Oil wells drilling problems in Iraqi fields and treatment methods

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Abstract - **Oil and gas industry is experiencing a revolutionary improvement in the past few decades. Petroleum engineers have harnessed technology to improve oil and gas industry by all means to ensure an efficient, safe and cost-effective operations, starting from exploration, passing by drilling, production treatment and refining. This paper concerns drilling operations which is a very critical stage as it is obstructed by many challenges that require precision, knowledge and wisdom to be carefully dealt with. Problems encountered during drilling are discussed with particulars in order to give a better understanding to the complications involved with the operation. And for progress, more effective solutions should be offered using latest technological methods.**

In this paper, have been discussing the most occurring and common drilling problems, mentioning their reasons, conventional practices to solve and prevent them.

I. Introduction

Drilling operation is the first and the costliest phase in petroleum industry as, according to API (1991), it represents nearly one fourth of the total oil-field expenditure and its efficiency is mandatory as it will affect the whole investment technically and financially. An efficient, well-designed and well-operated drill job must ensure maximum safety for operating engineers and workers, minimum damage for the formation, lowest costs and shortest time for the operations.

Drilling operation maybe subjected to multiple factors that consequently cause major or minor drilling problems which could expose the crew to hazards and danger, cause pollution to the environment, cause damage to the tools and equipment or simply cause non-productive time (NPT). While there are different reasons for the problems associated with drilling operations, they cannot be counted or summarized, due to the difference from site to site and from country to country. There are also differences that we notice in the same sites, but according to the difference in the
reservoir. Most of the problems that occur are caused by either the quality of the drilling mud liquid or either
human error or Geological and reservoir difficulties, and through this simple research that we present, we will address a group of problems that occur in the fields of Iraq and how they occur and treat them, based on purely site-based information.

II. General drilling problems

1. Problems Related to the Mud System Include:

- Lost Circulation
- Loss of Rig Time
- Minimized Production
- Mud Contamination
- Formation Damage

2. Problems by (Drilling Hydraulics)

- Fatigue failure
- Twist-off—due to excessive torque
- Parting—due to excessive tension
- Burst and collapse
- Buckling in the drill pipe
- Pipe stick
- tooth bit problems
- Wellbore instability

3. Well Control and BOP Problems

- Kicks
- Blowout

4. Drill string and Bottom hole Assembly Problems

- Pipe stick
- Drill pipe Failures

5. Casing Problems

- Casing Jams (Suck) during Run in hole.
- Buckling
- Casing Leaks
- Problem with Depth to Set Casing

Other problems such as:

- Cementing Problems
- Well bore Instability Problems
- Directional and Horizontal Drilling Problems

III. DRILLING PROBLEMS IN THI-QAR FIELD

1- GARRAF OIL FIELD

The Al-Gharraf oil field is one of the fields belonging to the Thi- Qar Governorate, which is affiliated with the Thi Qar Oil Company, and its geographical location is between the cities of Qalaat Sukkar and Al-Rifai. With the Ministry of Oil, Petronas will be the operator of the Al-Gharraf field for nearly 25 years, including all technical and coordination operations from the beginning of drilling till production.

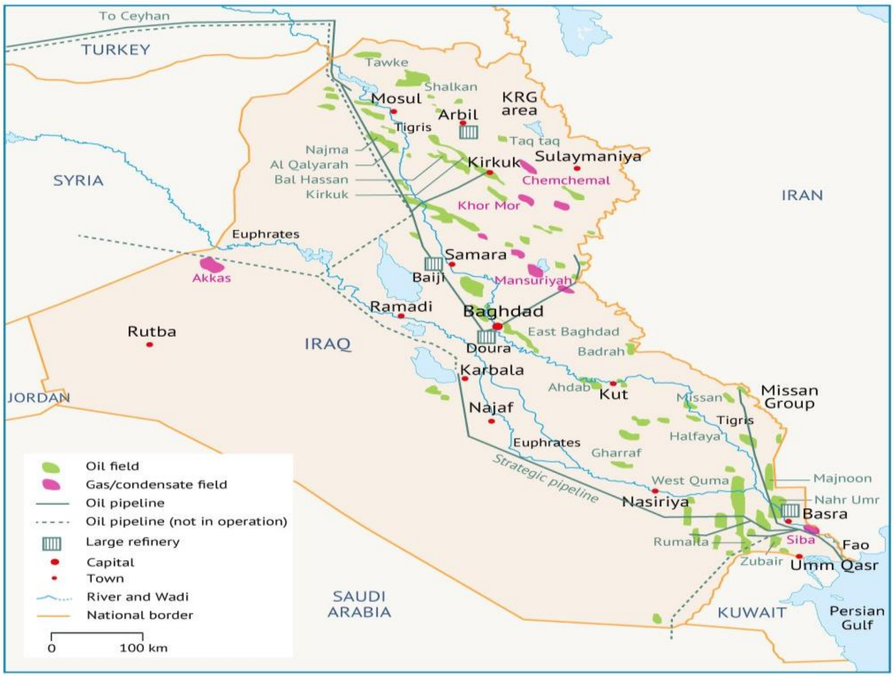

Figure1 (oil field in Iraq)

A. *Pipe stick*

Introduction:

Pipe sticking is one of the most common problems faced during drilling that causes a lot of nonproductive time (NPT). Pipe is considered stuck if it cannot be freed and dragged out of hole without damaging the pipe or surpassing the maximum allowed hook load (Azar, 2006). Basically, there are

Two types of pipes sticking:

a. *Differential pressure pipe sticking*

In this event, a portion of the drill pipe becomes embedded in the mud cake. This happens when there is high pressure difference between wellbore and formation pressures.

Several parameters will promote differential pressure stuck pipe; this includes:

- High differential pressure
- Thick mud cake
- Low lubricity mud cake
- Excessive embedded pipe length in mud cake
- Shape of drill collars

Indicators of differential pressure sticking are;

- Increase in torque and drag forces
- Inability to reciprocate drill string
- Uninterrupted drilling fluid circulation

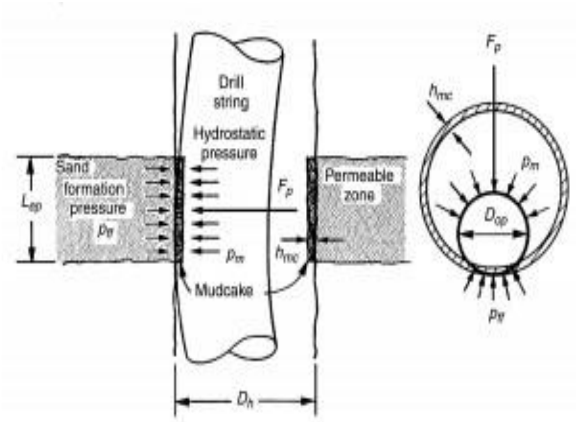

Figure2 (Differential pressure pipe stick)

Several precautions are considered during drilling operation in order to decrease the possibility of sticking. Methods of applying these precautions can vary depending on the type of the drilling fluid, wellbore features and the degree of sticking (Bonar MARBUN, 2016). They include;

- Maintain lowest continues fluid loss
- Keep up the lowest solid content in the mud system or removing all solids if applicable
- Using lowest differential pressure
- Adjusting the drilling fluid in order to yield a smooth mud cake
- If possible, keep the drill trig rotating all the time

And, if the event of sticking is already presented, we can free the pipe by different methods that include

- Oil-spotting around the stuck section of the drill string
- Washing over the stuck pipe
- Reducing mud hydrostatic pressure

(This can be done by dilution, gasifying with nitrogen or placing a packer above the stuck point)

b. Mechanical pipe stick

Three different causes can lead to mechanical pipe sticking. For every because there are different reasons, indicators and solutions to mitigate the problem (Santoso Effendi 2011).

i. Inadequate removal of drilling cuttings

Inadequate removal of drilling cutting can cause cutting to accumulate in the annular space at the bottom of the wellbore resulting in a stuck pipe. In directional drilling, cutting may settle on the low side of the well

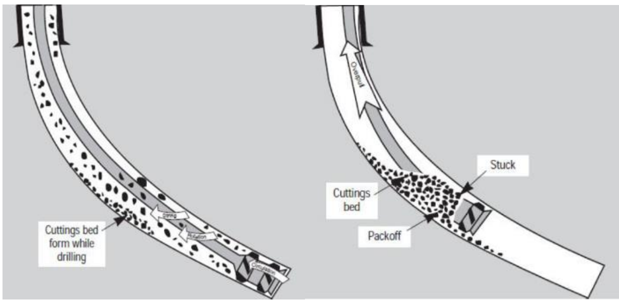

Figure3 (Mechanical pipe stick i)

Increasing torque and drag forces and increase in circulating drill pipe pressure are the indicators for mechanical pipe sticking caused by cuttings accumulation. This problem could be mitigated by rotating and reciprocating the drill string and increasing the flow rate without exceeding the maximum allowed equivalent circulating density (ECD).

ii. Borehole instabilities

In some cases, drilling through critical formations could lead to pipe sticking. Unstable wellbore may collapse, cave or slough (flow inward). These events mostly occur in plastic shale or salt sections or when using too low mud weight.

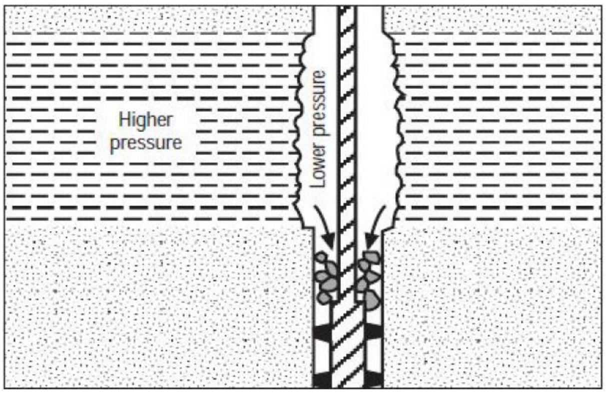

Figure4 (Mechanical pipe stick ii)

Indicators are:

- Rise in drill pipe circulating pressure
- Increase in torque
- No fluid return to surface

Preventions of mechanical sticking caused by wellbore instabilities is done by strengthening the wellbore and using a proper mud system that is compatible with the formation mechanically and chemically.

In case of hole narrowing, if it is a result of plastic shale, increasing mud weight would solve the problem. And if it is a reason of salt section, circulating fresh water is the solution.

iii. Key seating

In directional drilling, the drill string rotating with side force (lateral force) acting on it will cause a small hole into the side of the wall (groove). These grooves are found at doglegs or in unnoticed ledges near washouts

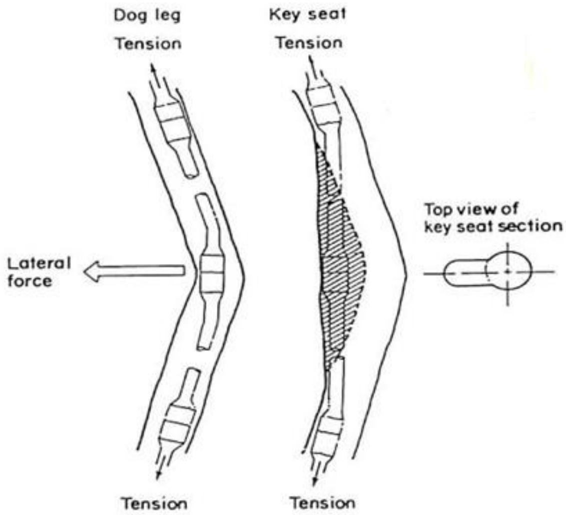

Figure5 (Mechanical pipe stick iii)

Key seating is not a very common event, but it is indicated when several stands of pipe are pulled out normally, then suddenly the pipe is stuck.

Using a stiff BHAs will minimize the occurrence of doglegs. But if the problem is already found, the solution is to back off below the key-seat section and going back into the hole with an opener to drill out the key section. A fishing operation is needed later to retrieve the fish.

The operating company have the decision on how long to attempt to free the stuck pipe or backing off and side track as it is considered an economical issue.

Above, we dealt with the problems of drilling stick pipe in general and what are their types and how to get them and solve them, but now we will address a problem in one of the wells of the Al-Gharraf oil field, knowing that drilling is in the form of a wave and not a vertical one.

The problem occurred in one of the wells in the Al-Gharraf field, which belongs to one of the subcontractor companies, when they reached the third bore ($12^{1/4}$) and reached the depth of the end of the formation, circulation of the drilling fluid, adjusting its specifications, cleaning the well and beginning the process of drawing upwards, cleaning and trimming the wall of the well, at a distance of 200 m from the depth of the end Configuration: The drill thread sticks during the formation of Al-Tanuma. Several attempts were made by the supervising staff to get the drill thread out, but to no avail.

Then it was started to open the drilling thread at another 200 m distance from the place of difficulty, followed by attempts to hunt the remaining part inside the well, but to no avail.

- Reasons for stick:

After completing the drilling of the bore $12^{1/4}$ to the final depth of the bore, a rotation and cleaning of the drilled bore was carried out, and then a Wiper trip and pull where there was a continuous obstruction between one depth and another from the depth to the depth of 200 m. in the formation of Tanomah while maintaining the continuity of the drilling fluid circulation but without Surface RPM During. During the pulling process, there was a sudden change in pressure and an increase in the weight of the drilling thread. The rig worked to reduce the flow rate, but to no avail. The pressure continued without a decrease with the presence of a return to the drilling mud and an attempt to pull and download the drilling thread several times, but the attempts were unsuccessful and with the observation of oil evidence, which in turn contains high permeability Which in turn causes the wall of the well to narrow significantly, and because of the high pressure and a large pressure difference between the pressure of the liquid column and the pressure of the formation, this led to the occurrence of stick

- Geological description:

It is a succession between shale stone as well as limestone, which leads to the formation of areas that add and cavitate in the wall. There is also oil evidence at the top of the formation of Al-Tanomah, which is like a penetrating area that can lead to the formation of a mud cake with a larger size and narrowing

B. Stick equipments log:

The slanted development well is located in the Al-Gharraf oil field in Thi-Qar province, where drilling operations were initiated and according to the drilling program and after the completion of the drilling of the first cavity 26", and the second 171/2" and after the completion of the drilling of the third cavity with the thread of directed drilling 121/4" to the final depth of the well (2974 m) within the composition of the supervisor containing the following geological description limestone beige to brown, firm –slightly hard, fine crystalline, sucrose to porous pyritic in parts, slight oil trace light brown oil stains, dull yellow direct fluorescence, slight to moderate blooming milky white cut fluorescence trace light brown resident ring Where the angle of inclination was from the shekel (36.15) and the direction of the well (41) the sensors of the open well were lowered to the final depth and then read up and at depth (2844.64 m) to the depth (2819m) which represents the length of the well sensor stomach (26 m) there was a difficulty for well sensor equipment (quad combo.) .

- problem Details:-

After the third cavity drilling was completed 12.25" quad combo equipment was removed. In the open well to read the petrophysical properties down to the final depth 2974 AD was drawn to the surface. During the drawing to the depth of 2844.64 m, there was a difficulty for the sensor stomach due to differential pressure stuck, where caliper was read at 13" as well as the pressure difference of the drilling liquid column and the pressure of the layer

Tension operations have increased and there have been numerous attempts to free up the difficulty by halting lifting operations, initiating work tool operations and increasing the withdrawal force within permitted limits to avoid interruptions of sensor equipment but failing.

- Solutions and treatments:-

1 .The pull-out tension, which represents the permitted force of open well sensor equipment, was initially used to prevent it from being cut off in order to free it from difficulty, but the attempt to free it failed.

2- It was decided to go to the hunt in a cut & thread method, which boils down the fishing equipment (over shot) with drilling pipes to the highest depth of intractable equipment (2819 m) with a pass for the wires of the sensor equipment through the stomach Quick connector, where the operation is carried out by cutting a wire and connecting it through the ends of one of the said stomach nose with the other end of the drilling pipe and engaging between the ends of the stomach, thus ensuring that the drilling wire is kept attached to the sensor equipment and (Logging truck). This process comes to ensure that the well sensor wire is not lost and falling into the well, as well as the sensor wire acts as an indicator of stomach baiting and the process can be illustrated with the following drawings:

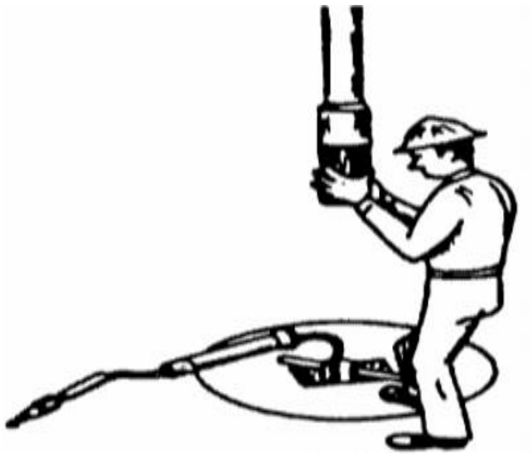

Figure 6 (Open the quick connector, Reel off the cable**)**

Figure 7 (Pick up the cable to monkey board by wire line hoist**)**

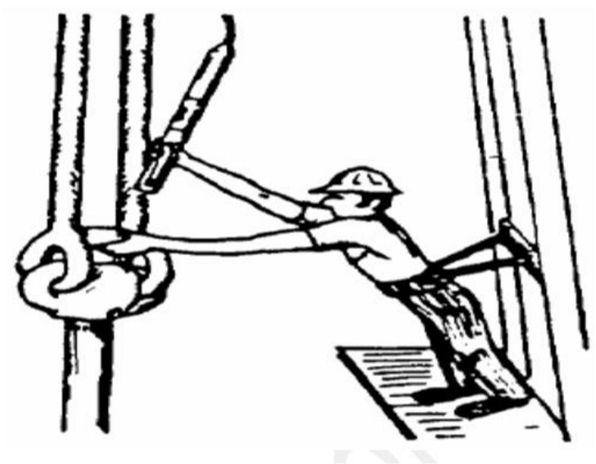

Figure 8 (The derrick man inserts the overshot assembly into the top of the drilling pipe**)**

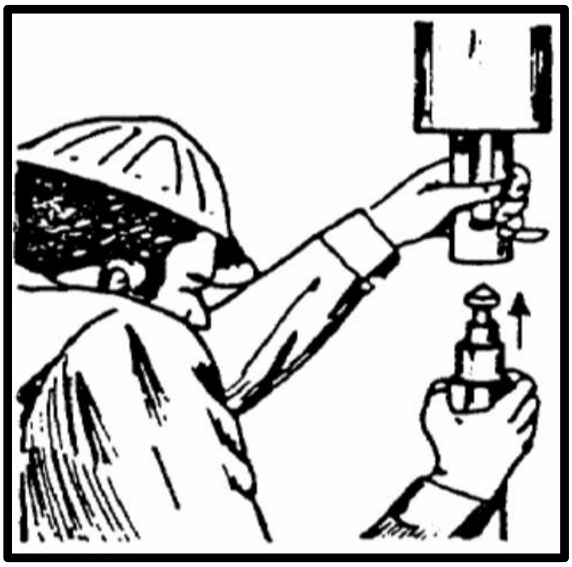

Figure 9 (When the overshot comes through the drill pipe and sub, connect the quick connector**)**

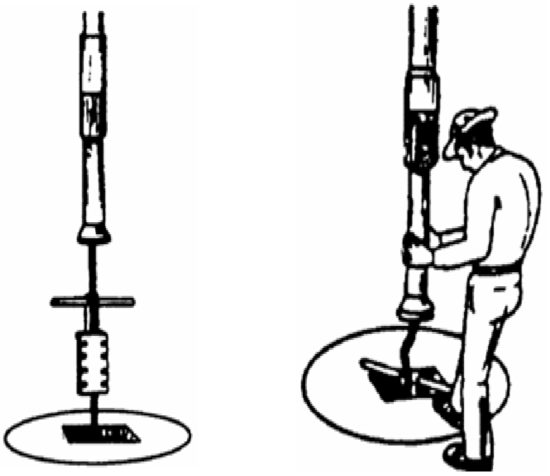

Figure 10 (Truck winch operator pulls up on the cable, lifting cable clamp from the rotary table**)**

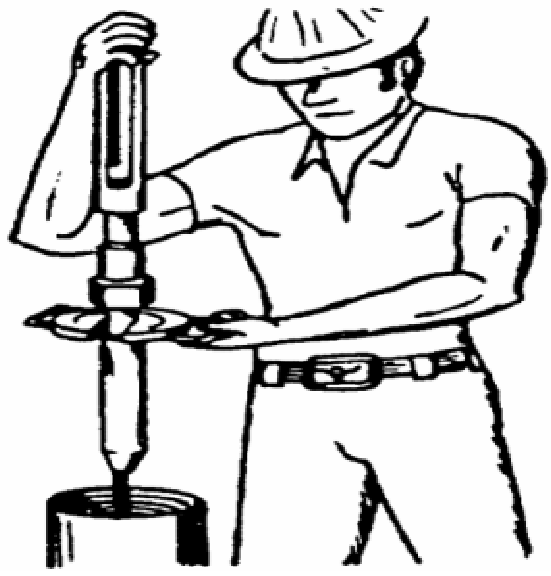

Figure 11 (The C-plate is placed in the slot between rope socket and spear.**)**

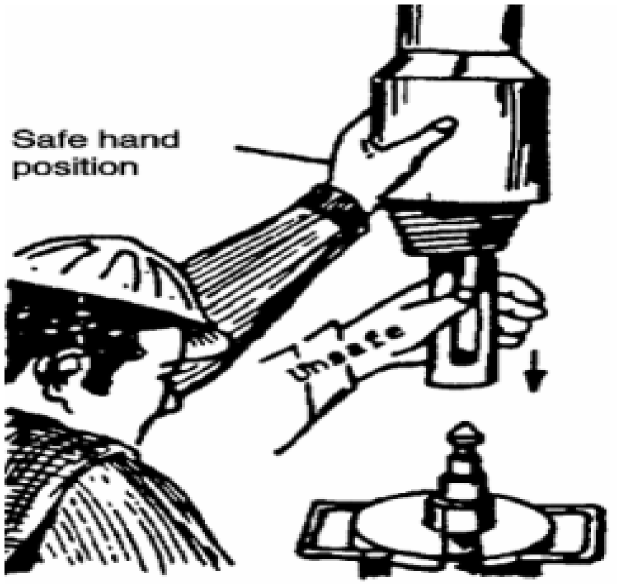

Figure 12 (The overshot again drops through the drill pipe stand and is attached to the spear**)**

After several days of continuous work, the intractable well-sensing stomach was successfully hunted without losing any part of the stomach, including the radioactive source (Neutron, Density log).

C. Directional and Horizontal Drilling Problems

- INTRODUCTION

A brief history of horizontal drilling Information contained in scientific sources, specialized institutes, and international associations (such as the Society of Petroleum Engineers and the Society of Drilling Contractors) indicate that horizontal drilling is the result of wave and inclined drilling. And it was the beginning of the year 1930 AD by an American company, where the length of the horizontal well was (7_10) meters, calculated from the center of the vertical well, and the activity was stopped at that time. OCTEN) a horizontal oil well in Italy in the seventies, after the activity synonymous with it in the past was specialized in reviving dead wells by drilling many sub-wells from a specific area in the old well

- Milestones in The Development of Horizontal Drilling

1950s Russians drilled 43 horizontals
1978Esso, modern horizontal, Alberta
1979Arco drilled to overcome high GOR’s and gas coning
83-1979Elf test 3 onshore horizontals; Elf and Agi drill first
Offshore horizontal (Rosso Mane, Adriatic)

1986horizontals worldwide. Cost 1.5-2 times greater than vertical wells

88-1987Horizontal well test theory and productivity assessment Guidelines. Number

of horizontals increased dramatically

horizontals drilled worldwide 265 1989

horizontals drilled 1000 1990

1991First Australian horizontal drilled

1992Over 2,500 horizontals drilled worldwide - 75% in North America (mostly

low permeability, gas/water coning regions(

Types of horizontal wells in Figure (13)

a. Short radius
b. Medium radius
c. Long radius

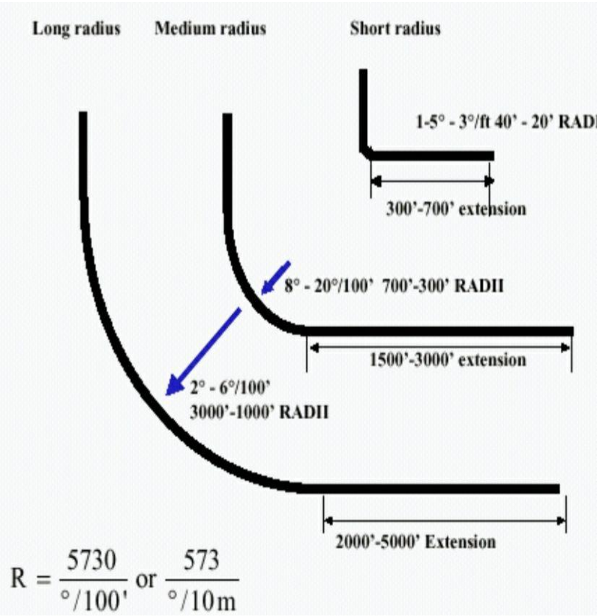

Figure 13(Types of horizontal wells)

- HOREZANTAL WELL

The horizontal well means that it is the new well that is drilled from the surface and its last section ends with a cavity parallel to the layers of the reservoir. As for the wells that are drilled from the middle or the bottom of the previously drilled (dead) wells, they are called (RE_ENTRY WEII), or in other words forked side wells.

Benefits and importance of horizontal drilling:

Horizontal wells are drilled to address future or immediate reservoir problems, as well as extract oil from private reservoirs in an economical and effective manner, as follows:

a- Increasing the productivity of the wells by tens or more times
b- Extraction of oil spills left between dead vertical wells and covered by reservoir water
c- Increasing the extraction rate 3-
d- Addressing the problem of water and oil gathering (CONING)
e- Extracting crude oil from cracked reservoirs naturally and vertically
f- Extraction of crude oil from reservoirs with low permeability and porosity
g- Extraction of heavy oil from cracked reservoirs and reservoirs adjacent to salt domes, as well as oil layer traps
h- For places that are difficult to reach vertically
i- For reservoirs with few thicknesses
j- For intermittent or non-absorbed oil traps
k- environmental reasons
l- Multiple lenticular reservoirs

- Reasons for the success of horizontal drilling:

Horizontal drilling and its related works have witnessed a significant development since 1986 AD for the following reasons:

1-Development of drill bits used in horizontal wells, especially diamonds (PDC BITS)

2-Development of drilling auger rotation equipment (Turbine Motors - PDM Motors - Top Drive)

3-The development of equipment and continuous survey devices during drilling to measure the direction and deviation of the well and the development of sensors during drilling (Logging)

4-The use of advanced sensors to monitor the behavior of the introduction of the auger

5-Use of remote sensors (GEO Steering)

This is to determine the horizontal bore path inside the reservoirs of very little thickness (3 meters) with extreme accuracy so that the well does not approach the gas layer at the top of the reservoir or the water layer at the bottom of the reservoir (the error range in the path of the well is in half meters), so that we can say now that the huge jump in industry activity Focused on horizontal drilling from others, and this is the main reason for the technical and economic success, as it entered fields previously considered uneconomic and turned them into huge economic fields, dead wells brought back to life, and wells whose productivity doubled to dozens of times the reviewer

- The important reason for the necessity of horizontal drilling in the Al-Gharraf oil field is the presence of a population density that requires planning for horizontal drilling

The risks of horizontal drilling operations in the Al-Gharraf field:

1-The difficulty of lowering the bushing 9 5/8 inches to the end of the open bore 1/4 12 due to the angle of deflection, which is more than 85 degrees

2-It is possible that the naming around the end of the lining is 9 5/8 weak due to the angle of deflection and this leads to the formation of channels behind the lining connected to the production horizontal section

3-The production is from one (L1.2) in the two horizontal wells of the Gharraf field, but in the case of production from two layers, it requires downloading (OH swellable PKRS) with the production lining, in addition to the fact that opening and closing the SSD in the future requires Coiled tubing due to the difficulty of using equipment Slick Line for horizontal wells

4-In the case of coning water for horizontal wells, the reclamation operations are complicated

5-The stratigraphic damage of horizontal wells occurs wider and faster than in inclined wells

6-Obstruction and loss of RSS equipment, and this will be very costly

2- NASIRIYAH OIL FIELD (Al-Kata'ah)

- Introduction:

It is one of the large Nasiriyah fields affiliated to Thi -Qar Oil Company and its geographical location is west of Nasiriyah, and it relies on drilling wells on vertical drilling. It was observed through the experiments during drilling operations that the most important problems and obstacles had the problem of loss and flow and get in two different geology regions,

The five previously drilled wells were first for a long time and the lack of work data at that time. We did not say whether it is not. This makes the work developmental and exploratory at the same time, even if this is not true in the oil custom. It is known that the problems that workers in this field may face is the loss.

In Al-Haritha and Dammam, sulfur water flowed from the planes, but we were surprised, for example, by the flow of water from the planes.

Dammam, which is unusual in the Iraqi field dictionary

- Suggestions:

The American company, (Weatherford), contracting with a group of national companies contracting with it to dig (20) wells in the Nasiriyah field (Al-Kita'a), suggested changing the lining designs to isolate the drilled layers from each other to control the flow and loss of the drilled layers at the same time

- Disadvantages:

One of the most important disadvantages in this suggestions is the increase in cost through cementing and casing operations.

- Advantages:

1- Reducing losses at the total loss.
2- Speed of completion of the well.
3- Reducing the risks of flow and explosion and isolating sulfur water.
3- Reducing pollution of the producing layers with drilling mud.

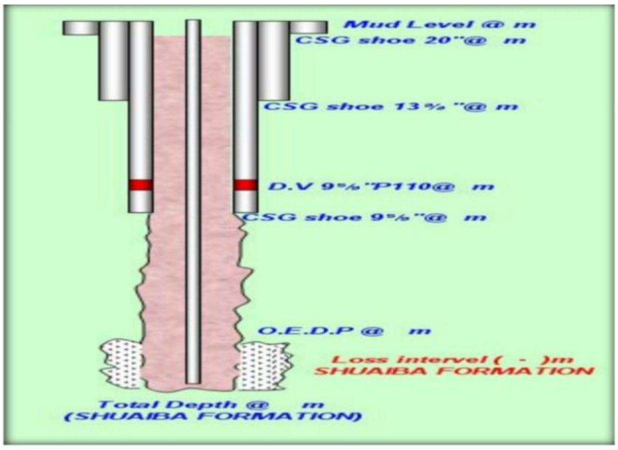

Figure14 (casing in Nasiriyah oil field)

IV. PROBLEMS IN MOST DRILLING WELLS

A. Lost circulation

Lost circulation is defined as the uncontrolled flow of whole mud into a formation, sometimes referred to as a thief zone. The loss can be partial or total, as shown in figure 5. In partial lost circulation, mud continues to flow to surface with some loss to the formation. Total loss circulation.

however, is when all the mud flows into a formation with no return to surface. In total loss circulation, if drilling is allowed to continue, it is referred to as blind drilling. This is not a common practice in the field , unless the formation above the thief zone is mechanically stable there is no production and the fluid is clear water) and it is feasible, in terms of economics and safety, to go ahead with the drilling operation.

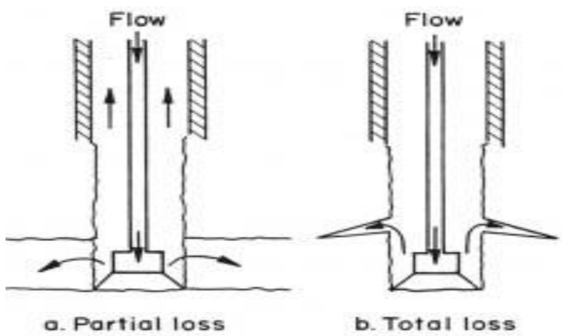

Figure15 (Lost circulation)

- Lost circulation zones and causes

Formations that are inherently fractured, depleted, or cavernous or have a high permeability, on the one hand, are potential zones of lost circulation. On the other hand, under certain improper drilling conditions, Induced fractures become potential zones of lost circulation. The major causes of induced fractures are excessive downhole pressures and improper intermediate casing-setting depth, especially in the transition zone .Induced or inherent fractures may be horizontal at shallow depth or vertical at depths greater than approximately 2,500 ft. Excessive wellbore pressures are caused by high flow rates (high annular friction pressure.

- Prevention of lost circulation

Complete prevention of lost circulation is not possible. This is because some formations such as inherently fractured, low-pressure, cavernous, or high-permeability zones—are not avoidable when encountered during the drilling operation if the target zone is to be reached. However ,mitigating the problem of lost circulation is possible if certain precautions, especially those related to induced fractures, are taken:

- Maintain proper mud weight
-Minimize annular friction pressure losses during drilling and tripping in
- Maintain adequate hole cleaning and avoid restrictions in the annular space
- Set casing to protect upper weaker formations during a transition zone
- Update formation pore pressure and fracture gradients for more accurate log and drilling data
- If lost circulation zones are anticipated, work out preventive measures prior to drilling that zone by treating the mud with lost circulation materials.

B. Hole Deviation

Hole deviation is the unintentional departure of the drill bit from drilling along a preselected borehole trajectory. Whether drilling a straight or a curved hole section, the tendency of the bit to walk away from the desired path can lead to a higher drilling cost and legal problems with regard to the lease boundary.

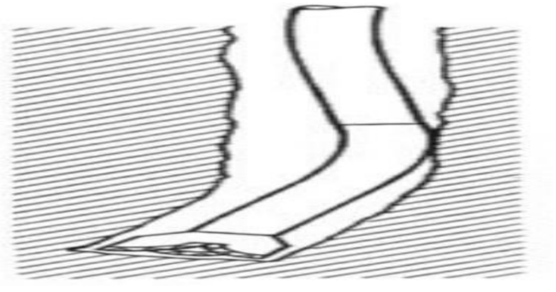

Figure16 (Hole Deviation)

- Causes

It is not exactly known what causes a drill bit to deviate from its intended path. It is, however, generally agreed that one or a combination of several of the following factors may be responsible for hole deviation:

- Heterogeneous nature of formation and dip angle
- Drill string characteristics and dynamic behavior
- Applied WOB
- Hole inclination angle from vertical
- Drill bit type and basic mechanical and hydraulic design
- Hydraulics at the bit
- Improper hole cleaning

A resultant force acting on a drill bit causes hole deviation to occur .The mechanics of this resultant force is complex and is mainly governed by the mechanics of the BHA, the rock-bit interaction, bit operating conditions, and to a lesser extent, the drilling-fluid hydraulics. The forces imparted to the drill bit owing to the BHA are directly related to the makeup of the BHA, (stiffness, stabilizers, reamers, etc.).

The BHA is a flexible elastic structural member that can buckle under compressive loads. The buckled shape of a given design of BHA depends on the amount of applied WOB. The significance of the BHA buckling is that it causes the axis of the drill bit to misalign with the axis of the intended hole path, causing the deviation. Pipe stiffness and length and number of stabilizers (their location and clearances from the wall of the wellbore) are two major parameters that govern the BHA-buckling behavior. The buckling tendency of the BHA is minimized by reduction of WOB and use of stabilizers with outside diameters that are almost in gauge with the wall of the borehole.

- The contribution of the rock-bit interaction to bit deviating forces is governed by the following factors:

1- Rock properties (cohesive strength, bedding or dip angle, and internal friction angle)
2- Drill bit design features (tooth angle, bit size, bit type, bit offset [in the case of roller cone bits]، teeth location and number, bit profile, and bit hydraulic features
3- Drilling parameters (tooth penetration into the rock and its cutting mechanism)

- The mechanics of the rock-bit interaction is a very complex subject and is the least understood problem contributing to hole deviation .

Fortunately, the advent of downhole measuring-while drilling (MWD) tools that allow the monitoring of the advance of the drill bit along the desired path has made our lack of understanding with regard to the mechanics of hole deviation more acceptable.

C. Equipment- and Personnel-Related Problems

Equipment The integrity of drilling equipment and its maintenance are major factors in the minimization of drilling problems. Proper rig hydraulics (pump power) are needed for efficient bottom and annular hole cleaning; proper hoisting power is required for efficient tripping out; proper derrick design loads and drilling-line tension load will allow safe overpull in case of sticking problems; a proper well control system (ram preventers, annular preventers, internal preventers) will allow kick control under any kick situation; a proper monitoring and recording system will allow the monitoring of trend changes in all drilling parameters and will facilitate the accessibility of drilling data for retrieval at a future date for learning; proper tubular hardware should be specifically suited to accommodate all anticipated drilling conditions; and finally, effective mud handling and maintenance equipment will ensure the mud properties fit their intended functions.

V. RECOMMENDATION

- PIPE STICK

-Drilling any cavity to great depths and leaving the cavity for a long time without softening, forming areas that narrow in abundance, and these areas pose a risk of obstruction or loss of drilling fluid. Therefore, after drilling the cavity, it is preferable to rotate the drilling fluid and make sure that the vibrating sieves are clean of rocky crumbs and drag to the lining shoes Or to the surface and replace the drilling thread with another suitable for the condition of the well and smoothing from the top of the bore down to the bottom to reduce the stubbornness problems resulting from the gathering of rock blocks.

- The driller must take the correct action during the occurrence of obstruction problems and use appropriate drilling limits to avoid any kind of obstruction while it was continuing to circulate the drilling fluid but did not take into account the constant pressure increase, which There were indications of Continuous mechanical stubbornness, in addition to the high mud density. which resulted in a large difference in pressure and the occurrence of differential stubbornness. rocky crumbs and maintain the pressure of the liquid column in the safe side.

- Stick equipment's log

- The fishing operation did not adversely affect the overall condition of the well as the intractable equipment was caught smoothly without losing any part of the well-sensing equipment, including the radioactive source (Neutron, Density) .

- The assurance by the drilling supervisors to the workers of the need to reduce the density of the drilling liquid in order to reduce the large difference between class pressure and the pressure of the drilling fluid, which led to the formation of a high mud cake that led to the difficulty of the sensor equipment.

- The need to remove the sensor equipment by drilling pipes or as called pipe conveyed logging PCL) to avoid the difficulty of the equipment, especially since the well is tilted.

- Nasiriyah oil field

-Continuously monitor the properties of drilling fluids.

-Monitoring the level of drilling fluid in tanks, especially when partial losses and abnormal pressures are observed

-Filling the well, especially when pulling and downloading pipes, and cleaning the well constantly.

-Ensure that there is an adequate stock of drilling fluids to control any flow or loss problem that occurs.

-Developing the staff and enabling it to solve the problems of the well, through an exam every 6 months.

- Developing the staff and enabling it to solve the problems of the well, through an exam every 6 months

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