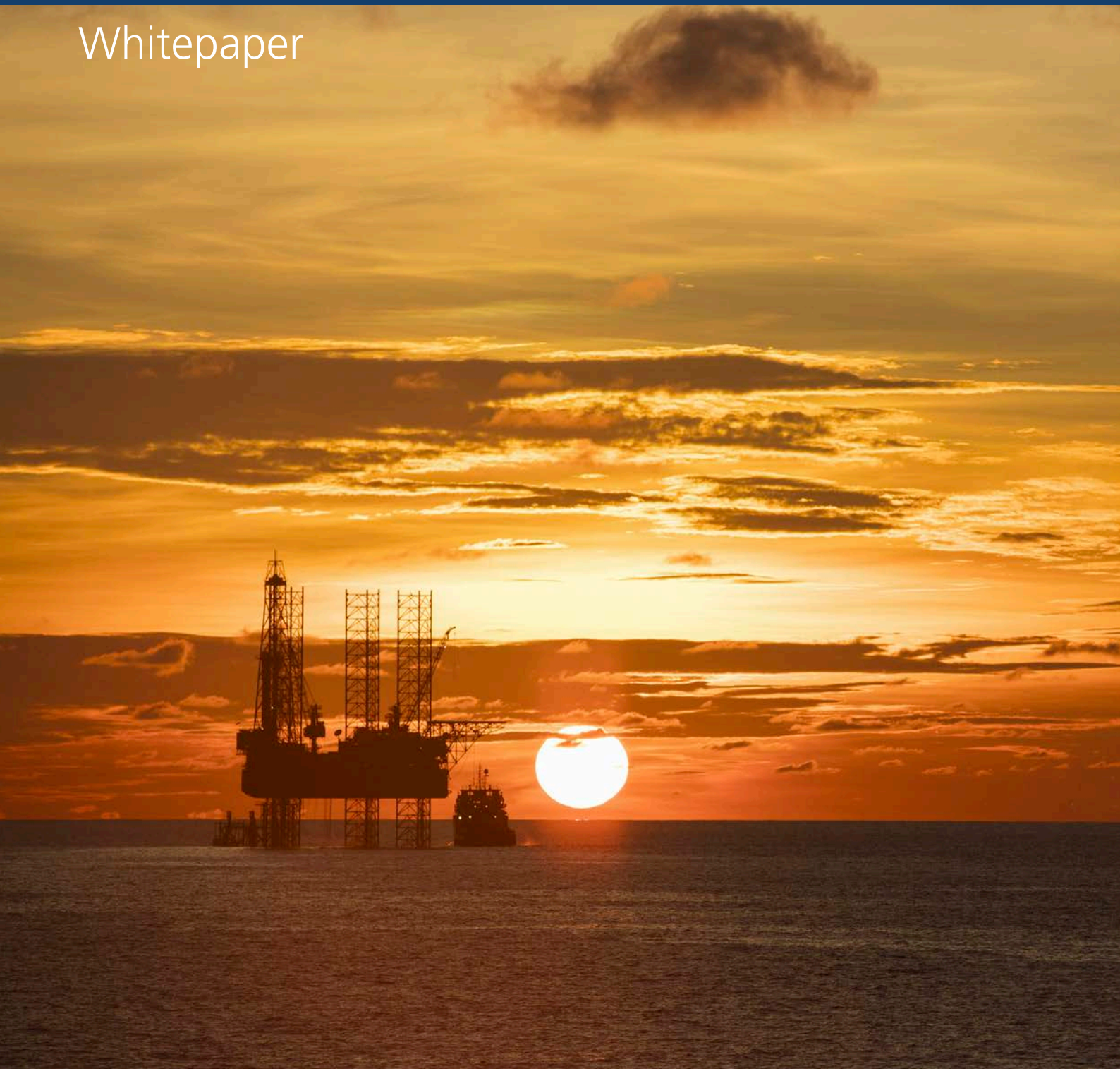




Lloyd's
Register

Iran's New Oil Narrative: Enhancing Recovery and Operational Efficiency

Whitepaper



Iran’s New Oil Narrative: *Enhancing Recovery and Operational Efficiency*

Eighteen months into Iran’s post-sanctions era and the home of the world’s fourth largest oil reserves is brimming with potential. Iran’s plans to bolster oil production from the 3.2 million barrels a day (b/d) in January 2016 to 5 million b/d by 2021 have already got off to an impressive start, with output nearing 4 million b/d this year. This marks an increase of approximately 25% in less than two years, which is an achievement unmatched by most of the OPEC member’s fellow oil producers and competitors.

Such growth sends a positive message that allays doubt in the global energy landscape that Iran does not have the capabilities to leverage its natural resources and reaffirm its position as a major player. The message is particularly well-timed considering the intensifying competition amongst US, Russian, European and Gulf oil producers for coveted Asian and European clients. The bullish sentiment also increases

Re-emerging with gusto

Any doubt in the global energy markets that the former powerhouse would start acting upon the ambitious tone set by Iran in early 2016 quickly dissipated. Just eighteen months after most of the Western-imposed sanctions were lifted, the country has already increased its oil output by nearly a quarter to near 4 million b/d of oil. Such growth comes against a backdrop of financial strain, following the United Nations (UN) and international bilateral sanctions imposed in 2006 and 2010 and the measures enacted by the US and the European Union (EU) in 2011 and 2012. Still, Iran has spearheaded major subsidy reforms and slashed inflation rates at a time when overconsumption and overspending put an unwelcomed spotlight on oil-centric economies in the Gulf. Improving recovery rates and optimising operations all along the value chain – upstream to downstream – is integral to Tehran’s efforts to re-gain export market share, with exports briefly touching 3 million b/d in February. A widening export market share also gives Iran a platform to fine tune its international alliances; strengthening the historical Sino-Iran bond and energy collaborations with Oman, for example. Nurturing such relationships will be front and centre of Tehran’s export playbook as today’s energy market is significantly more competitive than the one the country was forced to start stepping back from more than a decade ago.

confidence in Iran and beyond that production will reach the 6 million b/d that the country reported before the Islamic Revolution in the 1970s deterred investors.¹ To reach these goals – ambitious but realistic – Iran must increase its oil recovery rate and maximise operational value.

The new Iran Petroleum Contract (IPC) will help create an architecture with foreign entities for the country to import much-needed technologies, funding and human capital. Iran’s top security body is still reviewing the documents, though Iran named 29 companies from more than a dozen countries as being allowed to bid for oil and gas projects under the IPC in January this year.² Iran’s post-sanctions economic freedom could potentially be the biggest bonanza for international energy companies since the ouster of Iraqi President Saddam Hussein in 2003.

Funds from Iran’s foreign allies will help the country navigate the decline in upstream investments in global oil and gas fields caused by the low oil price era since mid-2014. Such spending fell by 25% to \$583 billion in 2015 and by another 24% to \$450 billion last year, according to the International Energy Agency (IEA). Iran’s own economic growth will help support its domestic market, with the World Bank expecting the country to report moderate growth rates at slightly over 4% this year. The country’s GDP growth in the first half of the Iranian calendar year (ending 20 March) reached 7.4% year-on-year.³ But Iran is not entirely free from the financial shackles incurred by more than a decade of sanctions. The International Monetary Fund (IMF) is one of many official voices advising that foreign direct investment (FDI) and stronger connections to the international banking system – still hampered by lingering sanctions – are essential to accelerating Iran’s growth.

Like many challenges in the global energy sector, it is a question of economics. At 81%, a large majority of the 100 respondents to a LR Industry Survey in Tehran in April said Iran’s rate of decline at its oil fields can be reduced to the global average with the right amount of investment.

Boosting Recovery Rates

The recovery rates of Iran’s liquid hydrocarbons, crude oil and gas average 29%, 25% and 70% respectively, according to the National Iranian Oil Company (NIOC). Strategies to optimise drilling and production performance are the most important steps in achieving higher recovery rates in Iran, said 65% of survey respondents. The NIOC aims to lift oil recovery rates to 40% as quickly as possible. Around 80% of oilfields operational in Iran are in their

4th

Iran is home to the world’s fourth-largest national reserves of oil.

2nd

Iran is home to the world’s second biggest reserves of natural gas – approximately 18% of the global total.

70%

Most of Iran’s crude oil reserves are onshore, with the remaining 30% offshore.

X3

The recovery rates of liquid hydrocarbons, crude oil and gas averages 29%, 25% and 70% respectively, according to the NIOC.

70%

Carbonate fields dominate the Middle East region, accounting for around 70% of oil reserves. The same applies to gas, at 90%.

1. <https://bloom.bg/2n9ZzTM>
2. <http://reut.rs/2oX0bOa>
3. <http://bit.ly/2qITvZ>



second half-life and require gas pressure support to maintain the production level. Iran’s annual decline rates are around 8%-11% – twice the global average.

The depths of the hydrocarbons in some of the offshore wells in the Persian Gulf can be anywhere between 3,500 and 5,000 metres, with some exceeding 5,000 metres. Drilling on formations similar to Azadegan can take around four months, while fields like Azar can take up to one year. Azar is one of the world’s most difficult fields as it has high and low pressure layers very close to one another.⁴ Iran can drill up to 1,000 metres horizontally, but the thickness of the oil at some of the country’s fields requires tools that can drill horizontally for more than 5,000 metres. Comparatively, other oil producers – Iran’s competitors – have access to tools that can drill 12,000 metres horizontally.⁵

The rewards of improving recovery are enormous. Iran’s in-place oil reserves are estimated at 800 billion barrels of oil, which means raising the recovery rate by merely 1% is equivalent to adding 8 billion barrels to production. The NIOC said this equates to around \$400 billion at current oil prices – highly useful for a post-sanctions treasury and financially-strained private sector.⁶

New techniques must be identified to displace today’s prominent use of gas re-injection into ageing oil fields, according to 90% of survey respondents. This would enable Iran to utilise its gas reserves – the second largest in the world – and broaden its downstream gas market, including liquefied natural gas (LNG) exports. In the near-to medium-term however, Iran will still be somewhat challenged as regards advanced technologies given

that the majority of present day cutting-edge oilfield technologies have US IP and patents.

Iran’s planned pipeline to connect its vast gas reserves to Omani consumers and LNG plants in Oman is gaining traction, as are plans to build the 2,700km Iran-Pakistan-India gas pipeline, which was first touted in 2002. Indian and Pakistani energy officials have cited the obvious economic and societal benefits of the gas pipeline through their lands, which could override their oft-fractious relationship and be a geopolitical win for Iran.

Iran could also join the charge for innovative green-based oil recovery strategies that are currently being pioneered by the UAE and Oman. Positioning itself at the front of the curve – rather than simply following trends – will see Iran reversing its current dynamic and enable it to start exporting technologies and talent.

Oman’s Miraah project will be one of the world’s largest solar plants when it starts coming online this year and will feed 6,000 tons of solar steam per day directly into Oman’s state-owned and Shell-led Petroleum Development Oman’s (PDO) thermal enhanced oil recovery operations at the Amal oil field. The UAE is also pioneering the Middle East’s inaugural commercial use of carbon capture and storage (CCS) for enhancing oil recovery. Al-Reyadah is a joint venture between Adnoc and Masdar that was officially inaugurated at the Mussafah facility last November. Al-Reyadah will capture up to 800,000 tons a year of carbon emitted from Emirates Steel and pipe it to Abu Dhabi Company for Onshore Petroleum Operations for use to enhance oil recovery at its Bab and Rumaitha fields.

80%
Most of Iran’s oil fields are in the second half of their life – EOR is vital to sustaining long-term production.

X2
The rate of decline in production from Iran’s oil fields is 8% – 11% – double the global average.

2022
Improving recovery rates is a widespread challenge, with the global EOR market anticipated to cross \$11.5 billion by 2022.

4. <http://bit.ly/2pk10mq>
5. <http://bit.ly/2pk10mq>
6. <http://bit.ly/2oXdVrT>
7. <http://bit.ly/2oDh67e>



Iran’s oil and gas industry is the oldest in the Middle East with the first petroleum exploration in 1901. 75% of survey respondents said this legacy is an asset as Iran looks to position its energy sector for the next 100 years.

Wind-powered water injection may also be on the horizon to commercially enhance oil recovery if the economics of current studies are viable. Floating wind turbines would generate the electricity needed to power the water injection system.⁷ Assuming the downward cost trajectory of such technologies continues – especially solar – they could prove highly valuable in helping Iran meet its 40% recovery target and in supporting the country’s capability to explore unconventional fields, such as shale oil reserves.

Whatever the means of increasing production, Iran must find a common ground to quell the near-equal division revealed by the survey respondents. A slim majority at 57% said Iran should disregard best practices for the long-term return and just focus on ‘drilling the limit’ today, with the remaining 43% disagreeing. Iran’s oil industry must follow the same narrative, for a fragmented market with differing agendas will only lead to expensive mistakes. Iran’s energy stakeholders and the foreign entities re-joining the country’s oil sector must tread carefully, for the fastest route to enhancing

recovery is rarely the best route to extending the life span of a field. Sustainability is key.

Strengthening the Value Chain

Enhancing asset integrity management is integral to enhancing recovery rates, according to 33% of survey respondents. Asset management services include inspection, risk assessment, maintenance, obsolescence mitigation, corrosion services, process safety, mechanical integrity services and health, safety and environmental strategies (HSE). More than a decade of sanctions have squeezed the flow of domestic and foreign investments into local training and infrastructure in Iran, much of it already ageing. Only 4.7% of survey respondents said they would evaluate the integrity of their plant equipment and operational processes as being up to date, while 36% said it was out of date and 59.3% said it was only adequate. Nearly half of all unplanned downtime is due to equipment failure.

Being unable to maximise production, optimise

4

In just eighteen months, Iran’s oil production is just shy of 4 million barrels a day from 3.2 million barrels in January 2016.

75%

EOR can increase production from an oil well by up to 75%.



Reviewing Performance Culture

Upstream technicians and engineers are the workforce most in need of training and skills upgrades, according to 83.3% of survey respondents. All agreed that energy industry workers in Iran need to upgrade their skills and knowledge in alignment with international standards and best practices, while nearly a third at 28% said their operations suffer weekly delays and setbacks due to a lack of competency skills. Such delays can be extremely costly and do little to reassure foreign investors and the wider energy industry at a time of penny-pinching and eagle-eyed focus on quarterly profit reports amid the low oil price era. Like all energy companies worldwide, Iran would benefit from continually improving the performance culture in its workforce. The importance of nurturing a positive performance ethos in-house is about more than just economics. Statistics show that teams with the best performance are also the safest. They must be empowered and given responsibility. This means that the teams at the oil fields, refineries or maintenance crews must help shape the improvement of their feedback on the areas to be rectified – this is vital because it’s only with their buy-in that progress will come about. Objectives cannot be set and enforced by a colleague sitting at a desk in an office offsite. It is also a case of ‘joining the dots’ to fix weaknesses in teams and maximise strengths. If a day crew are 40% more efficient than the night crew, then both crews need to share best practice and work together to guide them in constructing their own targets that can be measured and analysed. Such improvements cannot be approached on a generic basis, but must be targeted and assessed on a one-by-one basis. Making even small performance improvements of a few percent will have a significant impact when applied across multiple wells and projects. Companies must have a 100% buy-in from personnel across the team; from the drilling manager, the drilling superintendent, the offshore supervisors to the communications and maintenance teams, for example. The entire team must be aligned to the same objectives, with mentors assisting weaker team members.



inspection and maintenance regimes across up, mid and downstream operations inevitably has an impact on the financial bottom line and safety. Just over half of survey respondents said applying the best international practice in integrity management, risk and safety engineering should be Iran’s top priority for enhancing asset integrity management. Realising the value of optimising inspection and maintenance regimes by implementing an efficient integrity program should be prioritised, countered 42.2% of survey respondents.

General risk-based approaches include predicting repair and replacement dates based on the level of ‘acceptable’ risk rather than waiting until equipment is down. Maintenance regimes from upstream to downstream can be improved by applying the ‘what if...?’ analysis to troubleshoot problems before they have had a chance to gain traction.

To enhance efficiency and safety along the value chain, Iran’s energy industry can stretch its innovative muscle by integrating the benefits of the 4th Industrial Revolution. This includes digitising oil fields, robotics and predictive analytics and algorithms. Aside from improving the efficiency of day-to-day operations, this will build valuable historical data sets that the domestic industry can reference over the years to find cost-cutting operational trends. Consider the value to Iran’s oil industry when the World Economic Forum (WEF) reports that rapid digital transformation in the global electricity sector alone could generate more than \$1.3 trillion of value for industry up to 2025.

The industry already collects vast amounts of data, but it holds maximum value when strategically applied to plugging black holes of inefficiency in operations. Are players in the energy ecosystem – industry, government and academia – measuring the right things and are the data points compatible and consistent so that lessons can actively be applied to optimise operations? Improving data harnessing practices and establishing benchmarks are key steps to answering these key questions.

Energy companies must also be careful to avoid being swamped with multiple data points that mean little. A simple and systematic digestion of reliable data streams are more useful. Large cash investments in advanced software packages are not always required, though they are highly useful. To start with, bettering performance can be done by harnessing the information available in data that has already been collected. As sophisticated data management systems become more mainstream and less costly – a case of the chicken and the egg – such tools will increasingly be woven into the fabric of daily operations and increase visibility along the entire chain.

Iran’s oil and gas industry is the oldest in the Middle East with the first petroleum exploration in 1901, which 75% of survey respondents believe stands Iran in good stead for the coming century. As Iran’s new and post-sanction’s energy chapter gets underway, the oil industry must not be a phoenix that just rises from the ashes. It must soar.

EOR: A snapshot

Enhanced oil recovery (EOR), also known as tertiary recovery, can increase production from an oil well by up to 75%. Improving recovery rates is a widespread challenge; the global market of EOR is expected to exceed \$11.50 billion by 2022, according to Transparency Markets 2016-2011 Report on EOR. EOR is more expensive than primary and secondary oil production, which means the financial reasoning behind development must be particularly sound. Detailed evaluations of fields using reservoir characterisation, screening, scoping, and reservoir modelling and simulation determine the type of EOR that could work best on a reservoir. There are three main types of EOR; chemical flooding, gas injection and thermal recovery.

Source: Rigzone

1979

Iran’s oil exports touched 3 million barrels a day in February – the highest level since the Islamic Revolution in the late 1970s.

400

Increasing Iran’s recovery rate by just 1% could add \$400 billion to the oil industry’s coffers.

7.4%

Free from the economic shackles caused by sanctions, Iran posted strong GDP growth in the first half of the financial year (ending 20 March).

12,000

Some of Iran’s competitors can drill deeper than 12,000 metres – a coveted capability to explore some of Iran’s deeper and more challenging oil reserves.



PANEL DISCUSSION 1: Strategies for Optimising Production Performance

- Phil Davies, Head of Wells Engineering, LR
 - Michael Byrne, Global Head, Rock Properties, LR
 - Ahmad Salari, Chairman, Londwill Energy Middle East & Board Member, Well Drill Energy
 - Ali Gholipour, Principal Geologist, Energy Consultancy, LR
 - Moderator: Sean Evers, Managing Partner, Gulf Intelligence
-

Sean Evers: Let us start with a 10,000ft of Iran’s EOR market. We have seen over the last seventeen months a dramatic recovery in oil production following the lifting of the sanctions. Going forward, what is the biggest obstacle facing Iran as it tries to boost its recovery rates? Is it human talent, ageing equipment or maybe weak asset integrity?

Ahmad Salari: It is many, many factors. We have been through years of sanctions and years of war. And most of the companies are state-owned and there is hardly any incentive.

Sean Evers: A concept that is very relevant all around the world, is the creation and sharing of knowledge. Could that help identify solutions to the more technical challenges in Iran?

Ahmad Salari: Definitely. But how fast can we do it? How quickly can we change? It is a culture and a mentality that unfortunately we have lost throughout the years.

Sean Evers: In this context, how is the Azar field, one of the world’s most challenging, performing?



Sean Evers: *Considering the challenges at Azar and all the fields, which would you say must be measured as a priority to help the recovery rate? The flow of oil, gas or water?*

Michael Byrne: We already know the total volume of oil, water and gas that comes out of any well. But we have little to no idea as to where in the well those fluids are coming from. How is the reservoir contributing to the well – through fractures or through the matrix? We simply do not know in most of our wells where the flow is coming from. Just knowing where the initial fluids – be it oil or gas – are coming from gives us an indication of where the water is likely to come from. And of course, if we know where the water is coming from, then we may be able to control and reduce the amount of water that we are dealing with. Less water is generally good news.

What is critical in the management of the reservoir is to try to recover more oil and less water to ultimately improve the total recovery of oil from a field. But this can be quite a

difficult process and even more so with complex reservoirs. But that does not mean we should not be trying.

Audience Member 1: The main information we need to improve the rate of recovery more quickly is better geological data, particularly in terms of the geo mechanical features, the extent and location of the fractures and so on. We must have this sort of first-class information regarding the rock mechanics first.

Ahmad Salari: Every well that we drill is supposed to give us new information. Sometimes it gives us 10%, sometimes that number is 90% or well beyond expectations at 250%. This is all still new information. But do we use this and correlate it with a nearby well to help create a bigger picture of the whole field? No, we do not. That is why the well trajectory and well placement is often incorrect, which affects everything. We are simply not using the data that we already have in our hands.

**This is an edited transcript.*



PANEL DISCUSSION 2: Strategies for Enhancing Asset Integrity Management

- D.J. Schuld, Area Ops Manager, Asset Integrity Services, LR
 - Jan Reier Huse, Vice President, Risk Management, LR
 - Majid Abdi, Deputy Director of Engineering & Liability Directorate. Iran Insurance Company
 - Mr. E. Alauddin, Senior Reservoir Engineering & Development Advisor, Tehran Energy Consulting Engineering
 - Rajab Ali Rahmati, Senior Technical Advisor of PPZ
 - Moderator: Sean Evers, Managing Partner, Gulf Intelligence
-

Sean Evers: How do the worlds of analogue and digital data co-exist? What purposes are served by each?

Mr. E. Alauddin: Digital data is good when you are looking at static data, but analogue is preferred to digital data when we are dealing with well performance and reservoir performance. I am inclined to use analogue data for dynamic data and digital data for static data. Reservoirs and wells are like human beings. When you go to a doctor, the doctor cannot determine your situation by purely looking at the data of your blood work, previous appointments and medicine, for example. It is not that easy. You must talk with your doctor, which creates dynamic information. Talking to a doctor to give him a detailed report of your situation is like reviewing the status of a well and reservoir.

D.J. Schuld: I think industry also needs to make sure it understands the new terminology. What do we mean when we say analogue data and digital data? If when you speak about analogue data, it is something where you need human interference, then I agree. But there is also terminology that means analogue data is hard copy data. We should never have a situation where we do not do inspections and we are not taking the human interface into account. The total picture provides us deep understanding how we operate the asset / plant. I also do not believe that drones can take over all kinds of inspections, for example. It is mainly that we create and use additional data, such as digital data, to positively influence, survey and inspect a situation.



Sean Evers: *Under the sanctions, Iran’s energy industry operated under a buy-back regime with international energy companies. What is the challenge for Iran’s industry as it prepares for the return of international partners – what are the critical next steps, such as safety?*

Jan Reier Huse: In recent years there have been a lot of developments on our side in terms of tools and methods. This has been triggered by some very nasty accidents, such as the one in the UK a few years ago. This has led to a lot of research activity; large-scale explosion simulations, large scale fire simulations and so on. Industry should take advantage of the new tools when they are called for. They are not necessary every time, but they can prove very valuable in certain situations.

I work as a consultant in a lot of countries, which means I learn from various industries and can effectively be a messenger. The best way to bring information from one place to another is to interact with the industry by doing some body of work. Audits, for example, over a rather short period of time, enable a lot of experience and knowledge to be exchanged. The same goes for other projects for which we do some tasks in cooperation with the local industry. In turn, this helps break down the walls separating companies and ensures good international practices are widely applied. When I worked in China in the early 2000s, for example, they were not familiar with any of these tools. Today, they are doing a lot of risk analysis and that interface between us and them has been one of the reasons.

Audience Member 1: I have two questions, please. Firstly, which model is best for the implementation and prioritisation of an asset? And is there a model that is acceptable for all the platforms, or should we develop such a model? Or learn such structures from other companies? Secondly, what is the main challenge and cause of uncertainty in the implementation of asset integrity management?

D.J. Schuld: There are 3 Methodologies available: semi-quantitative, qualitative and fully qualitative. Our advice would be to start with a semi-quantitative. This means you collect a pre defined set of data of data and your engineers will do their final analysis based on information. This is especially important when you deploy assets in operation for many years. If you have calculated the risk and you have a risk distribution showing medium-high etc. of medium-high and high criticalities – normally that should be between 10% and 15% of the total number of components – you can start more in-depth analysis. This is when you can apply the qualitative model, which requires more subject matter experts being involved.

In response to your second question, the verification of data is the most important step to ensure you get good data translated into sound information. And keep it alive. Do not perform the study only and leave the information on your desk, saying ‘okay, that is done’. That is not how it works. What are you actually doing with your assets? How is the information being applied outside of the control room?

**This is an edited transcript.*

About Lloyd’s Register:

LR is a global engineering, technical and business services organisation, with a long-standing reputation for integrity, impartiality and technical excellence. We apply our expert knowledge and independence to help clients across the Energy industry design, construct and operate their capital-intensive assets and businesses to their highest levels of safety and performance. We have been delivering expertise to the Iranian oil and gas and marine industries for over 80 years and are committed to helping Iran optimise production, cost effectively and safely – providing the confidence demanded by engineering principles, government regulations and industry codes and standards.

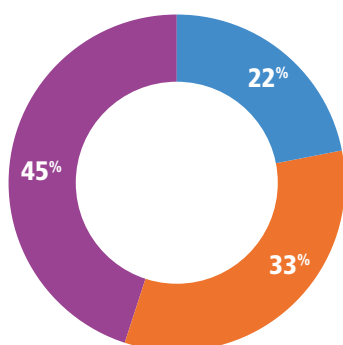
www.lr.org/oilandgas
Email: oilandgas@lr.org

Unlock Potential from Your Reservoir, Assets & Onshore Facilities

SURVEY A:

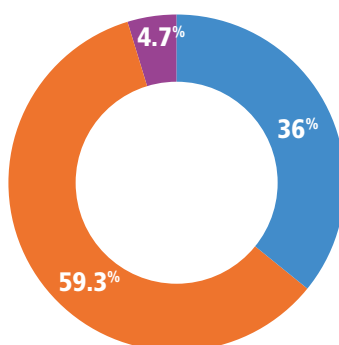
Nearly half of all unplanned downtime is due to equipment failure. An important piece of equipment stops working, which means the production unit has to stop to make repairs or replace the equipment.

Q1. How often do you suffer downtime from equipment failure?



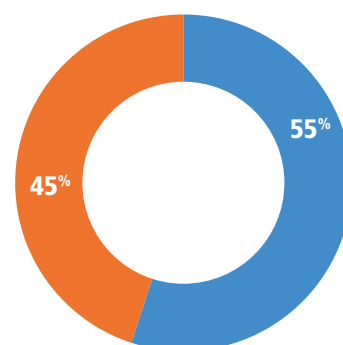
- A. Daily
- B. Weekly
- C. Monthly

Q2. How would you evaluate the integrity of your plant equipment and operational processes?



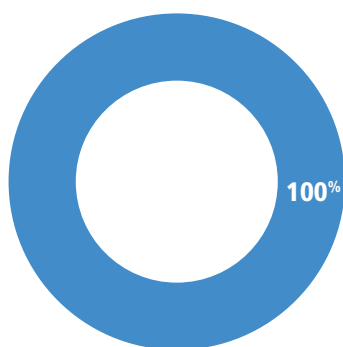
- A. Poor – Out of date
- B. Adequate – Gets the job done
- C. Good – Up to date

Q3. Should the Iranian Energy Industry invest to UPGRADE or REPLACE outdated equipment and processes?



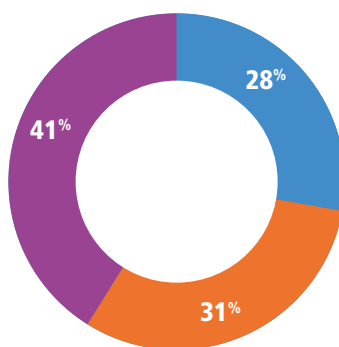
- A. Upgrade
- B. Replace

Q4. Iran's energy industry workers need to upgrade their alignment with international standards and best practices?



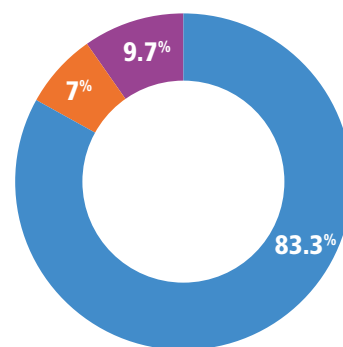
- A. Agree
- B. Disagree

Q5. How often do you suffer delays or setbacks due to a lack of Competency skills?



- A. Daily
- B. Weekly
- C. Monthly

Q6. Which Group of Iran's Energy Workforce are Most in Need of Training & Skills Upgrades?



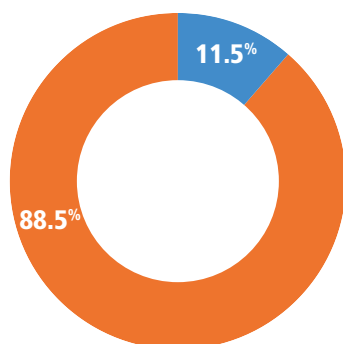
- A. Upstream Technicians & Engineers
- B. Procurement Teams – including support services such as Accountants & Lawyers
- C. Downstream Operators & Port Managers

Unlock Potential from Your Reservoir, Assets & Onshore Facilities

SURVEY B: OPTIMISING DRILLING & PRODUCTION PERFORMANCE

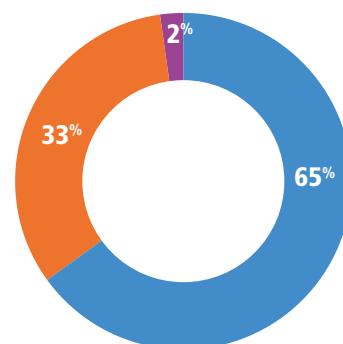
Q1. Iranian oil production has recovered quickly since January 2016, adding about 1 mbpd to raise output to levels of around 4 million barrels a day: Which of the following is the biggest obstacle for Iranian oil production levels to continue to rise?

- A. Human Talent
- B. Ageing Equipment



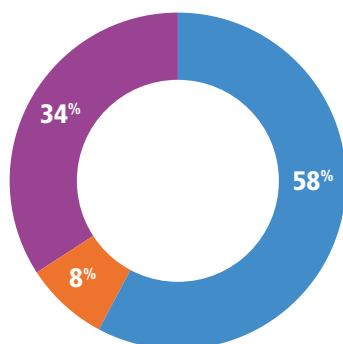
Q2. Abdol-Mohammad Delparish, manager of Integrated Planning in National Iranian Oil Company, has said that the recovery rates of Iran's liquid hydrocarbons, crude oil and gas are 29 per cent, 25 per cent and 70 per cent respectively on average. Which of the following strategies offer the Fastest Route to Higher Recovery Rates in Iran?

- A. Strategies for optimising drilling and production performance
- B. Strategies for enhancing Asset Integrity Management
- C. Strategies for Risk management – the key to good safety performance



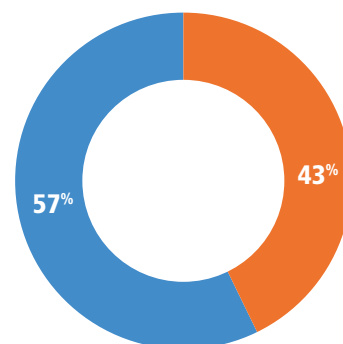
Q3. Which of the following should be the Top priority for Optimising Drilling and Production Performance in Iran?

- A. Well placement, reservoir contact and production technology optimisation
- B. Minimise reservoir damage, under/ non-producing wells or other production "losses"
- C. Techniques & technology to minimise well construction lost time & invisible lost time



Q4. Iran should disregard best practices for the long-term return and just focus on drilling the limit, produce the limit today?

- A. Agree
- B. Disagree



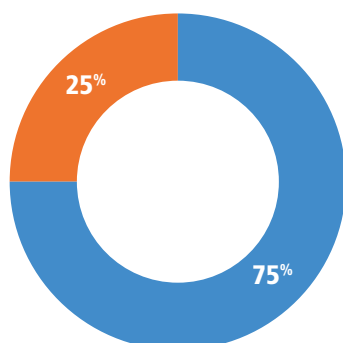
Unlock Potential from Your Reservoir, Assets & Onshore Facilities

SURVEY C: **ENHANCING ASSET INTEGRITY MANAGEMENT FOR IMPROVED PRODUCTION & HSE PERFORMANCE**

Asset Integrity Management services include inspection, risk assessment, maintenance, obsolescence mitigation, corrosion services, process safety, mechanical integrity services and health, safety & environmental strategies (HSE). Iran's ageing facilities and infrastructure pose a challenge in terms of maximising production, optimising inspection and maintenance regimes.

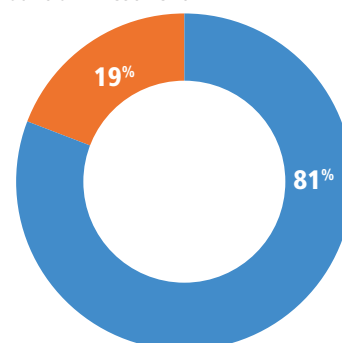
Q1. Iran's oil and gas industry dates back to the early 20th century, making it the oldest in the Middle East, with the first petroleum exploration dating back to 1901. As Iran looks to position its energy sector for another 100 years, this Legacy is an:

- A. Asset
- B. Liability



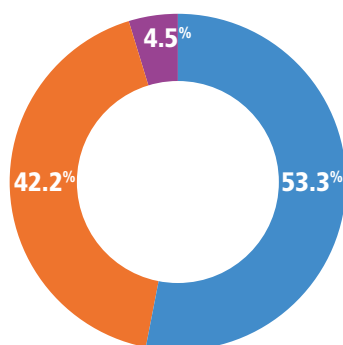
Q2. About 80% of oilfields operational in Iran are in their second half-life and require gas re-injection to maintain the production level, with high decline rates ranging between 8-11% -about twice the global average. Iranian decline rates can be reduced to global average with right amount of investment?

- A. Agree – like most places in the world, higher capex results in lower decline rates
- B. Disagree – with the age of Iranian fields, the best we can hope for is to keep decline rates from getting worse



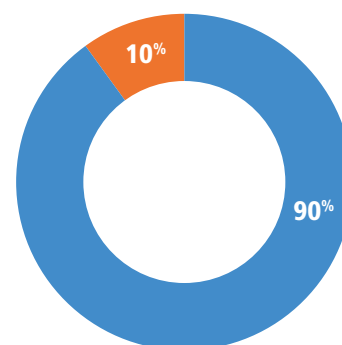
Q3. Nearly half of all unplanned downtime is due to equipment failure. Which of the following strategies should be Iran's top priority for Enhancing Asset Integrity Management for improved production?

- A. Best international practise in integrity management, risk and safety engineering
- B. Realising the value of optimising inspection and maintenance regimes by implementing an efficient integrity program
- C. Optimising and extending the life of aged plants



Q4. Iran should seek new enhanced oil recovery techniques to displace gas reinjection into ageing oil fields?

- A. Agree
- B. Disagree







Publishing

Thegulfintelligence.com

Lloyd's Register Group Limited

71 Fenchurch Street
London EC3M 4BS
United Kingdom

T +44 (0)20 7709 9166

F +44 (0)20 7423 2258

E oilandgas@lr.org

Unit No. 1 – 4th Floor, Commercial & Administration Building
Tajarloo Square, Shiyani Avenue, Lavizan
Tehran
Iran

T +98 912 1201023

www.lr.org/oilandgas

Produced: June 2017