.E. Ambassador of Chile in Egypt – Mr. Pablo Arriaran and CEO of ENAP Sipetrol and new General Manager of Egypt branch – Ms. Denisse AbudinénButto. During the meeting, Ms. Abudinén highlighted Enap Strategic Plan where one of its main objectives is to expand the company portfolio in Egypt due to the good results that the company has had in the country. Also, it was noted that EnapSipetrol plans to increase its investments in drilling activity in East Ras Qattara, considering the results of the seismic acquisition carried out by the company in its concession areas late 2020. In addition, Ms. Abudinén highlighted the high commitment of EnapSipetrol towards the Health, Safety, and Environment (HSE) standards.

Egypt's Midor Refinery expansion to cost $2.4 bln

The Midor refinery project in Alexandria is projected to cost $2.4 billion, according to a ministry press release.The statement came during the Minister of Petroleum and Mineral Resources Tarek El Molla inspection of the site.Head of the energy and environment committee in the house of representative, HossamAwad Allah, and several members have accompanied El Molla in his inspection tour, in addition to Alexandria Governor, Mohamed El Sherif, as well as other petroleum leading officials.The expansion is part of a strategy targets updating the refineries to meet the domestic market needs of petroleum products, and achieve self-sufficiency by 2023.The new expansion will boost operation capacity by 60%, which currently amounts to 100,000 barrels.After expansion, the Midor refinery will contribute to 40% of the exported volumes to close the gap between production and consumption. It will also double the production of diesel, gasoline, and jet fuel from 3 million tons per year (mmt/y) to 6.5 mmt/y within three years.

The Fifth Ministerial Meeting Of The East Mediterranean Gas Forum (EMGF)

The Fifth Ministerial Meeting of the East Mediterranean Gas Forum (EMGF) convened in Cairo -The Arab Republic of Egypt -under the Presidency of His Excellency Tarek El Molla, Minister of Petroleum and Mineral Resources of the Arab Republic of Egypt, as the current President of the EMGF Ministerial Meeting.The meeting was attended by the Cypriot, Egyptian, French, Greek, Israeli, Italian, Jordanian and Palestinian Esteemed Ministers of Energy and Foreign Affairs, as the heads of delegations of the EMGF Members, as well as the American Acting Assistant Secretary of Energy who attended as an Observer.The Meeting witnessed an important milestone that is the signing of the East Mediterranean Gas Forum HQ Agreement by His Excellency Minister Tarek El Molla on behalf of the Arab Republic of Egypt and the Acting Secretary General Mr. Osama Mobarez on behalf of the Forum.During the meeting, EMGF Members accepted by consensus and welcomed the requests of the World Bank and the European Union to join the Forum as "Observers". Additionally, the meeting witnessed the launch of the EMGF Website to be the forum's first official communication platform highlighting the EMGF's activities worldwide.The Meeting endorsed the EMGF Secretariat Establishment documents, as well as the agreed timeline for the appointment of the permanent Secretary General that will take place by January 2022 and the EMGF budget for 2021 and 2022.The Esteemed Ministers agreed on the next EMGF activities and roadmap and decided to convene for the next Ministerial Meeting in Cairo during the last quarter of 2021.

PETROJET is officially on Guinness Book of Records

Petrojet announced its "175,000 m3 (1.1 Million Barrels) Crude Oil Storage Tank" project in RasBadran, Sinai, has officially entered The Guinness Book of Records.This tank is part of the national level project assigned by the Egyptian Ministry of Petroleum to Petrojet, as main EPC contractor. Looking at the size of the tank, a first of kind technique, that is nothing short of amazing, was engaged to raise the stunning 110 m Diameter and 1,000 Tons Double Deck Floating Roof from assembly level to maintenance level utilizing 240 hydraulic jacks synchronized together to ensure smooth raising of the deck.

ARAB & INTERNATIONAL NEWS

UAE may become first major oil exporter to target net zero by 2050

The UAE is considering a 2050 target to align with a global push to keep temperatures from rising more than 1.5 degrees Celsius from pre-industrial levels, Bloomberg reported.The net-zero charge is being led by Sultan Ahmed Al Jaber, the UAE's special envoy for climate change and its minister of industry and advanced technology.The country aims to make an announcement before the UN climate summit in Glasgow in November, the people said, asking not to be identified for the privacy of the ongoing talks.

Iraq targets 90% self-sufficiency in natural gas by 2025

The Iraqi Ministry of Oil plans to attract a contractor to invest in Akkas gas field, to produce 4,000 million cubic feet of gas by 2025, which represents 90 percent of Iraq's need for electric power production, said Minister Ihsan Abdul Jabbar.Iraq will need more gas for electric power by 2030 to keep pace with the rise in the population, which is expected to increase by 10 million people to 50 million by then, he told Asharq. Iraq will still need to import 15 percent of the gas fuel it needs, he said. Infrastructure is being built in the south to open new outlets to import gas from other countries such as Qatar when needed, he said.Iraq is planning to build a number of power plants in the coming years in partnership with international and Arab companies. Some will use solar energy, while others will run on fossil fuels, including gas that is produced during the extraction of oil, by introducing it into the electricity production system, Abdul Jabbar said.Iraq plans to end gas flaring altogether by 2025, he said.

Eni begins digging offshore well in Bahrain

Italian oil company Eni has started digging the first well in offshore block (1), which is located to the north of Bahrain.The National Oil and Gas Authority (Noga) and the Italian firm signed in May 2019 an exploration and production sharing agreement for offshore block (1), which is estimated to cover an area of 2,800 sqkm, with a depth ranging from 10 to 70 metres.Oil Minister Shaikh Mohammed bin Khalifa Al Khalifa paid tribute to His Majesty King Hamad for his unwavering support.He pointed out that drilling phase will likely continue for several months, adding that exploration operations required time and continuous co-ordination with other specialised firms to achieve the desired goals.Tatweer Petroleum Company has carried out advanced geological and geophysical surveys and drilled experimental exploration wells.

China fund, UAE's Mubadala invest in Saudi Aramco's $12.4bln pipeline deal

A consortium led by U.S.-based EIG Global Energy Partners along with China›s Silk Road Fund and Hassana Investment Co controlled by the Saudi government has invested $12.4 billion in Aramco›s oil pipelines.While the consortium has closed the deal to acquire 49 percent of the equity stake in the new subsidiary, Aramco Oil Pipelines Co, the oil major will retain ownership of the other 51 percent of the shares.Saudi Aramco, the biggest oil producer in the world, will retain title and operational control of the pipeline network and has completed all closing conditions for the deal including all required merger control and related approvals.Other members of the consortium include Samsung Asset Management as well as Abu Dhabi wealth fund Mubadala.According to Bloomberg, the oil giant will look at options to raise money from a deal for its natural gas pipelines, as part of a plan to sell non-core assets. In the second week of June, Aramco raised $6 billion to help fund a large dividend in its first U.S. dollar-denominated sukuk sale.The state run oil producer saw its 2021 Q1 profit rising by 30 percent after a rally in global oil prices. It›s net income for the quarter was 78.6 billion riyals ($21 billion).

Chinese consortium wins Iraq's DhiQar 100,000-bpd refinery

OPEC member Iraq has officially awarded a project to develop a 100,000-barrels per day refinery in the Southern oil-rich DhiQar Governorate to a consortium dominated by Chinese companies, the country's oil minister said. The consortium consists of Chinese state-owned manufacturer Norinco (which owns ZhenHua Oil), PowerChina (Power Construction Corporation of China), CNEC (China Nuclear Engineering & Construction) and a UAE Company.The refinery contains units for hydrogenation, benzene improvement, isomerisation, catalytic cracking (FCC), a (CCR) unit, an asphalt unit, and an electric power production unit.

1-billion-tonne oil, gas area discovered in Xinjiang, China

The Tarim oilfield branch of PetroChina, China's largest oil and gas producer, said they had discovered a new ultra-deep oil and gas area with reserves of 1 billion tonnes.The new area is the largest petroleum discovery in the Tarim Basin in the last ten years, the company said.Located in northwest China's Xinjiang Uygur Autonomous Region, Tarim Basin is a major petroliferous basin in China. It is one of the most difficult to explore due to its harsh ground environment and complicated underground conditions.In the past six years, the annual crude oil output of the oilfield –where the newly discovered reserves locate — had increased from more than 30,000 tonnes to 1.52 million tonnes in 2020, and it is expected to produce 2 million tonnes of crude oil in 2021, the company's general manager Yang Xuewen said.

CORPORATE NEWS

SDX Energy kicks off two-well drill campaign to further tap potential of Egyptian gas asset

SDX Energy Plc on Monday (June 28) kicked off a two-well drilling campaign on its South Disouq gas asset in Egypt.The first well, IY-2, is a step-out development opportunity targeting the high-porosity and permeability Basal Kafr El Sheikh reservoir at 6,600 feet in the Ibn Yunus Field.It will take around a month to complete with results expected late "July-early August". The plan then is to tie it into nearby infrastructure, with production expected late in the third quarter.The second well, the HA-1X, is an exploration opportunity with work getting underway in early August, shortly after the completion of IY-2.It is targeting gross un-risked mean recoverable volumes of 139bn cubic feet (BCF) of gas with a 33% chance of success.It is also expected to take around a month to drill with results expected in mid-September.

ExxonMobil Signs Protocol with MagdiYacoub Heart Foundation

ExxonMobil Egypt announced that it has signed a cooperation protocol with MagdiYacoub Heart Foundation, a press release reported.According to the agreement, ExxonMobil will support the foundation to qualify and prepare a competent nursing staff, providing exceptional training opportunities complying with the latest global health care methods.On this occasion, Youssef Hafez, Public and Government Affairs Manager of ExxonMobil Egypt expressed his pleasure with this cooperation which affirms ExxonMobil Egypt's corporate social responsibility, stating "Hand in hand with MagdiYacoub Heart Foundation, we promote nursing staff's qualifications, reinforcing the foundation's noble mission to provide free state-of-the-art service.

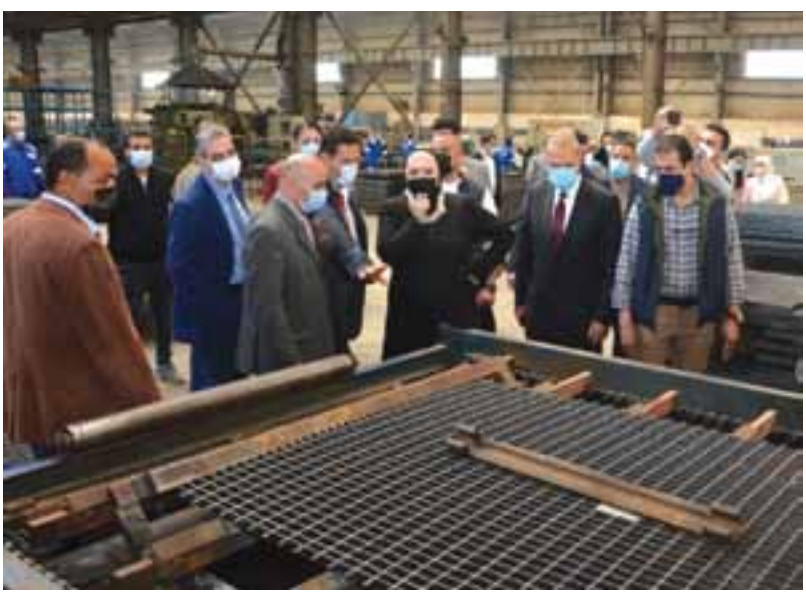
Eni Agrees to Merger of Meleiha and Meleiha Deep Concessions in Egypt

Eni SpA said Tuesday that it has signed an agreement with the Egyptian General Petroleum Corporation and Lukoil PJSC for the merger of two concessions in the country's western desert.The Italian oil-and-gas major said the concessions of Meleiha and Meleiha Deep will be merged and extended to 2036, with the possibility of a further stretch to 2041. The new concession, called Merged Meleiha, will be operated by Agiba the joint venture between Eni›s subsidiary IEOC Production BV and the Egyptian General Petroleum Corporation. IEOC holds a 76% interest in the concession, while Russia's Lukoil holds the remaining 24%.

Shell considering possible sale of U.S. Permian assets

Oil giant Royal Dutch Shell is reviewing its holdings in the largest oil field in the United States for a possible sale as the company looks to focus on its most profitable oil-and-gas assets and grow its low-carbon investments, according to Reuters.The sale could be for part or all of Shell's position in the U.S. Permian Basin, located mostly in Texas. The holdings could be worth as much as $10 billion, the sources said, on condition of anonymity because the talks are private.

Minister of Industry and Trade visit the HadyMeiser Egypt company for steel

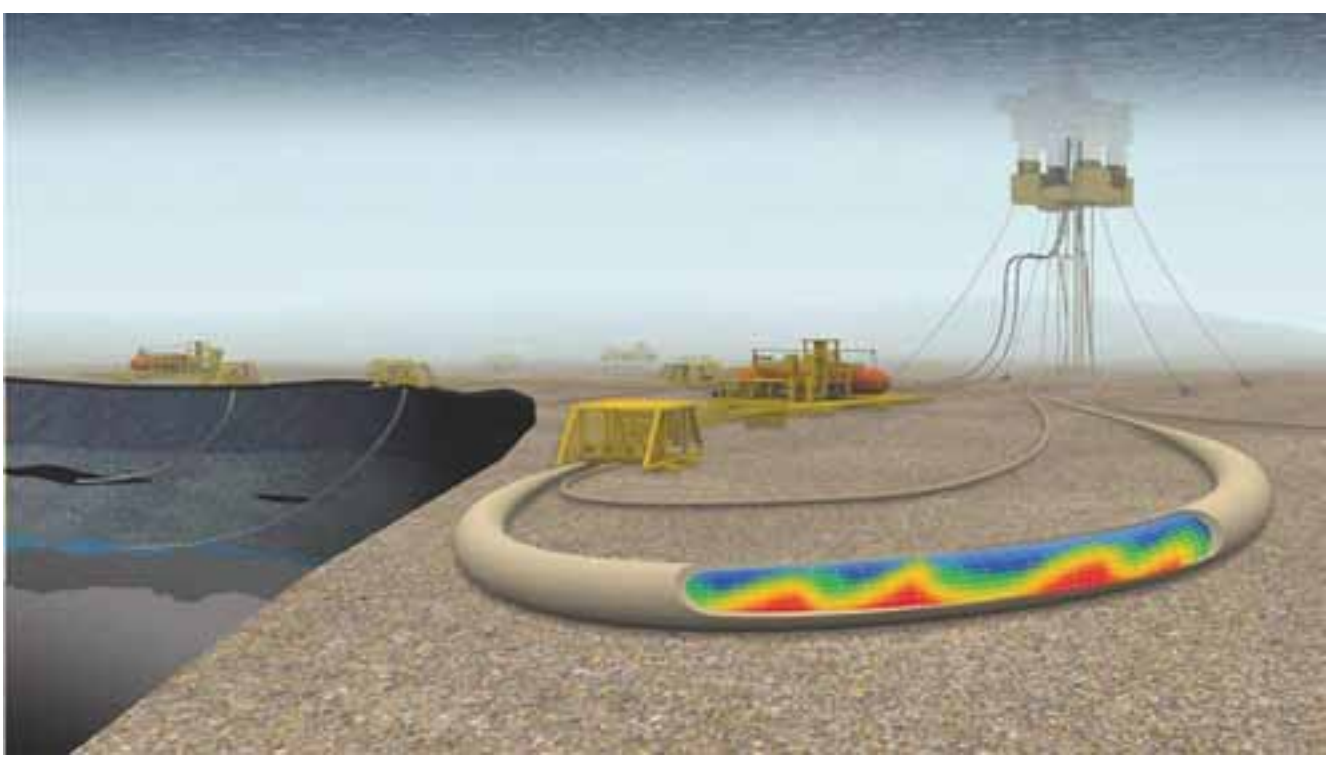


Dr. Nevin Jameh, Minister of Industry and Trade visited the HadyMeiser Egypt company for steel grating during the month of March 2021, accompanied by Mr. Major General Abdel Hamid. Hagan, governor of Qalubia And she expressed her admiration for the tremendous development in the grating industry, which is similar to European industries, and she was received by Eng - Islam Abdel Hadi - Chairman of the Board of Directors of the company andTaha Abu Rabia - General Manager of the company and the general manager of the company explained to her that the company had exported the grating during the year 2020 To Sudan - Singapore - USA – Uganda

ENAP Sipetrol Egypt Appoints new Chief Executive Officer and General Manager

ENAP, the Chilean oil company, informs that starting this month Denisse AbudinénButto takes over as the new Chief Executive Officer ENAP Sipetrol and General Manager ENAP Sipetrol Egypt branch replacing Roberto Mc Leod as ENAP Sipetrol Egypt branch GM as he reached his retirement age.Mrs. Abudinén held the position of Corporate Manager of Exploration & Production Business Line (E&P) at ENAP.

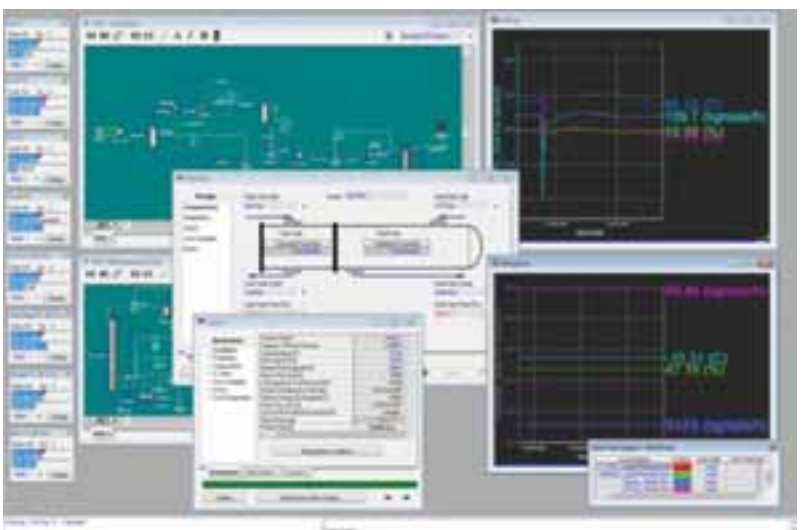
Kongsberg Oil & Gas Flow Simulation Technologies



[Fig (1) Kongsberg Ledaflow technology]

Based on models that are closer to the actual physics of multiphase flow, LedaFlow® provides a step-change in fidelity, quality, accuracy and flexibility over the previous generation of multiphase flow simulation technology. Tested and field proven, Ledaflow® provides an increase in model detail that offers the flow assurance engineer a greater understanding of well and pipeline flow behavior.

Honeywell UNISIM ® Design Suite



[Fig (2) Honeywell UNISIM Suite]

UniSim® Design Suite, Honeywell's process simulation solution, is the ultimate tool that engineers need to develop, enhance and re-use models throughout a project or plant-asset lifecycle. With an integrated steady-state and dynamics environment and a user-friendly interface, UniSim® Design helps engineers create and optimize plant designs and monitor asset performance, thus enabling stable operations and plant safety.

GASSONIC Observer-I Ultrasonic

Instantly detect pressurized gas leaks with this high-precision, omni-direction acoustic detector.

Works even when traditional methods of gas detection are unsuitable or dependent on ventilation. Features Artificial Neural Network (ANN) technology that distinguishes between real gas leaks and false alarm sources without requiring any in-field training. This breakthrough technology provides an industry-leading detection range (up to 28 m) reducing the number of detectors required. Ideal for use in complex, outdoor pipeline systems

[Fig (3) Acoustic gas detector]

[Fig (4) Allison Hydraulic Fracturing Transmission]

Allison Transmission Launches Hydraulic Fracturing Transmission

Forego fusion:
new methods for joining HDPE pipe

The new Refuse-to-Fuse™ Victaulic Style 905 coupling is specifically designed to quickly join 2″-6″ high density-polyethylene (HDPE) pipe and eliminate the need for fusing.

Features & Benefits

Rated for use with HDPE pipe ranging from SDR 7–17

Coupling ready for immediate installation – no cooling or heating time required

Visual confirmation of correct installation when coupling housings are fastened bolt pad to bolt pad

Stainless steel retaining rings engage the full pipe circumference allowing the joint to perform to the rating of the pipe while also providing a self-restrained joint

Save time and money – no fusion equipment or specialty tools required

Can be installed with standard socket or impact wrench

[Fig (5) HDPE pipe connection]

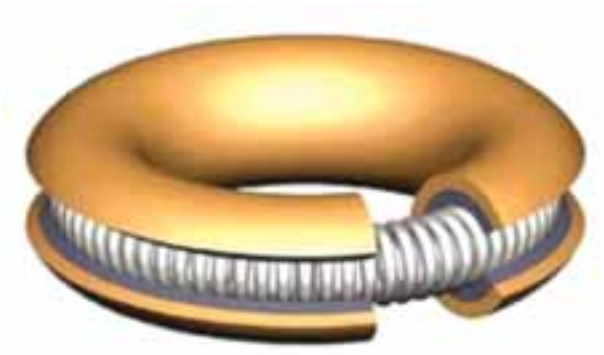
Purpose-built, based on the specific performance requirements of the customer, the FracTran is an all-new Oil Field Series™ transmission, designed to meet the unique and continually evolving demands of the hydraulic fracturing industry.

"As hydraulic fracturing fleets and operators move toward higher horsepower, smaller spreads to reduce their environmental footprint, and seek shorter times to reach depth in search of improved sustainability, efficiency and profitability, Allison is innovating with them to remain a desired partner of choice for the energy market," said John Coll, Senior Vice President of Global Marketing, Sales, and Service at Allison Transmission. "Allison is committed to our energy customers and has invested significant resources to bring them the product they demanded, FracTran."

Based on current market demand, FracTran will be launched with a rating of 3300 horsepower and 10 000 lb.-ft. of input torque. However, FracTran is capable of up to 3500 horsepower with no hardware modifications required. Key benefits and specifications of the FracTran include: high reliability with a service life up to 25 000 hours; an overhaul that provides a second life without hard parts replacement resulting in low total cost of ownership; and eight ranges available with multiple gear ratio options. In addition, the FracTran offers filter and fluid life prognostics, a transmission-mounted control module, torsional measuring diagnostics and an on-rig telemetric gateway.

Technetics Group HELICOFLEX ®

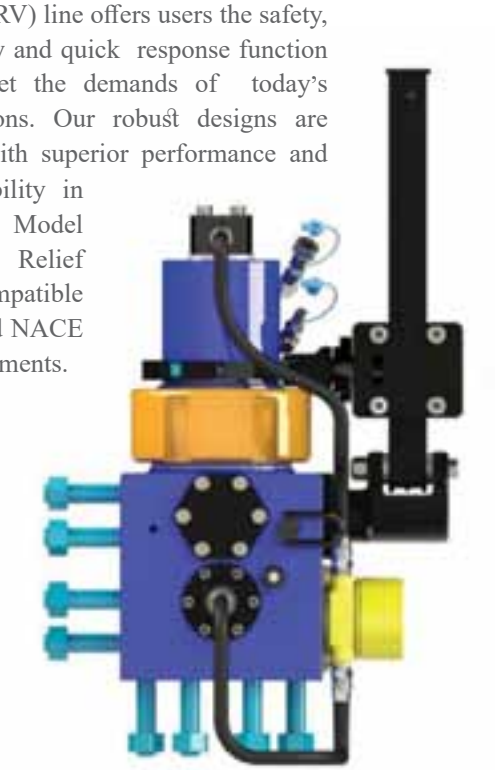
The sealing principle of the HELICOFLEX® family of seals is based upon the plastic deformation of a jacket of greater ductility than the flange materials. This occurs between the sealing face of a flange and an elastic core composed of a close-wound helical spring. The spring is selected to have a specific compression resistance. During compression, the resulting specific pressure forces the jacket to yield and fill the flange imperfections while ensuring positive contact with the flange sealing faces. Each coil of the helical spring acts independently and allows the seal to conform to surface irregularities on the flange surface.



[Fig (6) TECHNETICS Group HELICOFLEX]

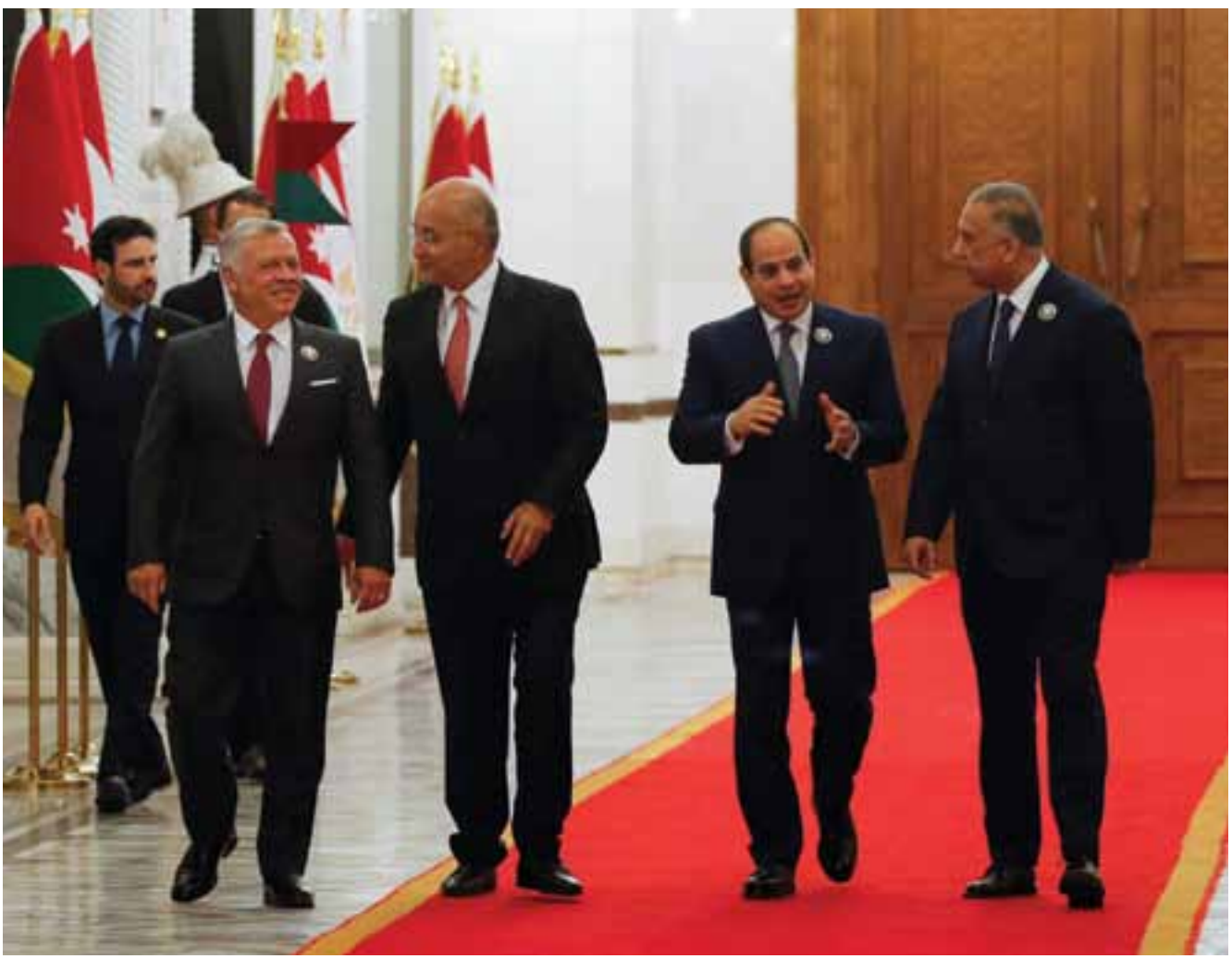
CORTEC Fluid Control

The CORTEC Model CRV Pressure Relief Valve (PRV) line offers users the safety, reliability and quick response function required to meet the demands of today's drilling operations. Our robust designs are manufactured with superior performance and field serviceability in mind. CORTEC Model CRV Pressure Relief Valves are compatible with API 6A and NACE MR0175 requirements.



[Fig (7) CORTEC Pressure Relief Valve]

EGYPT, IRAQ, AND JORDAN:
A NEW PARTNERSHIP 30 YEARS IN THE MAKING?



In April, the news that Iraq was mediating between longtime rivals Saudi Arabia and Iran captivated Middle East watchers. Iraq's new role as a Saudi-Iran intermediary comes as the Saudis have taken concrete steps in recent years to build a meaningful relationship with their northern neighbor, such as reopening their border last November for the first time since 1990. Yet while the new Saudi-Iraq relationship is indeed noteworthy, Iraq has simultaneously been forging a regional partnership with two other Arab states: Egypt and Jordan. Indeed, Baghdad hosted a summit in late June attended by Egyptian President Abdel-Fattah el-Sisi and King Abdullah II of Jordan. It was the fourth time leaders of the three countries have met together since March 2019, and the first time on Iraqi soil. It was also the first visit by an Egyptian president to Iraq in more than 30 years.

At first glance, a partnership grouping together Egypt, Iraq, and Jordan appears rather strange. One commentator, not without reason, called it an alliance composed of the "region's odd fellows." However, Iraq has historically had important economic relationships with both Egypt and Jordan, and in fact the three countries — along with North Yemen — came together in a very short-lived partnership called the Arab Cooperation Council (ACC) from 1989 to 1990. Today, like 30 years ago, economic cooperation lies at the heart of the trilateral relationship. But then and now it has also had strategic goals. And in the longer term, the new partnership potentially heralds a far more ambitious project to bring together not just Egypt, Iraq, and Jordan, but the countries of the Levant more broadly.

BACK TO THE FUTURE

Iraq's close economic ties to Egypt and Jordan date to the 1980s, during the Iran-Iraq War. Jordan became Iraq's economic lifeline at that time, serving as a conduit for imports and oil exports through the port of Aqaba. Jordan also received most of its own oil, highly subsidized, from Iraq. King Hussein was Iraqi dictator Saddam Hussein's closest ally at the time, visiting Baghdad often during the war. Egypt, meanwhile, saw more than one million of its citizens relocate to Iraq during the 1980s to fill jobs made vacant by the mass conscription of Iraqi men into the armed forces — so many that Iraq constituted Egypt's largest source of remittances.

Soon after the end of the war, the three countries, joined by North Yemen, formed the ACC. Each had a political motive to forge the pact. All wanted allies to balance against the Gulf Cooperation Council, the Saudi-led alliance of the six Gulf monarchies created during the war. Saddam owed the Saudis billions of dollars in loans from the war, while Amman and Sana'a had longstanding concerns about Saudi expansionism and interference in their internal affairs.

Nevertheless, economic cooperation formed a central pillar of the formation. The ACC was envisioned as a mechanism to increase trade among member states, as well as to facilitate labor movements, particularly from Egypt and Jordan to Iraq. The ACC had barely launched before it fell apart due to Saddam's invasion of Kuwait in August 1990. But even during the 1990s, while Iraq faced an onerous international sanctions regime, trade between it and Egypt and Jordan continued. Iraq continued to be Egypt's second biggest export market, under the U.N. Oil-for-Food Programme. Jordan remained dependent on Iraqi oil, which it continued to receive with U.S. acceptance. King Hussein only very reluctantly broke with his long-time friend, Saddam, when Washington agreed to welcome Jordan back as a close ally.

Not surprisingly, therefore, Egypt and Jordan were among the first Arab states to build ties to the new Iraq following the 2003 U.S. invasion. In 2005, then-Jordanian Prime Minister Adnan Badran became the most senior Arab official to visit Iraq since the invasion; three years later Abdullah was the first Arab head of state to visit. Egypt and Iraq reestablished trade ties in 2004. The following year Cairo sent an ambassador to Baghdad, although tragically the Egyptian diplomat was assassinated by al-Qaida in Iraq a few weeks after his arrival. The Jordanian embassy in Baghdad was also among the first targets of al-Qaida in Iraq.

The development of Iraq's economic relationships with Egypt and Jordan was significantly hindered by its sectarian civil war of the 2000s and the rise of the Islamic State group in the 2010s. But in recent years, the three countries have again taken meaningful steps to rebuild economic ties. In 2017, Egypt began to receive oil from Iraq, A delegation from the Egyptian Petroleum Ministry visited Iraq in February 2017 to finalize the draft agreement to import crude oil, Egypt aimed to import 1 - 2 million barrels per month from Iraq. In February 23, 2017, "The Iraqi Oil Marketing Company SOMO signed a contract for oil exports with the Egyptian government" Iraqi ambassador to Cairo Habib Mohamed Hady al-Sadr said. The move follows Saudi Arabia informing Egypt in November that shipments of oil products expected under a $23 billion aid deal had been halted indefinitely. Jordan began to take delivery of Iraqi oil in 2019.

Since at least 2017, the three countries have anticipated undertaking a major joint energy project, linking Iraq's oilfields in Basra to Aqaba via pipeline, which could be further extended to Egypt. Meanwhile, Iraq has also looked

to Egyptian and Jordanian companies for the massive reconstruction projects it will need to undertake to recover from four decades of wars. There are also plans to connect Iraq to Jordan and Egypt's electricity grids to reduce its dependence on electricity exported from Iran.

Nevertheless, all three countries are cash-strapped — a major challenge for their ambitions. In theory, as part of the new alliance, Baghdad is expected to hedge its vast oil and gas resources in return for "investments" and "human resources" from Egypt and Jordan. At one point, investments by Jordan and Egypt were even sold as a replacement for Iraq's $10 billion oil-for-infrastructure agreement with China.

BUT WHERE WOULD THE MONEY COME FROM?

Politicians in Baghdad are star-struck by Egypt's rapid infrastructure expansion, which aided in supporting GDP growth of 5% in 2018 and 2019, before the COVID pandemic struck. Largely fueled by debt, Cairo now owes the IMF $19 billion, the second-largest amount after Argentina. Egypt's debt-to-GDP ratio is projected to rise to 93%. Even with high oil prices, Baghdad's state budgeting is still rigid and weighed down by its large current expenditure, at 77%, meaning little money is left over for infrastructure spending. The World Bank also estimates that total government debt had reached almost 71% of GDP in 2020.

Jordan just borrowed $1.45 billion from the World Bank in June to "stimulate inclusive growth and create more jobs." This is on top of another $1.3 billion approved a year before by the IMF, which forecasts that unemployment is "rising to a record high of 24.7%." Taking social security holdings into account, the World Bank estimates Amman's debt reached 106% of GDP last year. None of the three countries is in a position to borrow more without risking further economic pain.

That leaves a major question mark over how the projects planned by the governments of this alliance can be financed. Stuck on the drawing board for at least a decade, the oil pipeline to run from Basra to Aqaba, now with a further extension to Egypt, was once expected to cost $18 billion if Syria were included. Adding plans to revive the old Arab Gas Pipeline would boost this even further, to an astronomical figure. Furthermore, Egypt wants to sell electricity to Iraq and Jordan; high-voltage transmission lines are expensive.

But what about private investment? The Iraqi private sector is nascent and dependent on government spending. Looking solely at Baghdad's needs, unlike well-endowed Chinese state firms, Jordanian and Egyptian contractors are expected to rely heavily on Iraqi funds to finance infrastructure projects. Even when syndicating finances on their own, eventually the Iraqi government will fully foot the bill either in cash or oil. This is especially problematic for projects where Baghdad is unable to recoup the spent funds anyway — the power sector, where bills go almost entirely uncollected, being a prime example.

It will also be a hard sell for politicians in Baghdad to promote an alliance that would create jobs for non-Iraqis given the country's own problems on that front. In June, under popular pressure, Baghdad deported thousands of foreign laborers. Demands for employment have been central in protests that took over the country in 2019. Iraq's unemployment rate rose to 27% and its poverty rate now stands at 25%.

At the end of last year, Egypt and Iraq agreed, in effect, to trade Iraqi oil for Egyptian reconstruction assistance. In the longer run, the three countries will need to look to outside parties for financing.

While Iraq is heading to elections this fall, most of its leaders appear enthusiastic about the partnership's economic promise. Discussions for the project were already underway during the premiership of Haider al-Abadi. Subsequently, Adel Abdul-Mahdi, on his first trip abroad as prime minister in March 2019, attended the first trilateral summit in Cairo. President Barham Salih met with el-Sissi and Abdullah in New York, on the sidelines of the U.N. General Assembly, in September 2019. Current Prime Minister Mustafa al-Kadhimi headlined Iraqi attendance at the third summit in Amman in August 2020.

A NEW LEVANT?

Economic cooperation is the driving force behind the formation, but as in 1989, each of the three has a political incentive to come together. Iraq wants to diversify its regional relationships beyond Iran — though it is important to emphasize that Baghdad does not aim to develop its relations with its Arab neighbors at the expense of its relationship with Tehran. Iraq wants friendly relations with both. The Iranians, for their part, might actually look favorably on Iraqi economic cooperation with Egypt and Jordan – if, down the line, they will also be able to benefit economically. By contrast, if Egypt and Jordan, and for that matter the United States, seek to use the formation as a means to isolate Iran, Tehran will undoubtedly sow problems. The extent to which Iran may be allowed to benefit will ultimately depend on the outcome of its ongoing negotiations with the Biden administration.

The three countries have discussed plans to establish a transport corridor between Egypt and Iraq, through Jordan.

Egypt and Jordan, meanwhile, want to reduce their dependence on Saudi Arabia. For Jordan, this is particularly critical following reports of Saudi involvement in a recent conspiracy to destabilize the country and replace King Abdullah with former Crown Prince Hamza. The new formation would give Jordan, as well as Egypt and Iraq, greater leverage vis-à-vis Saudi Arabia and the other Gulf countries.

But the most significant, if still implicit, political objective may be to provide a means in the longer term to rehabilitate Syria. Leaders from the three countries have begun to call their formation "the new Levant," or "al-Sham al-Jadid" in Arabic. Sham is a reference to the city of Damascus, and more broadly to Syria and the Levant. By definition, there cannot be a new "Sham" without Syria. Perhaps unsurprisingly, Egypt, Iraq, and Jordan have let it be known that partnership in their new bloc will be open to other countries in the region, without specifying which. In fact, this aspect of the new formation also has roots in the short-lived ACC experiment. ACC member states did not view their partnership as exclusive, and there was some anticipation that Syria and Lebanon might have joined at some point.

The Egypt-Iraq-Jordan formation is in many ways the resurrection of the old ACC, which was disrupted for 30 years by instability and war in Iraq. The U.S. has welcomed and should continue to support this growing partnership of three of its close partners in the region. In the longer run, if Syria and Lebanon are invited to join, U.S. support would be complicated by the continuation in power of Bashar al-Assad, rightfully seen as a war criminal. Nevertheless, the "new Levant" project could ultimately serve as a means to undertake the massive reconstruction needed in Syria and to reduce the considerable economic misery of the people there and in Lebanon.

After a decade of war in Syria, and four decades of war in Iraq, there has never been greater need for a new vision for the region. The nucleus of a new beginning might just lie in an economic partnership first launched more than 30 years ago.

USING NATURAL GAS FOR CARS AS AN ALTERNATIVE TO GASOLINE: IS IT THE FUTURE?

Egypt's government recently announced a multi-year plan to convert car engines running on traditional fuels to dual-fuel engines that can run on gasoline and natural gas. A parallel initiative sets to replace obsolete vehicles used in Egypt's public transportation system with newer ones equipped with natural gas tanks.

Egypt is planning to rise the country's gas natural vehicle (GNV) filling infrastructure from 306 to 1,000 stations by the end of 2021, Minister of Petroleum and Mineral Resources, Tarek al-Mulla, stated in a meeting two months ago. The goal set represents an increase of Egypt's GNV retail filling network by more than 200%.

The plans will be partially achieved by introducing NGV filling services at existing fuel stations offering octane. In addition, the private sector will be encouraged to roll out new NGV exclusive filling stations.

At the meeting, Tarek al-Mulla pointed out to the Government's goal to transform 450,000 fuel-powered into gas-powered vehicles during the period 2020 - 2023. Out of those, 250,000 units would be brand-new vehicles supported within a funding scheme offered to consumers.

From July 2020 until now, 42,000 cars have been transformed to gas-powered vehicles, raising the country's count to a total of 360,000 cars running on natural gas.

Decommission ageing cars

Egypt is seeking to replace cars older than 20 years that are still in service and encourage the use of gas-powered vehicles to protect the environment and improve air quality.

"In light of adequate gas supplies after recent discoveries in Egypt, there is a tendency towards using natural gas instead of Oil, a shift that will result in savings and protecting the environment," Minister of Trade and Industry Neevin Jama told private Egyptian TV station Extra News."For example, if the petrol costs 4,000 Egyptian pounds (Dh923), the cost will drop to 2,000 only," she argued.The cost of converting the Oil-fired car to the gas ranges from LE9,000 to LE12,000 that will be paid in instalments, the minister said.

Is It the Future?

News AUC spoke to Ahmed El-Banbi, professor of petroleum engineering and department chair, and Abdel-Aziz Khlaifat, professor of petroleum engineering, on the impact of these changes.

El-Banbi clarifies that the newly announced initiative isn't precisely «new»; it's been in place in Egypt since around 1995. However, the idea is undoubtedly being reinvented and more advocated for.

Both El-Banbi and Khalaifat support the decisions and find them feasible theoretically, technically and environmentally. Khlaifat highlighted that natural gas is a low-emission fuel that's environmentally friendly compared to petroleum-based fuel, affirming that this is an "excellent measure" for society's health and well-being.

By the same token, El-Banbi finds the replacement of old cars with new natural-gas operating ones essential. New engines would pollute the environment much less than old ones, reducing carbon dioxide emissions. They're also manufactured to be more efficient in their fuel consumption, and, accordingly, they consume less fuel per kilometer. It›s a win-win for the environment and car owners who will pay less for fuel consumption, in addition to the more obvious benefits of less maintenance, breakdowns and road congestions.

" When we talk about natural gas cars, we need to distinguish between two types of gas: liquefied natural gas and compressed natural gas,» said Khlaifat. «Compared with petroleum-based fuels, compressed natural gas reduces nitrogen oxide emissions by 30 - 60% and carbon-monoxide emissions by up to 97%. Dumping less of these gases into the atmosphere will protect the environment and improve people's living standards."

From an economic perspective, the conversion to natural gas achieves economic and financial savings for consumers and the economy. According to Khlaifat, natural gas is abundant and inexpensive compared to oil. The cost of modifying car fuel systems will be paid back, maybe during the first year of operation and consumption, due to the cost-effectiveness of natural gas. El-Banbi agrees, mostly when high-utilization cars are involved.

" Money is spent to convert cars to natural gas or dual-fuel gas because you add components to make this conversion," said El-Banbi. "Even if you're producing cars that run on natural gas, they'll be slightly more expensive. It makes economic sense to convert public transportation vehicles to natural gas because the return on investment comes from the money you save running on natural gas. But for your car, and my car, it's not significant savings. High-utilization cars move around more than 10,000 km per month, while ordinary cars can probably move around 1,000 km per month. When you consider it per km distance, it makes sense to start with public transportation. "

Egypt plans to convert around 450,000 cars to natural gas over three years. El-Banbi and Khlaifat acknowledged that many vehicle owners will not make the conversion without government incentive schemes, posing a major challenge. «The question is how the government will meet Egyptians halfway, if not all the way, with the cost issue,» said Khlaifat.

El-Banbi echoed the same sentiment. «Banks can help Egyptians with purchasing new cars," he said. "They can develop a scheme based on current consumer fuel spend: see how much they're spending on fuel and encourage them by offering them a car loan while making the monthly loan installment equivalent to their current fuel spend. If you encourage microbuses and taxis, particularly with payment schemes, the initiative will be feasible."

However, cost isn't the only challenge. The current number of gas stations won't cater to the upcoming shift. «During the initial phase of the project, Egypt will face some car jams in gas stations. It would be a smart idea to start constructing

new gas stations before the commencement of the project,» said Khlaifat, highlighting that most current gas stations don't offer compressed natural gas.

" You can't only work on converting the cars; you need to build the needed infrastructure. There are enough gasoline stations in Cairo, but not enough natural gas ones and not enough slots," El-Banbi asserted, adding that refueling a car with natural gas takes a longer time than fueling the same car with gasoline. "You need enough, bigger and more stations. You're also limited by where you can build natural gas stations because you need them to be near a gas pipeline. With gas stations for gasoline, you don't have this issue because you move it in trucks. With natural gas, you need the source to be close."

Another challenge is that cylinders in which natural gas is stored occupy significant space in cars. While that won't be an issue for buses and large vehicles, daily car riders will have to store it in the trunk, which may cause inconveniences for families, especially when traveling and carrying luggage.

On the bright side, Egypt has an overabundance of natural gas to cater to the converted vehicles. In fact, Egypt was once an exporter to neighboring countries, and with the recent gas discoveries in the country, gas supply won't be an issue. "Cars consume a very small fraction of Egypt's natural gas supply, even with the expansion. The amount of gas consumed as compressed natural gas is very minor compared to the amount used in electricity generation," emphasized El-Banbi.

At a country level, it's economically efficient to consume natural gas internally than to export it. When it's consumed internally, liquid fuel is freed. Egypt has also been importing gasoline, so the conversion to natural gas may lead Egypt to stop importing and maybe even start exporting it. The value of exporting gasoline tends to be significantly higher than exporting natural gas, mainly due to transportation methods. While gasoline can easily be moved from one destination to another, exporting natural gas requires more expensive methods.

«The hybrid, bi-fuel system of petrol and natural gas will come in very handy for consumers, with gasoline serving as a backup fuel,» said El-Banbi. Since Egypt currently has more gasoline stations than compressed natural gas ones, it will remain essential to have some gasoline in the car in cases of emergencies.

«Although running on purely natural gas is better for the environment and is cost-effective for the vehicle owners, I'm a fan of having a hybrid model of cars. Hybrid cars eliminate driving range worry and allow drivers to go a longer distance and time between car tank fill-ups,» explained Khlaifat.

For Khaifat, Egyptian citizens and residents will feel the initiative's added value after a few years of the project's implementation, when they will have a cleaner environment and when vehicle drivers make significant savings on fuel.

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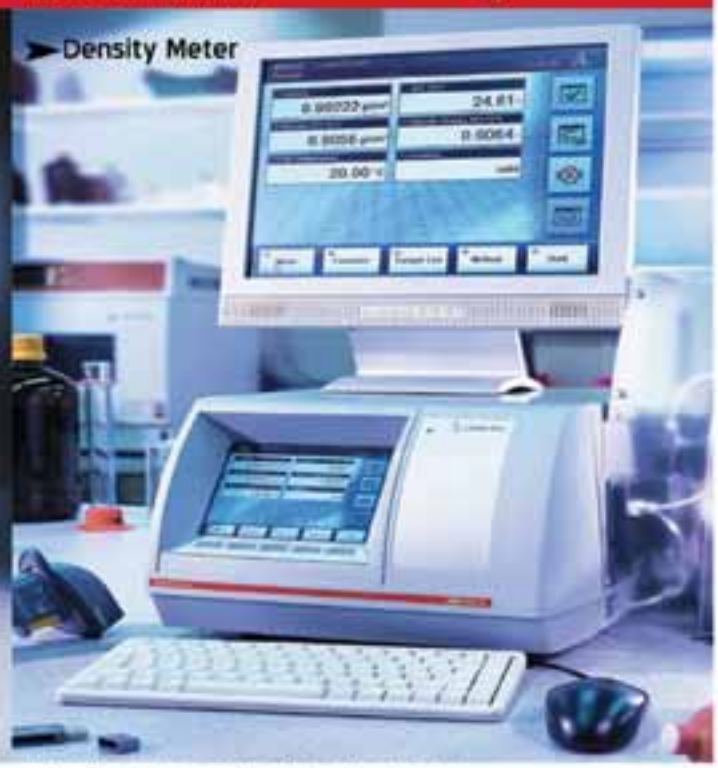

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IS THIS THE END OF OPEC?
HOW SAUDI ARABIA AND UAE INFIGHTING THREATENS THE FUTURE OF THE OIL ALLIANCE

Oil producer group OPEC has been plunged into crisis, with bitter infighting between Saudi Arabia and the United Arab Emirates raising questions about the future of the energy alliance.

OPEC and non-OPEC partners, a group of some of the world's most powerful oil producers, abruptly abandoned plans to reconvene on Monday after last week's meetings unexpectedly failed to broker a deal on oil production policy. The group did not set a new date to resume talks.

It means no agreement has been reached on a possible increase in crude production beyond the end of July, leaving oil markets in a state of limbo just as global fuel demand recovers from the ongoing coronavirus pandemic.

"OPEC+ has been thrown its most serious crisis since last year's ill-fated price war between Saudi Arabia and Russia," Helima Croft, head of global commodity strategy at RBC Capital Markets, said in a research note.

"Back-channel talks reportedly are continuing, but questions about UAE's commitment to remaining in OPEC will likely grow in the coming days."

OPEC+, which is dominated by Middle East crude producers, agreed to implement massive crude production cuts in 2020 in an effort to support oil prices when the coronavirus pandemic coincided with a historic fuel demand shock.

Led by Saudi Arabia, a close ally of the UAE, OPEC+ has met monthly to decide on production policy.

The disarray comes after OPEC+ on Friday voted on a proposal to increase oil production by roughly 2 million barrels per day between August and the end of the year in 400,000 barrels per day monthly installments. It also proposed to extend the remaining output cuts to the end of 2022.

The plans were rejected by the UAE, however, which wants a higher baseline to its quota to allow for more domestic production.

"No agreement was reached and as we stand now the OPEC+ alliance, if it is still the right word to describe the group, will produce at the July level for the rest of the year," TamasVarga, oil analyst at PVM Oil Associates, said in a research note.

"The [non] outcome of the meeting re-writes the supply demand landscape for the near and potentially for the distant future," he added.

The rare public stand-off between the UAE and Saudi Arabia saw energy ministers from both countries engaging in a media blitz over the weekend to outline their respective positions.

"For us, it wasn't a good deal," UAE Minister of Energy and Infrastructure Suhail Al Mazrouei told CNBC's Hadley

Gamble on Sunday. He added that while the country was willing to support a short-term increase in oil supply, it wants better terms through 2022.

Speaking to the Saudi-owned Al Arabiya television channel on Sunday, Saudi Arabia's Energy Minister Abdulaziz bin Salman called for "compromise and rationality" in order to reach a deal on Monday, Reuters reported.

Separately, a White House spokesperson reportedly said on Monday that President Joe Biden's administration was pushing for a "compromise solution." The U.S. is not a member of OPEC (which stands for the Organization of Petroleum Exporting Countries) but it has been closely monitoring the latest round of talks given their potential impact on crude markets into next year.

Responding to the news that the OPEC+ meeting had been adjourned without a deal on Monday, John Kilduff, a founding partner at Again Capital, said: "The Opec solidarity dissolved today."

"The pandemic held them together and now the post pandemic is breaking them apart. The UAE is sticking to their guns on wanting their baseline raised. They want to be able to produce more," he told CNBC via email.

"Now the fun starts as to who breaks away," Kilduff said, noting the UAE could be the "first domino" to fall.

OPEC was not immediately available to respond to a request for comment when contacted by CNBC on Tuesday.

Oil prices climb to multi-year highs

The news pushed oil prices even higher. International benchmark Brent crude futures traded at $77.34 a barrel on Tuesday morning, up 0.2% for the session, while U.S. West Texas Intermediate futures stood at $76.36, around 1.6% higher.

At one point, WTI crude hit as high as $76.98, which was the highest price since November 2014.

Oil prices rallied more than 45% in the first half of the year, supported by the rollout of Covid-19 vaccines, a gradual easing of lockdown measures and massive production cuts from OPEC+.

Samuel Burman, assistant commodities economist at Capital Economics, said OPEC producers were likely to increase oil production above quota next month as member states "seek to take advantage" of higher oil prices.

In addition to a rift between the UAE and Saudi Arabia, he said Abu Dhabi was probably "somewhat irritated" that Russia hadn't been complying with OPEC's production quotas.

Burman said non-OPEC leader Russia hadn't introduced any compensatory cuts at all and was currently overproducing by around 100,000 barrels per day. "We think that this spat involving the UAE increases the chances that the entire agreement falls apart which would clearly pose a downside risk to our near-term price forecasts."

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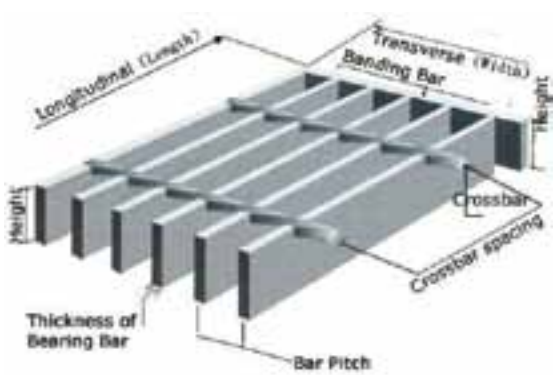

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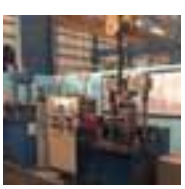

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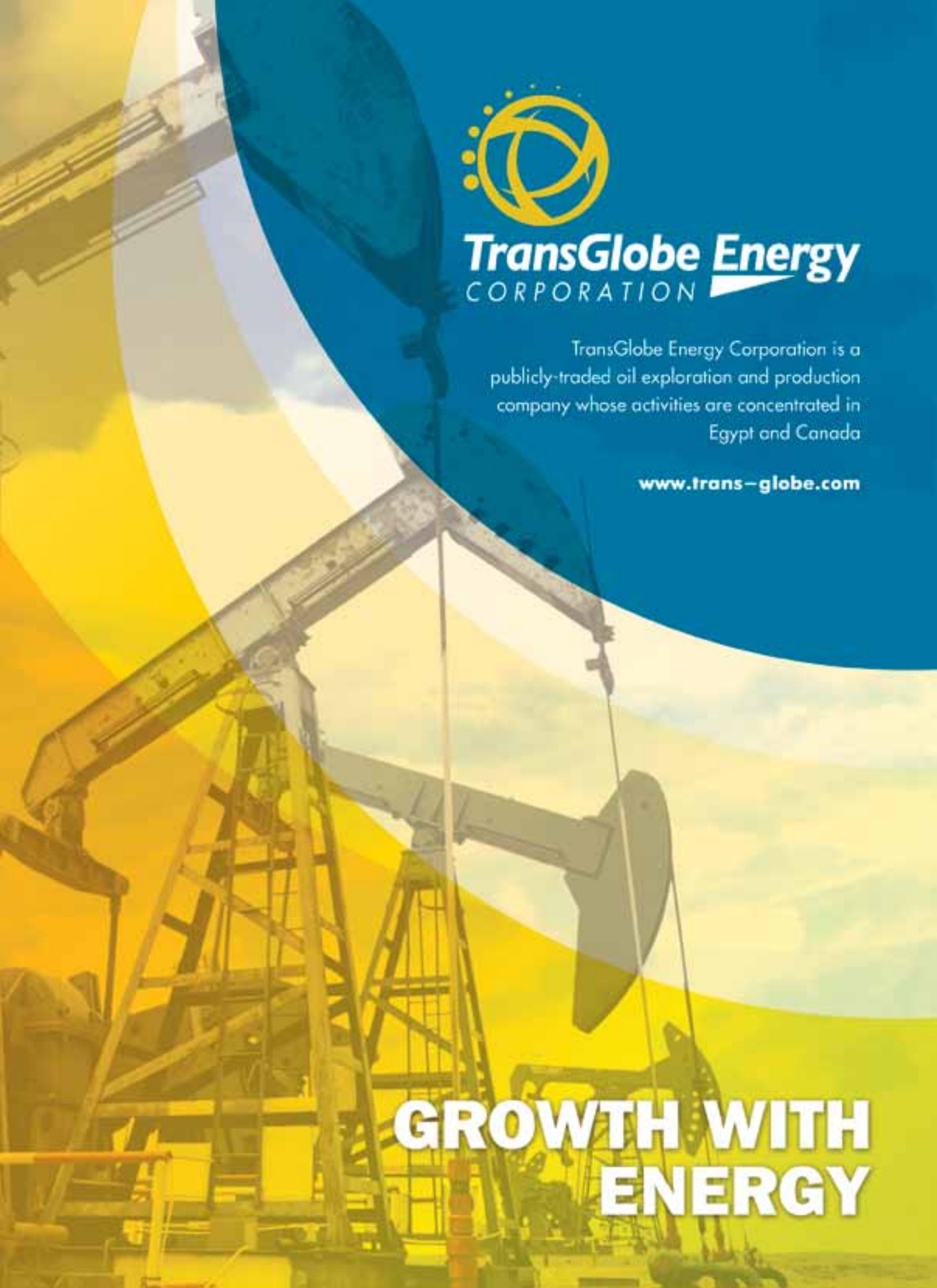

TransGlobe Energy CORPORATION

TransGlobe Energy Corporation is a publicly-traded oil exploration and production company whose activities are concentrated in Egypt and Canada

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GROWTH WITH ENERGY

An Interview With

MR. RANDALL C. NEELY, C.A., CFA

President and CEO, Director
TransGlobe Energy Corporation

TransGlobe Energy CORPORATION

Can we update our readers insight on the TransGlobe strategy in light of the current oil market?

Given the ongoing oil price volatility, TransGlobe is continually focused on strict capital discipline through operational cost controls and minimizing our exposure to financial leverage by remaining debt-averse. Despite market volatility, we have positioned ourselves as a nimble company with the ability to create value through a balanced portfolio of exploitation, development and exploration opportunities across our diversified onshore assets in Egypt and Canada. This approach has enabled us to build our production base, generate strong cash flows and provide a return to shareholders through a semi-annual dividend.

Where are the most promising areas / concessions the company is working in?

We are most excited about our low-risk development operations in Egypt and our newly discovered resource potential in the Cardium play in Alberta. In Egypt we are particularly focused on the continued expansion of our Eastern Desert Concessions. For the past year plus we have been working alongside the Egyptian General Petroleum Company ("EGPC") to develop a framework to extend the concessions and amend our licenses which will provide for the increased development and recovery of the oil in place in those legacy concessions through increased secondary as well as tertiary recovery approaches. We believe that some of the techniques utilized in our Canadian operations, namely horizontal drilling and multi-stage completions will be directly applicable to certain areas within our concessions in the Eastern Desert.

TransGlobe has been working in Egypt for more than a decade, what are some attractions in the Egyptian petroleum sector?

The production and distribution of oil is an integral part of Egypt's economy and the country has developed a well-established service industry to support exploration and development operations, exemplified by an increasingly large and talented workforce. This presents an exciting opportunity for TransGlobe to operate within. Addition-

ally, we are very encouraged by the leadership within the Ministry and EGPC who continue to work towards a modernization of the industry which we believe will lead to a stronger and more investible operating environment once completed.

What is the amount of TransGlobe`s 2019 allocated budget here in Egypt with reference to other countries? And how many wells do you plan to drill during the current calendar year?

Our 2020 capital program equates to $37.1 million (before capitalized G&A), which includes $23.7 million for Egypt and $13.4 million (C$17.4 million) for Canada. This plan is strategically aimed at maximizing free cash flow to direct at future value growth opportunities in Egypt and outside of Egypt. As a result of the recent de-risking of the area we refer to as South Harmattan, we can deploy capital in Canada, to achieve our production and cash flow goals in 2020 while we await finalization of our concession consolidation efforts in the Eastern Desert in Egypt.

What is the operational update on the South Ghazalat exploration?

Production was initiated at South Ghazalat on 24 December 2019 from the SGZ-6X well following the installation of production facilities at site. Initial oil production was in the range of a field estimated 800-1,000 bopd, however, the gas oil ratio rapidly increased to a level that interfered with the ability to separate oil from water in the facilities. This, combined with prudent management practices on the upper Bahariya reservoir completed in this well, has led to the well now being produced at a restricted field estimated 300-400 bopd. The lower Bahariya reservoir also tested oil in this well and remains a future recompletion target. We have a rig contracted to drill both a follow-up well in the 6X discovery pool as well as an exploration well in a prospect to the East of the existing discovery later this year.

What is the growth strategy of TransGlobe worldwide and in Egypt?

We are primarily focused on development and production with a core view of generating strong cash flows and long-term value accretion. By steering the bulk of the company's efforts towards stable production, we have been able to create a uniquely competitive position in the market. Given our strength in maximizing recoveries from under-loved and under-developed assets, we look to capitalize on our core skillsets to improve field rejuvenation possibilitiesby looking to expand our operations in Egypt or similar regions through synergistic acquisitions. Through this approach we hope to triple our production output and more importantly cash flow in the medium term. Having said that, having a little exploration success along the way is always welcome.

Do you see your recent success in Canada having you refocus to a more Canadian centered business going forward?

We re-entered Canada in 2016 in order to diversify our portfolio of development assets and gain exposure to the increasing technological advancements in North American drilling and completion techniques. Our Canadian re-entry was part of the Company's ongoing strategy of portfolio diversification into countries with attractive netbacks to support growth. This decision inevitably played to our core strength of value creation through development drilling and reservoir management. Recently, we have had some success in our South Harmattan area. This success provides more balance to our portfolio but we still see the real prize in the portfolio in the potential resources that could be pursued in the Eastern Desert if the Company has both the right fiscal terms and adequate time; which are the key elements of the restructuring work being discussed with EGPC.

How will your plans change if the recent fall in oil prices turns into a prolonged return to low prices?

We have been able to weather unpredictable markets by maintaining control over our own operations and focusing on opportunities where we can operate most efficiently. Because we are the operator of all our Egyptian assets and the majority of our Canadian assets, we can react quickly if oil prices shift materially. We're not forced to push ahead when it isn't favorable to do so and we can therefore control our costs accordingly. We believe there is potential for much stronger oil prices in the not-to-distant future and the key to success is being in a position to capitalize on those prices when they occur. We are also optimistic that the current sell-off in oil prices due to the potential for lower Chinese demand will be short lived.

You have recently had some key people in your organization depart and have added some new names, can you tell us a little about that transition?

After a 20+ year career with TransGlobe, Mr. Lloyd Herrick retired recently; Lloyd is one of the finest individuals I have ever worked with in my career. He was truly dedicated to our shareholders, our partners and loved by our employees, he will be dearly missed. In anticipation of Lloyd's retirement, we were fortunate enough to hire Mr. Geoff Probert last spring. Mr. Probert is a highly skilled professional Engineer with over 30 years of experience, much of which in North Africa including Egypt. Geoff has already made a valuable contribution to the Company assisting in the efforts of our consolidation and in particular advancing our understanding of the contingent resource potential within the Eastern Desert lands.

Finally, we would like to know about TransGlobe's ESG initiatives that you can share with us.

TransGlobe has been supporting the Ras Gharib hospital for many years, as a recipient of choice as suggested by our joint venture employees. Our production assets are close to city of Ras Gharib on the Gulf of Suez and a large number of our joint venture employees live in Ras Gharib and have a strong attachment to the hospital. In 2013, TransGlobe provided support to fund the establishment of the first intensive care unit at the hospital and we continue to support the unit with donations to fund the acquisition of specialist heart and lifesaving equipment on a regular basis. TransGlobe makes donations to the hospital whenever a significant HSE achievement is reached so that we are improving safety continually as well as supporting an essential local facility in Ras Gharib.

In addition to this, TransGlobe has 2 staff members on the CSR committee, which is a subcommittee of the Egypt Oil and Gas Technical Committee. Although only recently formed, this committee is already very active in liaising with other IOC's to share and align CSR activities across the industry.

We have additional plans to decrease our emissions in the Eastern Desert which will become viable once our consolidation efforts have been concluded. We look forward to discussing these with the industry, the public and our investors once we have concluded that consolidation.

Combining Elastic and Plastic Fatigue Damage in Coiled Tubing

By: C.D Bridge, Schlumberger

Abstract

Coiled tubing is a continuous pipe that, having been coiled around a reel for storage, can be deployed and used as a pipeline or riser. During deployment as a riser, the coiled tubing is unspooled from the reel, run into the water and connected to the wellhead. This process plastically strains the pipe causing plastic, or low cycle, fatigue damage. When the coiled tubing is connected to the wellhead, the environmental loading causes elastic stress cycles, resulting in elastic, or high cycle, fatigue damage.

There are numerous methods to determine the fatigue life from either plastic or elastic cycling; however, there is little data within the industry on how the fatigue damage from elastic and plastic cycles combine.

This paper presents the experimental work conducted to show the combined fatigue life of coiled tubing that has been plastically and elastically cycled. The data shows that the combined fatigue life can be lower than the summation of the plastic and elastic fatigue damages using Miner's rule. Existing theory suggests that the combined fatigue life could be as low as 10% of the Miner's rule of fatigue damages; however, the experimental data indicates that a more appropriate value is closer to 75% of the Miner's rule fatigue damage.

Fatigue Damage

Overview

Fatigue is the localized damage process of a component by cyclic loading. Fatigue can be described as consisting of three processes, Lee et al (2005):

1. Crack initiation
2. Crack propagation
3. Final fracture.

During cyclic loading localized plastic deformation occurs in areas of high stress concentration such as a notch, weld pore, or discontinuities between grain boundaries. (1.) The plastic deformation induces permanent damage in the component and a crack develops (crack initiation). (2.) As the component experiences an increasing number of load cycles, the length of the crack increases (crack propagation). (3.) After a certain number of load cycles the crack will cause the component to fail (final fracture).

Fatigue Damage and Cycle Ratio

Fatigue damage, or damage, is defined as the length of the crack in a component, compared to the crack size that causes complete failure. Damage therefore has a value between zero (no damage) and one (failure). Fatigue damage is non-linearly proportional to the number of load cycles the component experiences. An example relationship between fatigue damage and cycle ratio; the number of cycles occurred divided by the number of cycles to failure is shown in Figure 1. This shows that if a component experiences load cycles with constant amplitude, the crack length grows slowly at first, and then accelerates, so that the fastest crack growth occurs nearest to the component failure, a fatigue damage of one. The equation relating cycle ratio to fatigue damage from Lee et al (2005) is given below:

where $$D = \left(\frac{n}{N}\right)^{\frac{2}{3}N^{0.4}}$$

D	fatigue damage (ratio of actual to failure crack length)
n/N	the cycle ratio, where:
n	number of cycles that have occurred
N	number of cycles to failure

The implications of the non-linear relationship between fatigue damage and cycle ratio are that

- fatigue damage is dependent on the sequence of the load cycles
- fatigue damage is complex and simplifications are required to enable modeling.

Plastic and Elastic Cycling

Fatigue damage is caused by load cycling. Three types of load cycling are considered as follows:

- Low cycle, which are large stress/strain cycles which require less than 10^3 cycles to fail a component.
- High cycle, which are generally cycles within the elastic range of the material and require from 10^3 to 10^7 cycles to fail a component.
- Fatigue limit, which are low stress cycles that are considered non-damaging. These stress levels are considered within the endurance limit of the component.

Plastic load cycling is considered to be low cycle fatigue. Elastic load cycling is considered to be high cycle fatigue.

Plastic load cycling causes crack initiation, where a (micro) crack is formed due to the high concentrated loading and deformation of the material. Further plastic load cycles tear the material growing the crack by crack propagation.

Elastic load cycling causes crack propagation, where an existing crack is grown. If no crack exists the elastic cycling is considered to cause little fatigue damage.

Predicting Number of Cycles to Failure

The number of cycles to failure for a load cycle can be determined using either stress or strain. Typically stress is used for elastic cycling and strain is used for plastic load cycles. A brief overview of these methods is given below. Further details can be found in Lee et al (2005).

Stress-Based Fatigue Damage

In riser systems, where the stress ranges are in the elastic region, fatigue damage may be calculated using S-N curves, where for a given stress range the number of cycles to failure can be estimated. An example S-N curve is given in Figure 2. The equation for the S-N curve is given below:

$$N = k\sigma^{-m}$$

where

k	fatigue curve constant
σ	stress range (peak to peak)
m	fatigue curve exponent

The stress levels that correspond to the 10^3 and 10^6 cycles to failure in Figure 2 can be estimated from the formula below Lee et al (2005). However S-N curves are generally derived from experimental data and the fatigue constant and exponent are published in design codes such as DNV-RP-C203.

$$\sigma_{1000} = 0.9\ Cr\ \sigma_u$$
$$\sigma_{be} = C_M\ Cr\ \sigma_u$$

where

σ1000	stress range at 1,000 cycles to failure
σ_{be}	stress range at 1,000,000 cycles to failure
σ_u	ultimate stress of the material
C_r	reliability factor, 0.868 for 95% reliability (2 standard deviations)
C_M	material type ranging from 0.26 for martensite to 0.55 for ferrite steel

Strain-Based Fatigue Damage

Coiled tubing fatigue may be calculated using the strain-life method, where the number of reversals to failure is determined for strain amplitudes ('strain' is used, as the amplitude of the load reversals is above the elastic limit of the material). One load cycle is equal to two load reversals. The Morrow (1965) equation, presented in Lee et al (2005) used for strain-life fatigue is given below:

$$\varepsilon_a = \frac{\sigma_f'}{E}(2N_f)^b + \varepsilon_f'(2N_f)^c$$

where

ε_a	strain amplitude
σ_f'	fatigue strength coefficient
E	Young's modulus
Nf	strain reversals
b	fatigue strength exponent, usually varying between -0.04 and -0.15 for metals
ε_f'	fatigue ductility coefficient
c	fatigue ductility exponent, usually varying between -0.3 and -1.0 for metals

Combining Fatigue Damage

Overview

A number of methods exist that can be used to combine fatigue damage from different load cycles. The three being considered here are

- Miner's linear damage rule,
- Double linear damage rule,
- Power law damage rule.

Details are given below.

Miner's Linear Damage Rule

Miner's linear damage rule, or Miner's rule, assumes that the relationship between fatigue damage is linearly proportional to the cycle ratio; therefore for a given load,

each load cycle causes the same amount of damage. The advantage of this rule is that the sequence of the stress levels is independent of the fatigue damage, so the rule is simple to apply. Experimental data has shown that, for elastic cycling, Miner's linear damage rule provides reasonable correlation with fatigue test data, Lee et al (2005).

Using Miner's rule, the total fatigue damage from different load cycles is the sum of the individual cycle ratios, as shown below:

$$D_T = \sum \frac{n_i}{N_i}$$

where

D_T	total fatigue damage
n_i	number of cycles of that stress range that occurred
N_i	number of cycles of that stress range to failure

Miner's linear damage rule is the most widely used of all of the damage rules, and is considered the industry standard method. However, the criticism of Miner's linear damage rule is that it is unreliable and may over-estimate the number of cycles to failure; it is, therefore, considered non-conservative.

Power Law Damage Rule

The power law damage rule was developed by Manson and Halford, discussed in Lee et al (2005), and derived from the relationship between damage and cycle ratio. The method assumes that for a given damage level the cycle ratios from different loading can be determined. This is shown in Figure 3, A, where the damage / cycle ratios are sketched for two different load levels. For a given damage, D, the cycle ratios, n1/N1 and n2/N2, can be determined.

If a two-step load sequence is assumed, the number of cycles from the first load step can be recorded, and the damage for load step one calculated. The equivalent cycle ratio for the second load step can then be determined, and consequently the number of cycles remaining assessed. This is shown in Figure 3, B.

The same damage level for two stress levels in terms of cycle ratio is as follows:

$$D_i = \left(\frac{n_1}{N_1}\right)^{\frac{2}{3}N_1^{0.4}} = \left(\frac{n_2}{N_2}\right)^{\frac{2}{3}N_2^{0.4}}$$

Rearranging the above equation for the first cycle ratio gives:

$$\frac{n_1}{N_1} = \left[\frac{n_2}{N_2}\right]^{\left(\frac{N_2}{N_1}\right)^{0.4}}$$

This equation presents a method that can be used to calculate the fatigue life of two or more load steps. The fatigue life determined using this method is dependent on the sequence of loading. It can be observed from Figure 2.3, A, that when load step one occurs before load step two, the total cycle ratio at failure would be below one. Conversely, if load step two occurred before load step one the total cycle ratio at failure would be greater than one.

The power law damage rule is not generally used to calculate fatigue damage as it requires prior knowledge of the load sequence. For systems with multiple load steps, such as risers, the calculation would quickly become complicated.

Double Linear Damage Rule

The double linear damage rule is a linearization of the power law damage rule that assumes that fatigue damage can be represented by two linear relationships; one for crack propagation and one for crack initiation. An example is shown in

Figure 4, where the co ordinates of the 'knee' in the double linear damage rule were calculated as follows:

$$\left[\frac{n_1}{N_1}\right]_{knee} = 0.35\left(\frac{N_1}{N_2}\right)^{0.25}$$

$$\left[\frac{n_2}{N_2}\right]_{knee} = 0.65\left(\frac{N_1}{N_2}\right)^{0.25}$$

The advantage of the double linear damage rule is that within the linear systems, or phases, the damage is allowed to be summed using linear theory, such as Miner's rule. This implies that the order of the cycling within each phase is not important. The double linear damage rule can be implemented with relative ease compared to the power law damage rule.

The limitation of the double linear damage rule is that the equations for the knee have been validated with experimental data to an elastic to plastic cycle ratio of 1,000; whereas the elastic to plastic cycle ratio for coiled tubing used as a riser is expected to be around 1,000,000. The double linear damage rule is considered more conservative than Miner's rule.

Comparison of Methods

The fatigue damage along a piece of coiled tubing is calculated for consecutive deployment consisting of spooling and unspooling, without straightening, and ten days of connected operations, as can be seen in Table 1. The cumulative fatigue damage is determined using each method; hence the number of deployments estimated, as shown in Table 2. The elastic cycle fatigue damage incorporated a factor of safety of five,

representing an inspectable fatigue critical component.

The number of deployments varies from the conservative 4 to the over-estimated 38. This shows that using different methods to combine plastic and elastic fatigue damage changes the results significantly. This indicates that further research is required to validate and calibrate the models for determining the combined fatigue life from elastic and plastic cycles.

Experiment

Overview

A set of experiments were proposed to examine the number of plastic and elastic cycles to failure of a material representing coiled tubing. The experiments were conducted with the primary purpose of illustrating the effect of combining plastic and elastic cycles, with the intention of conducting further experiments using full-scale coiled tubing sections.

Material Samples

The material tested was ASTM A606 plate, 0.3 in thick master coil. Dog bone shaped samples were machined to ASTM E466, Figure 5, which had a length of approximately 140 mm, were 30 mm wide at each end and tapered to 5.5 mm wide in the middle. The taper had a radius of 100 mm. All edges of the samples were lightly polished to remove any sharp edges.

In the centre of the samples, notches were added to artificially lower the number of cycles to failure. Each 0.25 mm or 0.5 mm notch was cut using an EDM machine. With a 0.25 mm notch, the minimum width of the sample was 6.0 mm. With a 0.5 mm notch, the minimum width of the sample was 6.5 mm. This change was made to ensure that the smallest cross-sectional area at the start of each test was identical.

Strain gauges were attached to each sample and were used during the tests to record axial strain.

Strain and strain cycling was conducted using the tension apparatus at DNV in Singapore (DNV Pte Ltd, 2010).

Test Procedure

Each test was conducted using the following test procedure:

1. Load the specimen in tension to 1.8% strain and then in compression to 0.0% strain by monitoring the strain measured by the strain gauge on the sample. Record stress and strain.
2. Load the sample cyclically from 0.0% to 1.8% then to 0.0% strain and repeat for the desired number of plastic cycles.
3. Cycle the sample with a constant stress range of 300 MPa or 400 MPa until failure. Record number of cycles.

For each notch size (0.0 mm, 0.25 mm and 0.5 mm) the first test conducted was to cycle the sample to failure using just plastic cycling. The second test cycled the sample to failure using only elastic cycling. These tests were repeated to provide an average number of plastic and elastic cycles to failure. Subsequent tests were then conducted; plastically cycling a sample to 10%, 20%, 30%, 50% and 75% of the average number of plastic cycles to failure. Each sample was then elastically cycled to failure.

Experimental Data

For each notch size the average plastic cycles to failure and average elastic cycles to failure for 300 MPa and 400 MPa stress are shown in Table 3. As expected, as the notch size increased the number of cycles to failure decreased. An unnotched sample required on average 520 plastic cycles to failure, while a 0.25 mm notched sample required 15/ the number of plastic cycles to failure. For the elastic cycles to failure the un-notched samples exceeded 1,000,000 cycles and the tests were stopped. To ensure that the samples failed due to elastic cycling within a reasonable time frame, testing was conducted using the notched samples.

The number of plastic and elastic cycles to failure for each notch size and the 300 MPa and 400 MPa elastic cycling are shown in Figure 6. As expected, the general trend shows that as the number of plastic cycles increases, the number of elastic cycles required to fail the samples reduces and nominally follows the power law shape shown in Figure 1 and Figure 4. The equation for the power law, from equation (8), is shown below.

$$\frac{n_e}{N_e} = 1 - \left[\frac{n_p}{N_p}\right]^{\left(\frac{N_p}{N_e}\right)^P}$$

where

n_e	number of elastic cycles
N_e	number of elastic cycles to failure
n_p	number of plastic cycles
N_p	number of plastic cycles to failure
P	power law exponent

Comparison with Theory

The plastic and elastic cycles to failure were normalized to the average plastic and elastic cycles to failure given in Table 2, and are presented in Figure 7. This shows that when normalized most of the test data follows a similar non-linear trend, which may be described using a power law form, equation (11) with a power, P, of 0.05. However, this value was arbitrarily chosen and does not account for data points where the normalized cycles to failure were above 1.0. A more conservative value for P was 0.15 as this curve forms a

conservative trend line where each data point appears above the trend line. For comparison, a linear trend is also shown in Figure 7, which represents Miner's rule.

A comparison of the number of deployments calculated using the power law damage rule with a range of exponents is given in Table 4. This shows that if P was assumed to be 0.15 the number of deployments was 29, which gave a fatigue life of around 75% of the fatigue life generated using Miner's rule.

Conclusions

The experiments presented were conducted as a preliminary investigation to determine the fatigue life of coiled tubing that was subject to both plastic and elastic cycles. The work shows that the combined fatigue damage from plastic and elastic cycles is higher than the linear summation of the fatigue damage from both sources. Experimental work conducted confirms that plastic and elastic cycles can be combined using a non-linear relationship. Examination of the experimental data suggests that a power law damage rule provides an appropriate method to determine the overall fatigue damage. The data shows that the published value of P of 0.4 may be too conservative and that a value of 0.15 is more appropriate; however, further work and experiments are required to determine the appropriate power law exponent to use for fatigue design.

The experiments cycled the steel samples assuming that all of the plastic cycles occurred before the elastic cycles. This test sequence was chosen to simplify the testing process; however the cycling experienced by coiled tubing risers would be more appropriately represented as a repeating sequence of plastic and elastic cycles. It is expected that changing the sequence of the plastic and elastic cycles changes the overall fatigue damage, and may improve the overall fatigue life.

Additional areas for further work include examination of how corrosion affects the combined plastic and elastic fatigue damage, performing tests using coiled tubing sections, internal pressure cycling and test coiled tubing sections that contain a bias weld.

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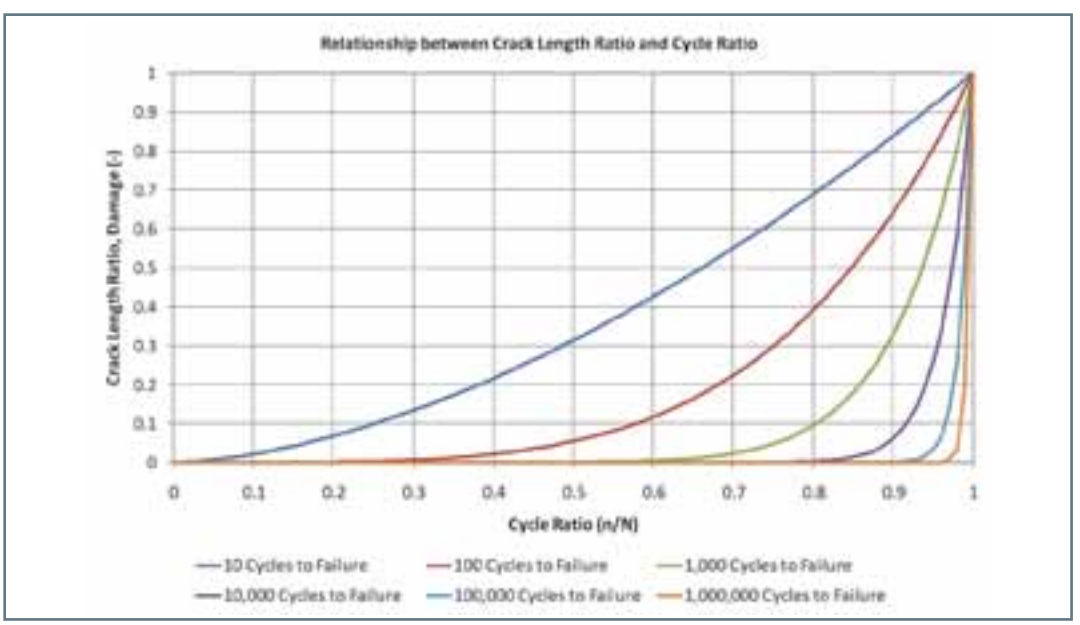

Figure 1: Example relationship between damage and cycle ratio.

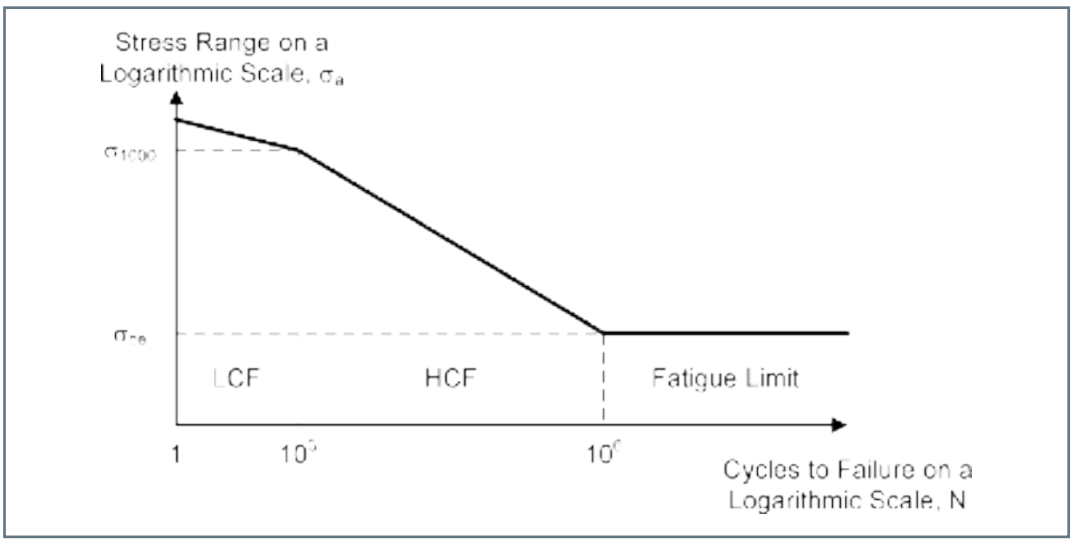

Figure 2: Example S-N curve, after Lee et al (2005).

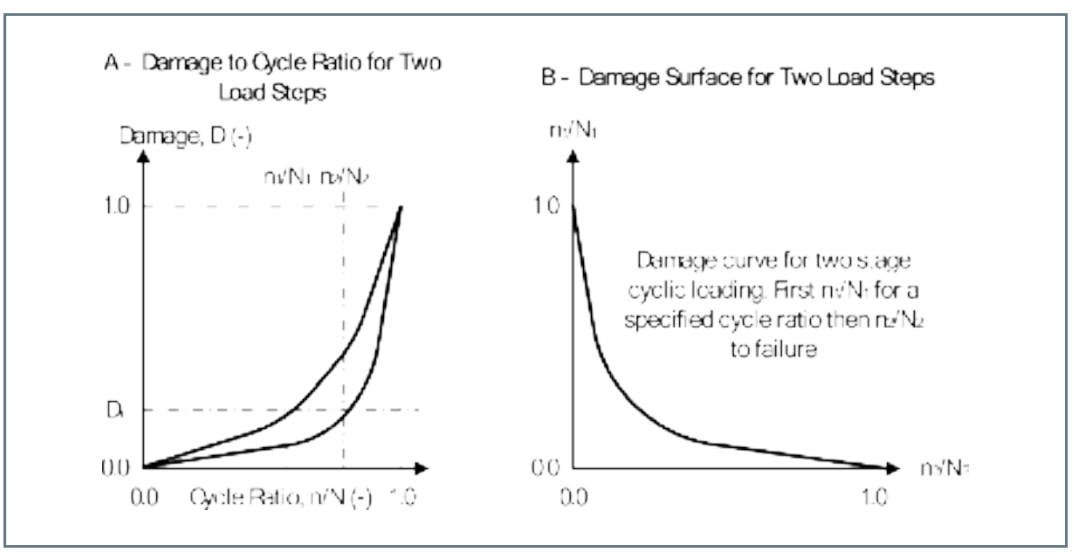

Figure 3: Power law damage rule, after Lee et al (2005)

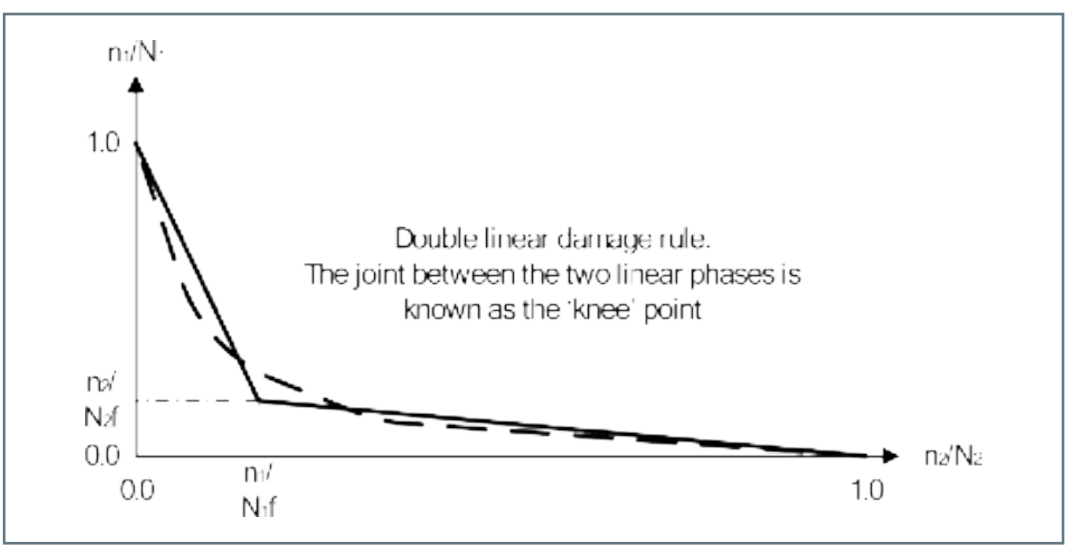

Figure 4: Double linear damage rule, after Lee et al (2005)

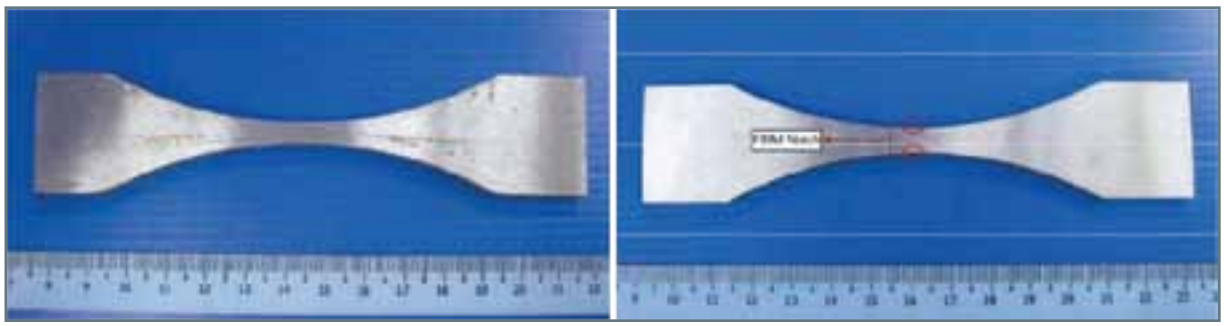

Figure 5: Test samples A; smooth and B; notched.

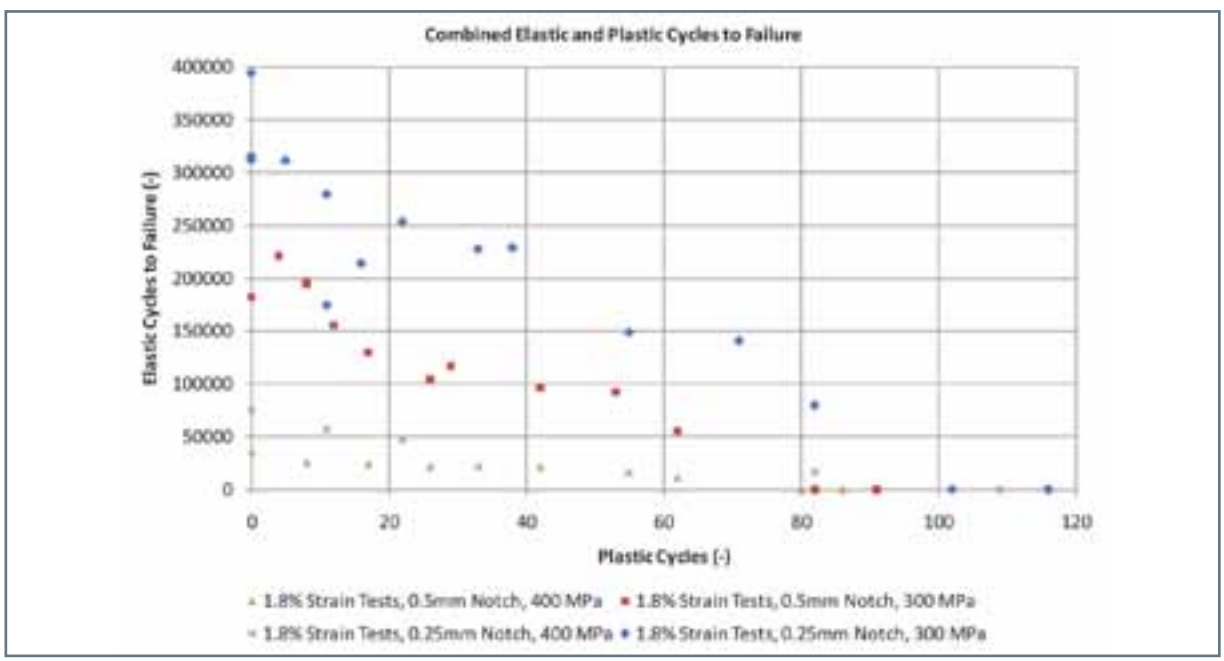

Figure 6: Plot of plastic cycles to failure with elastic cycles to failure

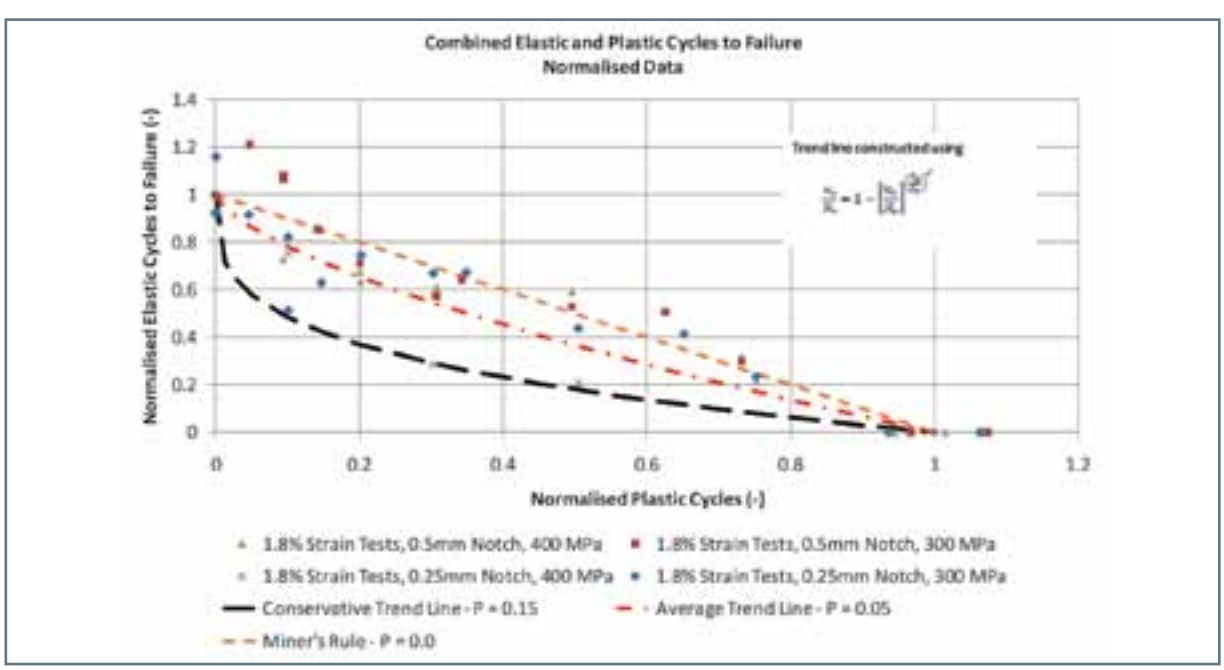

Figure 7: Plot of normalized plastic cycles to failure with normalized elastic cycles to failure

Table 1: Assumed fatigue characteristics of coiled tubing

Cycles	Number of Cycles to Failure	Cycles per Deployment	Cycle Ratio per Deployment	Factor of Safety Applied
Plastic	128	3	0.0234	1
Elastic	1.72×10^8	86400	5.03×10^{-4}	5

Table 2: Summary of deployments by fatigue method

Method	Fatigue Damage Ratio	Deployments	Comment
Miner's Linear Damage Rule	100 %	38	Known to be unreliable for combining damage from two load cycles of different orders of magnitude. Result shows maximum number of deployments
Power Law Damage Rule	10 %	4	Standard industry model that produced conservative estimation of number of deployments. Indicates the need to validate the model with test data
Double Linear Damage Rule	15 %	6	Gives a conservative result using an industry standard method

Table 3: Average number of cycles to failure for plastic or elastic cycles

Notch Size	Average Plastic Cycles to Failure	Average Elastic Cycles to Failure with 300MPa Load	Average Elastic Cycles to Failure with 400MPa Load
0.0 mm	529		4
0.25 mm	109	343970	75217
0.5 mm	85	182405	35642

Notes
1. Experiment is exceeded 1.0×10^7 cycles and were stopped

Table 4: Deployments calculated using power law damage rule with differing powers

Power Law Exponent	Deployments	Comparison to Miner's Rule
Miner's Linear Damage Rule, $\beta = 0.0$	38	100%
0.05	37	97.4%
0.15	29	76.3%
0.25	17	44.7%
0.40	4	10.5%

Well Interventions in Depleted Gas Wells Made Economical With Use of Small Size (3/4 in.) Coiled Tubing

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Abstract

Well interventions in depleted gas wells are often seen as not being economically viable. Since the production rates in these wells are generally low, the pay-back time on the cost of a coiled tubing (CT) intervention could be rather long, making cash flow and earnings not attractive for gas producing companies. Furthermore, due to the low reservoir pressure, introducing fluids in depleted gas wells may cause a water block, formation damage and liquid loading, which can kill the well. Small diameter Coiled Tubing, often called Mini Coil, can overcome these problems, making interventions in depleted gas wells both economical and feasible.

Mini Coil operations with ¾" coiled tubing were re-introduced in Europe, after 25 years of absence, to offer cost-effective

intervention methods for depleted gas wells. Typical Mini Coil operations include small acid treatments, salt plug washes, fluid lifting, inhibition of tubing, etc. For clean outs in wells with a coiled tubing velocity string completion or on offshore installations, where crane limitations do not allow for a standard coiled tubing reel to be used, Mini Coil can be an useful option[1].

In this paper the design criteria, applications and the limitations of Mini Coil operations are discussed. Equipment design features and principles for the choice of coiled tubing size and material are presented. Candidate well selection criteria and the benefits of these types of operations are illustrated by case histories in the Netherlands and Germany.

Depleted gas wells, which might not be considered for any further interventions, can now be treated economically again. Mini Coil allows for the use of a compact equipment spread, resulting in cost savings through faster rig-up and rig-down times, smaller footprints, fewer personnel required and fewer truck loads. The small internal volume of the Mini Coil increases the control over the amount of fluid injected into a well, thereby reducing the risk of killing the well during a treatment.

Introduction

Small size coiled tubing, like ¾", was first introduced in 1964. Over the years larger sizes of CT were developed, in particular due to the need for higher pump rates and for enabling interventions in larger, deeper and deviated or even horizontal wells.

Nowadays in most parts of the world 1 - 3 / 4" CT is most commonly used for well interventions, but also 2 - 3 / 8" and 2 - 7 / 8" are

becoming part of a standard coiled tubing outfit. Moreover, CT sizes up to 3 - 1 / 2" OD are being produced for particular

applications. For more than 2 decades small size coiled tubing work strings were not used until the recent re-introduction of ¾" coiled tubing services in Europe.

About 15 years ago small diameter coiled tubing or capillary string installations with adapted Coiled Tubing units were introduced to inject mainly surfactants for gas well deliquification 2,3,4, and other remedial solutions such as inhibitors required within the wellbore. Today these units for capillary string installation can be used for cost effective, safe and successful well interventions as well, bearing in mind that there are limitations in pump rates and intervention depths. In the meantime the first successful case studies were reported [1,5,6].

Coiled Tubing interventions in wells producing at low rates are generally avoided or postponed due to the relatively long payback times. In these type of wells slickline operations are the preferred intervention methods for removing obstructions and scale deposits, due to their lower costs. However, slick line is not always able to remove these obstructions, whereas a simple wash with water or acid sometimes would.

With the (re-)introduction of a small size coiled tubing (3/4") the job execution time can be reduced, due to faster rig up/

rig down times and the use of a smaller equipment spread. The reduction in job time results in a reduction of the overall job cost, making coiled tubing interventions economically interesting again for interventions in these type of wells. The interventions with small size coiled tubing are referred to as Mini Coil interventions.

In depleted marginal gas wells there is another challenge beside the economical viability of coiled tubing operations: the introduction of too much fluid volume will kill the well. This can be prevented by the application of a commingled fluid system, for example with the use of nitrified fluids, however, this will add to the overall cost, which might result in exceeding the budget for the project. Bullheading the fluids would lead to the same problem and would often not provide a solution.

During Mini Coil operations, however, fluids are pumped at low rates and with the aid of a back pressure valve in the bottom hole assembly only small volumes are introduced in the well, removing the need for commingled fluid systems. The addition of a foaming agent or surfactant to the fluid system may help with the flow back of the well fluids and reduces the risk of a water block.

The elimination of the need for commingled fluid systems has another advantage. During standard coiled tubing jobs where nitrogen is used, the wells need to be flared, because the gas contaminated with nitrogen cannot be sold. Since the need for nitrogen can be omitted during most Mini Coil interventions, the wells can be brought back in commercial production faster.

Moreover, smaller water volumes reduce the risk of creating a water block in the near wellbore area during the coiled tubing intervention. Especially in gas wells with low reservoir pressures the relative permeability can be reduced by lost water and the surface tension of the water can prevent gas flow.

On offshore installations with limited crane lifting capabilities difficulties with placing standard coiled tubing equipment on the deck may exist, due to the weight of some of the components. Normally the coiled tubing reel would be the heaviest lift.

Where the planned intervention would allow for the use of a smaller CT size, the use of Mini Coil would be a viable option to achieve a reduction in weight.

Typical Mini Coil applications include the removal of salt plugs by washing with fresh water, scale removal with acid, stimulation with small acid volumes, fluid lift with nitrogen, inhibition of tubing, gas hydrate removal etc. Under certain conditions debris or sand can be removed from the well with help of a gelling agent and the natural production of the well.

Due to the size of the Mini Coil there are limitations as well. The reduced pump rate, for instance, does not allow for proper debris clean outs in large wellbores. Interventions in highly deviated or horizontal wells may not be possible due to the limited push reserves of the string. The ability to work in deep vertical wells needs to be investigated on a well to well basis with use of tubing forces analyses software programs. Operations whereby heavy duty fishing or torque is required exceed the capabilities of Mini Coil and should be performed by standard CT equipment.

Equipment Selection

The equipment used for the Mini Coil operations consists of standard coiled tubing components, like CT control cabin, power pack, injector head, gooseneck, stuffing box and BOP. The injector head is a standard coiled tubing injector dressed with ¾" blocks.

Initially, attempts were made to use an injector head normally used for capillary operations (1 / 4" – 5 / 8"), however, the injector head turned out not to be powerful enough to pull the Mini Coil at larger depths without slippage of the injector chains.

Figures 1. and 2. in the Appendix show pictures of Mini Coil rig up with a capillary injector head and coiled tubing injector head.

The BOP is a standard CT BOP dressed with ¾" inserts. A small fluid pump may be used since only low pump rates can be achieved.

Initially, both ½" and ¾" tubing were considered. A comparison of the achievable pump rates and corresponding pressures between the two sizes were simulated and given in Figure 3. and Figure 4. below. The pump pressures were calculated based on a coiled tubing string of 3,000 m (9,843 ft). For simplicity the pressure losses over the bottom hole assembly were not included. At a fluid pump rate of 15 l/ min (4 gal/min) through ½" CT a pump pressure of 427 bar (6,193 psi) was indicated, while with ¾" CT a pump pressure of only 77 bar (1,117 psi) was found. During actual ¾" CT interventions, which included a back pressure valve, the pump pressures at fluid pump rates of 30 to 40 l/ min (7.9 to 10.6 gal/min) were typically below 500 bar (7,252 psi).

For the nitrogen pump rates and pressures a similar comparison was made. At a minimum nitrogen pump rate of 8 sm3/ min (283 scf/min) a pump pressure of 240 bar (3,481 psi) was found for the ¾" CT, whereas with ½" CT 550 bar (7,977 psi) would have been needed to pump nitrogen at the same rate. Because of the higher pump rates and lower pump pressures ¾" CT was preferred over ½" CT for these Mini Coil applications.

Another advantage of using ¾" CT is that carbon steel can be used for the manufacturing of these strings, which is standard

coiled tubing carbon steel. The properties of these materials are well known, which provides benefits when managing the fatigue life of the strings and providing corrosion inhibition of the Mini Coil during acidizing. As well, the behavior of carbon steel in sour environments is known.

A standard bottom hole assembly consists of a coiled tubing connector, double flapper check valve (DFCV), back pressure valve, straight bar and wash nozzle. The adjustable back pressure valve is set such that it can hold a fluid column in the Mini Coil preventing losses of fluid from the coiled tubing. Figure 5. in the Appendix shows a picture of the standard bottom hole assembly used for Mini Coil interventions.

Case Histories in Germany and the Netherlands

Several case histories are discussed based on Mini Coil jobs performed in Germany and the Netherlands during 2009 and 2010.

Case Histories in Germany. In sweet gas fields in North Germany seven Mini Coil interventions were performed during 2009 and 2010. The operations were performed in low pressure gas wells, and were selected for Mini Coil interventions to obtain better control of the amount of fluids introduced in the well and for economical reasons.

Cost reductions were anticipated due to faster rig up and rig down times, the absence of nitrogen equipment and a support tower, which had been required during previous interventions with standard coiled tubing equipment. Because of the low pump rates and the inclusion of a back pressure valve in the bottom hole assembly the wells in these fields were expected to handle the small volumes of treatment fluids without problems. Additionally, in some occasions a surfactant was added to the treatment fluids to help lifting water out of the well and to prevent formation damage due to a water block.

Table 1. summarizes the Mini Coil interventions performed in Germany. For two wells the interventions have been repeated after one year. In wells #1, #2 and #3 salt washes were performed without the need of nitrogen equipment. Wells #4 and #5 were performed with the aid of nitrogen equipment, which was required due to the complex work scope.

Salt Washes. Most of the Mini Coil Jobs were realized in wells producing from an Early Triassic Bunter gas reservoir, developed as a flat, oval anticline with a weak aquifer. This turtleback structure with radial natural fractures was formed by a Zechstein salt pillow below the Bunter and is located near a salt dome.

The gas is produced from a sandstone with good porosity and average permeability. Most of the gas wells were drilled, perforated and fractured in the 1970s.

From the mineralogical view the reservoir rock contains aeolian quartz and feldspar grains. The grains are more or less consolidated and cemented with salt, calcite, anhydrite or barite and within the formation there are layers with variation on the amounts of clay.

Mauthe [7] describes salt cemented sandstones of two gas reservoirs in the neighborhood and offers the salt pillows below and the salt domes next to the gas reservoirs as possible sources for the salt. The diagenetic salt precipitation is the result of contact of the sodium chloride supersaturated reservoir water with the salt pillow and the salt dome.

The formation of massive salt plugs in the tubing and in the liner at the perforations causes a severe production problem.

Entrainment of reservoir water from gas reservoirs results in the deposition of halite scale as the wellhead pressure declines.

The cause is associated with the increase in solubility of water in methane with decreasing pressure[8].

Other production problems are formation sand plus fines production, partially crushed frac proppants and liquid loading.

Moreover, due to dissolving salt in the matrix a deconsolidation and collapse of the matrix can be caused, which makes the formation sensitive to fresh water. This problem is so severe that it can lead to a reduction or even the loss of the gas production from that gas field.

Additional limiting conditions for well interventions are small drift diameters in the wells due to coiled tubing velocity string installations to prevent liquid loading[4] , a low reservoir pressure and low budgets for operations due to the well's situation being in the tail end of its production life.

These problems forced looking for low cost well intervention methods, which includes the use of small size coiled tubing and the reduction of the amount of fresh water volumes to a minimum.

Wells # 1, 2 and 3 were suffering from the above described problems and were successfully cleaned out with the ¾" Mini Coil using 2% potassium chloride brine only. Typical pump rates were between 40 – 50 l/ min (11- 13 gals/ min) at pumping pressures of between 400 – 450 bar (5,800 – 6,525 psi). For each well approximately eight operational hours were required to perform the clean out.

Figure 7. in the appendix is an example chart of a successful salt wash intervention with Mini Coil. The chart documents the characteristic parameters of a Mini Coil job, showing the pump rates at corresponding pump pressures and the Mini Coil weight indicator readings at different depths. The chart shows as well that the intervention was completed within one day.

Because no nitrogen was used, it was possible to reduce flaring to a minimum. After the corrosion inhibitor was pumped during pulling out of hole the well was brought back on production.

Sand Clean Outs. Sand clean outs were performed in wells #4 and #5. Well # 4 is 3,453 m (11,329) deep and completed

with a 4 - 1 / 2" tubing and 4 - 1 / 2" liner and contains a 2" coiled tubing velocity string (packerless). The well is nearly horizontal with a maximum deviation of 88 degrees. Due to reduction in production rates over time an acid treatment was performed by bullheading and the well was subsequently lifted with nitrogen, however, at no success to restore the production. Due to the high angle and the velocity string completion, it was not possible to determine a hold up depth with slick line, instead, only a scraper run to the shoe of the velocity string was performed. It was suspected not all the perforations were open and therefore a clean out intervention with CT was planned.

A study was performed to investigate the feasibility of using ¾" Mini Coil for performing a sand clean out in this well. Several challenges were to be investigated for this difficult intervention: Is the ¾" CT able to reach the bottom of perforations in this highly deviated well? Are the pump rates sufficient to carry the sand to surface? How can we prevent killing the well and keep returns to surface?

Tubing forces analyses performed with the ¾" CT in well # 4 indicated that the coiled tubing should be able to reach end depth. However, the simulations showed as well that washing the obstruction with only 40 – 50 l/min (11 – 13 gal/min) would not be enough to perform a proper clean out even with the well flowing. To increase lift velocities pumping nitrogen additionally in the 2" velocity string x ¾" CT annulus was investigated by means of computer simulations. This turned out to be a viable option. Additionally, slugs of gel were to be pumped to help carrying the sand to surface.

The Mini Coil intervention in well # 4 was performed as planned and resulted in a successful clean out. The annulus pressure was monitored very carefully considering a safety margin to prevent collapse of the installed coiled tubing velocity string, which may have been already corroded to a certain extent.

Potassium chloride brine was pumped via the Mini Coil at 45 l/min (12 gal/min) and 400 bar (5,800 psi) pumping pressure.

Slugs of gel were pumped at intervals. Additionally, nitrogen was pumped via the 2" velocity string x ¾" CT annulus at 20 sm^3 / min (706 scf/min).

The well was flowing during the clean out operation via the annulus of the installed 2" velocity string x 4 ½" production tubing and produced through the well test set up. The job was performed slowly to prevent the risk of loading up the 2" x 4 ½" annulus with sand creating a sand plug. The production of well # 4 increased with more than 100 %, see Figure 6. in the Appendix.

Well # 5 is a nearly vertical well and is completed with 2 - 3/ 8 " tubing and a 5" liner till 3,815 m (12,516 ft). The lower perforations were abandoned in 1995, such that the end depth became 2,694 m (8,839 ft). In 1998 a wire line scraper tool was left behind in the well.

Part of the perforations were covered with produced proppants, formation sand and salt deposits, which resulted in a reduced production rate. A CT intervention was planned to clean out the wellbore and to stimulate the formation. CT simulations were performed and it was concluded that 1 -1/4" and 1 - 1/2" CT would not be suitable to perform the clean out, due to the small completion size. The returns of the required pump rates combined with the natural gas production of the well would result in very high friction pressures in the 2 - 3/8" tubing, such that no returns would be obtained.

The use of ¾" Mini Coil was investigated for this application as well and showed returns can be obtained at pump rates of 40 – 50 l/ min (11 – 13 gal/min) during natural flow of the well. However, in case the obstructions were very hard, the jetting action applied by the Mini Coil system would not be sufficient to break it up.

Nevertheless, an attempt was made to clean out well # 5. The hold up depth appeared to be very firm and no progress could be made by washing with potassium chloride brine. An attempt was made to clean out the obstruction with a weak acid system, however, only one meter of fill could be removed. The operation was aborted and the limitations of the Mini Coil were accepted for this application in this well.

Case Histories in the Netherlands. In the depleted gas fields in the eastern part of the Netherlands several Mini Coil operations were performed during 2009 and 2010. Table 2. shows an overview of the Mini Coil interventions performed in the Netherlands, where Mini Coil was used for several applications, including acid stimulations, salt washes and nitrogen lift.

In wells # 6 and # 11 Mini Coil was used for acid stimulation of the reservoir and removal of acid-soluble scale, respectively.

Only small volumes of acid were used to perform these work scopes. For the intervention in well # 6 a volume of 1.3 m^3 (8.2 bbls) of 28% hydrochloric acid was used, whereas in well # 11 a volume of 2.0 m^3 (12.5 bbls) of 15% hydrochloric acid was spotted with the Mini Coil.

Well # 6 was producing intermittently from a carbonate formation. The reservoir pressure is very low, around 34 bar (493 psi), while the perforations with a length of approx. 58 m were covered with deposits of unknown composition. The end depth was tagged with the Mini Coil and the hydrochloric acid was pumped across the open perforations. Unfortunately, the well's performance did not improve as a result of this job.

In well # 11 information obtained by a wireline run indicated that this gas well was suffering from an acid soluble scale

buildup. The reservoir pressure was also very low with 32 bar (464 psi) and the well flow had been very erratic since a couple of months. It was therefore decided to minimize the acid volumes pumped into this well and to do an acid wash just across the perforations. The job was carried out with 2 m^3 of 15% hydrochloric acid and displaced from the coil with Nitrogen. The well is currently producing stable since over 6 months (20,000 Nm^3 /d or 706 Mscft/d).

In wells # 8 and # 10 the Mini Coil was used to perform a salt wash with potassium chloride brine similar to the interventions in the German wells. For both wells only fluids were used to remove the salt obstruction, however, after the clean out nitrogen was used in well # 8 to lift in the well.

Both interventions needed 9 hours operational time to complete the clean out and return the Mini Coil to surface. Well #8 was suffering from a salt build-up since early 2009. Monthly bullhead water washes were being carried out to mitigate the salt. By the end of Q3 2009 the water washes no longer had the desired effect and a Mini Coil water wash job was planned in.

Using the ¾" Mini Coil with a wash nozzle the three sets of perforations were washed twice. During the second wash run the coil no longer met resistance on the way down. In total some 4 m^3 (25 bbls) of potassium chloride brine was pumped. The well was kept closed in during the wash operation and left to soak for about 1 hour. Then the well was lifted in with nitrogen for a few hours and the well put back on production of 120,000 Nm^3/d (4,2 MMscf/d). The well produced stable for about 6 months with monthly water soaks. Then a new coiled tubing water wash job was needed to remove a solid salt obstruction.

In well # 7 Mini Coil was used to lift in the well. After running in hole and pumping nitrogen the well started to produce. The Mini Coil, however, was not able to enter the 2 3 / 8" tailend extension for unknown reason. Since the lift could not be carried out from the target depth the well did not improve. The well is currently on automatic intermittent production.

Well # 9 is a sour gas well producing from a carbonate formation and suffers from high formation water production and severe scale build-up. Reservoir pressures are still relatively high around 100 bar (1,450 psi). On average 4 bullhead acid jobs per year are required to maintain gas production.

Due to the scaling, the bullhead acid job is split in two stages. A first stage pumping 1.0 m^3 (6.3 bbls) of 28% hydrochloric acid to confirm there is injectivity, followed by the main treatment of 20 m^3 (125 bbls) of 28% hydrochloric acid. The treatment is then overdisplaced with Nitrogen.

During the injectivity test the acid could not be displaced into the reservoir, indicating blockage inside the tubing. As the live acid had a corrosion inhibitor package that provided protection for 24 hours, the Mini Coil unit was mobilized on short notice to attempt removing the obstruction, and in case not successful, to circulate the live acid out of the tubing to a well services surface tank for neutralization. The obstruction appeared to be too hard to remove with Mini Coil and therefore, the acidic fluid was circulated out of the well with potassium chloride brine without further problems. The well since then has had a full coiled tubing acid stimulation with full production test equipment on location to restore production of 100,000 Nm^3/d (3.5 MMscft/d).

Conclusions

1. Well interventions can be made economically viable in depleted gas wells with the use of Mini Coil (3/4"), due to faster rig up/rig down time, the use of a smaller equipment spread and the ability to perform interventions without the use of nitrogen.
2. Mini Coil (3/ 4") has been used successfully to perform CT interventions in low pressure gas wells in Germany and the Netherlands.
3. Standard CT equipment and carbon steel is used to perform the Mini Coil operations in Continental Europe.
4. ¾" coiled tubing was selected as the optimum size, since the achievable maximum pump rates through smaller size coiled tubing, like ½" CT, would be very limited with corresponding high pumping pressures.
5. Mini Coil can be the only choice for interventions in small size completions, like coiled tubing velocity strings.
6. Mini Coil is a viable option for offshore platforms with limited crane capacity and space.

Acknowledgements

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Fig 1. – Mini Coil Rig Up with Capillary Injector Head

Fig 2. - Mini Coil Rig Up with Coiled Tubing Injector Head

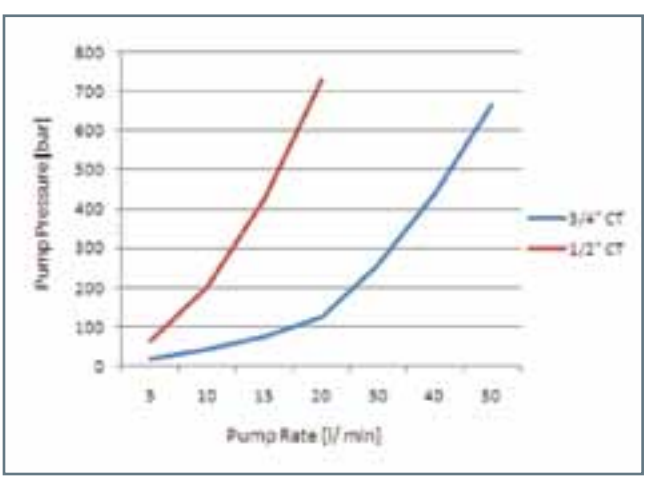

Fig 3. – Fluid Pump Rates and Pressures

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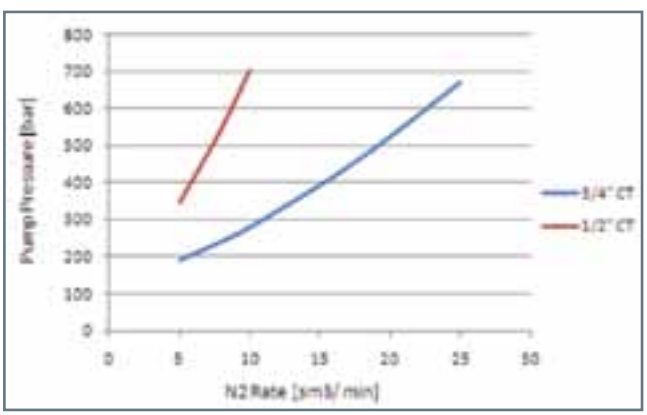

Fig 4. - Nitrogen Pump Rates and Pressures

Fig 5. – Standard Mini Coil Bottom Hole Assembly

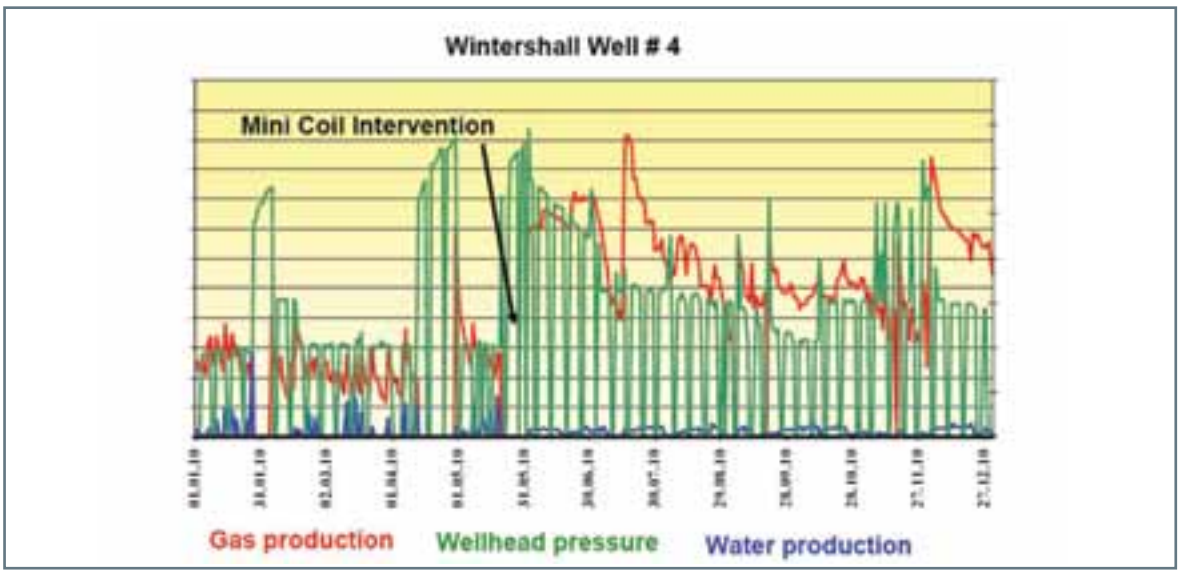

Fig 6. – Production Chart Well # 4 before and after the Mini Coil Intervention

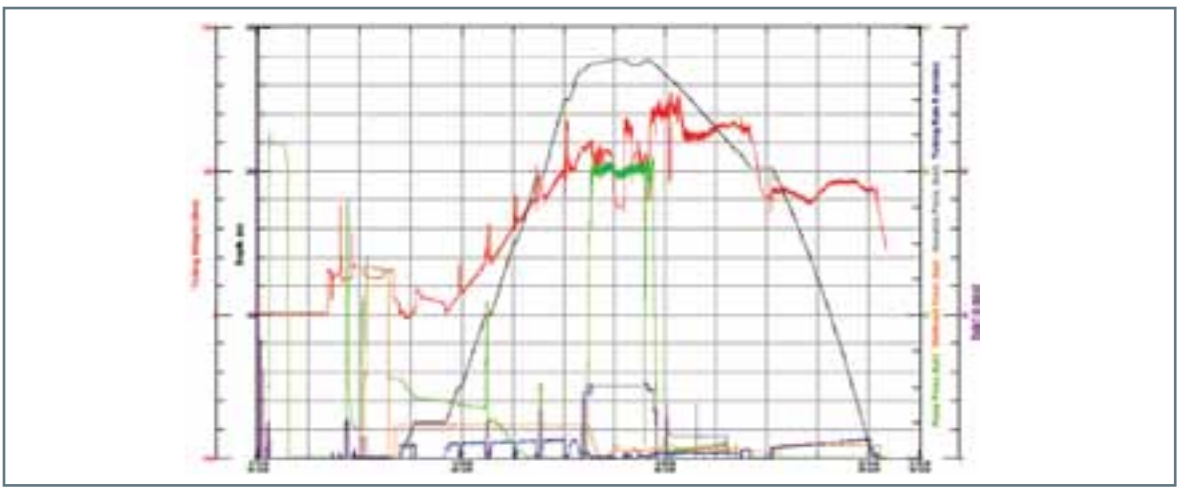

Fig 7. – Characteristic Mini Coil Intervention Chart of a successful job

Table 1. – Mini Coil Interventions in Germany

Well	Job type	Cold Up depth m] [ft]	Final Depth m] [ft]	Equipment used
Well #1	Sand and salt wash	2,055 (6,939)	2,073 (6,998)	Mini Coil and fluid pump
Well #2	Salt wash	2,449 (8,035)	2,557 (8,369)	Mini Coil and fluid pump
Well #3	Salt wash	2,129 (6,985)	2,217 (7,277)	Mini Coil and fluid pump
Well #4	Sand clean out	3,270 (10,728)	3,436 (11,273)	Mini Coil, Fluid and nitrogen pump
Well #1	Sand and salt wash	2,753 (9,032)	2,772 (9,094)	Mini Coil and fluid pump
Well #2	Salt wash	2,546 (8,353)	2,553 (8,376)	Mini Coil and fluid pump
Well #5	Sand and salt clean out	2,685 (8,806)	2,685 (8,806)	Mini Coil, Fluid and nitrogen pump

Table 2. – Mini Coil Interventions in the Netherlands

Well	Job type	Hold Up depth [m] [ft]	Final Depth [m] [ft]	Equipment used
Well # 6	Acid stimulation with 28% HCl	3,081 (10,108)	3,081 (10,108)	Mini Coil and fluid pump
Well # 7	Nitrogen lift	N/A	N/A	Mini Coil, fluid pump and nitrogen unit.
Well # 8	Salt wash and nitrogen lift	3,020 (9,908)	3,043 (9,983)	Mini Coil, Fluid and nitrogen pump
Well # 9	Wash cementagency after failed acid injectivity test	2,848 (9,344)	2,848 (9,344)	Mini Coil, Fluid and nitrogen pump
Well # 10	Salt wash	3,485 (11,437)	3,570 (11,713)	Mini Coil and fluid pump
Well # 1	Acid wash with 15% HCl	3,274 (10,[illegible])	3,274 (10,741)	Mini Coil and fluid pump

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New Higher-Strength Coiled Tubing Developed To Extend Coiled Tubing Operating Envelopes

By: W.D. VanArnam, SPE, C Hargis, SPE, NOV-Quality Tubing

Abstract

A new high strength coiled tubing grade has been developed to address the demands for improved axial strength, better fatigue performance and the ability to function at higher operating pressures. Coiled tubing service companies and operators defined several areas where existing coiled tubing grades are not considered capable of performing, including carrying heavier payloads to the well perforation zone and working in today's increasingly longer horizontal sections. Designing a coiled tubing product that meets these requirements presented unique challenges. The project goal was to develop reliable high strength coiled tubing that provides 130,000 psi minimum yield strength and predictable fatigue life. Coiled tubing strength comes from a balance of strength from the initial hot rolled strip and modifications while forming into tubing. However, some coiled tubing manufacturing operations, including welding, can influence those strength characteristics. The process controls during manufacturing, including bias welds and any tube to tube welds needed to assemble long strings; all determine the final properties of the tubing. The high strength tubing has been successfully made using existing manufacturing methods. The initial testing indicates the tubing has high strength with good ductility. Fatigue testing shows superior fatigue performance to existing grades of tubing in both cycles to failure and diametrical growth. This paper will cover the development program inclusive of strip manufacturing, tube forming, welding and other processes including the quality control necessary for assuring consistent properties. Initial application trails to verify operating characteristics will also be reviewed in the paper.

Introduction

As wells used to recover oil and gas reserves reach deeper and laterals extend further from the well site and into formations with higher pressures and temperatures, equipment employed must be capable of handling the conditions while performing the required tasks. In order to function in these extreme conditions, coiled tubing must be designed to carry the weight of longer and heavier strings, resist higher differential pressures and operating temperatures while performing the intended function with an adequate over pull allowance.

Increasing the yield strength from the previously available 100,000 to 110,000 psi range to higher strengths, increases coiled tubing performance in these conditions. The first benefits are in tubing operating limits derived directly from the increase in strength, including the increases in pipe body load, burst rating, collapse resistance, and tensional load limits. Alternately, the higher strength can allow reduction of the wall thickness along the length of the string, lightening the total string weight.

A viable coiled tubing product capable of providing these benefits is dependent on raw material and manufacturing capabilities being robust enough to provide consistent product.

Material

The material chosen for the higher strength coiled tubing is high strength low alloy steel (HSLA) similar in composition to other coiled tubing grades with increased amounts of solid solution elements and of microalloy strengthening elements. The composition limits and chemistry from the first two heats of the higher strength grade are shown in table 1.

Various master coils were sampled at different locations across the widths and at the beginning, 20%, 50%, 80% and the end of the length. Duplicate reduced section tensile specimens were taken from each location and tensile tested. The results showed a maximum change in strength for either tensile or yield strength of 4000 psi in any single master coil.

This is an indication the steel mill is producing an extremely uniform high strength product.

The material was milled into various sizes of tubing and representative mechanical properties for several different diameters and wall thickness are given in table 2.

Bias welds were made and successfully run through the mill. This confirms the bias weld can be made on the existing equipment. However, the internal product development criteria which requires the bias welds have a tensile strength equal to or greater than the base metal and must not fail along the weld or heat affected zone has not been achieved. Additional work on improvement of the bias welds is ongoing at the present time. Analysis of the yield strength in a transverse weld tensile test does not produce reliable results due to the known variations in properties in the gage length during testing. For this reason, while the minimum yield strength of the high strength tubing appears to by 130,000 psi or greater, the present yield strength rating is being reduced proportionally to the reduction in tensile strength reduction to 125,000 psi.

While butt welding in high strength tubing is not currently recommended, the need may arise on certain occasions. Work is now moving forward employing newer welding technologies. Initial results are promising, but further testing is required before a welding procedure can be recommended...

Application Testing

Samples of 2" O. D. with wall thickness' of 0.134", 0.156" and 0.188" were burst and collapse tested. The burst test results are shown in table 3, with the collapse test results shown in table 4. The theoretical burst and collapse were calculated using Barlow's formula incorporating the actual tensile strength for the burst estimate and API TR 5C3 utilizing actual yield strength for the collapse estimate.

The fatigue test results for 2.0" outside diameter. by 0.156" wall high strength material were compared with previous fatigue tests made on the standard fatigue test machine for 100,000 psi SMYS material. The averages of the cycles to failure and diametrical growth are shown in figures 1 and 2 respectively. The fatigue cycle life of the higher strength material is measurably higher than that of the 100,000 psi material. In addition the diametrical growth measured after the fatigue testing was substantially lower for the high strength material. This means that while the high strength tubing is cycling longer than the 100,000 psi material, its diameter is not growing as fast as the lower strength material. The results confirmed the anticipated improvement in both increased fatigue life and reduction in diametrical growth when compared to data for 100,000 psi minimum yield material.

Samples of tubing were sent to University of Tulsa for strain controlled fatigue testing in accordance with ASTM E606. The standard fatigue test machine and strain controlled fatigue data was then incorporated into both the Flexor TU 6 and Cerberus 9.0 models. Inclusion in the fatigue models assures service companies operating with this material the ability to monitor string life and remove tubing from service prior to anticipated failures.

While performing the fatigue tests fractures were observed and documented. Even at high test pressures the fatigue fractures final fracture surfaces were ductile and limited in size. No yawning fractures or fractures extending to half circumference were observed. Typical O. D. fracture morphology for a 10,000 psi internal test pressure test is shown in figure 3.

Equipment Compatibility

In order to determine the practicality of using the new material in common workover and intervention applications, the new tubing needed to be compatible with existing coiled tubing equipment designs. To determine this, a series of testing was conducted with various parties to subject the tubing to the types of ancillary equipment that are currently used in the coiled tubing industry.

For injector testing, a 2,500 foot string of 2.00 inch outside diameter. and 0.134 inch wall thickness was sent to a major manufacturer of coiled tubing injector heads. The purpose was to test the interaction of the tubing with the injector. The tubing was run through opposing injectors and into a test well. The upright injector served as a normal injector allowing the tubing to be pushed and pulled against the opposing injector which resisted the motion of the tubing to mimic axial forces.

The tubing performance was comparable to existing grades of coiled tubing.

To assure the tubing could be handled by commercially available pressure control equipment, samples were sent to a major manufacturer of coiled tubing blow-out preventers. Shear tests were conducted using both a 4.06 ES Combi and a 4.06 ES Quad BOP. The pressures required to shear various dimensional configurations of the tubing are shown in Tables 6 and 7.

Slip tests were also conducted on the tubing by the same BOP manufacturer and using the same 4.06 ES Combi and 4.06 ES Quad BOP designs as the shear tests mentioned above. Pipe heavy tests were conducted using samples of the high strength tubing in 1.750 and 2.000 diameters and varying walls. The pipe/slip rams were pressured to 2,500 PSI for the 4.06 ES Combi and a 60,000 pound downward force

was applied to each tubing sample tested with no slipping observed. For the 4.06 ES Quad, 2,500 psi was applied to the pipe slips and an 80,000 pound downward force was applied to the tubing samples with no slipping observed. Pipe light tests were also conducted on both BOP designs. The 4.06 ES Combi held the tubing sample without slipping with 2,500 PSI on the pipe/slip rams and a 66,000 pound upward force on the tubing sample. The 4.06 ES Quad was able to hold the tubing sample without slipping using 1,500 psi on the pipe slips and an upward force of 66,000 pounds on the sample.

Field Application

In addition to the fatigue machine testing, the new material was subjected to full-scale fatigue testing that utilized a test well to mimic field operations. A string of tubing with a 1.750 inch diameter and varying wall thicknesses was manufactured onto a spool with a 130 inch diameter core and shipped to a service company facility. The spool was loaded onto a mechanized cradle, and the tubing was pulled over a 96 inch guide arch and through a 135K injector. A five thousand foot cased test well allowed for the tubing to be cycled over the spool and gooseneck while maintaining pressure both inside the tubing and inside the test well. . In order to fatigue a selected section of the string, a 20 foot length of tubing located on the reel would be marked. This section would be pulled off of the reel, over the guide arch, through the injector, and run 30 feet into the test well. This procedure allowed the selected 20 foot section to experience the various bending moments it would see in a common field operation. Various internal pressures were used in order to create a suite of testing that was comparable to the models that were built from the fatigue machine testing done at tubing manufacturer and the University of Tulsa.

The first true field application was performed in the North Sea by the same service company for a major operator. The operator needed a string of coiled tubing that could lower and retrieve a 500 foot long set of perforating guns from a depth of 16,200 feet in a nearly vertical well. The accumulated weight of the guns and the coiled tubing would have been too great for any existing grade of coiled tubing to successfully pull-out-of-hole after the perforations were made and the buoyancy in the well bore decreased due to the invasion of gas. The new higher strength coiled tubing has successfully made three trips in and out of the well, including a deployment test, a drift/logging/displacement run, and the final perforating run. This successful application also served as a test for a future job with the same operator that will involve a greater total depth and a longer set of perforating guns.

Looking at potential field applications, a 30,000 foot long 2.00" diameter by 0.203" to 0.134" wall tapered string, conveying a 10,000 pound bottom hole assembly, was designed to show the potential differences the higher strength material can provide service companies. The complete string design is shown in figure 4. Figure 4 shows the effect the new higher strength tubing can achieve over an existing 100,000 psi SMYS material in a hypothetical 30,000 foot vertical well. The vertical axis in figure 4 is the overpull provided while picking up on the string in an essentially vertical hole. Overpull is the amount of force that can be applied above and beyond the hanging weight. To allow for additional forces it has become common in the industry to not exceed 80% of the available overpull to assure contingencies can be handled. This graph shows the new higher strength material provides over 33,000 pounds additional overpull above the 80% overpull safety margin, while the currently available 100,000 psi SMYS string is unable to provide the basic 80% overpull margin.

Conclusions

High strength coiled tubing can be successfully and reliably made using existing coiled tubing mills.

High strength coiled tubing has mechanical properties which exceed those of existing grades of coiled tubing.

High strength coiled tubing has higher cycles to failure in fatigue testing combined with reduced diametrical growth compared with existing coiled tubing.

Testing confirms there are a significant number of coiled tubing units in the field that are capable of running high strength coiled tubing.

High strength coiled tubing offers service companies the ability to reach further, which is likely to result in higher pump pressures, convey heavier bottom hole assemblies, experience more trips into the hole as the result of higher tubing cycles or various combinations thereof in field operations.

Nomenclature

AWS = American Welding Society

BOP = Blow out preventer

HSLA = High strength low alloy

psi = Pounds per square inch

SMYS = Specified minimum yield strength

REFERENCES

API TR 5C3 Technical Report on Equations and Calculations for Casing, Tubing, and Line Pipe Used as Casing or
Tubing; and Performance Properties Tables for Casing and Tubing

ASTM E-606 Standard Practice for Strain-Controlled Fatigue Testing, American Society for testing and Materials,

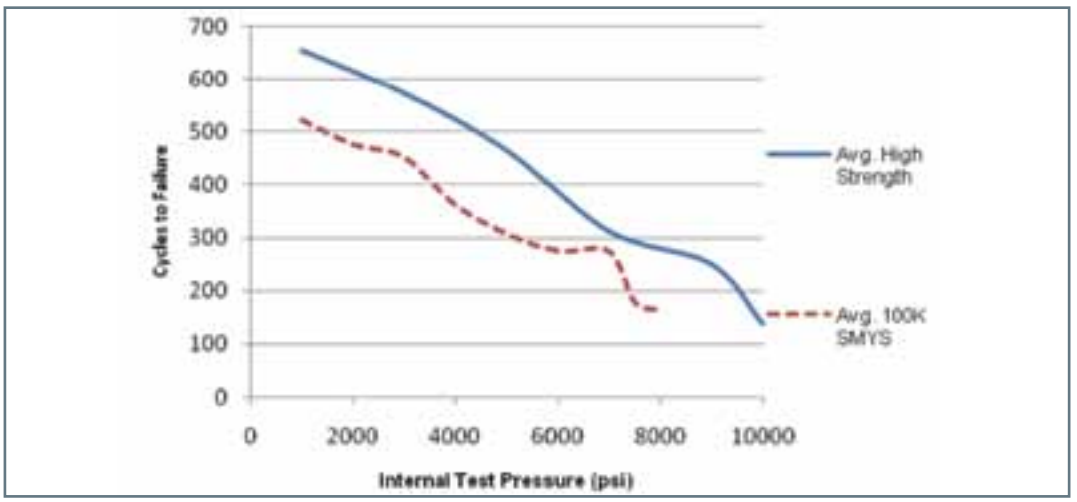


Figure 1: Comparison Average Fatigue Life of 2.0» x 0.156» Wall Tubing

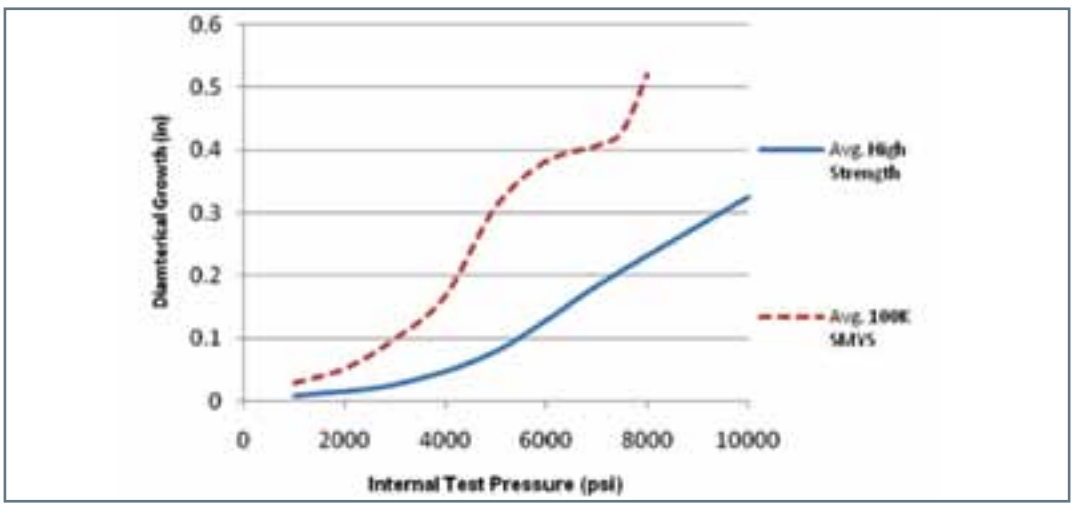
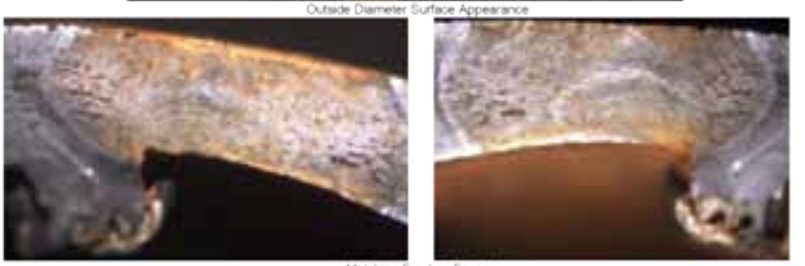


Figure 2: Comparison Diametrical Growth of 2.0» x 0.156» Wall Tubing

Figure # 3 2" O. D. by 0.156" Wall Fracture Characteristics
Fatigue Tested at 10,000 psi, Sample #1 129 cycles

Outside Diameter Surface Appearance



Matching Fracture Faces

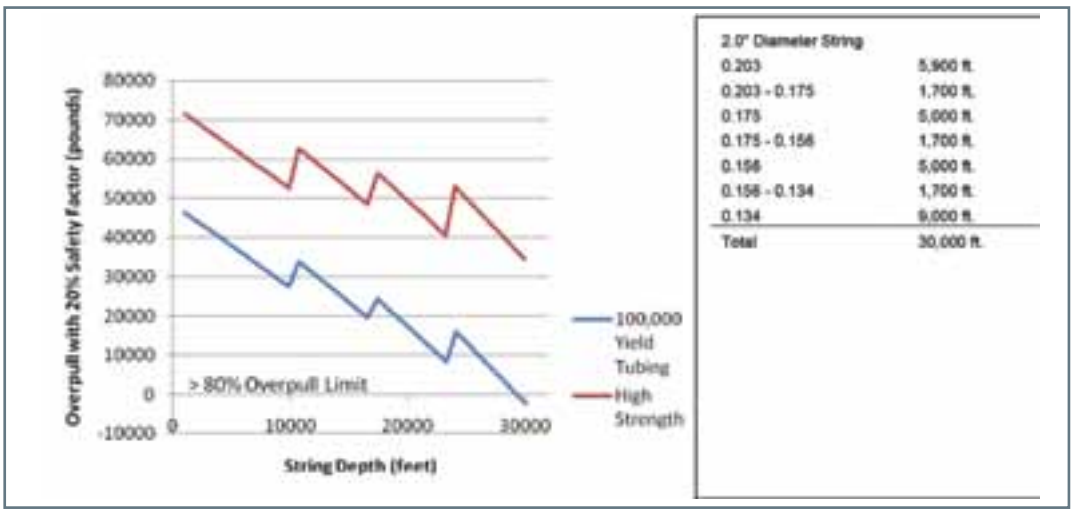


Figure 4: Overpull Comparison of 100.000 Yield Tubing vs. New High Strength Tubing

Table 1 Chemistry of high strength coiled tubing

Element	Min. (%)	Max. (%)	Ht 9721832	Ht 0320223
Carbon (C)		0.15	0.13	0.12
Manganese (Mn)		1.80	1.50	1.47
Phosphorus (P)		0.025	0.010	0.012
Sulfur (S)		0.0014	0.0007	0.0007
Silicon (Si)		0.50	0.41	0.38
Chromium (Cr)	0.50	0.70	0.58	0.58
Copper (Cu)	0.20	0.40	0.23	0.23
Nickel (Ni)		0.20	0.08	0.08
Molybdenum (Mo)	0.10	0.40	0.24	0.23
Vanadium (V)		0.10	0.066	0.072
Niobium (Nb)		0.08	0.057	0.062

Table 2 Mechanical Properties of High Strength Coiled Tubing

Diameter (in)	Wall Thick. (in)	Heat No	String No.	Yield Str. (psi)*	Tensile Str. (psi)	Elongation (%)
1.75	0.134	9721832	322878000	138,500	143,500	24.5
1.75	0.156	9721832	319700000	148,500	150,500	22.5
1.75	0.175	9721832	327760000	146,000	150,500	22.0
1.75	0.188	9721832	322970000	141,600	147,400	22.5
1.75	0.188	0320223	330260000	141,500	147,500	25.0
1.75	0.203	9721832	330660000	145,000	149,500	24.5
1.75	0.203	9721832	332770000	131,500	136,300	26.0
2.00	0.134	9721832	318770000	137,500	143,000	24.0
2.00	0.134	0320223	331070000	141,000	146,000	24.5
2.00	0.156	9721832	318760000	140,000	145,300	24.5
2.00	0.156	0320223	329170000	143,500	148,000	25.0
2.00	0.188	9721832	318790000	138,000	145,500	26.0
2.00	0.188	0320223	331060000	131,500	140,300	22.5
2.00	0.203	9721832	329810000	140,500	147,000	26.5
2.00	0.203	0320223	348420000	135,500	147,500	29.5

Table 3 Burst Testing

Diameter (in)	Wall Thickness (in)	Length (in)	Estimated Burst (psi)	Actual Burst (psi)
2.000	0.134	96.00	18,880	21,437
2.000	0.134	96.00		20,233
2.000	0.156	96.00	22,620	25,431
2.000	0.156	96.00		27,273
2.000	0.188	96.00	27,377	32,297
2.000	0.188	96.00		32,542

Table 4 Collapse Testing

Diameter (in)	Wall Thickness (in)	Calculated Ovality (%)	Estimated Collapse (psi)	Actual Collapse (psi)
2.000	0.134	0.650	11,200	16,780
2.000	0.134	0.400	11,900	16,641
2.000	0.156	0.290	17,500	22,008
2.000	0.156	0.150	15,600	22,338
2.000	0.188	0.399	22,100	28,023
2.000	0.188	0.448	21,800	28,937

Table 5 Fatigue Testing for 1.750 O.D. High Strength Tubing

Diameter (in)	Wall Thickness (in)	Interna Test Pressure (PSI)	Average Diametrical Growth (in)	Average Cycles to Failure
1.750	0.134	6000	1.06×10^{-4}	565
		7000	3.86×10^{-4}	433
1.750	0.156	1000	0.24×10^{-4}	911
		3000	0.60×10^{-4}	755
		5000	0.82×10^{-4}	745
		7000	2.12×10^{-4}	603
		9000	5.05×10^{-4}	435
		10000	7.56×10^{-4}	482
1.750	0.175	1000	0.05×10^{-4}	1330
		3000	0.40×10^{-4}	926
		5000	0.85×10^{-4}	855
		7000	1.65×10^{-4}	945
		9000	3.51×10^{-4}	785
		10000	4.85×10^{-4}	878
1.750	0.188	1000	0.25×10^{-4}	1162
		3000	0.27×10^{-4}	1023
		5000	1.00×10^{-4}	1024
		7000	1.36×10^{-4}	905
		9000	2.80×10^{-4}	721
		10000	3.75×10^{-4}	572
1.750	0.203	1000	0.31×10^{-4}	753
		3000	0.47×10^{-4}	878
		5000	0.95×10^{-4}	955
		7000	2.15×10^{-4}	728
		9000	5.15×10^{-4}	531
		10000	5.00×10^{-4}	901

Table 6: Coiled Tubing Shear; 4.06 ES Combi

Diameter (in.)	Wall Thickness (in.)	Master Coil	Heat	.2% Offset YS (psi)	UTS (psi)	Elongation	Pressure to Shear (psi)
1.750	0.134	660389	9721832	140200	147100	20.00	1700
1.750	0.156	656836	9721832	144000	147500	21.00	2000
2.000	0.134	660389	9721832	138100	143600	23.75	1800
2.000	0.156	656836	9721832	144050	149700	23.25	2250
2.000	0.188	539905	9721832	138450	145200	26.00	2500

Table 7: Coiled Tubing Shear; 4.06 ES Quad

Diameter (in.)	Wall Thickness (in.)	Master Coil	Heat	.2% Offset YS (psi)	UTS (psi)	Elongation	Pressure to Shear (psi)
1.750	0.134	660389	9721832	140200	147100	20.00	1525
1.750	0.156	656836	9721832	144000	147500	21.00	1810
2.000	0.134	660389	9721832	138100	143600	23.75	1725
2.000	0.156	656836	9721832	144050	149700	23.25	2040
2.000	0.188	539905	9721832	138450	145200	26.00	2450

INDUSTRY AT A GLANCE

by: **Ali Ibrahim**

World liquid fuels production and consumption balance (MMBPD)

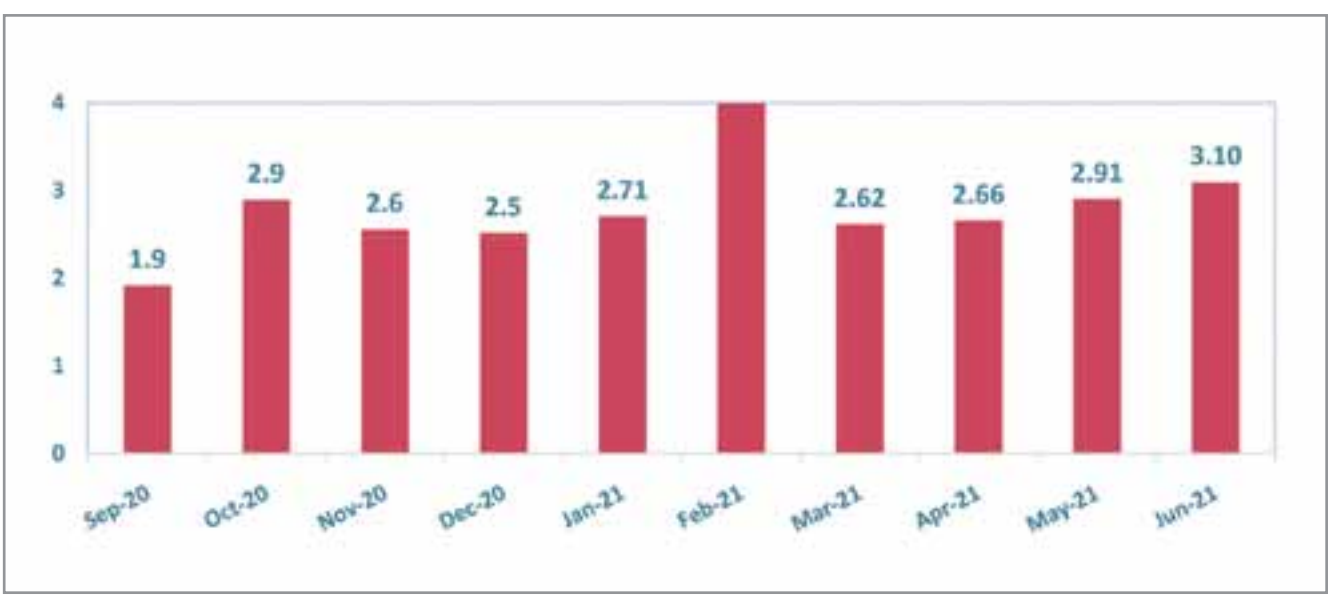
million barrels per day

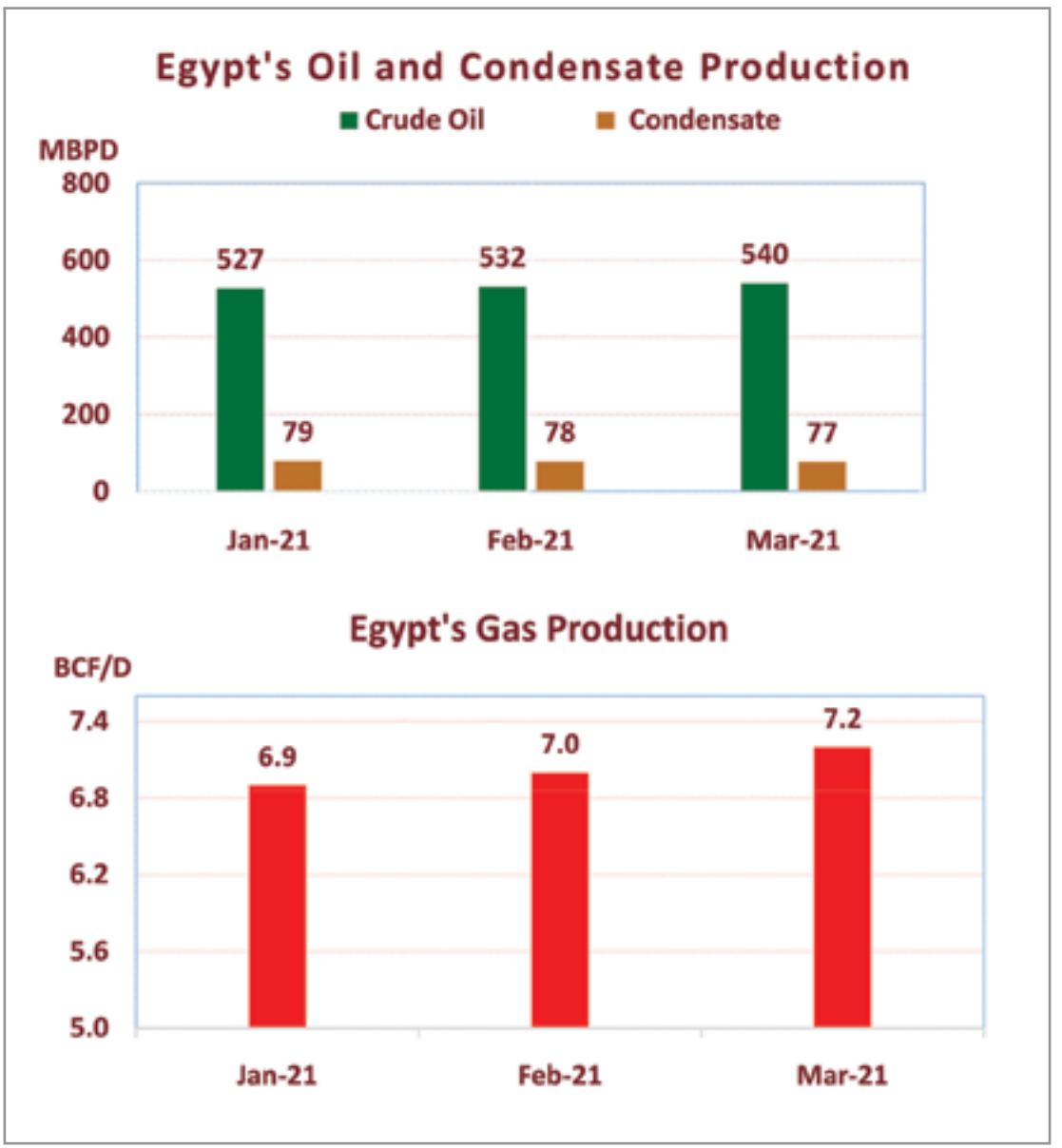
OPEC Crude Oil Production

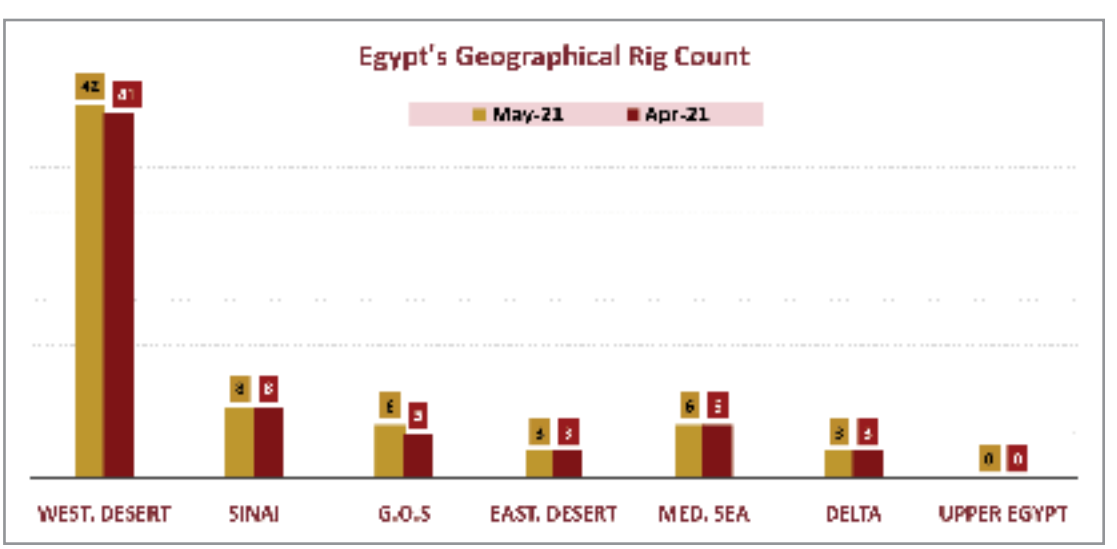
Crude Oil Prices

NYMEX Natural Gas Prices

USD/Million BTU




Egypt's Oil and Condensate Production
Crude Oil
Condensate
MBPD
800
600
400
200
0
527
79
532
78
540
77
Jan-21
Feb-21
Mar-21
Egypt's Gas Production
BCF/D
7.4
6.8
6.2
5.6
5.0
6.9
7.0
7.2
Jan-21
Feb-21
Mar-21


Egypt's Geographical Rig Count
May-21
Apr-21
WEST. DESERT
SINAI
G.O.S
EAST. DESERT
MED. SEA
DELTA
UPPER EGYPT

TAM OILFIELD SERVICES

TAM OILFIELD SERVICES

Baker Hughes

mokveld

Garsport

RED WING

DRESSER
NATURAL GAS SOLUTIONS

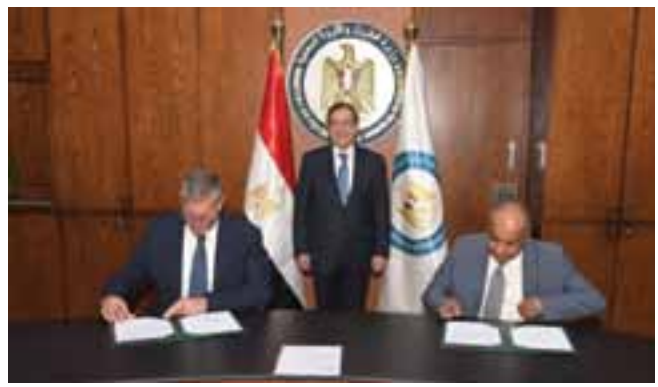
TXT
TEXSTEAM

AQUANESS

Phoenix
Oilfield Services

(+2) 02 - 2736 - 4529
(+2) 02 -2736 - 0659
info@tamoilfield.com

مذكرة تفاهم بين انبى وشلمبرجير للتعاون فى المشروعات البترولية



شهد المهندس طارق الملا وزير البترول والثروة المعدنية توقيع مذكرة تفاهم بين شركتى إنبى وشلمبرجير لتعميق التعاون ودعم وتطوير الامكانيات المشتركة في مجال تنفيذ مشروعات البحث والاستكشاف والإنتاج وخطوط الأنابيب.

وقع مذكرة التفاهم المهندس أشرف بهاء رئيس شركة إنبى وعن شركة شلمبرجير المهندس كريم بدوى المدير التنفيذي للشركة بمصر وشرق المتوسط.

وأكد رئيس شركة انبى أن مذكرة التفاهم تشمل التعاون في مجال تحديث وتطوير المنشآت والتسهيلات البترولية داخل مصر وخارجها بالإضافة إلى تأمين فرص الأعمال وتنمية التعاون المشترك وتبادل الخبرات و استثمار الإمكانيات المتاحة لتلبية احتياجات مشروعات البترول والغاز والمياه وغيرها داخل مصر وحول العالم.

٢ مليار دولار حجم استثمارات "دانة غاز" بمصر في ١٢ عاماً

أعلنت شركة دانة الإماراتية للغاز أن حجم استثماراتها خلال الـ١٢ عاما التي مرت على عملها في مصر بلغت نحو ٢ مليار دولار ما جعلها خامس أكبر شركة لإنتاج الغاز محليا حيث يبلغ معدل إنتاج دانة غاز ٣٠ ألف برميل من النفط المكافئ يوميا في مصر حاليا.وأضافت الشركة في بيان لها أنها تخطط لتنفيذ مشروع تنقيب في منطقة امتياز التنقيب البحري في القطاع السادس والتي تزخر بموارد محتملة تقدر باكثر من ٢٠ تريليون قدم مكعب من الغاز الطبيعي.

مصر تصدر ٥٦ شحنة غاز مسال من إدكو ودمياط منذ بداية العام

كشفت مصادر مسئولة بقطاع البترول، عن تصدير حوالى ٥٦ شحنة غاز مسال من مصانع إسالة الغاز بإدكو ودمياط، وذلك منذ بداية العام الجاري ٢٠٢١ وحتى الآن.

وأضافت المصادر طبقا لـ"اليوم السابع"، أن الفترة القادمة ستشهد تصدير عدد من شحنات الغاز المسال من مصانع الإسالة.

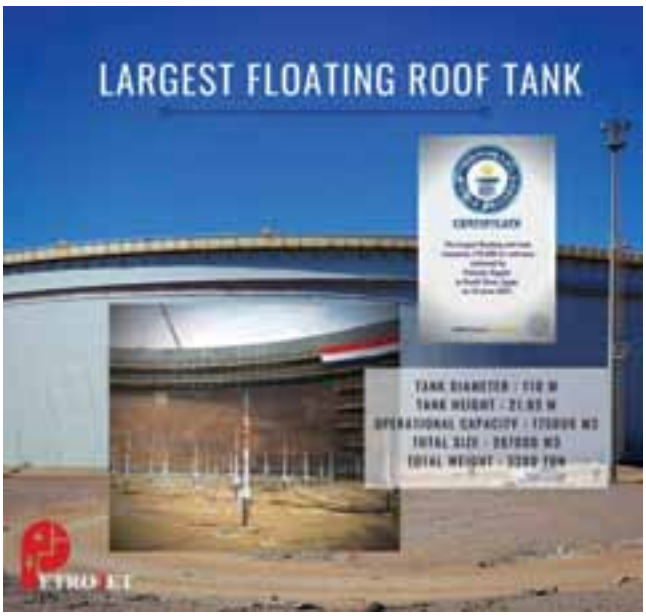
وتمتلك مصر مصانع لإسالة الغاز على البحر المتوسط فى دمياط وإدكو، مما يفتح آفاقا جديدة نحو تعظيم دور مصر الإقليمى كمحور لتجارة وتداول الغاز الطبيعى، ويساهم فى تحقيق عائدات لصالح الاقتصاد المصرى وتأمين إمدادات الطاقة للسوق المحلى ومشروعات التنمية.

ويساهم تشغيل مصنع دمياط للإسالة فى تعزيز قدرة مصر على تصدير الغاز الطبيعى المسال إلى الأسواق الأوروبية، وجعلها مركزاً إقليمياً للطاقة فى شرق المتوسط، فمن المتوقع أن ينتج المصنع نحو ٥,٤ مليون طن من الغاز سنوياً، بما يسهم فى زيادة الطاقة التصديرية إلى ١٢,٥ مليون طن

يذكر أنه خلال شهر مارس ٢٠٢١، كان قد تم الإعلان عن بدء سريان صفقة تضم أكثر من ٤٠ اتفاقية، والتى تشمل تسوية جميع المطالبات بين مصر وكل من الشركة المصرية القابضة للغازات الطبيعية (إيجاس)، وشركة يونيون فينوسا للغاز (UFG) والشركة الإسبانية المصرية للغاز (سيجاس)، ضمان استئناف الإنتاج فى مصنع إسالة الغاز الطبيعى بدمياط التابع لشركة سيجاس، وزيادة

طاقة إيجاس على الإسالة فى المصنع وإمتلاك كل من إيجاس والهيئة المصرية العامة للبترول ٥٠٪ من أسهم سيجاس، مع امتلاك إينى نسبة الـ٥٠٪ المتبقية ومن خلال هذه الصفقة، ستقوم مصر وإيجاس بتسوية النزاعات السابقة، والتى نشأت منذ حوالى ثمانى سنوات مع كل من UFG وSEGAS، بالإضافة إلى أنها تعزز مكانة مصر كمركز إقليمى للغاز، من خلال زيادة طاقة إسالة الغاز الطبيعى المصرى الذى يتعدى الطلب المحلى أو الغاز المنتج من دول أخرى، والتى قد ترغب فى الاستفادة من البنية التحتية الرائدة فى مصر.

بتروجيت تسجل اسمها رسميا في موسوعة جينيس للأرقام القياسية لأكبر خزان بسقف عائم



فـى إنجاز جديد وغـير مسبوق، نجح قطاع البترول المصـرى ، ممثلاً فى شركة بتروجـت ، فـى الحصـول على شهـادة موسوعة جينيـس للأرقـام القياسية فى مجـال تصنيع وإنشاء مستودعـات تخزين الزيت الخام من خـلال إتباع أسلوب جديـد وغير مسبوق فى تنفيـذ وإنشاء المسـتودع بنظام السقـف العائم المزدوج والمتحرك Double Deck Floating من خلال إستخدام أكثر من ٢٤٠ رافع هيدروليكـى متصلين بنظام تحكم واحد ، وهو الأسلوب الذى يعتبر الأول والأكبر مـن نوعه فيما يخص أعمال إنشاء مستودعات التخزين على مستوى العالم حيث تبلـغ سعة المستودع ١٧٥ ألـف متر مكعب وبما يعادل أكثر مـن مليون برميل زيت خـام ، ويبلغ قطر المستودع ١١٥ متر ووزن أكثر مـن ٣٠٠٠ طن. ويتكون المشروع، الـذى ينفذه قطاع البـترول المصرى ضمـن المشروع القومى لإنشـاء مستودعات تخزين الزيت الخام، من عدد ٢٩ مستودع تم إنشاؤهم بنفس الأسلوب.

إينـاب سيبترولتخطط للمزيد من الاستثمارات في مصر

التقـي المهندس طارق الملا ، وزير البـترول والثروة المعدنية بمعالي سفير تشيلي في مصـر – السيـد بابلـو أريـران والرئيس التنفيـذي لشركة إينـاب سيبترول والمديـر العـام الجديد لفـرع مصـر – السيدة دنيـس أبو دينان بوتـو. وحضر الاجتمـاع ايضـاً المهندس عابد عـز الرجال الرئيـس التنفيـذي لهيئة البترول ومهندسـ أشرف فرج وكيل أول وزارة البـترول للاتفاقيات والاستكشاف.يذكر ان إينـاب سيبترول هي شركة نفط تشيلية حكوميـة تستثمر في مصر منذ عام ١٩٩٨ وتعمـل حاليًا في الصحراء الغربية في منطقه امتياز شرق رأس القطارة. وخـلال اللقـاء استعرضـت السيدة دينيس خطـة الشركـة الإستراتيجية حيث يتمثـل أحد أهدافها الرئيسية في توسع أنشطتهـا في مصر وهذا بسبب النتائج الجيدة التي حققتها في مجال البحث والاستكشاف. كما اشارت ان شركة إيناب سيبـترول تخطط لزيادة استثماراتهـا في أنشطة الحفر في منطقه امتياز شرق رأس القطـارة، في ظل نتائج عمليات البحث السيزمـي التي نفذتها الشركة في مناطق امتيازها أواخر عام ٢٠٢٠. هذا بالإضافة الى الالتزام الكبير من شركه إيناب سيبترول نحو معايير السلامة والصحة وحماية البيئة.

رئيس شركة ميدور: ٧١٪ نسبة تقدم الأعمال بتوسعات المصفاة لتكرير البترول

عرضـ الكيميائى جمال القرعيش رئيس شركة ميـدور، موقف تنفيذ الأعمال لمشـروع التوسعات الـذي بلغت نسبة تقدم أعماله ٧١٪.جـاء ذلك خلال جولة وزيـر البترول والـثروة المعدنية المهندس طارق الملا ، لتوسعـات مصفاة ميدور لتكريـر البـترول، مشـيراً إلى أن المشـروع يجـري تنفيذه بهدف زيـادة طاقة التكريـر والحصول علي منتجات بترولية عالية القيمـة تتواكب مع المواصفات العالميـة بهدف المساهمة في تلبية جانب من احتياجات السوق المحلية وتصدير الفائض.وأوضح أنه سيزيد مـن الطاقة الإنتاجية لمصفاة ميدور من المنتجات البترولية المختلفة وفي مقدمتها السولار ثم البنزين عالي الأوكتين و البوتاجاز ووقـود الطائـرات علاوة علـي الفحم والكبريـت، لافتاً إلى أن المشـروع يتسم أيضـا بالتوافق الكامل مـع المعايير الدولية للسلامـة والصحة المهنية وحماية البيئة.كمـا استعرضـ موقف التشغيل الحالي للمصفـاة ، موضحاً أنه بالرغم من تحديـات جائحة كورونا فقد نجحت ميدور على مدار عام ٢٠٢٠ في توفير نحو ٢٠٪ من احتياجات السوق من البنزين والسولار، محققة أعلى معدل إنتاج للسولار في تاريخها.

رئيس الوزراء يشهد توقيع بروتوكول تعاون بين "كهرباء مصر" و"العامة للبترول"

شهد الدكتور مصطفي مدبولي، رئيس مجلس الوزراء، اليوم، بمقر مجلس الوزراء، مراسم توقيع بروتوكول تعاون بين الشركة القابضة لكهرباء مصر والهيئة المصرية العامة للبترول، لبيع ٢٠ وحدة توليد كهرباء متنقلة قدرة كل منها ٢٥ ميجاوات.ووقع على بروتوكول التعاون الدكتور محمد شاكر، وزير الكهرباء والطاقة المتجددة، والمهندس طارق الملا، وزير البترول والثروة المعدنية، والذي يأتي استكمالا لجهود الحكومة المصرية لإيجاد سبل لفض التشابكات المالية بين الجهات الحكومية، حيث سيتم بموجبه قيام الشركة القابضة لكهرباء مصر ببيع ٢٠ وحدة توليد كهرباء متنقلة طراز "TM2500+" قدرة كل منها ٢٥ ميجاوات وقطع الغيار الخاصة بالوحدات إلي الهيئة المصرية العامة للبترول، علي أن يتم تسوية القيمة المالية للوحدات وقطع الغيار من خلال مقاصة حسابية بين قطاعي البترول والكهرباء، يتم خلالها خفض مديونية الشركة القابضة لكهرباء مصر وشركاتها التابعة لقطاع البترول بقيمتي الوحدات وقطع الغيار.

العامة للبترول تنهى ربط ٤ آبار بكشف «الحمد» على خريطة الإنتاج

انتهت الشركة العامة للبترول من أعمال ربط كافة آبار اكتشاف «S.ALHAMD» «ساوث إيست الحمد البحرى» الواقع بامتيازها بمنطقة خليج السويس، على خريطة الإنتاج.ووفقا لجريدة المال فقد تم الإنتهاء من ربط ٤ آبار مستهدفة بالكشف فى زمن قياسى، كما تم إنشاء خطين للانتاج بطول ٤ كم.كانت الشركة قد أعلنت فى أبريل الماضى عن بدء باكورة الانتاج من حقل اكتشاف S.ALHAMD «ساوث إيست الحمد» البحرى الواقع بامتيازها بمنطقة خليج السويس من البئر الأولى بمعدلات ١٥٠٠ برميل يومياً.

ومن المستهدف أن ينتج حقل الحمد من خلال الآبار الأربعة ما يتراوح بين ٣ إلى ٤ آلاف برميل يوميا.وتستهدف الشركة العامة للبترول زيادة حجم إنتاجها من مناطق الامتياز العاملة بها لتقفز إلى مستوى قياسى جديد يتحقق لأول مرة فى تاريخها خلال العام المالى المقبل ٢٠٢٢/٢٠٢١.وتخطط الشركة للوصول إلى معدلات إنتاجية تبلغ نحو ٧٥ ألف برميل زيت يوميا و٨٠ ألف برميل يومى زيت مكافىء العام المقبل، مقابل متوسط ٦٠ ألف برميل حاليا.

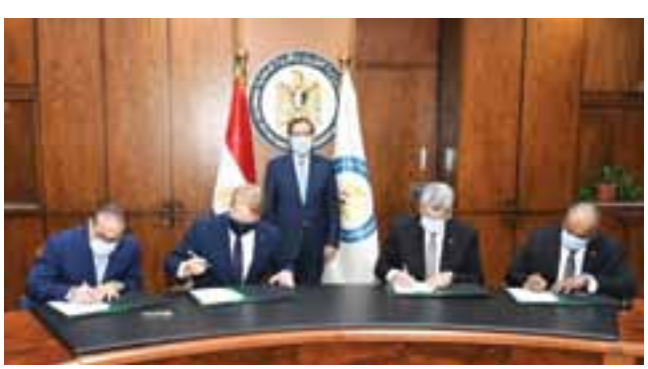
منتدى غاز المتوسط يوافق على انضمام الاتحاد الأوروبي والبنك الدولي للمنتدى بصفة مراقب

رأس المهندس طارق الملا وزير البترول والثروة المعدنية أعمال الاجتماع الوزاري الخامس لمنتدى غاز شرق المتوسط والذى تستضيفه مصر افتراضياً عبر تقنية الفيديو كونفرانس وشهد الموافقة بالإجماع على انضمام الاتحاد الأوروبى والبنك الدولى للمنتدى بصفة مراقب.وأكد الملا في كلمته أن المنتدى أصبح منظمة دولية بمعايير عالمية ومنصة لأنشطة الغاز إقليمياً تضمن التعاون الإقليمى الاقتصادى الناجح لمواجهة التقلبات وتخفيف حدة التوترات السياسية بالمنطقة واستقطابه الاهتمام العالمى. وأضاف أننا نعيد تعريف مفهوم الطاقة ونأمل من خلال خارطة الطريق الصحيحة للتعاون بالمنتدى أن نكون قادرين على تحقيق التعاون من خلال الطاقة لضمان الازدهار لدولنا ومجتمعاتنا ولدينا توقعات هائلة لإمكانية تحقيق نجاحات كبيرة لصالح الجميع في المنطقة.وشهد الاجتماع إطلاق المهندس طارق الملا للموقع الالكترونى الرسمي للمنتدى على الانترنت على الرابط www.emgf.org.

توقيع ٤ عقود جديدة للبحث عن الذهب باستثمارات تتعدى ١٧ مليون دولار

شهد المهندس طارق الملا وزير البترول والثروة المعدنية توقيع ٤ عقود جديدة للبحث عن الذهب والمعادن المصاحبة له واستغلالها فى ١٥ قطاعاً جديداً بين الهيئة المصرية العامة للثروة المعدنية وشركتى Centamin الأسترالية و B2 Gold الكندية العالميتين باستثمارات تتعدى ١٧ مليون دولار للبحث فى ١٥ قطاعاً لتصبح الشركات التى وقعت عقود الجولة الأولى للمزايدة العالمية رقم ١ لسنة ٢٠٢٠ التى طرحتها وزارة البترول والثروة المعدنية فى نظامها الحديث، ١٠ شركات عالمية ومحلية ، ويصبح إجمالى العقود الموقعة ٢٠ عقداً للبحث فى ٥٦ قطاعاً باستثمارات تزيد على ٤٧ مليون دولار.

بكتل توقع اتفاقيتين لتنفيذ أعمال هندسية وتصميمات مشروع مجمع البحر الأحمر



شهد المهندس طارق الملا ، وزير البترول والثروة المعدنية، توقيع اتفاقيتين بين قطاع البترول ومجموعة بكتل الأمريكية لتنفيذ الأعمال الهندسية الأساسية وتصميمات مشروع مجمع البحر الأحمر للبتروكيماويات وتكوين ائتلاف تنفيذ المشروع الذى سيتم اقامته بالمنطقة الاقتصادية بالعين السخنة والذى يعد أكبر مشروع للبتروكيماويات في مصر وأفريقيا، ويُقام بتكلفة استثمارية تصل إلى ٧,٥ مليار دولار، ويضم مجمعاً لإنتاج المنتجات البتروكيماوية والبترولية ذات القيمة المضافة مثل البولي إيثيلين والبولي بروبيلين والبوليستر ووقود السفن وغيرها من المنتجات للسوق المحلى والتصدير..

خطة طموحة للإنتاج المبكر من ذهب «إيقات» بالصحراء الشرقية

وضعت وزارة البترول والثروة المعدنية خطة طموحة لبدء الإنتاج المبكر من الكشف التجارى للذهب فى منطقة إيقات بصحراء مصر الشرقية خلال الشهور القادمة.وأوضح تقرير حديث صادر عن الوزارة، أن نسبة استخلاص ذهب الاكتشاف الجديد تعتبر عالية، بواقع ٩٥٪.جدير بالذكر أنه تم الإعلان عن تحقيق الكشف فى شهر يوليو ٢٠٢٠، باحتياطى يقدر بأكثر من مليون أوقية من الذهب بحد أدنى، وبإجمالى استثمارات تتجاوز حاجز المليار دولار على مدار السنوات العشر القادمة.ويقع الكشف الجديد فى منطقة امتياز شركة شلاتين للثروة المعدنية، فيما تقوم «الثروات والموارد للتعدين» بأعمال الخدمات الاستكشافية.هذا الاكتشاف ناتج عن استثمار مصرى خالص فى مجال البحث والتنقيب عن الذهب فى مصر، بخلاف النماذج الموجودة حاليا التى يتم الاستثمار فيها بالتعاون مع شركاء أجانب ومستثمرين.يشار إلى أنه تم إنشاء شركة العمليات المشتركة (إيقات لمناجم الذهب) ، التى ستتولى إدارة وتشغيل المنجم فى الصحراء الشرقية.

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