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EVALUATION OF BIT ANALYSIS BY DIFFERENT METHODS AND CONCLUDING WITH RECOMMENDATIONS FOR CURRENT OIL ECONOMY

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ABSTRACT

One of the crucial factors in oil industry is overall cost for a well which depends on the formations. Even seismic analysis cannot give a complete output, so most of the times it's difficult to forecast the end cost, but this can be resolved to a certain limit by proper bit evaluation. Bits are one of the crucial factors in deciding the cost of rig which depends on the formations. The current oil economy is not the one which was forecasted. It is so unstable that the oil industries focus on increasing the production rate to balance the decreasing barrel price, so the industries aims in maximum output from the existing well and the wells belonging to high hydrocarbon potential which are going to be drilled. Bit evaluation plays a crucial role in deciding the minimum cost for a well if the conditions agree. The result of the bit evaluation by different methods can be used for wells with similar formations after the seismic analysis and calculated assumptions. This project discusses about the current scenario in the oil industry, reasons for the decline in the barrel price and evaluation of bit performance in different wells by some of the most important and common methods. A case study has been conducted on six wells, out of which two wells have been evaluated using cost per foot method and the remaining four wells have been evaluated using specific energy method. The data's used in the project report are taken from drillers logbook, the recommendations and conclusions given for each well are part of discussions with experts. The project concludes with recommendations for current oil economy.

INTRODUCTION

Barrel price was at its peak value of 115-125 during the year 2012 was reduced to 32-48 in the following years up to 2017. Shale gas production is one of the principle reasons for decreasing barrel price. It is presumably consequently that industry experts who were bragging a couple of years back that two-digit oil costs are presently consigned to history just, swear today that three-digit costs will take no less than three years to return. Bounce Dudley, an industry expert recently mentioned that oil will stay in the $55-70 section for whatever remains of the decade (which implies next 3-4 years) also the low cost would crush the spirit of shale business and production in US would decrease including the removal of a few players from this business. It is genuine likewise to some degree as US production has additionally declined in the most recent one year, and reports of loss

of employments, hault of oil rigs generally originate from the US. Nonetheless, this is the thing that a portion of the US Shale makers have expressed in the later past (Source: Beliefonomics and shale; Oilpro).

The oil rich nations have critical disintegrations in their GDP. Indeed, even major and extremely stable nations like Russia and Saudi Arabia have started to confront monetary crunch. Many drilling rigs have ended up sit out of gear and lakhs of employments have been lost. exploration and development activities have nearly arrived at a stop. No new tasks are being reported and extends worth trillions of dollars have been continued hold. Everyone focuses on increasing the production rate from the existing well and by drilling the most productive wells which are selected on the basis of screening criteria developed by the experts. Drilling plays a major role in bringing hydrocarbons to the surface in a commercial scale. During drilling process one of the main components that acts the role of boring hole in the ground is "DRILL BIT'' Due to the severe drilling conditions, well complications, decreasing barrel price and high drilling cost, the bits grading's and bit evaluation plays a major role in the drilling operation.

As drilling companies aims in maximizing profit, in which drill bit performance is a crucial factor for drilling cost. The drill bit performance is evaluated by many methods to find the capacity and bit efficiency for a given section of a hole with optimum suitability. The overall efficiency of drilling program is weighed by drilling bit evaluation. For the drill bit evaluation some of the criteria used are maximum drilling rate, rotating hour, cost of rig, cost of bit, penetration rate etc.. After the careful analysis of result obtained from different methods by the industrial experts, it is being applied for similar wells in the future if the conditions apply. This can reduce the cost of a well by bringing down the unnecessary bit cost and trip time which is a huge loss for the industry by using the correct bit type for a particular formation up to an extend.

CURRENT SCENERIO IN OIL INDUSTRY

1. Oil And Gas In Global Economy

low costs have conveyed great help to India with the Foreign Exchange holds rising and agreeable adjust of instalment, however the inflows have additionally been influenced because of loss of employments, contracting markets and lesser settlements. In any case, this has been making genuine concerns in the OPEC nations as well as in the whole oil industry. The oil rich nations have critical disintegrations in their GDP. Indeed, even major and extremely stable nations like Russia and Saudi Arabia have started to confront monetary crunch. Many drilling rigs have ended up sit out of gear and lakhs of employments have been lost. exploration and development activities have nearly arrived at a stop. No new tasks are being reported and extends worth trillions of dollars have been continued hold. There has been a general back off everywhere throughout the world, over all enterprises because of lower cash supply. OPEC, which had been assuming a key part in restraining the market, has been meeting over and over, however every one of its gatherings wind up without a system or a firm action plan with the fault going to cracks inside the association, differences between Saudi Arabia and Iran, over creation from Russia and so on.

2. DEMAND

Global oil request is estimated to develop by 1.3mb/d in 2016, a minimization of 0.1mb/d on our past conjecture because of a more purported 3Q16 log jam. Energy facilitates further to 1.2mb/d in 2017 as fundamental macroeconomic conditions stay questionable.

The seriousness of the 3Q16 log jam has shocked, with year-on-year (y-o-y) development diving to 0.8mb/d because of vanishing OECD development and a stamped log jam in India and China. Since cresting at an almost five-year high of 2.3mb/d in 3Q15, y-o-y worldwide oil request development has consistently diminished facilitating to 1.6mb/d in 1Q16 and 1.4mb/d in 2Q16 an advancement estimates during a time of Reports.

One of the greatest 3Q16 downsizes is in Europe, which sees its first y-o-y decrease in one-and-a-half years because of a sharp log jam in France, Austria, Finland, and Italy.

A deceleration in China and India which impeded non-OECD Asian 3Q16 development to a two-year low is the other real conjecture change. Chinese request development everything except vanished as the economy kept on rebuilding and moderate, while substantial flooding checked picks up in street transport and blue-sky strategies in front of Septembers G20 taking care of controlled modern demand. India's development kept on moderating strongly, with y-o-y development facilitating to a 16-month low.

The most recent US information demonstrate June conveyances 240kb/d (or 1.2%) up on a year prior, firmly coordinating our late figure. This three-month US development high was accomplished as the beforehand vigorously declining US gasoil showcase seemed to scrape the bottom.

BIT DEVELOPMENT

1.BIT DEVELOPMENT

In the historical backdrop of drilling operation the drag bit is the first to be utilized. This was utilized by the Chinese as a part of the year 256 BC. At that point, each tool pusher and metal forger was a bit maker and producer. The bit was upgraded amid this time by expansion of hard metal to the cutting edge and guage surface. In 1909, the rock cone bit was presented from the possibility of the drag bit. The rock cone then, includes two cones. The rotary drilling procedure with the utilization of two cone bit was then utilized for hard formation where the drag bit can't perform. The incapability of this bit is as found in the "balling up" impact. Subsequently, in 1920 it was upgraded in the apparatus floor with new cones to anticipate bunching together. It was outlined with cross section teeth (self-cleaning teeth).

2.TYPES OF BIT

- THE DRAG BIT
- FISH TAIL BIT
- DIAMOND BIT
- ROLLER CONE BITS
- MILLED TOOTH BITS
- TUNGSTEN CARBIDE INSERT BIT

3.CLASSIFICATION OF BIT

Penetrating bits are characterized into three fundamental classes.

- Soft formation drill bits
- Medium formation drill bits
- Hard formation drill bits

4.FACTORS AFFECTING RATE OF PENETERATION

Rate of penetration (ROP) is a measure in penetrating for the pace with which a bit drills through a formation. There are two methods for showing the ROP; cuttings per time unit or time unit per cutting. These are not the same, there are numerous variables affecting penetration rates including:

- Fluid type
- Bottom Hole cleaning
- Solid's expulsion
- Lost flow
- Hole stability
- Rotary speed
- Weight on Bit
- Bit design

5.CARE OF BIT (ROCK BIT)

Bit considerations are not typically considered by drilling operations. On the off chance that the greatest consideration is given to the bits, the exhibitions will be all the more better contrasted with when the bit is not given extraordinary consideration. Bit care has an exceptionally delicate impact on the bit execution. One must be extremely cautious in taking care of bits and taking after these directions underneath combined with experience amid field operations so as not to make the bit insufficient or dull before we send it to the bottom hole.

6. MAKING UP THE BITS

In making up our bore along a drill string there are some critical strides which must not be overlooked, keeping in mind the end goal to run an effective and mischance free strategy. It is as expressed beneath.

(i) Open the hole containing the bit painstakingly and check the string on the shank and clean them if fundamental.

(ii) Treat the string with an oil; clean string oil of the bit suggested for device joint string.

(iii) Lock the turning table. Spread the gap and place the bit breaker in the bolted rotating . Place the bit in the breaker and lower the neckline or neckline sub over the shank.

(iv) Place the make-up tong on the collar simply over the bit apply torque as suggested.

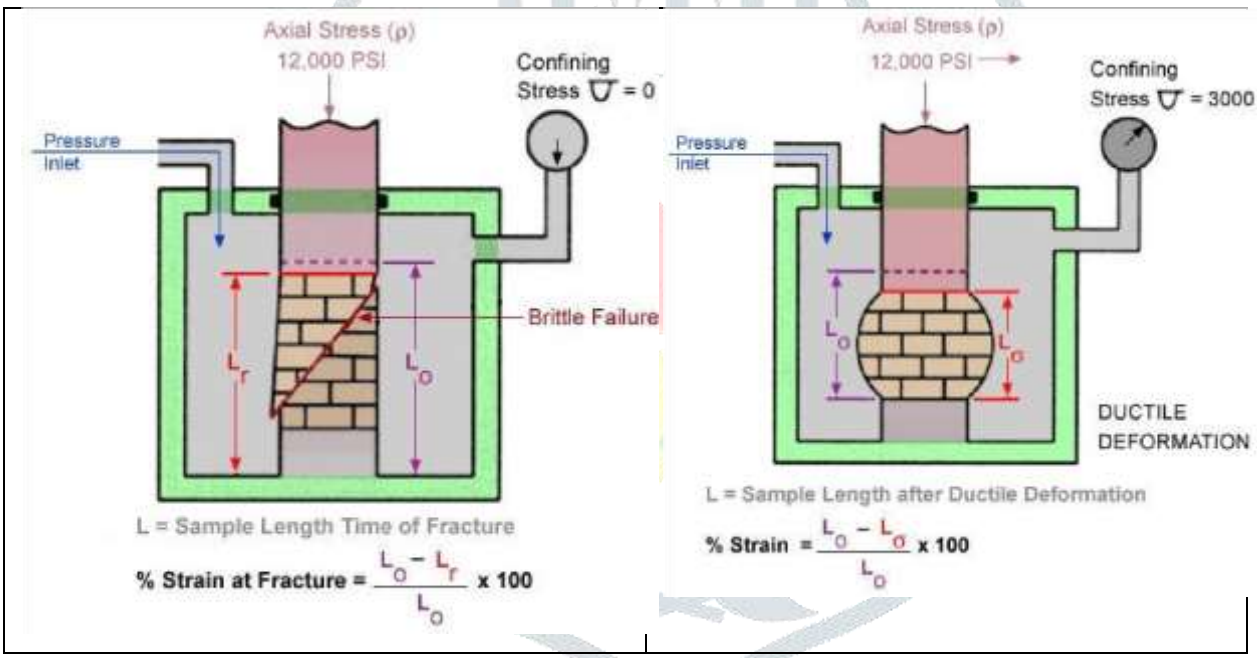
Rock Failure Mechanisms

Bits are intended to instigate rock failure. Since rock failure can happen in various courses, contingent upon the arrangement and on downhole conditions, there are an extensive number of outline varieties among moving cutter and settled cutter bits. To assess these outline varieties and select a bit, we initially require a fundamental comprehension of how rock fail and how formation conditions influence boring execution.

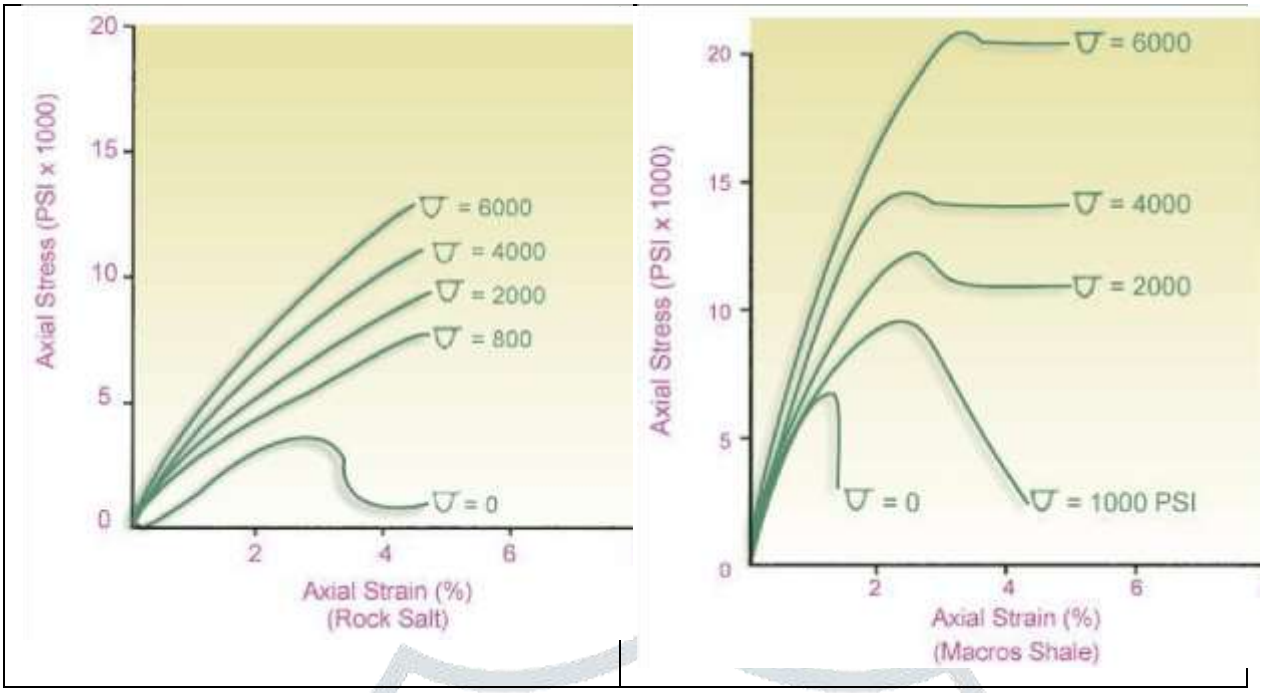
The Stress/Strain Relationship

Stress is the force applied to a unit area of material. An analysis of the stresses acting on a particular object can become quite involved. For the purpose of this discussion, however, we can classify three basic components of stress:

- compressive stress (a pushing or squeezing force)
- tensile stress (a pulling or enlongating force)
- shear stress (a slicing or cleaving force)

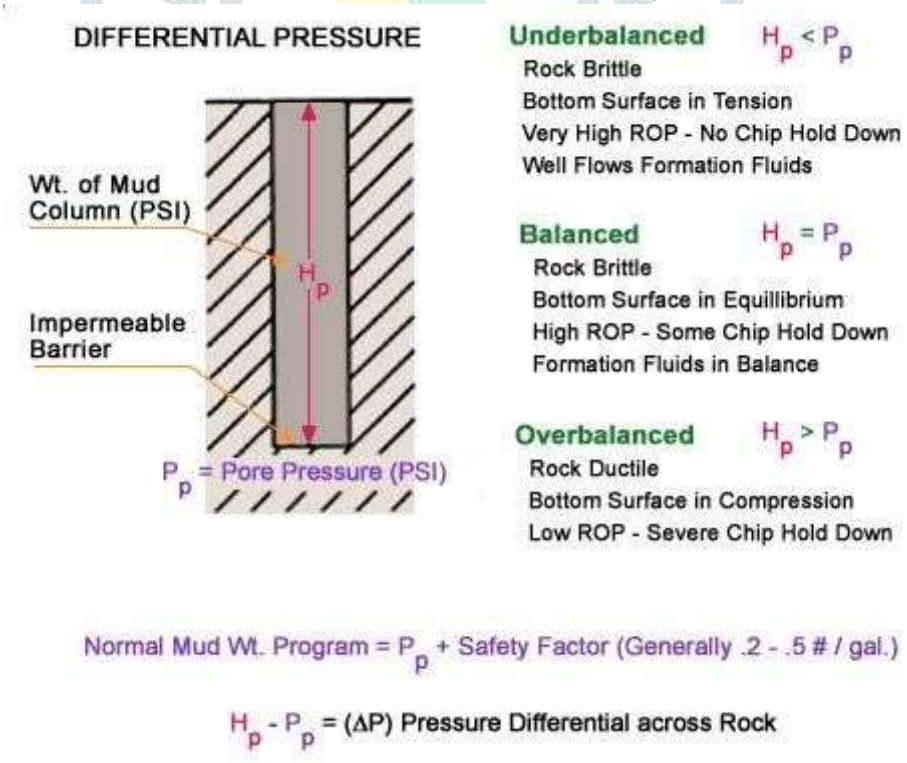


STRAIN AT FRACTURE

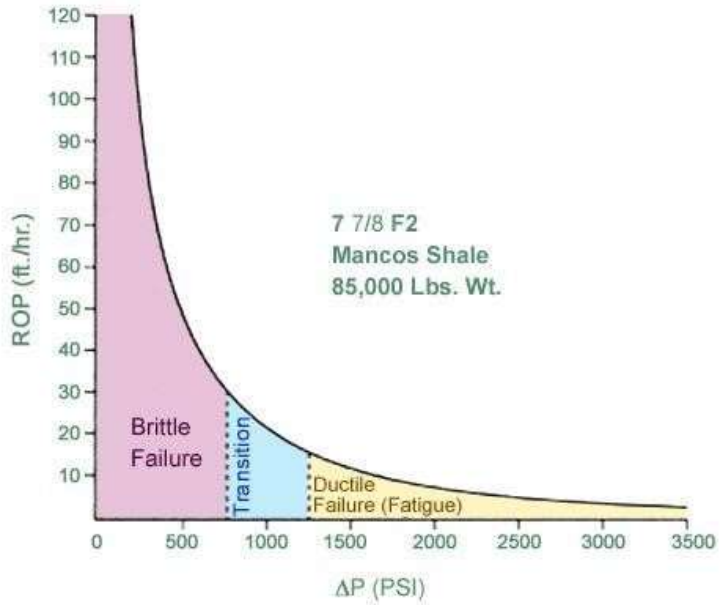


AXIAL STRESS VS AXIAL STRAIN

The tests mentioned above demonstrate confine pressure significantly affects rock conduct. To make an interpretation of this perception into common terms, we have to apply these lab conditions to the wellbore. The confine pressure at the base of a wellbore is equivalent to the distinction between the weight applied by the section of drilling fluid in the gap and the pore weight, or inside weight, of the stone. This amount is ordinarily communicated as differential weight, or deltaP. The value of deltaP defines the hole condition as underbalanced, balanced or overbalanced. Each of these hole conditions, together with temperature and rate of deformation, affects rock failure mechanisms, which in turn affect penetration rate.



PRESSURE DIFFERENTIAL



ROP VS FAILURE

Failure Mechanism Of Drag Bits

Drag bits are intended to bore basically by a wedging component. On the off chance that drag bits could be continued penetrating by wedging, they would not dull so rapidly. when they are dragging accordingly, scratching and grinding that they bore gradually.

EVALUATION OF BIT PERFORMANCE

1.COST ANALYSIS

As earlier complained, the recent trend toward deeper and costlier holes has led to the development of various drill bits which can stay in the hole longer and which can drill more footage and eliminate expenses. This led to need for bits that can perform matching with these qualities, these are the milled tooth bit and the insert bit which are designed to have either sealed or non-sealed bearing. These bits are the ones most commonly used in drilling operations. The various design have made the various bits to have different price range, footage drilled, penetration rate, and rotary hour. But all these factors have lost their significance, the only factor considered in drilling or selecting a bit is the cost per foot comparison.

2. COST PER FOOT METHOD

IADC developed the most realistic and approved method for performance analysis for drilling bit which is COST PER FOOT METHOD. This method helps to achieve an optimum relationship between penetration rates, bit cost and drilling cost per foot. The equation used in this method is given below

$$CT = \frac{B+CR(T+t)}{F}$$

CT= Drilling cost per foot ($/ft)

B= Bit cost ($)

CR= Rig operating cost ($/hr)

T= Rotating or drilling time

t= Trip time (hr)

F= Footage drilled by bit (ft)

from the equation, it shows that cost per foot is controlled by a number of variable for a given bit cost (B) and hole depth (ft), cost per foot will be highly sensitive to change in rig cost per hour (R), trip time (t) and rotating time (T). The principle for bit evaluation using the cost per foot method in a given formation of a hole section is usually comparative where a bit with the minimum value of cost per foot is selected to have the best performance. This formula can be used to filter the best bit on minimum cost per foot analysis. In the cost per foot method bit performance is not judged by the footage drilled, rate of penetration, cost of bit, etc.

3.BREAK EVEN CALCULATION

This is a method of bit selection based on minimum cost analysis from an offset wells. i. Select the offset control wells.

ii. Offset wells bit records have to be obtained. iii. Rig cost for the prospect wells have to be determined.

iv. By using the break even calculation, the condition that gave the lowest cost per foot result have to be selected to determine the best bit with minimum cost per foot to be run on a given interval using the formula.

ROPBE = _____ RR _____ (C-(((RR×T)+B)/F))

ROPBE= Breakeven Penetration Rate (ft/hr)

RR= Hourly Rig Rate ($/hr)

F= Assumed footage for breakeven (ft)

T= Trip Time (hour)

B= Bit cost ($)

C= Bit cost per foot ($/ft)

By using this equation, it is possible to determine the possible performance by a different bit to give cost per foot performance equal to which is achieved with the current bit selection.

CONCLUSSION

While U.S. shale oil generation will presumably positively affect oil production and the level of oil imports, it will scarcely make a mark in the worldwide oil supply. Add up to U.S. oil generation oil will top at 7.50 mbd in 2019 preceding it begins to decay achieving 6.10 mbd by 2035. This implies there is neither a shot for the United States ever to wind up self-sufficient in oil nor to overwhelm either Saudi Arabia or Russia in oil generation. Additionally, the U.S. will never be in a position to deny OPEC the ability to set worldwide oil costs.Be that as it may, the greatest obstructions to an extension of U.S. shale oil generation would be a reaction against its antagonistic effect on the earth, absence of oil transport and refining base and increasing expenses of creation. Without higher costs surpassing $100/barrel, nobody would pursue shale oil.The U.S. shale oil blast would not be anything but difficult to duplicate in whatever remains of the world nor will it refuse the idea of pinnacle oil.With the continuing instable barrel rate it is best to prepare for the worst case scenario like below $20/barrel-$45/barrel which means to reduce the cost of production to minimum.Drill bits have a prominent role in deciding the cost of production up to an extent,most accurate bits have to be recommended for a formation based on the calculations and analysis of result done on various similar wells.Analysis on bit done using various methods ,this project includes some of the common methods used and rcommendations are given for each well .

The assessment of drilling execution performance utilizing cost per foot condition contrasted with breakeven analysis gave a superior bit execution assessment for WELL OG#1 and WELL OG#2. From our investigation in well-OG#1, the bit gave the best execution in penetrating the surface segment of the opening was a 16" REED T135 (first run). For the profound segment of the opening the 12 ¼" REED DSR616M (third run) and 8 ½" REED MSR616M (first run) and the 8 ½" REED DSX713M bits gave the best execution. Along these lines, they would be temperate for use in this way.

From the specific energy study we have come to realize that, weight on bit, day by day bit hours and footage every day assumes an imperative part in choosing the sp.energy of a drill bit. Also we have seen that even a PDC bit with more bit hours and footage every day requests a more sp.energy. So in any formation, we can accomplish an ideal sp.energy include just by adjusting the other boring parameters. Accordingly choice of a drilling bit on the premise of sp.energy chiefly relies on the kind of formation. Clearly a harder formation will require more particular vitality contribution than a soft formation. In addition, we additionally came to realize that PDC bit is by and large utilized as a part of more profound and harder formation. The principle advantage, we became more acquainted with from the study is that, PDC bit can withstand high weight on bit and additionally utilized for more bit hrs and all the more day by day footage without influencing the particular sp.energy essentially. Be that as it may, the fundamental problem of PDC bit is that it is costlier. So it will include more esteem in expense per foot strategy in bit determination .So while picking a bit we need to consider the financial elements as well. Along these lines we can say that, sp.energy method alone can't be utilized to choose a bit for drilling. We need to consider the monetary elements, arrangement components, log information as well. Consequently we can presume that, sp.energy method together with different components like arrangement, monetary elements and so forth can be reasonably adjusted to get an ideal bit for a specific development. This investigation of bore profundity information will help future drilling operations and give a definite viewpoint towards the sp.energy strategy for bit determination to the drilling engineers.

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