

Unit 3

1. Learn to pronounce the following words properly:

Approach	suitable
Particular	govern
Horizontally	require
Precaution	consideration
Average	conventional
Insertion	primary

II. Read the following international words and give their Russian equivalents:

Actual	characteristics	uniform
Formation	exploitation	

III. Translate the following sentences. Pay attention to different meanings of "It".

- e.g. 1. It's interesting to know everything about these facts. — Интересно знать все об этих фактах.
2. It's crude oil that comes from the ground. — Именно сырая нефть поступает из-под земли.
3. It's known that such bits are used in drilling hard formations. — Известно, что такие долота применяются при бурении твердых пород.
4. Look at the derrick. It is mounted over the well. — Посмотрите на вышку. Она сооружена над скважиной.
5. We know that it is a very interesting journal. — Мы знаем, что это очень интересный журнал.
1. It is necessary to use this method of drilling.
2. It should be noted that such problems are of great interest.
3. It was difficult for the students to solve some problems.
4. It's known that they couldn't use this equipment in the fields.
5. It is necessary that oil be found in great quantities.
6. The demand for petroleum has greatly increased and this means that it should be looked for everywhere.
7. I know that it is a very interesting problem to be discussed at the conference.
8. It is not difficult to find the solutions of this problem.
9. It took them much time to solve the problem properly.
10. It should be emphasized that such problems are very difficult to solve.
11. Now a railway has been built from this region. It is 1,5000 km long.
12. As the hole deepens, it is necessary to add new lengths of drillpipe.

IV. Translate the following sentences into Russian. Pay attention to the Infinitive Constructions.

1. This method is said to be the best one.
2. I want him to tell me about the application of this method.
3. I've heard the professor speak about a new method of extracting oil.
4. The teacher asked the student to tell about the new methods of drilling.
5. This method of drilling wells is sure to have some advantages.
6. To give the students the necessary knowledge of the properties of drilling fluids was the main task of the laboratory work.
7. The students wanted to be given the necessary information about the characteristics of the formation to be drilled.
8. The young specialists were known to have been working at the problem of well completion some months.
9. They are happy to have taken part in assembling the derrick over the well.
10. Many various bits are reported to have been produced at our plants.
11. Casing a well is known to be one of the most important processes in completing a well.

V. Read the text and give the main idea of it.

ROTARY DRILL BITS

The bit which does the actual drilling is attached to the lower end of the drill collar.

The choice of the bits which should be used in any particular instance is governed primarily by the characteristic of the rock to be drilled and the conditions under which the rock must be drilled. The softer shales of the younger sedimentary rocks are drilled with one type of a bit while the harder shales and limestone are effectively drilled with another type. Rock strata which lie horizontally are more easily penetrated than inclined beds, where it is often necessary to use less weight on the bit to maintain a vertical hole. Different types and variations of bits are therefore in use in drilling wells.

Mention is to be made that the rocks of uniform type present a single problem while interbedded soft and hard layers require the use of different bits.

Drilling conditions mentioned above include the drill string, particularly the size and weight of the drill collar, the straightness as well as the vertical character of the hole, the nature of the drilling fluid, circulation rate, the rotary speed and safety precautions demanded by the drilling equipment, caving formations and so on.

In the conventional drilling operation, the drilling bit becomes worn at frequent intervals, necessitating its removal and replacement, which requires the removal of the entire drilling string. The number of times the drilling bit is to be replaced depends on the depth of the well and the character of the formation penetrated.

The removal of the drill pipe for the purpose of replacing a worn bit is commonly referred to as “making a trip”. “A round trip” therefore refers to both the removal and the insertion of the drilling string.

Bits may be classified into three general groups. These are: (1) Drag type, (2) Rolling cutter (roller bits), (3) Diamond bits. Drag bits have no moving parts and drill by the shovelling action of their blades. Their water courses are placed so that the drilling fluid is directed on the blades, keeping them clean. Bits of this type were once used for drilling soft, sticky formations, but in recent years have been largely replaced by rolling cutter type. Rolling cutter bits have moving parts, i.e. cones that rotate grinding the rock. The soft formation, tri-cone (three cone) bits have relatively long, widely spaced teeth with interruptions in the pattern. Tooth length, spacing and pattern are balanced to obtain the fastest penetration rate with a minimum of balling between the teeth. Some bits have tungsten carbide inserts or buttons instead of teeth. They are designed for drilling the hardest formations and have excellent success in many areas. Jet bits are rolling cutter bits which have been equipped with fluid nozzles. Each nozzle directs a high velocity fluid jet on the bottom of the hole which rapidly removes the cuttings. The pressure losses through those nozzles are considerable and require extra pump capacity. Diamond bits are normally used in hard formations. Diamond core heads are widely used in coring.

(Drilling Engineering Handbook).

VI. Read and remember the following words and word combinations:

to attach	прикреплять, присоединять
drill collar	УБТ, утяжелитель
weight	вес, нагрузка
to interbed	прослаивать
safety precaution	мера безопасности
footage	количество выбуренной породы в футах
inclined beds	наклонные пласты
remove	выносить, удалять, вымывать
to wear (wore, worn)	изнашивать(ся)
to insert	спускать, опускать
insert (button)	штырь, вставка

straightness	прямызна (скважины)
round trip (operation)	спускоподъемная операция
drill string	колонна бурильных
drill column	труб
rolling cutter (roller) bit	шарошечное долото
jet bit	гидромониторное долото
drag bit	лопастное долото
diamond bit	алмазное долото

to be hard-faced with tungsten carbide – армированный карбидом вольфрама

VII Find Russian equivalents to the following phrases:

1. system of drilling	1. очищать
2. to keep clean	2. использоваться
3. rotation of the drill string	3. вращение колонны бурильных труб
4. to drill with a bit	4. бурить эффективно
5. to drill effectively	5. Различные типы долот
6. to penetrate easily	6. система бурения
7. different types of bits	7. бурить долотом
8. to be in use	8. Легко проходить (при бурении)

VIII. Translate the following sentences into Russian:

1. Soft rocks are being easily penetrated.
2. The total cost of drilling a well is known to depend upon the average rate of drilling and the footage drilled per bit.
3. The bit is attached to the lower end of the drilling string.
4. Water passes through the water courses keeping the bit clean during the drilling operation.
5. Passing through the bit nozzles the drilling fluid cleans and lubricates the bit.
6. Having studied the formations to be drilled, the engineers realized that bit of special design will be needed.
7. Being manufactured from high-grade steels the bits are rather expensive drilling tools.
8. Having increased the fluid velocity they improved the removal of cuttings from the bottom of the well.
9. Improper lubrication of the bit and drill string will cause much trouble and reduce bit bearing life.
10. Holes must be drilled through a large number of different types of formations.

IX. Find the English equivalents to the Russian words and word combinations.

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|-----------------------------|--------------------------------------|
| 1. заменять долото | 1. to keep the bit clean |
| 2. нагрузка на долото | 2. circulation rate |
| 3. очищать долото | 3. to penetrate the rock |
| 4. проходить породу | 4. to be governed by |
| 5. скорость циркуляции | 5. the weight on the bit |
| 6. руководствоваться чем-то | 6. the type of the formation |
| 7. спуск буровой трубы | 7. to replace the bit |
| 8. тип пласта (породы) | 8. casing formations |
| 9. истираться (о долоте) | 9. to become worn |
| 10. Осыпающиеся породы | 10. insertion of the drilling string |

X Translate the sentences into Russian. Pay attention to the Infinitive used as an attribute.

e.g. 1. He was the first to solve this problem. — Он первым решил эту проблему.

2. The problem to be solved is of great importance. Проблема, которую нужно решить, имеет большое значение.

1. They were the last to use this equipment.
2. The substance discovered has some properties to be examined before a final conclusion is made.
3. The methods to be discussed in this text are not easy to be identified.
4. The problem to be dealt with is very important for our research work.
5. The articles to be translated at the lesson deal with the problems of oil extraction.
6. According to the predictions, the oil to be recovered from this field is of high quality.
7. Cable tool rigs to be employed under these conditions are simple to move and operate.
8. The formation to be drilled is adaptable to the percussion action of the cable tool rig.
9. The diameter of the pipeline to be used for oil transportation is large enough to let the oil flow through it.
10. They were the last to use this method in the experiment.

XI. Translate the following sentences into English according to the following model:

e.g. Проблема которую предстоит обсудить на нашем собрании, представляет большой интерес для нефтяников. — The problem to be discussed at the meeting is of great interest for oilmen.

1. Скважина, которую будут бурить, самая глубокая в нашей стране.
2. Выбор метода, который будет использоваться для бурения скважин, зависит от ряда факторов.
3. Нужно собрать все необходимые сведения о формации, которую предстоит пробурить.
4. Прежде чем выбрать метод бурения, необходимо изучить геологические условия района, в котором предстоит проводить разработку.
5. Прибор, который был создан в нашем институте, нашел широкое применение в нефтяной промышленности.
6. Вопросы, которые предстоит обсудить на собрании, связаны с разработкой нефтяных и газовых месторождений.
7. Долото, которое нужно укрепить на нижнем конце трубы, изготовлено из прочной стали.
8. Специальные трубы, которые предохраняют стенки скважины от обвала, называются обсадными.

XII. Answer the following questions

1. By means of what is the rotation of the drill string established?
2. What is the bit attached to?
3. What formations are more easily penetrated?
4. By what. is the choice of the bit governed.?
5. What is the drilling fluid discharged through?
6. What does the total cost of drilling depend on?
7. Why are the bits to be replaced?
8. How often should the bits be replaced?
9. What is the round-trip operation?
10. What types of bits do you know?
11. What bits have no moving parts?
12. What formations are drilled with rolling cutter bits?

XIII. Translate the following text in writing. Use a dictionary:

TEMPERATURE IS THE KEY

BITS - Significant developments in rock bits have been made in the past several years. Not many years ago a rock bit would last only 6 to 12 hours before both the teeth and bearinga wore out. Now rock bits routinely last for two to three days on normal depth wells. With deeper depth and higher temperatures, the elastomer seals, which protect the bearing lubricants, become the first limiting factor. Most elastomer seals are rated at 280 to 325 ° F maximum operating temperature. At higher temperatures, a rapid decrease in seal life and thus rock bit life is experienced. Because mud circulation lowers the bottom hole temperatures, long bit life is sometimes obtained even though the bottom hole static teperature (BHST) exceeds 400°F. The length of life also depends upon the type and weight of fluid, type of formation, and the drilling parameters used (Bit weight, RPM, etc.). Improved seals will be required to obtain extended rock bit life when operating at temperatures above about 325°F.

Diamond bits are quite often used in deep drilling when formation conditions allow. Higher temperatures also shorten diamond bit life, but not as dramatically as with rock bits. Some significant improvements in drag-type, synthetic diamond bits have been made recently, particularly in bits for drilling chalk formation using oil-base mud. Penetration rates of 10 to 15 ft per hour are common as compared to 3 to 7 ft per hour a few years ago.

Higher operating temperatures should not appreciably affect the steel rock bits or diamond bits at temperatures below 800°F. Special alloys will be required when operating temperatures exceed approximately 800°F.

(Drilling, July 1981).