Nat. Volatiles & Essent. Oils, 2021; 8(4): 12904-12919

Modernistic Exploration Model Of Geophysical Automation In The Expedition Of Deep Oil And Gas

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Abstract-This industry's exploration approach, according to an examination, often limits new ideas and thwarts exploration activities. The existing exploration paradigm does not allow for sufficient exploratory activities to be done in huge, unexplored regions with high oil and gas potential. Outlining a new exploration model that utilizes equipment that is now accessible challenges the current paradigm in the field. As Iraq's first exploration well was drilled in the Kurdistan Region in 2005, the region experienced extraordinary amounts of exploration activity. More than 15 billion barrels of recoverable reserves have been identified as a consequence of drilling. Because of their proximity to the Iranian and Iraqi supergiant fields, the reservoirs found in this region are impacted by them. The bulk of Iraq's known oil and gas deposits are found in Cenozoic and Cretaceous strata, topped by Cenozoic evaporation. Northern and northeastern areas of Kurdistan lack Cenozoic strata in particular. Despite the lack of Cenozoic evaporate sequences a decade ago, it is now commonly acknowledged that significant volumes of hydrocarbons may be trapped. While some reveled in the sight of massive buildings and oil spills, others worried about the potential of a trap leaking. More investigation and drilling are needed for several of Kurdistan's surface anticlinal. Two-dimensional seismic and vertical drilling are the most common methods used in Kurdistan for drilling. The quantity of oil and gas that can be taken from the earth's crust is predicted to increase as a consequence of recent 3-D seismic investigations. Three rich fields have been discovered after a decade of considerable exploration: Khurmala, Khurke Tawke, and Khurke Tawke. Increased production and superior reservoir qualities have led to the discovery of new reserves in the Tawke Field. Additional fields and discoveries are expected to emerge in the future. Multilateral wells, for example, and hydraulic fracturing have yet to be used in the region despite the fact that several horizontal wells have been drilled. Within the fold belt or foreland, the vast bulk of Kurdistan's wells were drilled. Several wells have been accidentally drilled by thrusts, rather than purposely, rather than by design. The discovery of hydrocarbons under massive thrusts and even beyond apparent structural closure in certain strata has not prompted the drilling of any specialized wells. Still, there are issues in this industry, which has recently undergone a major structural shift. Construction of pipelines and a surge in exploration are both indications of the times. In Iraq's Kurdistan Region, oil and gas development and production might increase dramatically. Here we take a look back at the first ten years of exploration and assessment in Iraq's Kurdistan Region. Since there aren't many technical papers on this issue, the writers relied on their own knowledge and that of local firms to build this research.

Keywords-Geophysical Technology, Exploration of deep oil and gas

1. INTRODUCTION

Kurdistan Region of Iraq (Kurdistan) was "opened" to exploration, appraisal, and production operations in 2003, and this paper provides a detailed analysis of these activities since then In recent years, Kurdistan has grown to be one of the world's most active onshore hydrocarbon regions, with output reaching over 400,000 bopd and fresh reserves exceeding 15 billion barrels of oil equivalent. As of 2003, there has been a lot of licensing and exploration going on. Among other things, it discusses the difficulties of drilling in this fold-and-thrust zone. Maps chronicle all of the major discoveries and producing fields, as well as wells that have failed and the likely causes of their failure. Toward the conclusion of the study, an overview of present and projected Kurdish developments is provided. Few technical studies have been done on Kurdistan, and this research relies heavily on previously published papers and industry presentations. An overview of the first decade of Kurdish exploration operations is expected to be provided in this publication."Ultra-deep formations" refer to formations that are more than 6 000 m deep [1–3]. Deep reservoir oil and gas exploration entails more danger, greater complexity, and a higher financial outlay than shallower endeavors [4,5]. As a result, geophysical technologies are even more crucial. Seismic exploration technologies have made a number of notable advances and triumphs in deep reservoir research since 2000 [5,6]. This article examines the challenges and opportunities in the discovery and exploitation of deep oil and gas reservoirs. Currently, oil and gas exploration relies on a protracted and exhausting process before drawing conclusions regarding a place's feasibility. Now, the industry cannot justify the expense of completing risk-reduction analysis and site selection before the first exploratory well is dug. Many areas have remained unexplored for a long time as a result of the costs, delays, and dangers associated with exploratory missions of this kind. Paradigms are usually shattered and new business models are developed during times of crisis Because of the current economic situation and the difficulty of exploring big, uncharted regions, the oil and gas sector has to break a long-held industrial paradigm once again. The finding of oil and gas leads may be facilitated by using a revolutionary exploration strategy that is less costly and more direct. This shift is only possible with the advent of brand new technology. We need a paradigm shift if the sector wants to overcome present market constraints that are preventing large-scale exploration projects in frontier regions to proceed. We need to modify the way we do our research and apply new technologies in order to accomplish this.

1.1 Global situation

In this article, we take a look back at the first 10 years of Iraq's Kurdistan Region exploration and appraisal. This study was based on the authors' personal experience and that of nearby companies since there aren't many existing technical articles on the subject [3.9]. At a depth of 9146 meters below sea level, the Kaskida oil and gas field is currently the deepest offshore sandstone gas field discovered to date. Nearly 1 trillion barrels of recoverable oil equivalent (oil equivalent) may be found in the area.

1.2 Constraints of the current exploration model

For any major exploratory region, the O&G industry's present exploration model and related geophysical research methods indicate that substantial investments and lengthy lead periods are inevitable before sufficient information about its potentially is acquired. Prior to this conclusion, all current investigation phases must have been completed, even if the examined region is unfavorable for hydrocarbons and no findings are predicted. Regardless of the conclusions of the study, there will be enormous expenses and dangers that cannot be swiftly addressed. It's widely documented in the oil and gas industry that geophysical research equipment are utilized and how they are employed. It is impossible to criticize the oil and gas sector for sticking to the same exploration methodology that has led to the discovery of 3 trillion barrels of conventional O&G resources throughout the globe (IEA 2014). O&G players are now essentially unable to explore most of the remaining unexplored portions of the planet because of the same methodology that has been so successful in enabling massive amounts of resources to be found. If the O&G sector is able to effectively investigate these frontier regions, fresh discoveries might continue to be made. Due in part to the present oil prices' marginal attraction. Poor optimum costs, instead of short-term changes in the market, are regarded to be the cause of this scenario due to supply and demand mismatches.

1.3 Background

However, the existing exploratory paradigm is impractical, slow, and onerous, making it difficult to effectively explore huge new frontier regions. If you take into account the expanses involved, new seismic 2D surveys offshore are prohibitively costly. Furthermore, large surveys need extensive data collection and analysis periods. As a general rule, it is difficult to justify large investments over long periods of time for most operators, especially those engaged in high-risk, high-reward initiatives.

Seismic acquisition companies are increasingly conducting speculative surveys (speculative surveys) that they may then sell to several clients. An O&G company's risk and expense might be shared with other O&G companies interested in acquiring the target via the spec survey approach. An advantage for the oil and gas business occurs when corporations are unwilling to engage in proprietary surveys that demand an initial expenditure from a single customer. Acquisition companies are unable to undertake large-scale "spec" surveys on their own due to a lack of financial resources. It is difficult to get commercial exploration operations up and running despite the fact that a number of prospective places exist across the world. For oil and gas exploration to be successful, it must first challenge the preexisting model's assumptions and boundaries.

1.4 Background and Motivations

Prior to 2006, there were no data packages or formal bidding procedures in place for the oil industry. There was a general agreement between the Ministry of Natural Resources and oil corporations as to where the blocks in issue would be placed and how much incentive oil companies would get if they joined the block. The first three years of the Production Sharing Agreement necessitated more geological fieldwork and 2-D seismic gathering. The completion of one of these exploratory wells was scheduled during this second two-year timeframe. Given the lack of early infrastructure and backing from the service sector, this was a tight timeframe. Before the end of 2007, the Ministry of Natural Resources created a "official" block map and provided financial restrictions. Throughout 2007 and 2008, there was a fierce competition for blocks. As a result, the KRG preferred enterprises who were ready to spend in fieldwork, data collecting, and analysis. Technical hurdles persist in Kurdistan's first oil exploration in more than 30 years. Many considered Kurdistan to be a border or wildcat territory.

2. REVIEW OF LITERATURE

Many intriguing exploratory enterprises have gone undiscovered and unrealized because the current exploratory paradigm is difficult to fund and execute.

US Geological Survey's Globe Petroleum Evaluation 2000 (USGS 2000) undertook a worldwide research and assessment of sedimentary basins having potential petroleum resources, according to the USGS. Several significant assessment units, most of which relate to well-known petroleum systems, were discovered to represent untapped potential in this comprehensive review. Onshore basins may be found all over the world, including the former Soviet Union, Africa, South America, and Asia.

A substantial world-class petroleum play in Brazil, the current province was rated in 2011 and 2015, according to Jones and Chaves (2011). Between 176 billion barrels (P90) and 273 billion barrels (P90) of recoverable resources were assessed in 2015. Petro bras, Brazil's biggest oil corporation would not be able to meet the investment needs of that portion of the nation. For political reasons, the present concession blocks and the Libra production-sharing contract region have not received any substantial exploration activity as a consequence of Petrobras' dominance. It is projected that no new oil and gas exploration projects will be financed, and the budgeted investment will be concentrated on re-exploring existing oil and gas blocks (TB Petroleum 2016).

Due to geopolitical reasons, such as the need for further exploration and military concerns, substantial frontier exploration efforts are impeded (Judice and Jones 2016). NOCs and petroleum organizations that supervise bidding rounds for exploration concessions have insufficient budget. In such countries, fresh oil and gas resources are constrained because of the current exploration paradigm. In several of the world's known petroleum basins, significant recoverable resources were discovered even at the most conservative (P95) probability threshold (USGS 2000). Unfortunately, there isn't enough research to make any predictions about how these scenarios will play out. Because of this, it is clear that a lot of more research is needed to properly grasp the potential of these places.

According to the USGS, only 10 main Brazilian basins (Solimes, Amazonas, Parnaba, Paraná, Foz do Amazonas, Sergipe-Alagoas, Campos, Santos and Pelotas) have recoverable barrels of oil equivalent resources ranging from 54 billion (P95) to 343 billion (P95) barrels of oil equivalent resources in 2012 (P05). They are mostly unexplored, thus there is a wide variety of possibilities in them. As a result, many of the world's new frontiers have an enormous resource base that cannot be ignored. In at least some of the locations where economically viable resources have not yet been identified, there is a 95 percent possibility that substantial discoveries will be made.

Thus, optimizing and rating all main energy sources is the most effective way to increase the economy. In order to maximize benefits (or "utility," as the phrase is used by economists), resources must be allocated in a way that maximizes their efficiency (hopefully, one that considers externalities). This notion has been around since the 18th century neoclassical theorists Manger, Jevons, and Walras articulated these ideas in economic theory (Bilginsoy 2015).

The current energy landscape is impeding the development of alternative fuels and energy sources because oil and gas prices are so low. In the beginning, these alternatives are more expensive because of technological advancements or economies of scale.Unconventional hydrocarbons, although having a bigger environmental effect than conventional oil and gas, remain uncompetitive or just marginally competitive (Gordon 2012).

As a result, there is a pressing need to identify, develop, and produce resources that are less harmful to the environment and more cost-effective than the unconventional resources now being considered as potential future energy sources for the world. To attain this aim, it is necessary to do exploratory work in areas with resource potential but which have received little or no attention in previous exploration. Under the current exploration model's cost and time constraints, it will be impossible to conduct the requisite geophysical study to confirm or refute this possibility. If the sector wants to speed up the exploration process, save costs, enhance performance, and, most importantly, stay competitive, it must accept new technology, new concepts, and new business models. By establishing new standards, the oil and gas business may move forward from the existing paradigm.

There is no way to significantly alter the hierarchy of geophysical research methods while seismic surveys remain an important part of petroleum exploration. Other geophysical research methods, in compared to seismic ones, have achieved only modest advances in exploration costs (Barclays Capital 2010, apud Peebler 2010, p. 5). In 2015, the geophysical exploration business spent more than 85% of its resources on 3D seismic surveys, a trend that is projected to continue in the future (Transparency Market Research 2017). Even in today's oil and gas industry, seismicity is still the king (Bamford 2015). Over-reliance on a single geophysical research instrument has resulted in a major lack of investment in the development and use of alternative technologies.

Researchers have voiced their displeasure with the lack of resources devoted to alternative or unconventional geophysical study techniques and technologies due to the reliance on seismic methods and technology (Wilson et al. 2015; Kleemeyer 2015). Lower pricing, deeper depths, longer water columns, increased image detail requirements, and tougher safety and environmental norms are just some of the growing pains that the sector must deal with on a daily basis. For a long time, oil and gas businesses depended on seismic advances to stay competitive in new and more difficult economic and operational contexts.

A conservative approach is appropriate given that the O&G business works with high-risk, high-cost, long-term experimental projects. Especially in far-flung locations, drilling exploratory wells entails making challenging choices with high financial and safety consequences. There is no basis for industry conservatism or dependence on seismic equipment in light of new technology and ideas that might transform the sector.

Hydrocarbon leaking from reservoirs may be detected utilizing geophysical instruments using a seep detection technique. From large-scale regional surveys (Shengwei 2012) to the identification of seeps and hydrocarbon fractions immediately leaking from specific accumulations, a variety of approaches are available to identify seeps and hydrocarbons directly leaking from specific accumulations (Mcconnell 2016). To ensure that hydrocarbons are identified in a reservoir, there must be an operational petroleum system.

Gravimetry (which measures reservoir density) and gravity gradiometry (which measures reservoir density) have achieved considerable breakthroughs in the last few years (which measures density at the subsurface at the grain scale). Additional geological, structural, and hydrodynamic data may be obtained using these methods, which have shown to be quite beneficial (Nabighian et al. 2005). Moreover, gravity gradiometry-based approaches are on the verge of becoming DHIs, since they can accurately anticipate lower-density hydrocarbon accumulating areas on a given site. There are no other prospective field technologies that are dependent on gravity sensing, allowing for an independent confirmation or denial of the potential for hydrocarbon deposits to be made. Instead of just calculating the rate of change in gravitational acceleration over a given distance, these components may be used to provide a more precise sense of depth and target composition.

Subsurface stress anomalies may now be detected using a geophysical research approach. Stress field detection (SFD) anomalies are common in major geological features, such as faults and folds. Pressurized zones are a consequence of variations in the lateral stress regime that occur in reservoirs where fluids are stored. Analyzing stress levels in the earth may help locate fluid accumulations. In addition, restricted fluids such as water, brine, and no hydrocarbon gases may be to blame for these abnormalities. This novel and essential feature allows for the identification of both possible (preferably hydrocarbon) fluid accumulations and places where no fluid accumulation has occurred. This is an important technique for cutting exploration expenses if restricted fluids aren't available where it's needed.

To identify the effects of subsurface stress fluctuations on the gravitational field, interferometry approaches, rather than standard gravimeter, have been increasingly used in recent years (Anderson et al. 2011). It is possible to identify volatile fluids trapped in reservoirs using stress energy anomalies, which may alter the gravitational field's magnitude and direction. It has been argued that gravity tensor changes might be used as an alternative geophysical technique. Despite the fact that the density of the FTG has a direct influence on the gravity tensor, this is not the case.

As a result, high-speed stress field detection devices may save time and money since the data does not have to be processed. In addition, this geophysical research tool does not give depth information for anomalies, nor does it provide a 3D view of the researched region. However, in frontier areas, where only the most significant accumulations are of interest to drillers, and where broad-area surveys are commonly used to locate enormous hydrocarbon pools, 3D seismic is the most suited tool for structural description. Additional geophysical equipment is needed for geophysical surveys in order to offer a complete picture of a site's structure and other vital information.

3. RESISTANCE TO INNOVATION IN THE O&G INDUSTRY

According to O&G industry claims to be creative, they are really rather conservative. It has been a long time since disruptive innovations have been adopted by the geophysical research community despite their success.

Floating production, storage, and offloading rigs (FPSOs) are a great choice for swiftly establishing a new offshore field. However, even though the FPSO-based development and production model has proven to be a successful one for new deep-water fields, in addition to providing operational advantages and accelerating production from existing fields, the oil and gas industry as a whole, particularly in the United States, has been slow to adopt this new method. When Petrobras sanctioned its first FPSO for the Gulf of Mexico, it had already adopted the FPSO idea and was using it as a normal operating model at the time (Offshore Technology 2008). Since the first FPSO in the North Sea went into service in 1978 (the BW Pioneer), the Gulf of Mexico has had two FPSOs (Oil and Gas Journal 2012). Since 2000, the notion of the FPSO model has had a significant influence across Africa (Offshore Engineer 2015).

3.1 New geophysical investigation tools

Direct hydrocarbon indicators (DHIs), or sensors that might possibly detect hydrocarbon accumulations directly, are now available for use in geophysical studies. Even the most advanced seismic technologies are unable to consistently and reliably detect hydrocarbon accumulations. It is possible to determine the kind of fluid contained in subsurface reservoirs using tools like CSEM, which identifies variations in the properties and reactivity of hydrocarbons and water. In spite of these benefits, there are some negatives, such as a lack of spatial definition and shallowness in research (Macgregor and Tomlinson 2014).

3.2 A new exploration model for the O&G industry

As a result, a new oil and gas exploration model must minimize the time it takes to obtain relevant geological knowledge and lower exploration expenses, while allowing risk reduction strategies to be applied throughout the exploratory process there are too many undesirable dangers for prospective operators to take on in experimental endeavors. The oil and gas business must be able to efficiently locate and explore petroleum resources if it is to reduce risk. It should be feasible to terminate exploration before incurring huge, unrecoverable expenses if early studies demonstrate that the explored region does not have enough discovery potential.

3.3 Exploration Challenges

Since 2005, more than 20,000 line kilometres of fresh two-dimensional seismic data have been collected. Traditionally, two-dimensional grids employed dip lines spaced 2–5 kilometres apart and a relatively restricted number of strike lines; one along the structure's axis/crest and another at both extremities of the structure.. They utilized bulldozers wherever feasible to keep the lines straight while traversing more rugged areas of land. Vibroseis acquisition has been successful in areas with appropriate geography and Cenozoic shale on the surface.

4. DISCOVERIES AND PETROLEUM GEOLOGY

Most of the wildcat hydrocarbon discoveries in the Kurdistan Region have occurred in the north of the Kurdistan Region. These discoveries have been given the green light to be developed, and four of them have a long history of manufacturing. Most of the resources are expected to be located in the Cenozoic, Cretaceous and Jurassic levels, with Triassic strata making up a modest but important component. The majority of Kurdistan's Cenozoic hydrocarbons are situated in the country's south. Only two of southern Kurdistan's freshly discovered resources, Kor Mor and Chemchemal, have not yet been granted development permits.

4.1 Structures

Most of the wildcat hydrocarbon discoveries in the Kurdistan Region have occurred in the north of the Kurdistan Region. These discoveries have been given the green light to be developed, and four of them have a long history of manufacturing. The Cenozoic, Cretaceous, and Jurassic layers are projected to hold the most of the resources, with the Triassic strata making up a small but significant portion. Cenozoic hydrocarbons are concentrated in the south of Kurdistan. Only two of southern Kurdistan's freshly discovered resources, Kor Mor and Chemchemal, have not yet been granted development permits.

4.2 Reservoirs

The majority of hydrocarbons identified in Kurdistan have come from carbonate reservoirs dating from the Upper Triassic to the Upper Miocene. Detailed descriptions of the Iraqi and Kurdish reservoir units may be found in Aqrawi et al. (2010) and in van Bellen et al. (2012). (1995-2005). Kurdish palaeozoic layers have as far produced no petroleum. The Jabal Kand-1 Well was the last Kurdish well to be sunk until the Tawke-1 Well was drilled in 2005. Well completion has reached the Lower Carboniferous Harur Formation at full depth. Because they have been reached, the Ga'ara Formation reservoirs in the Lower Permian were found to have flowing water (Gulf Keystone, 2009). Only the Khabour Formation in Iraq's Akkas Field has gas-bearing Ordovician sandstones (the Khabour Formation).

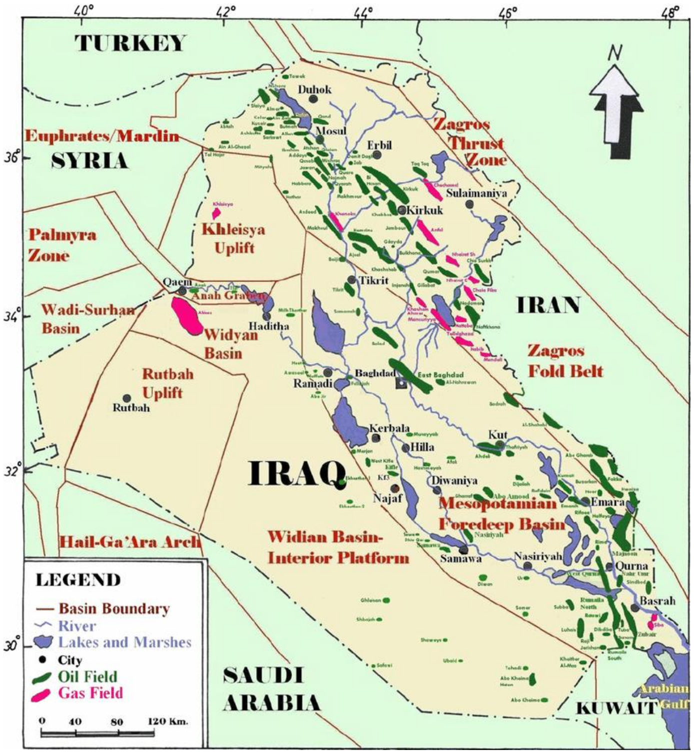

Figure. 0.1 Map of Iraq showing the location of major oil and gas fields.

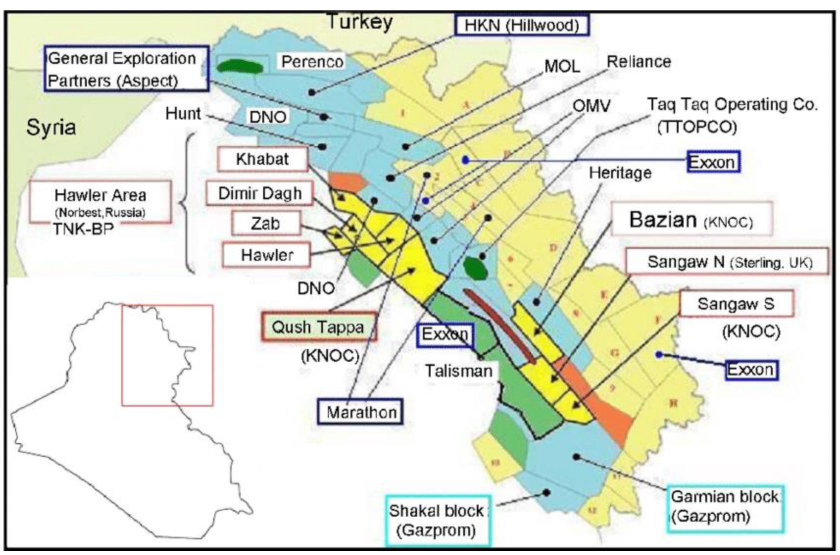

Figure 1.2. Kurdistan Region of Iraq showing the wells drilled

4.3 Reservoir Evaluation

Finding and analyzing hydrocarbon resources in Kurdistan has proven to be tough. Cretaceous and Jurassic reservoirs in the north are often or almost always under stress.. Low pressure and fracturing carbonates make drilling difficult, resulting in large losses. Drilling at or near the water table, which may be difficult to identify while drilling, is particularly vulnerable to this. Logging operations in Kurdistan are often large by international standards because of the complexity of the stratigraphy underneath.

5. EXPLORATION SUCCESS RATES AND FAILURES

Due to Kurdistan's abundance and quality of source rocks, practically all wells drilled to date have yielded some amount of oil and/or gas. The new field wildcat wells included in this research were classified as either successful or unsuccessful based on their ability to produce hydrocarbons (500 bopd or more) to the surface. Sidetracks are considered as successful exploration wells if the original new field wildcat wells fail to flow. Some 63 new field wildcat (NFW) wells have been drilled and tested in Kurdistan since 1901 using this method. 23 of these wells were deemed failed, while 40 were deemed successful, resulting in an NFW success rate of 63%. Obviously, the same data might be seen in various ways by different employees. Scouting material (maps, industry papers and studies) has been utilized in cases when the data has not been made public.

A total of 25 of the 63 new field wildcat wells were drilled beyond the mountain front, while 38 were drilled west and southwest of the mountain front. Twelve out of the 25 mountain wells drilled have been declared successful, resulting in an overall success percentage of 48 percent. It is estimated that 38 wells have been sunk west of the mountain front and on the lowlands. A success rate of 70% in this area is based on the results of 28 of these. Due to trap destruction and seal breaching, success rates seem to be lower in hilly locations.

6. PRODUCTION AND RESOURCES

Despite the fact that Kurdistan now has 12 authorized field development plans, Taq Taq, Tawke, Khurmala, and Kor Mor have dominated production history in Kurdistan too far. More than 400 million barrels of oil equivalent have been produced from these fields since 2008. "(Table 3 in MMBOE)" The Taq Taq Field produced 27.5 million barrels of oil (MMBO) in 2012, averaging 75,500 barrels per day. In 2013 (bopd; Genel Energy,), In comparison to 2013's production of 77,000 bopd (28.1 MMBO), 2014's output averaged 103,000 bopd (37.5 MMBO). This is a statement made by Genel Energy in 2015. The Taq Taq Field produced more than 138 million barrels of oil over its existence.

There were 16.5 MMBO of oil equivalent per day (bopd) produced in Tawke Field in 2012, while in 2014 it produced 91,000 bopd (bopd) (Genel Energy, 2015). Since the beginning, more than 100 MMBOs have arisen (DNO, 2015). The Kor Mor Formation has produced 90 MMBOE worth of gas and condensate, or 415 bcf and 18 MMBO, since 2008. (Dana Gas, 2013). As a result, production from the Shaikan, Barada Rash, and Sarqala fields may only be transported by truck at this time. There was little consumption inside the country, but most of the product was exported. Increased pipeline capacity has led to an increase in the area's production during the last 24 months and beyond, and this trend is expected to continue.

6.1 Oil-in-Place, Reserves and Recovery Efficiency

There are just a few fields and finds in Kurdistan that have provided data on oil in situ, reserves, and recovery factors. Obtaining precise reserve estimates for many other finds is challenging since the publicly listed operators of Tawke and Taq Taq fields usually provide reserve estimates. Because of the requirement to shift from hydrocarbons that are currently recoverable to those that have yet to be identified, recovery factors are difficult to determine. Complete information of matrix parameters such as total rock volume and porosity is necessary for in situ oil estimate. Using these characteristics, it may be challenging to quantify and extrapolate carbonate reserves in Kurdistan. If you're dealing with a fracture, it's far more difficult to get an accurate reading.

6.2 Reserve Estimates

8 finds in Kurdistan are estimated to have more over 500 million barrels of proved and probable reserves, as well as the best estimate of contingent resources, according to published reserve estimations. Over 15 billion barrels of oil have been found in 2P and 2C reserves and resources so far (based on published numbers).

Few fields in Kurdistan have been evaluated or in production for any length of time, therefore only publicly accessible data from the Tawke and Taq Taq fields may be used as a reference for field performance and how reserve predictions have developed over time. There have been 43 wells drilled in all, 40 of which are now producing, and the combined output of these two fields exceeds 230 MMBO.

Conclusion

The discovery of hydrocarbon resources in deeper layers has shocked the oil and gas sector. Hydrocarbons that are lighter and more pressured are found in Kurdistan's Triassic layers (higher API, higher GOR, and more mobile). Accordingly, hydrocarbons may still be found in the Permian and Carboniferous layers, despite the fact that few wells have targeted lower Triassic levels. It may be necessary to employ crude blends in the region's oil resources to improve exports due to their broad range of hydrocarbon qualities. At the regional and industrial levels, Kurdistan's petroleum systems and seals are becoming more important. Seal efficiency, the timing of generation versus trap formation, and the impact of thrust and strike-skip faults on migration efficiency are all unknown factors that affect vertical migration. In spite of the backing of the MNR, Kurdistan has no public data release procedure. With this development, it is predicted that the area's exploration and drilling procedures would benefit as well.

For broad border regions, oil and gas exploration is now a lengthy and hard procedure. In a reasonably favorable oil price situation, high costs and severe delays preclude the exploration and development of many prospective places. As an example, a lack of conventional financing or political or legal restrictions might make exploration more difficult. A new model of exploration for the oil and gas sector must be developed that emphasizes speedier, less costly, and more direct methods of identifying leads in light of the present economic climate.

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