МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение высшего образования
«СЕВЕРО-КАВКАЗСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»

МЕТОДИЧЕСКИЕ УКАЗАНИЯ ПО ДИСЦИПЛИНЕ

АНГЛИЙСКИЙ ЯЗЫК В НЕФТЕГАЗОВОЙ СФЕРЕ

Направление подготовки	21.04.01 Нефтегазовое дело
Профиль подготовки	Строительство глубоких нефтяных и газовых скважин в сложных горно-геологических условиях

Ставрополь, 2026

Введение

Методические указания к практическим занятиям по английскому языку составлены в соответствии с Федеральным государственным образовательным стандартом высшего образования по направлению подготовки Нефтегазовое дело, профиль подготовки: «Строительство глубоких нефтяных и газовых скважин в сложных горно-геологических условиях» и программой дисциплины «АНГЛИЙСКИЙ ЯЗЫК В НЕФТЕГАЗОВОЙ СФЕРЕ».

Основной целью методических указаний является организовать работу студентов на практических занятиях, изложить тематику, порядок выполнения заданий для формирования и совершенствования коммуникативной компетенции, уровень которой позволит практически использовать иностранный язык в сфере академической и профессиональной коммуникации.

В результате усвоения тем и разделов дисциплины «АНГЛИЙСКИЙ ЯЗЫК В НЕФТЕГАЗОВОЙ СФЕРЕ», работы на практических занятиях у обучающихся должна сформироваться способность применять современные коммуникативные технологии, в том числе на иностранном языке, для академического и профессионального взаимодействия (УК-4).

В результате освоения дисциплины обучающийся должен:

Знать:

- методы и технологии академической и профессиональной коммуникации на иностранном языке;
- основные нормы, стилистические особенности устной и письменной речи иностранного языка, необходимые для успешной коммуникации в сфере академической и профессиональной деятельности.

Уметь:

- следовать основным нормам, принятым в академическом и профессиональном общении на иностранном языке;
- использовать информационно коммуникационные технологии при поиске необходимой информации в процессе решения стандартных коммуникативных задач на иностранном языке;
- вести деловую переписку, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на иностранном языке;
- использовать диалогическое общение для сотрудничества в академической и профессиональной сферах;
- представлять результаты академической и профессиональной деятельности на различных научных мероприятиях, включая международные.
- демонстрировать интегративные умения, необходимые для эффективного участия в академических и профессиональных дискуссиях.

Владеть:

- навыками анализа профессиональных текстов на иностранном языке;
- навыками критической оценки эффективности различных методов и технологий научной коммуникации на иностранном языке;
- методами и технологиями различных типов коммуникаций на иностранном языке при осуществлении профессиональной деятельности;
- основами делового иностранного языка;
- навыками выступления на научном семинаре, навыками ведения беседы, дискуссии в профессиональной сфере.

Методические указания содержат лексический материал, задания для выполнения, тексты, лексико-грамматические упражнения и задание на развитие речи.

При отборе текстового материала учитывалась информационная ценность текстов и их соответствие интересам студентов.

СОДЕРЖАНИЕ

INTRODUCTION

In the late 20th century, changes in the oil market moved influence from generally oil-consuming areas such as the US and Europe to oil-producing countries.

Iran, Iraq, Kuwait, Venezuela and Saudi Arabia formed the Organization of the Petroleum Exporting Countries (OPEC) in 1960 in response to multinationals in the 'Seven Sisters' including ExxonMobil – at the time split into Esso and Mobil – Shell and BP, which operated from oil-consuming countries.

Today, OPEC has 15 member countries, accounting for approximately 44% of global oil production and 81.5% of the world's oil reserves.

The 1980s saw a significant glut in oil following the 1970 energy crisis. Petroleum production peaked in the 1970s, which caused a sharp rise in oil price and a subsequent decrease in demand.

Oil-producing countries suffered during this glut, with OPEC struggling to maintain high oil prices through decreasing oil production. The dissolution of the Soviet Union can also be attributed in part to a loss of influence as an oil producer.

The glut lasted six years, with oil prices gradually recovering in 1986, but a similar surplus in oil started in 2014 and continues to have effects on global oil prices.

The oil and gas industry is still thriving today despite competition from renewable sources of energy, albeit in a more volatile state than ever due to world events.

(Source: https://www.offshore-technology.com/comment/history-oil-gas)

UNIT 1
OIL AND GAS INDUSTRY

Task.1 Read the text

Uncovering the oil and gas industry

Considered being the biggest sector in the world in terms of dollar value, the oil and gas sector is a global powerhouse using hundreds of thousands of workers worldwide and generating hundreds of billions of dollars globally each year. In regions which house the major NOCs, these oil and gas companies are so vital they often contribute a significant amount towards national GDP.

In this introduction to the oil and gas industry, we provide a snapshot of the petroleum sector.

What are the different oil and gas sectors?

The energy sector has three key areas: Upstream, midstream and downstream.

- **What is upstream? -** Upstream is E&P (exploration and production). This involves the search for underwater and underground natural gas fields or crude oil fields and the drilling of exploration wells and drilling into established wells to recover oil and gas.

- **What is midstream?** - Midstream entails the transportation, storage, and processing of oil and gas. Once resources are recovered, it has to be transported to a refinery, which is often in a completely different geographic region compared to the oil and gas reserves. Transportation can include anything from tanker ships to pipelines and trucking fleets.

- **What is downstream? -** Downstream refers to the filtering of the raw materials obtained during the upstream phase. This means refining crude oil and purifying natural gas. The marketing and commercial distribution of these products to consumers and end users in a number of forms including natural gas, diesel oil, petrol, gasoline, lubricants, kerosene, jet fuel, asphalt, heating oil, LPG (liquefied petroleum gas) as well as a number of other types of petrochemicals.

What are the largest volume products?

The largest volumes of products of the oil and gas industry are fuel oil and gasoline (petrol). Petroleum is the primary material for a multitude of chemical products, including pharmaceuticals, fertilisers, solvents and plastics. Petroleum is therefore integral to many industries and is of critical importance to many nations as the foundation of their industries.

Oil and gas industry outlook: 2019

In consideration of industry low's, such as the price collapse in 2013 and major environmental disasters such as the Deepwater Horizon Gulf Of Mexico Oil Spill in 2014, the oil & gas sector has now recovered.

The world's dependence on oil and gas is increasing as global economies and infrastructure continue to rely heavily on petroleum-based products. Discussions of when world oil and gas production will peak seem to be on the periphery, even amid a weakened global economy and the shrinking availability of oil. The oil and gas

industry continues to wield incredible influence in international economics and politics - especially in consideration of employment levels in the sector, with the U.S. oil and gas industry supporting at least 10 million jobs.

The recovery occurred for several reasons, but the chief among them is the success of the production restraint agreement between OPEC and non-OPEC nations. In addition, developing nations such as China, Brazil and Russia are increasing exploration and production efforts. However, geopolitical considerations such as the ongoing troubles in Venezuela, Iran, and Qatar's exit from OPEC will influence oil and gas supply.

The trend towards renewable and alternative energy is another threat to traditional oil and gas companies. Coupled with the rise in pro-eco legislation and governmental pressure has meant the industry is under more scrutiny than ever.

Generating electricity from solar power systems and offshore wind is becoming increasingly cheaper and cost-effective. According to IRENA, over 80 percent of newly commissioned renewable energy will be cheaper than new oil & natural gas sources.

More recently, there has been a resurgence of confidence in the industry as it enters its third year of recovery. Growth is increasing at a remarkable rate, as increased upstream production continues to have a positive knock-on effect for midstream businesses. The price of crude has also stabilised - steadying at around $50 per barrel. In addition, 100,000 jobs are expected to be created in 2019 and the number of active drilling rigs in the U.S. has increased to 780+ compared to 591 from a year ago.

The UK continental shelf also appears to be back, with the potential to unlock dozens of undeveloped discoveries with drilling prospects on the horizon. Additionally, we can expect an improved outlook for UK upstream production. The UK offshore sector is expected to improve after historical lows in the past few years as there are 16 planned greenfield projects with identified development plans and 29 announced greenfield projects forecast to start production between 2019 and 2025.

It is estimated that 30 billion barrels are consumed globally each year, primarily by developed nations. Oil also accounts for a significant percentage of energy consumption regionally from 32% for Europe and Asia, 40% for North America, 41% for Africa, 44% for South and 53% for the Middle East.

(Source:https://www.oilandgasiq.com/strategy-management-and-information/articles/oil-gas-industry-an-introduction)

Task 2. Write a short summary about the oil and gas industry.

_____

_____

_____

_____

_____

_____

UNIT 2
FROM THE HISTORY OF OIL AND GAS

Task 1. Read the text.

History of oil and gas: First discoveries

Oil and gas had already been used in some capacity, such as in lamps or as a material for construction, for thousands of years before the modern era, with the earliest known oil wells being drilled in China in 347 AD.

The modern history of the oil and gas industry started in 1847, with a discovery made by Scottish chemist James Young. He observed natural petroleum seepage in the Riddings coal mine, and from this seepage distilled both a light thin oil suitable for lamps and a thicker oil suitable for lubrication.

Following these successful distillations, Young experimented further with coal and was able to distil a number of liquids including an early form of petroleum. He patented these oils and paraffin wax, also distilled from coal, in 1850, and later that year formed a partnership with geologist Edward William Binney.

The partners formed the first truly commercial oil refinery and oil-works in the world, manufacturing oil and paraffin wax from locally mined coal.

Young wasn't the only scientist making discoveries about coal in the 19th century. In 1846, Canadian geologist Abraham Pineo Gesner refined a liquid from coal, oil shale and bitumen that was cheaper and burned more cleanly than other oils. He dubbed this liquid 'kerosene' and founded the Kerosene Gaslight Company in 1850, using the oil to light the streets of Halifax and later the US.

The first modern wells

From these initial discoveries, new businesses were created, with the coal industry now also seeking to create the oils developed by Young and Gesner.

Polish engineer Ignacy Łukasiewicz improved Gesner's method to more easily distil kerosene and petroleum in 1852, opening the first 'rock oil' mine in Bóbrka, Poland in 1854.

The first oil well drilled was in the town of La Brea, Trinidad in 1857. It was drilled to a depth of 280ft by the American Merrimac Company.

The first modern oil well in America was drilled by Edwin Drake in Titusville, Pennsylvania in 1859. The discovery of petroleum in Titusville led to the Pennsylvania 'oil rush', making oil one of the most valuable commodities in America.

Big Oil

The late 18th century and the early 19th century marked the creation of major oil companies that still dominate the oil and gas industry today.

John D. Rockefeller founded the Standard Oil Company in 1865, becoming the world's first oil baron. Standard Oil quickly became the most profitable in Ohio, controlling about 90% of America's refining capacity and a number of its gathering systems and pipelines. ExxonMobil, one of Standard's successors after it dissolved in 1911, is the world's ninth largest company by revenue today.

In Russia, the Rothschild family commissioned oil tankers from British trader Marcus Samuel to expand their oil operations and reach more overseas customers. Samuel's first vessel, the Murex – named after a sea snail – became the first oil tanker to pass through the Suez Canal connecting the Mediterranean Sea to the Red Sea.

The Murex became the flagship vessel of Shell Transport and Trading, which eventually merged with Royal Dutch Petroleum to become Royal Dutch Shell. Today, Royal Dutch Shell is the fifth largest company in the world and one of six oil and gas supermajors.

The discovery of oil in Masjed Soleyman, Iran by William Knox D'Arcy led to the incorporation of the Anglo-Persian Oil Company (APOC) in 1907. The British Government purchased 51% of the company to provide the Navy with oil during World War I in 1914. In 1954, APOC became British Petroleum, known today as BP, which is currently the sixth largest oil and gas company in the world.

Task 2. Write a short essay about any interesting fact from the history of oil and gas.

UNIT 3
PERSPECTIVES

Task 1. Read the text

Perspectives

2021 oil and gas industry outlook

Exploring oil and gas trends and impact of COVID-19

The oil and gas industry is used to the highs and lows of economic cycles. The downturn caused by COVID-19, however, is unlike any other. With the survival of many companies at risk, coupled with a longer-term decline in petroleum demand, the next decade could look very different for the oil and gas market. Explore what the next year may look like in our 2021 outlook.

Facing the challenge of transformation for the oil and gas industry

Since we published our midyear outlook in July, the global economy and capital markets have rebounded faster than expected in the third quarter of 2020. However, the pace of recovery in the coming months remains highly uncertain as mounting COVID-19 cases amid winter conditions, especially in Europe and the United States, may trigger another round of shutdowns and restrictions. Any further normalization of economic activity largely depends on how the pandemic evolves during the winter and, most importantly, when COVID-19 vaccines reach the general public. Even when the virus is controlled, economies are expected to continue dealing with the adverse impact of deteriorated fiscal balances and the effect of muted business investment on the labor market and consumer spending in 2021.

What does this mean for the oil and gas (O&G) industry? Global oil demand fell by 25% in April, but it has rebounded sharply since then, cutting its losses to just

8%. Looking ahead, 2021 oil demand is expected to recover strongly but remain lower than it was at pre–COVID-19 levels—about 4% lower in the base case, and about 7% lower in Rystad Energy's second-wave scenario. Similarly, oil prices and energy stocks have underperformed base metals and the broader S&P 500 index by about 10% and 25% and 6% and 10%, respectively, since July 2020. Mass layoffs and heightened cyclicality in employment continue to challenge the industry's reputation as a reliable employer. US O&G companies laid off about 14% of permanent employees in 2020, and our research shows that 70% of jobs lost during the pandemic may not come back by the end of 2021.

Although the oil and gas sector is used to the highs and lows of economic and price cycles, this downturn seems unlike any other. In fact, it's the "great compression" of the O&G industry. With the survival of many companies at risk, and the longer-term decline in petroleum demand, the next decade could look very different for the entire O&G value chain. 2021 will either be a leapfrog year or a test of endurance for many. We see five oil and gas trends that may challenge traditional methods of oil and gas production in 2021, determine the direction of the industry, and begin separating the pioneers from the followers.

Five oil and gas trends to consider

The corridor of uncertainty

Bail out the shale

Crisis accelerates big oil and gas trends

Is natural gas out of gas?

Turbulence down the value chain

The future is now for the oil and gas sector, and the signs are hidden in plain sight

The oil and gas industry was facing market headwinds even before the pandemic started. However, the pandemic has turned into a "fast-forward" scenario for the industry, where what might have taken years to happen has instead unfolded in a matter of months. Pivoting to the new energy future could be tough and may require companies to make bold choices—and not everyone is likely to succeed. The following signposts could help O&G companies in deciding their strategy and direction in 2021:

- The stance and commitment of a new administration on clean energy.
- Changes in end-use demand patterns and supply composition.
- The rise of environmental, socially responsible, and impact-focused investing.
- An adoption of new talent strategies to succeed in the future of work.
- Consolidation in a low-priced environment.

The choices O&G companies make in the coming months, and the trends they prioritize, will decide the path forward and reverberate through their decision-making in the coming decade.

Today, oil and gas is an international, multi-million dollar industry, but where, when and how did the industry begin? Offshore Technology explores the history of oil and gas, from the first discoveries to present-day businesses.

(Source: https://www2.deloitte.com/us/en/pages/energy-and-resources/articles/oil-and-gas-industry-outlook.html)

Task 2. Write your outlook for oil and gas industry in Russia for 2022.

UNIT 4
GLOBAL GIANT

Words to know

production	производство
exploration	разведка месторождения, разведка с попутной добычей
to supply	обеспечивать, снабжать
supplier	поставщик
supply and demand	спрос и предложение
joint venture	совместное предприятие
to be engaged in	заниматься, участвовать, включать
to obtain	получать, добывать
to refine	очищать
refinery	нефтеперерабатывающий завод
to consume	потреблять
consumer	потребитель
customer	клиент, потребитель
extraction	добыча, извлечение, разработка
profitable	рентабельный, эффективный
upstream	в нефтяном и газовом бизнесе об операциях по разработке месторождений и добыче сырья
downstream	транспортировка, переработка нефти и газа и производство конечных продуктов
on-stream	в процессе эксплуатации, действующий
onshore	наземный
offshore	морской, удаленный от берега
to drill	бурить
well	скважина
rig	буровая установка
oil field	нефтяное месторождение
employ	нанимать
fossil fuel	ископаемое топливо
retail site	АЗС

Task 1. Read and translate the text.

The oil and gas industry

The oil and gas industry is one of the largest in the world. It is made up of a small number of conglomerates and a very large number of smaller independent companies. Generally speaking, the industry is divided into two areas. Upstream operations involve exploration and production, often known as E&P, while downstream operations involve transportation, refining and sales of products to consumers.

Relationships between companies can be very complex, with large companies owning multi subsidiaries around the world. In some cases, they compete for market share, in others they can be suppliers and customers of one another. They make joint ventures with other large companies for specific projects and there are frequent mergers and acquisitions.

Oil and gas production takes place onshore and offshore. Oil and gas companies are engaged in a constant search to discover new reserves and to obtain extraction rights for proved reserves. Construction of drilling wells and rigs is an enormous risk and companies need to calculate supply and demand in order to be certain that an operation will be profitable before it comes on-stream.

Task 2. Check and point out which information is true according to up-to-date Internet information:

1. The world produces and consumes 75 million barrels of oil a day.
2. The USA consumes 25% of the world's supply of oil.
3. China is the second largest consumer.
4. Sixty-eight per cent of the world's oil reserves are in the Middle East.
5. The price of a barrel of oil quadrupled from US $3 to $12 in the 1973 oil crisis.
6. The Thunder Horse platform in the Gulf of Mexico was hit by two hurricanes in 2005.
7. The biggest oil field in the world is in Venezuela.

Task 3. Write either of the prepositions 'of' or 'for' in each space:

1. Demand _____ oil will continue to increase until 2015.
2. The market _____ liquefied natural gas is growing steadily.
3. Consumption _____ fossil fuels has declined slightly in recent years.
4. The supply _____ North Sea oil can be maintained until around 2024.
5. Transportation _____ oil presents many security risks.
6. Reserves _____ natural gas are being found almost daily.
7. Drilling _____ oil and gas is a major part of our upstream operations.
8. The extraction _____ oil at the Burgan field began in 1946.
9. Exploration _____ oil and gas has been going on for over a hundred years.
10. Production _____ gas from deep-water reserves is our main area of expertise.

Task 4. A word family is where a number of words can be made from the same root word. Complete this table with words from these families:

Verb	**Noun (abstract)**	**Noun (person)**

operate	operation	operator
extract		
	competition	
		consumer
produce		
explore		
	supply	
transport		

Task 5. Fill in the gaps with words from the table below:

London is where BP's corporate headquarters are (1) _____ and the UK is therefore a centre for many of its mainstream business functions. The UK is also home to three of BP's major global research and technology (2) _____.

Our (3) _____ and production business in Europe covers the North Sea – both the UK and Norway – and also The Netherlands. In Russia, we have an important joint venture through our 50% (4) _____ of TNK-BP, a major oil company with the majority of its assets in Russia. We are involved in a number of E&P projects in Azerbaijan, and are leading the Baku-Tbilisi-Ceyhan (BTC) pipeline project.

Refining and marketing activities are spread throughout Europe, with BP owning or having a stake in nine (5) _____ across the region. BP retail sites are a common sight in several European countries. In Germany, we (6) _____ under the ARAL brand. We also sell lubricants and other oil products in Europe to both (7) _____ and business customers.

locate	located	locating	location	locations
group	grouped	grouping	group	groups
explore	explored	exploring	explorer	exploration
own	owned	owning	owner	ownership
refine	refined	refining	refinery	refineries
market	marketed	marketing	market	
consume	consumed	consuming	consumer	consumers

Task 6. Be ready to speak about oil and gas industry.

UNIT 5
AN OIL COMPANY

Words to know

recognition	признание
tailor-made	нестандартный
company	компания
to attribute	относить, связывать, приписывать
commitment	открытый интерес, курс
with regards to	по отношению к, что касается

quality	качество
safety	безопасность
logistics	логистика, снабжение
to register	регистрировать, описывать
operational	функционирующий
the head office	головной офис
stabilization	стабилизация
liaise	поддерживать связь, действовать согласованно
cutting-edge technology	современные технологии
market	рынок
turnover	оборот
share	доля, акция
Ltd	с ограниченной ответственностью

Task 1. Read and translate the text:

LCM Oil & Gas

... has wide recognition and a firm position in the sector of Oil & Gas Services in Libya. We provide tailor-made services in Construction & Maintenance (CMD) and Project Management Services (PMS) to all major operating oil and gas companies in the country. Since we started, we have grown consistently, and this success can be attributed to our commitment to working to the highest European standards with regards to communications, quality, safety, logistics and legal issues. LCM Oil & Gas Ltd has been operational in Libya since 1993. In 2003, LCM Oil & Gas Ltd was registered in the UK and the head office was implemented in London. Today, the head office, which was ISO 9001 accredited in 2004, supervises the entire operation of LCM Oil & Gas Libya. Over the past three years, our continuous growth and stabilization have helped us gain recognition in Europe. Our presence at worldwide events has spread our name and given us the opportunity to liaise with European partners and bring cutting-edge technology to the Libyan market.

Task 2. Fill in the gaps with following words: *market leader, joint ventures, rapid improvements, multinational, contract out*

We are a (1) _____ company, operating in 135 countries around the world. Our work is divided into upstream and downstream operations, with the majority of our turnover coming from E&P. We are the (2) _____ in gas production, with the share of around 31%. We have seen (3) _____ in technology in recent year and we now (4) _____ a lot of our work to specialists and often make (5) _____ with other companies in the same field.

Task 3 Which 9 of 14 phrases are better to use in the presentation of sales and marketing director of the oil company?

a wide range of services	founded in 1979

commitment to excellence	key competitive advantages
environmentally sound	further to our discussions
grouped into four geographical areas	kind regards
leading-edge technology	proven track record
looking forward to meeting you	put you through
the first item on the agenda	vital to our success

Task 4. Fill in the gaps with phrases from Exercise 3:

Good afternoon, gentlemen. My name is Peter Ashling and I am the marketing director of Cranford Oilfield Services. The company was (1) _____ as a seismographic operation in the North Sea. Since that time, we have grown considerably and the company is now (2) _____: The Americas, Europe and CIS, the Far East, Africa and the Middle East. We have a (3) _____ in most upstream operations and provide (4) _____ to our clients around the world. One of our (5) _____ is our flexibility. We are small enough to move quickly, but large enough to offer genuine cost-effectiveness. The company's policies are both customer-focused and (6) _____. Our 3,000 staff have a dedication and (7) _____ which are second to none and (8) _____ in this very dynamic field.

Task 5. Be ready to retell the text using new words and following models:

1. The title of the article is …
2. The article deals with …
3. The aim of the article is …
4. It is pointed out that …
5. The main idea of the text is …
6. The fact that … is stressed.
7. In conclusion I should say that …
8. Personally, I think that …

UNIT 6
OIL AND GAS ACCOUNTING

Words to know

disagreement	разногласия
assets	активы
account for	рассчитывать, учитывать
to follow	следовать
property acquisition	приобретение собственности
costs	затраты, расходы
dry hole	непродуктивная, сухая скважина
to support	поддерживать, обеспечивать
equipment	оборудование
facility	аппаратура, обслуживающее устройство

balance sheet	балансовый отчет
exploratory well	поисково-разведочная скважина
expense	затраты, расход, списывать в расход
profit and loss account	счет прибылей и убытков
full-cost accounting	финансовый учет по полной стоимости
overheads	накладные расходы
direct costs	прямые затраты
depreciation	износ, амортизация
treatment	обращение, обогащение, установление
depletion	исчерпание, истощение
accountancy	бухгалтерский учет

Task 1. Read and translate the text:

Methods of accounting

There is some disagreement among experts over the correct way to account for oil and gas properties, but companies normally follow Generally Accepted Accounting Principles (either UK or US) and use a method known as 'successful efforts'. In this method, all property acquisitions, successful exploratory wells, all development costs (including development of dry holes) and support equipment and facilities are capitalized, and are therefore seated as assets in the company's balance sheet.

On the other hand, in this method, unsuccessful exploratory wells are charged to expense at the time it is agreed that the wells are non-productive, and recorded in the profit and loss account. In the alternative method – 'full-cost accounting' – all operations are capitalized whether successful or unsuccessful.

Items such as overheads and direct costs incurred in E&P are normally placed in the P&L account, but the treatment of items such as depreciation, depletion of any unproved reserves, or the costs of clean-up operations, varies widely from company to company.

In an industry where cross-border mergers and acquisitions are commonplace, factors such as national differences of accountancy principles, frequent changes to legislation, the use of estimation and currency fluctuations combine to make oil and gas accountancy a highly complex operation.

Task 2. Fill in the gaps with following words: *produce, producers, producing, production, productive, productivity, products*

1. We need to improve the _____ of the drilling crew. They're just not working hard enough.
2. It was a very _____ meeting. We made a lot of good decisions.
3. Demand is very high at the moment. Can we increase _____ by around 10%?
4. A number of African countries have started to _____ oil and gas recently.
5. Saudi Arabia is the biggest oil-_____ country in the world.

6. Refined petroleum _____ are usually grouped into three categories based on the way the crude oil is distilled.
7. OGP is the International Association of Oil and Gas _____ .

Task 3. Fill in the gaps with following words: *product, price, place and promotion.*

To create the right marketing mix, business have to meet the following conditions:

The goods must be in the right (1) _____ at the right time. Making sure that the goods arrive when and where they are wanted is an important operation.

The (2) _____ must be right. Consumers will need to buy in large numbers to produce a good profit.

The (3) _____ has to have the right features – for example, it must look good and work well.

The target group needs to be made aware of the existence and availability of the product through (4) _____.

Task 5. Cross out the unnecessary word, put other words in the correct order to form phrases as in the example:

Example: account | and | loss | ~~balance~~ | profit profit and loss account

1. incur | costs | facilities | unnecessary
2. exploratory | varies | unsuccessful | wells
3. to | charged | fluctuation | expense
4. reserves | of | overheads | depletion | unproved
5. and | mergers | acquisitions | capitalized | cross-border
6. sophisticated | operation | liabilities | highly

Task 6. Fill in the gaps with following words: *price sensitive, set the price, pricey, price them out of the market, up our prices, price-fixing, agree a price, giving them a good price*

1. We'll need to _____ if we want to make a profit on the deal.
2. By _____ we'll be able to insist on better payment terms.
3. I wouldn't _____ too low - they'll think our quality is poor.
4. Oil and gas services are becoming very _____ as competition increases.
5. I'm afraid these diamond bits are much too _____.
6. I don't think we should go any higher. We don't want to _____.
7. The big oil companies were accused of _____.
8. If we fail to _____ we'll have to find another supplier.

Task 7. Be ready to retell the text using new words and word combinations.

UNIT 7
LEASING AGREEMENT

Words to know

to be agreed	соглашаться
to remain	оставаться, находится
in force	имеющий силу, действующий
whatsoever	абсолютно, какой-либо, совершенно
therewith	к тому же, немедленно, вследствие того
hereinafter	ниже, в дальнейшем, впредь
acreage	площадь
to terminate	завершать, истекать, приводить
reworking	переработка, восстановление, повторная разработка
cessation	приостановка, прекращение, отмена

Task 1. Read and translate the text:

Leasing Agreement

It is agreed that this lease shall remain in force for a term of FIVE (5) YEARS from the date of this lease and as long thereafter as oil or gas of whatsoever nature or kind is produced from said leased premises or on acreage pooled therewith, or drilling operations are continued as hereinafter provided.

If, at the expiration of the primary term of this lease, oil or gas is not being produced on the leased premises or on acreage pooled therewith, but lease is then engaged in drilling or reworking operations thereon, then this lease shall continue in force so long as operations are being continuously prosecuted on the leased premises or on acreage pooled therewith; and operations shall be considered to be continuously prosecuted if not more than One Hundred Twenty (120) days shall elapse between the completion of abandonment of one well and the beginning of operations for the drilling of a subsequent well.

If, after discovery of oil or gas on said land or on acreage pooled therewith, the production thereof should cease from any cause after the primary term, this lease shall not terminate if Lessee commences additional drilling or reworking operations within One Hundred Twenty (120) days from date of cessation of production or from date of completion of dry hole.

If oil or gas shall be discovered and produced as a result of such operations at or after the expiration of the primary term of this lease, this lease shall continue in force so long as oil or gas is produced from the leased premises or on acreage pooled therewith

Task 2. ***Put the following words into correct box:*** *premises, acreage, lease, expiration, term, in force, discovered, produced, pooled, abandonment, completion, terminal, cessation of production, land*

Contract	**The drilling area**	**E&P operations**

Task 3. Fill in the gaps with words and phrases from the exercise above:

1. We had to _____ the contracts of three crew members when they were caught smoking on the rig.
2. Shell and Kazakh government have a production-sharing agreement on several _____ in the south of the country.
3. After _____, the well is abandoned.
4. The contract will remain _____ until the _____ of the well.
5. The _____ of the contract can be extended with the agreement of both parties.

Task 4. Fill in a/an/the or – if necessary:

Oil has formed on _____ Earth in the past and is still forming today. Most oil comes from _____ microscopic plants and animals. Oil from _____ North Sea is found in _____ rocks that were made about 150 million years ago. At that time, the seas and wet areas of land were rich in _____ microscopic organisms. When _____ organism dies, it sinks to the bottom of _____ sea. It forms _____ layer of organic material. This gets covered in _____ layers of sand and mud. _____ air can't reach _____ organic matter.

Task 5. Match job titles with their descriptions:

1 crane operator	**a** studies rocks
2 driller	**b** operates equipment to help geologists
3 geologist	**c** supervises a drilling crew
4 geotechnician	**d** works in a drilling crew under the driller's supervision
5 maintenance technician	**e** operates a machine for lifting and moving heavy things
6 pipe-fitter	**f** fits pipes to make a pipeline
7 production operator	**g** services and repairs machines and equipment
8 roughneck	**h** checks and operates production equipment

UNIT 8
ENVIRONMENTAL IMPACT

Words to know

environment	среда
impact	влияние, воздействие
declaration	объявление, декларация
major	значительный, главный
issue	вопрос, проблема

protection	защита
safe	безопасный
exploration	разведка
effect	влияние, воздействие
spill	разлив, нефтяное пятно
oil leak	утечка нефти
fire	пожар
pollution	загрязнение
management	управление, менеджмент
waste	отходы, траты
consideration	рассмотрение, обсуждение
damage	повреждать, наносить ущерб
accident	несчастный случай, катастрофа, авария
error	ошибка
disaster	катастрофа
reduce	сокращать
reuse	использовать повторно

Task 1. Read and translate the text:

Agenda 21

As long ago as 1992, at the Earth Summit in Rio de Janeiro, in a declaration known as Agenda 21, it was recognized that major industries such as oil and gas had an adverse impact on the environment. Issues such as sustainable land management, protection of the oceans, safer use of toxic chemicals and the management of waste, became crucial considerations for boards of directors around the world. In oil and gas exploration, there are several possible side effects, such as oil spills, damaged land, accidents and fires, and incidents of air and water pollution.

Task 2. Fill in the gaps with following words: *basic, cleaner, continuous, efficiently, environmentally sensitive, high, particularly, poor, responsible*

- GP aims to reduce the environmental impact of its operations by cutting waste, emissions and discharges, and by using energy _____ .
- _____ air quality is one of the most topical environmental issues, _____ for large population centers. GP is helping to address this issue through the provision of _____ transport fuel in major cities worldwide. However, emissions from large operating sites are still a concern -stated to local or regional air quality.
- We operate in a variety of different environments around the world, from arctic to tropical, desert to deep sea. Many, if not most, of these areas are _____ and are often areas recognized to be of _____ biodiversity value.
- Recycling and reuse are now perceived as among the most _____ ways that the public, local ways that the public to help protect the environment.
- When projects reach the end of their lifecycles, we follow an approach designed to exercise _____ stewardship of the environment and leave a positive legacy in which sites can have a productive future use.
- GP is committed to delivering _____ commercial business improvement and greenhouse gas reductions through energy efficiency.

Task 3. Make up sentences using words and phrases from each box:

We operate in environmentally We must reduce carbon It is important to avoid We measure energy We aim for continuous	spillages improvement sensitive emissions efficiency	to our environmental policies in joules per annum caused by flaring areas of the desert by handling toxic materials with care

Task 4. Fill in the gaps with following phrases: *are being used, has invested, can be pursued, have been drawn, has been made, have been explained*

- Norway's oil industry (1) _____ NOK300 million in new clean-up equipment in recent years.
- With the latest oil-detecting radar and infra-red sensors, clean-ups (2) _____ in darkness or with poor visibility.
- A substantial new commitment (3) _____ to developing collection technology through an international collaboration.
- Landing crafts (4) _____ to transport clean-up resources.
- Training and recruitment of personnel involved in oil company and public sector response organizations (5) _____ .
- Detailed maps of the coastal zone (6) _____ to improve local response in the coastal and shore zones.

Task 5. Read and translate the text:

What causes oil pollution?

1. Oil causes pollution of rivers, lakes, and oceans. But where does this oil come from? Scientists believe that waste oil is responsible for the most pollution. Some of this comes from industry, some from our roads, and some is thrown away by people.
2. Oil leaks and spills happen because of technical problems, mistakes, vandalism (damage caused by people for no reason), accidents, or war. The smallest amount of oil comes from offshore drilling activities where oil is sometimes spilled because of burst (broken) pipes or human error (mistakes made by people). Major oil tanker disasters account for slightly more oil pollution. Accidents with ships are the result of ships hitting each other or hitting sand or rocks below the water. Accidents happen because of human error, poor maintenance, or poor communication between the crew members working on the ship. They can also happen when bad weather forces an oil tanker against a rocky coast.
3. A major oil leak or spill can result in very serious damage to plants and animals, the environment, and the local economy. Some parts of die environment are more easily damaged than others. For example, in water near the coast there are thousands of plants and animals that could die.
4. Governments and oil companies around the world are working together to reduce oil pollution. Improved safety training and management means fewer spills. Satellite and aircraft are used to quickly identify new cases of pollution. New technical measures include double-hulled tankers, ships with one body inside another.

Task 6. Pick the best title to parts 1-4:

1. a The main source of oil pollution
   b Waste oil from industry
2. a Tanker disasters
   b The reasons for oil spills
3. a Damage to the environment
   b The effects of oil spills
4. a Preventing oil pollution
   b Working together

Task 7. Fill in the box:

Verb	**Noun**	**Adjective**
pollute		
		technical
damage		
		(un)protected
		transported
		leaked
globalize	globe	
	environment	
	seepage/seeps	
spill		

Task 8. Fill in the gaps with words from exercise 7:

1. The natural place where plants and animals live is the _____ .
2. If a pipe carrying oil bursts, the oil causes _____ .
3. Carbon dioxide is causing _____ warming.
4. New car _____ means that car engines are more efficient.
5. Oil companies produce oil but they also try to _____ the environment.
6. An oil tanker accident can cause serious _____ to the environment.
7. Industrial facilities have ways to stop _____ oil getting into water and soil.
8. In some places oil _____ slowly to the surface of the ground by itself

UNIT 9
THE DEVELOPMENT OF AN OIL AND GAS COMPANY

Words to know

refine	очищать
refinery	нефтеперерабатывающий завод
refining	очищение, переработка
dissolve	аннулировать, разлагать
shareholder	владелец акций

establish	основывать, создавать
dump	сливать, сбрасывать
pile up	накапливать, нагромождать
manage	управлять, справляться
disparate	различный, несоответственный
enterprise	предприятие
effective	эффективный, успешный
effectively	эффективно, успешно
efficient	действенный, эффективный
efficiently	эффективно
efficiency	эффективность, полезное действие
scale	размер, масштаб
giant	громадный, гигантский

Task 1. Read and translate the text:

The History of Standard Oil

Standard Oil was a huge, integrated, oil- producing, transporting, refining and marketing company. Established in 1870, it operated as a major company trust and was one of the world's first and largest multinational corporations until it was dissolved by the United States Supreme Court in 1911. John D. Rockefeller was a founder, dominant partner and major shareholder, and the company made him a billionaire and eventually the world's richest man.

Standard Oil's market position was initially established through an emphasis on efficiency and responsibility. While most companies dumped gasoline in rivers, Standard used it to fuel its machines. While other companies' refineries piled up mountains of heavy waste, Rockefeller found ways to sell it.

In response to state laws trying to limit the scale of companies, Rockefeller and his partners developed new ways of organizing, to manage their fast – growing enterprise effectively. In 1882, they combined their disparate companies, spread across dozens of states, and created a single group of trustees. This organization proved so successful that other giant enterprises adopted this 'trust' form.

Task 2. Match the following events with data below. If you don't know find this information on www.geohelp.net/world.html ***:***

1. Anglo-Persian Oil Company was renamed British Petroleum.
2. Colonel Edwin Drake struck oil 69 feet below the surface of the ground in Titusville, Pennsylvania.
3. Conrad and Marcel Schlumberger successfully identified the presence of oil in a formation by measuring resistivity.
4. *Exxon Valdez* ran aground in Prince William Sound, Alaska
5. Ford Motor Company was founded.
6. J.D. Rockefeller formed Standard Oil (Ohio), controlling 10% of American oil refining.
7. Oil prices quadrupled from $2.90 a barrel to $11.65 a barrel, following an Arab oil

embargo on oil exports to the US.
8. Oil was discovered in Kuwait and Saudi Arabia.
9. The combustion engine was invented.
10. The Kyoto agreement was made with the aim of limiting greenhouse gases.
11. Thomas Edison invented the electric light bulb.

Task 3. Put phrases below in the correct box according to the activities of these organizations:*lend money, borrow money, obtain a financing package, provide financing, sign a loan agreement, raise money, offer funding, give a loan, secure a loan, get financing, negotiate a loan, set interest rates*

Bank	**Oil and gas company**	**Both parties**

Task 4. Fill in the gaps with the following words: *achieve, adhere to, comply with, ensure, fulfill, maintain, meet, reach, satisfy*
1. If you _____ your sales targets, you will get a good bonus.
2. Hopefully, we can _____ the objective we discussed at our last meeting.
3. We need to _____ a good level of profitability in the UAE.
4. He was sacked because he did not _____ the safety regulations.
5. The goals I would like us to _____ are as follows…
6. The company has a legal duty to _____ the environmental standards of the oil and gas industry.
7. Unfortunately, this equipment does not _____ all our criteria.

UNIT 10
RIG LOCATION

Words to know

concession	концессия на разведку
located in	расположен в
exploration	разведка месторождения
pipeline	труба
stretch	удлинять, тянуть
ice-free port	незамерзающий порт
hurricane	ураган, взрыв
regain	получать обратно, восстанавливать
flooding	заводнение пласта, нефтяного месторождения

Task 1. Read and translate the text:

Rig Location

Total has interests in a number of concessions in Murzuq basin, located in the south-west of Libya.

Oil is by far the most important mineral product in Alaska. Exploration for oil and gas is in progress in several land areas and on the outer continental shelf from the Gulf of Alaska to the Beaufort Sea coast. The 800-mile-long Trans Alaska Pipeline System (TAPS) is one of the largest pipeline systems in the world. It stretches from Prudhoe Bay on Alaska's North Slope, through rugged and beautiful terrain, to Valdez, the northernmost ice-free port in North America. Since pipeline start-up in 1977, Alaska Pipeline Service Company, the operator of TAPS, has successfully transported over 15 billion barrels of oil.

Hurricane Dean reaches Belize

The first tropical storm of the year, Hurricane Dean, hit the Yucatan Peninsula this morning, with lashing rain and driving winds of up to 168 miles (270 kilometers) an hour. Petroleos Mexicanos, the state-owned oil company, evacuated almost 19,000 workers and ordered 437 offshore wells to be shut down. The hurricane is moving west through the Mexican jungle and is forecast to regain strength Tuesday night as it crosses the Bay of Campeche. Coastal areas are bracing themselves for extensive flooding and storm damage.

Task 2. Complete the following sentences about the location of some of the world's biggest oilfields. Refer to a world atlas if you need to: *located between, located at, off the coast of, along the north-east coast of, in northern, in the Norwegian sector of, from the northern edge of*

1. Samotlor Field is the largest of Russia's oilfields, _____ Lake Samotlor in Urals Federal District, Siberia.
2. Azeri-Chirag-Guneshli(ACG) is a large complex of oilfields in the Caspian Sea, about 120 kilometres _____ Azarbaijan.
3. Ekofisk is an oilfield _____ the North Sea.
4. Shaybah is about 40 km _____ the Rub' Al-Khali/Empty Quarter desert and is a major crude oil producing site in Saudi Arabia.
5. Bolivar Coastal Field is the largest oilfield in South America, stretching 35 miles _____ Lake Maracaibo, Venezuela.
6. The Athabasca Oil Sands are a large deposit of oil-rich bitumen, or extremely heavy crude oil, _____ Alberta, Canada.
7. Daqing complex is the largest oilfield in the People's Republic of China (PRC), _____ the Songhua river the Nunjiang river in Heilongjiang province.

Task 3.Match the different branches of engineering in the oil and gas industry a-h with sentences 1-8:

a drilling engineering
b electrical engineering
c environmental engineering
d process engineering
e mechanical engineering
f structural engineering
g production engineering
h reservoir engineering

1. _____ is about finding ways to protect plants and animals and the environment and stop damage to the environment.
2. _____ is about designing, developing, and testing tools, engines, machines, and mechanical equipment.
3. _____ is about understanding the complex forces that will act on the platform and designing the platform to stand up to them.
4. _____ is about taking account of the flow rates, pressures, and temperatures of different fluids and the processes required to change them into a useful product, then deciding on the size and type of equipment required.
5. _____ is about getting the best oil and gas production results. These engineers study detailed diagrams of the field to help them.
6. _____ is about managing the technical side of drilling wells.
7. _____ is about designing, developing, and testing electrical equipment that is used to produce power and control systems.
8. _____ is about managing the reservoir and the well. These engineers watch the equipment and the oil.

Task 4. Read this text and fill in the table:

The semi-submersible drilling rig has vertical columns that are connected to pontoons below the water. They often have an engine. This allows them to move easily into position. The pontoons can be filled with water.

This lets the rig go down into the water and makes it more stable. They can be used in water up to 300 metres deep.

Drill ships can move easily into position. They are able to drill in deep water of more than 1,500 metres.

But in bad weather they are unstable.

The jack-up unit is like a floating platform with legs.

It has to be pulled into position by a ship. When the platform is in position, the legs are lowered to the seabed and then the platform is lifted out of the water. It is stable and can be used in water up to 100 meters deep.

Task 5. What are the advantages and disadvantages of each of these platforms:

	Advantages	Disadvantages
Semi-submersible drilling rig		
Drill ship		
Jack-up unit		

Task 6. Complete the sentences with can / can't and the active or passive form of the verb:

1. The semi-submersible drilling rig _____ (move) easily into position but it _____ (use) in deep water.
2. The drill ship _____ (use) in bad weather, but it _____ (use) in deep water.
3. The jack-up unit doesn't have an engine so it (move) into position by itself.
4. It _____ (operate) in 100 meters of water but it _____ (use) in deeper water.

Task 7. Choose the correct word in these sentences:

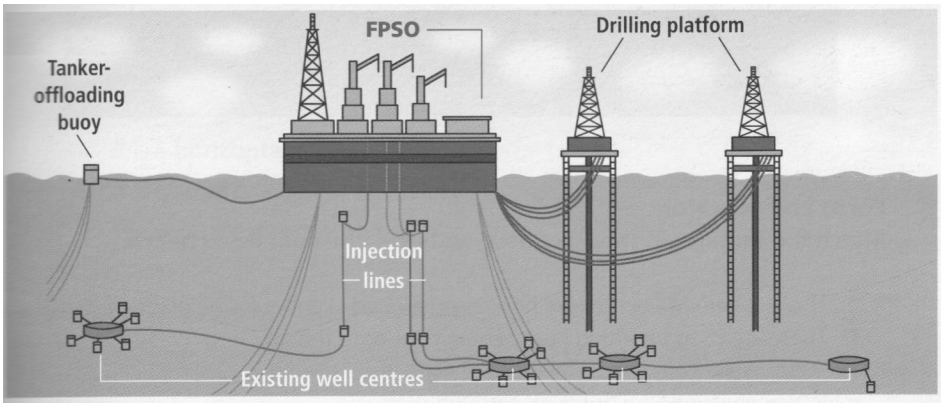
1. Each pipe section is 10 to 15 metres length/long.
2. How weight/heavy is the platform?
3. The borehole is over 90 metres depth/deep.
4. The structure is 50 metres high/height.
5. How wide/width is the pipeline.

UNIT 11
OFFSHORE PLATFORMS

Words to know

proportion	пропорция, отношения
adapted	адаптированный
vessel	корабль
employee	сотрудник, рабочий
vessel	баржа

Task 1. Read and translate the text:



A high proportion of oil and gas exploration and production is carried out offshore. Platform construction has developed over time to become better adapted to deal with the physical challenges of different offshore locations. This unit focuses on vocabulary which will help you to describe in English the different offshore platforms and vessels on which you or employees of your company work.

Task 2. Study the table describing the different platforms and vessels for drilling offshore. Which of these are?

1. easy to move from one place to another?
2. probably fixed in one place for a long period of time?
3. designed for use in shallow water?

4. designed for use in deeper water?

Type of platform/vessel	Description
Drilling barge	A flat-bottomed rig used in shallow waters.
Jack-up rig	A rig which has two hulls and at least three vertical legs through the hulls.
Semi-submersible rig	A rectangular-shaped platform floated with pontoons below the surface of the water.
Drillship	A ship with a drilling rig mounted in the centre.
Gravity-base fixed production platform	A platform with a steel-reinforced concrete base, held to the seabed by gravity.
Steel-jacket platform	A platform which has steel legs that sit on the seabed, held by concrete piles.
Tension-leg platform	A platform held in position by heavy weights connected to hollow steel tubes.
Compliant platform	A light platform designed to sway with the wind, waves and currents.

Task 3. Write the words in the correct order to make sentences:

1. pipeline kilometres is long The five.
2. five hundred is The deep sea metres.
3. wide The metres is heliport twenty-five.
4. metres The drilling platform the forty length of is.

Task 4. Learn this dialogue by heart:

A: How long is this pipe?
B: It's 30 feet long.
A: Did you say 30 feet?
B: Yes, that's correct.
A: What's that in metres?
B: About 10 metres.
A: OK. What's the diameter?
B: The outside diameter is 6 inches. The wall thickness is half an inch. And, before you ask, an inch is about two and a half centimetres. So that's about 15 centimetres outside diameter and a wall thickness of just over a centimetre.
A: So the bore is about 12.5 centimetres.
B: That's right.
A: OK, thank you.
B: You're welcome.

Task 5. Read the text and study the diagram of a FPSO again. Are the following statements true (T) or false (F)?:

1. An FPSO vessel is a small drilling rig.

2. The FPSO can offload oil or gas to either a tanker or a pipeline.
3. It can store oil produced on several different platforms.
4. It is useful in shallow waters just off the coast.
5. It is used as a replacement for seabed pipelines.
6. It saves a lot of money in certain situations.
7. It works well in fields where oil or gas is expected to last a long time.
8. It is more cost-effective than a fixed platform in some situations.
9. It is very mobile and flexible.

Task 6. Complete this conversation using much and many. Learn this dialogue by heart:

A: Tell me about the platform. How (1) _____ oil does it produce?
B: It produces about 21,000 barrels per day.
A: How (2) _____ tonnes is that per year?
B: Let me see. That's over one million tonnes per year.
A: How (3) _____ oil workers are there on the platform?
B: I think there are about 120.
A: How (4) _____ money do the oil workers earn?
B: They earn quite a lot because they have to work away from home.

UNIT 12
JOBS ON THE RIG

Words to know

driller	буровик, инструктор
hands-on	практический
set up	устанавливать
assist	помогать, содействовать
crane operation	крановые работы
troubleshooting	выявление и устранения неисправностей
tool pusher	старший буровой мастер, прораб участка буровых работ
relay	обеспечивать смену

Task 1. Read and translate the text:

Drillers

Drillers have a hands-on role on the rig. Their tasks include moving, setting up and operating drilling equipment to drill holes for exploration. They may also move rigs onto site, monitor equipment, including how fast the drill is going, and assist in crane operations. Once drilling activity begins, a driller operates the brake and motor of the drill, and determines how fast and deep the drill needs to go. Throughout the day, drillers need to record drilling progress. Drillers also play a ‘troubleshooting’ role, determining and fixing any drilling-related problems that occur during their

shift.

Tool pushers

Tool pushers monitor the drilling operations or activity on board an oil and gas drilling rig. They relay their instructions to drillers on the rig via the telephone. They also manage personnel and equipment, and must have an understanding of all drilling processes. This knowledge allows them to set the drilling schedule, which defines the rate at which work will be undertaken and how much work will be completed in a shift. A toolpusher constantly monitors the schedule, making relevant changes when required. Toolpushers are also in charge of delegating work to the most appropriate employees. It is a highly responsible position and a huge variety of duties need to be undertaken on an oil rig, so careful consideration needs to be given to this allocation of work.

Task 2. Read and translate this job advertisement. Identify and write a summary of the most important competencies and areas of expertise needed for the job:

Field Engeneers
Region: Middle East **Salary:** Competive
Join *OGTec* for a career in a booming, high-tech oilfield service company. OGTecInc is seeking field engineers to take part in developing the company, by delivering the best services to our customers in the area of the Arabian Gulf States. You can expect personal development in a demanding work environment. It is challenging, exciting and rewarding. Expect every day to be different. You will experience a great trust in your capabilities and will be the first point of contact to our customers. You will also be responsible for very critical and expensive operations. The overall task is to operate OGTec technology for oilfield service applications: ~ Operate electronic and hydraulic equipment downhole. ~ Consult with customer and suppliers to plan layout of equipment. Study blueprints, schematics, manuals and other specifications to determine installation and procedures. ~ Install or oversee installation of equipment according to manufacturers' specifications. ~ Operate systems to demonstrate equipment, utilizing knowledge of electronics and using standard test instruments and hand tools. ~ Instruct and direct workers in servicing and repairing the equipment. Consult with engineering personnel to resolve unusual problems in system operation and maintenance.

Task 3. Match the job title to its description. Write your answers in the first column. In the last column, write down whether it is *a manual job, a technical job or a management job****:***

Job title	**Job description**	**Job type**

	represents the oil and gas operator	
	sets up and handles the rotary drilling equipment	
	is in charge of the platform	
	analyzes samples of rock cuttings	
	carries out drilling operations under supervision	
	handles supplies and equipment	
	operates the various electronic tools used in the well	
	sets up and operates lifting equipment	
	supervises operations on the rig	
	is responsible for overall operation of the drilling rig	
	handles pipes and other equipment for the rig	

Task 4. Read and answer these questions:

1. Which five are most important in your job?
2. What other responsibilities do you have as a manager?

Extract 1 Abi is one of a growing number of women working in the oil industry: currently between 10% and 15% of the working population on oil rigs are women. Oil and rig companies have gradually added separate facilities onto rigs to make it easier for women to join the industry. Abi says that she feels completely at ease working in an environment which is still predominantly male. 'I am treated first and foremost as someone who does a job, rather than as a woman,' she says.	**Extract 2** 'The work is always 12 hours on, 12 hours off when on a 'hitch' (shift) offshore or onshore. Each hitch usually lasts between two and four weeks, with an equal amount of time off between hitches. The shift start times also vary; either a.m. to 6 p.m. for day shifts, or 6 p.m. to 6 a.m. for night shifts. Depending on where you work, living conditions can vary somewhat, and getting used to the working offshore lifestyle is difficult for some.
Extract 3 Hamish Thomson Hamish is contracted to work in the North Sea and so far has worked in Norway, Denmark and Holland. He has used this as an opportunity to travel throughout northern Europe when onshore. His employer provides services on oil rigs all over the world, so he may well have further opportunities for travel in the future. As mud loggers are in demand wherever there is oil, travel is viewed as one of the perks of the job.	**Extract 4** 'Mud loggers typically work two weeks offshore followed by two weeks at home. When I'm onshore, I am not actually 'at work', but I can be called offshore at any time, even at weekends. The only time I can't be called back offshore is when I am on booked annual leave. It's a bit like being on-call as, even though I might be at home, still have to be prepared to go back offshore if required.

Task 6. Make a monolog, using the following information and phrases:

1. You can make a good living.
2. There is a strong team spirit.
3. The work can be hazardous.
4. Shift work is arduous.
5. Weather conditions are extreme.
6. You learn a variety of skills.
7. You get very dirty.
8. It is a predominantly male environment.
9. When you are onshore, you can be called back to the rig at any time.
10. You have to be away from family and friends for long periods.

a. The best thing about working on a rig would be that ...
b. The worst thing…
c. I (would) really like the fact that… and that…
d. What I (would) dislike most is…
e. Personally, I don't (wouldn't) mind (being / getting / having)…
f. I found (would find) it difficult to get used to (being / getting / having)…
g. But I (would) really enjoy…

UNIT 13
MAINTAINANCE AND REPAIR

Words to know

suppose	полагать
maintenance	ремонт и обслуживание
outfit	набор инструментов, снаряжение
mending	ремонт
replacing	замена
adjustment	реконструкция, корректировка запасов
overhaul	осмотр, переборка
heavy load	большая нагрузка, большая масса

Task 1. Read and translate the text:

Anthony Johnson

I suppose the type of maintenance we do would be called 'corrective maintenance'. In other words, we're pretty casual about it and just take action when something breaks down. So far this has worked out OK. We're quite a small outfit and everybody works very closely with the equipment. You usually get a feeling when something is going wrong, and a quick check will show what needs mending or replacing. We certainly don't do anything systematic.

Faisal Riyad

We have a systematic procedure of preventive maintenance. This involves planned inspections of each item at specific times, and every two years we do a complete overhaul during a scheduled shutdown of the rig. We perform tests, measurements and adjustments; we replace or replenish lubricants and other fluids; and we replace worn parts so that faults can be corrected before they develop into major defects.

Colin Freyer

I'm a rope access technician. I work in a harness up to 70 metres about sea level. A lot of the maintenance work we do involves using ultrasonic equipment, which measures the thickness of metal. If metal is supporting a heavy load or transporting gas or liquid, after a while it will wear and tear, and it's very important that it's repaired if it becomes too thin. I guess it's quite dangerous work, but I get a big thrill from it.

Igor Borovsky

It is important for us to keep our older platforms producing and in good working condition, so we constantly need to monitor and modify our equipment. In the past, we carried out surveys and assessed the work required by taking hand-read measurements and making two-dimensional drawings. Nowadays, we can do this with a hand-held scanner to record and visualize complex components within construction projects and working installations. Instead of climbing ladders and around dangerous pipe work with harnesses, a laser scanner allows the data to be collected remotely from a d stance of up to 50 metres.

Task 2. For each sentence, choose three of the five words to complete the sentence. Two of the words are not correct.

1. During shutdown, we _____ the equipment for defects.

check, control, inspect, monitor, supervise

2. We _____ many different tests and analyze the results using special software.

carry out, do, make, perform, take

3. Regular maintenance enables us to detect _____ in the equipment.

flaws, damage, defects, errors, mistakes

4. We _____ a lot of data to ensure the accuracy of the tests.

assess, collect, gather, measure, obtain

5. If we find a defect, we can _____ the part.

remove, replenish, repair, replace, restore

6. Taking preventive _____ saves a lot of money on expensive repairs.

action, activity, measures, maintenance, steps

Task 3. Match the correct definition to each of these types of maintenance: *breakdown maintenance, predictive maintenance, condition-based maintenance, corrective maintenance, preventive maintenance, reliability-centred maintenance, risk-based maintenance*

1. Planned maintenance or servicing at regular intervals to avoid failures occurring in the future.

2. Maintenance carried out at the optimum time, based on forecasts of a machine's lifespan and failures that could happen during that time.
3. Maintenance carried out at the optimum time, based on analysis of events which have caused damage to this or other such machines in the past.
4. Maintenance carried out at the optimum time, based on an analysis of the current health of a machine and what could happen to it in the future.
5. Maintenance to determine, systematically and scientifically, what must be done to ensure that physical assets continue to function normally and as the users want them to.
6. Maintaining only when inspection shows that it is required.
7. Not maintaining at all, unless the machine has actually failed.

Task 4. Read and learn this dialogue by heart:

A. How's it going with that pump?
B. Fine . We found the problem.
A. What was wrong with it?
B. The bearing was frozen.
A. Have you replaced it?
B. Not yet. But we've ordered a new one. It'll be here tomorrow. And we've replaced the hose.
A. Why did you do that?
B. It was split.
A. Oh, OK. So when will it be ready?
B. We'll get the bearing tomorrow morning. We'll reinstall the pump tomorrow afternoon.

Task 5. Find and correct the mistakes as in the example:

Например: The fire ~~have~~ been put out. – has

1. Her latest book can found at many bookshops. – …
2. The house cleaned every Friday. – …
3. My favourite song sung by Elton John. – …
4. You will invited to our wedding. – …
5. The ironing haven't been done. – …
6. The car were serviced a week ago. – …
7. Gifts is always given at Christmas. – …
8. Many new houses will built in my street next year. – …
9. This sweater knitted by my mother. – …

UNIT 14
RIG ERECTION

Words to know

company	компания

contract	контракт
platform	платформа
steel	метал, металлический
heavy	тяжёлый
to represent	представлять
rig	вышка
project	проект
to include	включать
pipeline	трубопровод
dismantling	демонтаж

Task 1. Read and translate the text:

Local firm awarded contract to dismantle rigs

A local company has been awarded the country's biggest ever oil rig dismantling contract. Abbott UK will recycle and dispose of the North-West Lennon platform at its Blackthorn yard, in Hartford. Last night, Abbott Chief Executive, Peter Stephens, said: 'We are very pleased. We have been involved in the technical process of getting the contract for a couple of years.

The North-West Lennon is a very big platform and dismantling it will mean two years of work.' The rig's topsides and steel jacket will be removed by heavy lift vessel and towed 130 km to Abbott's Hartford yard for disposal.

BP awarded the offshore removal and onshore recycling of the rig to prime contractor Heering Marine Contractors, of Leiden, in the Netherlands. Work will be carried out by a range of specialist subsea, engineering and waste handling companies, including Abbott. The contract represents the largest remaining element of the North-West Lennon decommissioning project.

Work already completed includes the well abandonment and topsides cleanup phases carried out after the field ceased production at the end of 2008. The pipeline decommissioning, debris clearance and site inspection is all that remains. BP is proud of its excellent safety performance record to date. 'Ensuring that we complete the offshore removal and onshore disposal safely and in an environmentally responsible manner will continue to be priorities,' said spokesman Richard Webb

Task 2. Complete the sentences below using one word from each box.

call, carry(x2), deal, hook, put, set, slow, sort, speed, tow, work	Down, off(x2), out(x4), up(x3), with, on

1. We can only _____ the jacket _____ to sea when the weather is good.
2. Sometimes, we have to _____ _____ the work until the weather is better.
3. I told the operator to _____ _____. He was going far too fast.
4. I told the operator to _____ _____. He was going far too slowly.
5. We had to _____ _____ a lot of paperwork before the work could start (two answers).

6. Before operations can begin, we have to _____ _____ and test all the equipment.
7. The maintenance team needs to _____ _____ hundreds of different tests.
8. You're doing fine. If you _____ _____ like that, you will be very successful.
9. With a laser scanner, it is much easier to _____ _____ the dimensions of the pipes.
10. Unfortunately, we have had to _____ _____ the meeting. No one can make it at that time.

Task 3. Which of these verbs and verb phrases do you associate with *the erection of a rig****, and which do you associate with*** *dismantling****? Write the words in the correct columns:*** *abandoned, attached to the deck, broken up for scrap, decommissioned, disposed of or recycled, installed, lifted into place, mounted, detached from its mountings, secured to the seabed, towed back to shore, unscrewed*

Erection	Dismantling

Task 4. Match the verbs 1-5 with the nouns a-e.

1. Turn	a) the gauge
2 Close	b) the pressure
3 Read	c) the valve
4 Write	d) the wheel
5 Check	e) the flanges

Task 5a. Underline the key phrases used for making forecasts. The first one is done for you:

1. Technology <u>is certainly going to</u> play a crucial role in increasing recovery.
2. In the future, offshore platforms could well be run by robots alone.
3. It is quite likely that operators will not need to be transported out to the rigs.
4. Recovery costs could easily be reduced by up to 50%.
5. These platforms might possibly look like hi-tech warehouses.
6. It is highly unlikely that supplies of oil and gas will increase.
7. We are fairly convinced that seabed rigs will replace topside platforms for subsea drilling.

8. The profitability of many oilfields will undoubtedly depend on the prices of oil and gas.
9. We are pretty sure that the oil and gas industry will continue to play a major role in the global economy.

Task 5b. What would happen if these forecasts came true? Complete these sentences:

1. If the price of oil rose above $200 per barrel, many transport companies…
2. If the US government limited the use of air conditioning in public buildings…
3. If the airline industry agreed to cut carbon emissions by 50%...
4. If big oil and gas companies had to pay a special 'environment tax'…
5. If there were a number of big takeovers or mergers in the oil and gas industry…

UNIT 15
DRILLING FOR OIL AND GAS

Words to know

drill bit	буровое долото
hole/well	скважина
drill string	бурильная колонна
drill collar	утяжелённая буровая труба
to break up	разрывать, фракционировать
pump	насос
pressure	давление
surface	поверхность
to contain	содержать
to reach	достигать

Task 1. Read and translate the text:

A summary of the drilling process

An oil well is created by drilling a hole 5 to 36 inches (127.0 mm to 914.4 mm) in diameter into the earth with a drilling rig, which rotates a drill string with a bit attached.

These are the key steps involved in drilling a well:

- The drill bit, assisted by the weight of drill string and drill collars above it, breaks up the earth.
- Drilling fluid (‘mud’) is pumped down the inside of the drill pipe and exits at the drill bit, helping to break up the rock, keeping pressure on top of the bit, as well as cleaning, cooling and lubricating the bit.
- The generated rock ‘cuttings’ are swept up by the drilling fluid as it circulates back to the surface outside the drillpipe.
- The cuttings and returning fluids are monitored for abnormalities to detect any possible ‘kicks’ in pressure.
- The pipe or drillstring to which the bit is attached is gradually lengthened as the well

gets deeper by screwing in several 30-foot (10 m) joints of pipe at the surface.

This process is all facilitated by a drilling rig which contains all necessary equipment to circulate the drilling fluid, hoist and turn the pipe, control down hole pressures, remove cuttings from the drilling fluid and generate onsite power for these operations.

The first oil wells were drilled in China in the 4th century or earlier. They reached depths of up to 243 metres and were drilled using bits attached to bamboo poles.

The Middle East's petroleum industry was established by the 8th century, when the street of the newly constructed Baghdad were paved with tar, derived from petroleum that became accessible from natural fields in the region.

The first modern oil well was drilled in 1848 by Russian engineer F.N. Semyonov on the Asheron Peninsula north-east of Baku. By 1861, Baku produced about 90% of the world's oil.

The word 'petroleum' derives from two Greek words meaning 'rock oil'. When Edwin Drake struck oil in the first US discovery in 1859, he was actually boring for salt.

Until the 1970s, most oil wells were vertical. Using deviated and horizontal drilling it has become possible to reach reservoirs several kilometers away from the drilling place.

Task 2. Complete the table and ask questions, using these words as in example:

Example: *How long is the pipeline? What is the length of the pipeline?*

Adjective	**Noun**
long	
	length
wide	
	depth
high	
thick	
heavy	weight
old	
	price

Task 3. Complete these questions using words from the box. Start each question with 'What is the ...?' or 'How ...?:

diameter, long, deep, height, thick, cost, pressure, wind, load

1. **Q:** _____ is the well?
   A: There are several wells on this rig. The deepest is around 4,500 metres.
2. **Q:** _____ at that depth?
   A: It can be as much as 15,000 psi, which is why we have a BOP to prevent blowouts.
3. **Q:** _____ of the derrick?

A: It is approximately 40 metres from the crown block to the working floor.

4. **Q:** _____ of the derrick?

A: It can withstand wind speeds of anything up to 125 miles per hour.

5. **Q:** _____ of the hole?

A: The hole gets narrower as you go down, but at the surface it is more or less 50 cm.

6. **Q:** _____ are the drillpipes?

A: These pipes are made of steel with a thickness of just under 1 cm.

7. **Q:** _____ are the drillpipes?

A: Each joint is roughly 10 metres in length. If they are all the same, it makes storage much easier.

8. **Q:** _____of a diamond bit?

A: They are extremely expensive, ranging from $12,000 to $15,000 each.

Task 4. Study the diagram of a drilling rig and match the descriptions to the words in the diagram:

Example: This raises and lowers drilling equipment in and out *of the well,* hoisting line.

The swivel and the drilling equipment are all suspended from this.….

The hoisting line goes around this piece of equipment. When it turns, the line goes up or down…..

This is the steel tower that goes over the well. All the lifting and drilling equipment is inside it. .....

This connects two objects. It allows the one below to rotate, and the one above to stay still. …..

This is the small platform near the top of the derrick where the one of the drilling team stands…..

This is the frame and wheels that move up and down the derrick on the hoisting line…..

This is the steel frame and wheels that are fixed on top of the derrick…..

Task 5. Read and translate the text:

The drill string

The work of drilling under the ground is performed by the drill string. The drill string consists of the kelly, sections of drill pipe, the drill collar, and a bit to drill the rock. The kelly is a strong pipe that is always at the top of the drill string. It has four or six sides and goes through the rotary table which turns around (rotates). The rotary table is on the drill floor. There are many lengths of drill pipe between the kelly and the drill collar. Oil workers add sections of drill pipe one by one to the kelly. Each time they add a section, they lift the kelly out of the hole. Then they add a section of ll pipe at the top of the string and lower it back into the ground. At the bottom of the string we can find the drill collar. The bit goes into the collar.

Bits are usually tricone – in other words, they have three rotating cones. A circular bit with a hole in the middle is used to take core samples. Drill bits can be covered with industrial diamonds to make them last longer. Drilling mud is pumped through jets in the bit - this lubricates and cools it and, as the mud is circulated, it also carries the pieces of drilled rock fragments to the surface.

Task 6. Complete these sentences:

1. The crown block is _____ the top of the derrick.
2. The drill collar is _____ the bit and the drill pipe sections.
3. A member of the crew stands _____ the monkey board.
4. The kelly goes _____ the rotary table.
5. The hoisting line goes _____ the draw works.
6. The swivel is _____ the hook.

Task 7. Match the jobs with the descriptions:

1. company man	a. is in charge of the engines,
2. drill pusher	b. is a general helper,
3. derrick man	c. looks after the mud supply,
4. mud man	d. leads the drilling team,
5. motor man	e. is second in command,
6. roustabout	f. represents the oil company,
7. roughneck	g. handles the pipes.

UNIT 16
ROTATING SYSTEMS

Words to know

bottom hole	забой
drill bit	буровая коронка, головка бура
drill collar	удлинитель, воротник бура
tubular	цилиндрический, полый
sub	переводник, переходная муфта

logging	каротаж
drillpipe	бурильная труба
drillstring	бурильная колонна
extend	удлинять
deviate	отводить, отклонять
joint	трубка, замок
cone	конус, колокол, коническая насадка
wear out	изнашивание
screw	завинчивать, привинтить
rotate	бурить, вращать

Task 1. Read and translate the text:

Rotating Systems

The bottom hole assembly (BHA) is made up of a drill bit which is used to break up the rock formations, drill collars (which are heavy, thick-walled tubulars used to apply weight to the drill bit) and subs (smaller sections of pipe), such as stabilizers, which keep the drilling assembly centred in the hole. The BHA may also contain other components, such as a down hole motor, Rotary Steerable System, measurement while drilling (MWD) and logging while drilling (LWD) tools.

Heavyweight drill pipe (HWDP) is used to make the transition between the drill collars and drill pipe. The function of the HWDP is to provide a flexible transition between the drill collars and the drill pipe. This helps to reduce the number of fatigue failures seen directly above the BHA. A secondary use of HWDP is to add additional weight to the drill bit. Drill pipe makes up the majority of a drill string.

A drill string is typically about 15,000 feet in length for an oil or gas well vertically drilled onshore in the United States, and may extend to over 30,000 feet for an offshore deviated well. The components of the string are joined together with special threaded connections known as tool joints, on the ends of each joint.

Drill tubulars are manufactured in 31-foot lengths, although they can also be manufactured in 45-foot lengths. Each 31-foot component is referred to as a joint. Typically, two, three or four joints are joined together to make a stand. Pulling the drill string out of or running the drill string into the hole is referred to as tripping. Drill pipe, HWDP and collars are typically tripped in stands to save time. This is a device used for safe automated handling of double or triple stands.

There is a typical tricone drilling bit. In today's modern industry, the two main types of drill bits are classed as PDC (Polycrystalline Diamond Compact) and Roller Cone; although the tricone dominates, bicone and mono cone bits do exist. Natural and synthetic diamonds are used in coring bits, as well as for very hard rock drilling with mud motors and turbines.

Task 2. Identify the following items of equipment mentioned in reading task 1:

1. Threaded connections used for joining together the different parts of the string.
2. An outer layer of piping thick enough to withstand the pressure of the sea, down circulation fluids can be passed.

3. A steel and concrete shoring used in a formation to protect the walls of the well.
4. The part of the bottomhole assembly used to break up rock.
5. Heavy pieces of piping which add extra weight to the bottomhole assembly.
6. Devices that enable the drillers to keep the drillstring centred in the hole.
7. The combination of all the elements used downhole in the drilling process.
8. A length of pipe, typically 31 feet long.
9. A combination of pipes and other components, connected to the string above the rig f as the string is extended.
10. A bit with three rotating parts for cutting and breaking the rock.
11. Another name for drillpipe, so-called because it is shaped like a tube.
12. These are smaller sections run between and below drill collars with various functions in the drilling process.

Task 3. Use the verbs given in the box below to complete the information about drilling bits. Use the 's' ending if you think it is necessary:

create(s), crush(es), decreas(es), drill(s), flow(s), make(s), rotate(s), screw(s) turn(s), wear(s) out

1. The bit _____ into the bit sub on the bottom of the drillstring.
2. Drilling mud _____ through channels in the bit.
3. In a rotary cone bit, the cones _____ on sealed and self-lubricating bearings.
4. The teeth or buttons on the bit _____ the rock at the bottom of the well.
5. A PDC bit is the most expensive type, but it _____ more footage in a well then any other type.
6. A bit _____ at a rate of up to 200 rpm.
7. The bit _____ cuttings which are washed back up to the surface by the drilling.
8. A tricone bit _____ and needs to be replaced after 8 to 200 hours of drilling.
9. When a bit has worn out, rate of penetration _____ and the drillpipe _____ a different noise on the drilling floor.

Task 4. Read and translate the text. Ask your own questions:

How does the drillstring rotate?

Thanks a lot, Dieter, that's a good question. First of all, I will explain the traditional rotating system and then we can look at some of the latest technological developments. As you know, there is a hook attached to the hoisting line below the travelling block. Well, attached to the hook is a swivel, which in turn connects to the drillstring. Below that is a heavy four or six-sided pipe called the kelly, which is gripped by something known as the kelly bushing, which in turn fits into the master bushing of the rotary table. The kelly is connected to the drillstring, and so when the rig is powered up, all the components rotate together as a unit. Is that clear? Good ... now let's look at some of the recent developments in power systems…

UNIT 17

CIRCULATING SYSTEMS

Words to know

drilling fluid	буровой раствор
rock cuttings	шлам
pit	резервная яма, колодец
caving	образование пустот, обвал стенок скважины
film	пленка, тонкий слой
seal	уплотнять, закупоривать, герметизировать
weighting material	уплотнитель, утяжелитель
lubricate	смазывать, делать скользким
cool	охлаждать
bearings	опоры
barite	барит, тяжелый шпат
environment	окружающая среда
circulating system	циркуляционная система

Task 1. Read the introduction to the uses of mud on a drilling rig and underline two or three words that best summarize the main point of each use:

Drilling fluid

Drilling fluid (often called 'mud') is used to:

lift soil/rock cuttings from the bottom of the borehole and carry them to a settling pit

allow cuttings to drop out in the mud pit so that they are not recirculated (influenced by mud thickness, flow rate in the settling pits and shape/ size of the pits)

prevent cuttings from rapidly settling while another length of drillpipe is being added (if cuttings drop too fast, they can build up on top of the bit and seize it in the hole)

create a film of small particles on the borehole wall to prevent caving and to ensure that the upward-flowing stream of drilling fluid does not erode the formation

seal the borehole wall to reduce fluid loss (minimizing volumes of drilling fluid is especially important in dry areas where water must be carried from far away)

keep underground pressures in check by adding weighting materials, such as barite, to the fluid

cool and clean the drill bit

lubricate the bit, bearings, mud pump and drillpipe.

Task 2. Read and translate the text:

Types of drilling fluid

Water-Based Fluids

Baker Hughes Drilling Fluids' high performance water-based muds (HPWBM) are designed to emulate the performance attributes of invert-emulsion systems. The

need for environmentally safe and technically equivalent, water-based alternatives to emulsion systems is increasingly becoming an important consideration in the drilling fluid selection process. Baker Hughes I' ling Fluids was the first service company to introduce HPWBM, starting with the AQUA-DRIILL System^{SM}, in the early 1990s.

We have continually researched technology to constantly improve high performance water-based muds. New technology such as MAX-SHIELD^{SM} and MAX-PLEX^{SM}, which improves shale stability, and MAX-GUARD^{SM}, which suppresses the hydration and dispersion of heavy reactive clays, have proven to be significant performance-enhancement products in our high performance water-based product line.

Specialty Fluids

As the drilling industry matures and the search for hydrocarbons moves into even more challenging environments, the need for innovative and novel drilling solutions takes on neater importance. The utilization of specialized drilling fluid additives is becoming more prevalent, especially in depleted fields and in deep and ultra deep waters. These challenging wells require more than just traditional additives to successfully achieve the goal of moving oil d gas from the reservoir into the refining process.

Baker Hughes Drilling Fluids offers a complete line of innovative specialty products for every drilling need. From basic components for controlling lost circulation, maintaining shale control and providing downhole lubricants, to the more exotic products designed to prevent 4'ential sticking in demanding wells, no problem is too large or too small.

BHDF's product portfolio includes lost circulation materials, lubricants, ROP enhancers, sophisticated shale control products, and most importantly, spotting fluids. Since its first successful application in the 1940s, Baker Hughes Drilling Fluids' BLACK MAGIC™ spotting fluid has been widely recognized as the drilling industry's best product for successfully freeing differential stuck pipe.

Emulsion Fluids

Baker Hughes Drilling Fluids is on the forefront of developing synthetic-based compliant emulsion systems for drilling in challenging downhole conditions, such as deep-water and (high pressure – high temperature). The developments were driven by the extreme HPHT environment associated with Deep Shelf drilling in the Gulf of Mexico and the deviated HPHT wells drilled in the North Sea. Laboratory testing demonstrates fluid stability at temperatures in excess of 580°F and pressures exceeding 30,000 psi.

Since 2001, Baker Hughes Drilling Fluids has been working on perfecting a major change in HPHT emulsion-based systems. Although the revision was initially triggered by environmental legislation changes in the North Sea area, the developments and improved chemistries have demonstrated superior performance in both diesel-based fluids and in the synthetic fluids used r e Gulf of Mexico (GOM) and other areas. The chemistries chosen deliver minimal impact on the environment and to the health and safety of the personnel involved.

Task 3. Read the text. Use English-Russian dictionary to give Russian

equivalents to the following words: *swivel, kelly, drillpipe, wellbore, drill colar, bit, rotary hose, mud mixer, stand pipe, discharge, mud suction line, reserve pit.*

During drilling, a multi-purpose fluid known as 'mud' is circulated in the borehole. Large quantities are required for the circulating system, and there are strict rules governing the chemicals which can be used because of potential environmental impacts.

On a drilling rig, mud is pumped from the mud pits through the drillstring where it sprays out of nozzles on the drill bit, cleaning and cooling the drill bit in the process. The mud then carries the crushed rock ('cuttings') up the annular space ('annulus') between the drillstring and the sides of the hole being drilled, up through the surface casing, and emerges back at the surface. Cuttings are then filtered out at the shale shakers and the mud returns to the mud pits. The returning mud can contain natural gases or other flammable materials. These can collect in and around the shale shakers area or in other work areas, so safety procedures have to be in place and special monitoring sensors and explosion-proof certified equipment have to be installed. The mud is pumped back down hole and is continuously recirculated. After testing, the mud is treated periodically in the mud pits to give it properties that optimize and improve drilling efficiency.

Task 4. Decide if the following statements are true (T) or false (F). If the statement is false, see if you can correct it:

a) Mud travels from the mud pit, down the drill string and out of the drill bit.
b) The mud carries the cuttings back up the drill string to the surface.
c) The shale shakers are used to mix the mud.
d) Mud can be dangerous after it has been down hole.
e) Dangerous mud is disposed of.
f) Drilling efficiency can be enhanced by adding supplementary fluids.

Task 5. Put each phrase in the correct column in the table below:

The following phrases in the box refer to either:
– the *functions* of mud (i.e., what it does during the drilling process)
– the *properties* of mud (i.e., why it is used for these functions and how it can be altered to enhance its functionality)
– the *ingredients* of mud (i.e., what it contains)

protection of the borehole
reduction of fluid loss during drilling
solubility in water
suspension of cuttings
toxicity and danger to the environment
various polymers for specific purposes
water or a synthetic alternative
clays, such as bentonite
density and gel strength

efficiency detergents and thinners to improve improvement of ROP (rate of penetration) lubrication of drilling tools lubricity and viscosity maintenance of pressure

Functions, property or ingredient?

Functions	Properties	Ingredients

Task 6. Complete the sentences:

1. The basic ingredients of mud are…
2. Two of the most important functions of mud are the…
3. Additives are used in mud to modify it…

UNIT 18
DRILLING PROBLEMS

Words to know

rathole	скважина с обсадной колонной
kelly	ведущая бурильная труба
downhole	нисходящая скважина
fishing services	партия, производящая ловильные работы
blowout	внезапный выброс, фонтанирование
jar	бурить ударным буром
drillstring	бурильная колонна
deviation	отклонение скважины
dogleg	резкое искривление ствола скважины
sloughing	обрушение
reamer	райбер, инструмент для расширения

	скважины
embrittlement	хрупкость, повышение хрупкости

Task 1. Read the transcript of the conversation between Alan Noughty, a journalist working for a local newspaper in Aberdeen, and Jo Mcleod, a platform manager, who is giving him a tour of the rig and showing him some of the day-to-day operations. Answer the questions:

What is the problem? How is the problem being solved?

Alan Noughty: There doesn't seem to be a lot going on here today. The rotary table isn't going round and there's nothing on the Kelly.
Jo Mcleod: No, you're right, we've tripped out and put the kelly into the rathole for the time being. You can see the drillpipes are stacked over there in the rack.
AN: Why? What's the problem?
JM: There's a fish down the hole.
AN: A fish? How did that get there?
JM: I don't mean a real fish. It's what we call stuff that gets lost downhole. We also call it junk.
AN: So what have you lost today?
JM: It's not exactly lost, it's at the bottom of the hole. It's one of the bit cones. So we have to suspend drilling and bring in a fishing services company to retrieve it.
AN: How long will that take?
JM: Well, hopefully not too long. They're very expensive, and every minute were not drilling is time and money wasted. Once they've arrived and set up, it doesn't usually take too long to latch onto a fish. They're due to turn up in about thirty minutes or so. All being well, we'll be up and running again sometime tomorrow.

Task 2. Read the discussion of some other problems that can occur during drilling. Make a list of the problems. Tell how these problems are solved:

AN: So, what other problems can occur while you are drilling?
JM: Well, fortunately, technology has improved so much in the last few years that the number of incidents is declining all the time. Nevertheless, the pressure to increase drilling speeds does mean that the chance of making mistakes has gone up. The most dangerous and potentially expensive problem is a blowout. These are extremely rare, thank goodness.
AN: What is the most common?
JM: I suppose fish are the biggest problem, but we also get stuck pipe from time to time.
AN: What happens then?
JM: You mean how does it happen? Or what do we do about it?
AN: Well, both, I guess.
JM: Well, it can happen when the drill pipe gets literally stuck to the walls of the well. We call that differential pipe sticking, and we can usually free the pipe by jarring it, using a sub in the drill string called, funnily enough, a jar. Sometimes we

need to use a spotting fluid in the area where the sticking happens. Other times you get a deviation in the well - we call it a dogleg - which causes the drill pipe to stick. We can free it by reshaping the hole using a piece of kit called a reamer.
AN: I see. Anything else?
JM: Let me see. You can have different types of damage to the formation. Sometimes this means lost circulation, where the mud flows into the formation, for example. And you can also get sloughing.
AN: Sloughing? What's that?
JM: That's when the formation collapses.
AN: And how can you prevent these problems?
JM: Well, in most cases, the mud is the key. You can use particular types of mud; you can thin it down, thicken it, add different substances to it, and so on.
AN: So it's pretty complicated.
JM: That's right.

Task 3. Complete the sentences using one word from each box:

adhere, escapes, falls, forced, forces, got rid, lead, pass	into (x 2), of, through, to (x 2), up, from

1. A fish is a piece of drill string, part of the bottom hole assembly or a tool that _____ the hole.
2. Stuck pipe is when suction causes the pipe to _____ the wall of the well or the hole is too narrow to allow the drill string to _____.
3. Sloughing shale is material from the formation that forms large balls which cannot be _____ by the mud.
4. Formation damage occurs when the drilling fluid is _____ the formation.
5. Lost circulation occurs when the formation is porous or highly fractured and an amount of mud _____ the well.
6. Corrosive gases, such as carbon dioxide ($C0_2$) or hydrogen sulphide (H_2S), can _____ corrosion and embrittlement of a steel drill string.
7. Kicks occur when an abnormally high pressure below the surface _____ an uncontrolled flow of fluids _____ the well.

Task 4. Match the phrasal verbs with their meanings in the table below, using context of the interview to help you:

bring in, do about, go on, go up, set up, thing down, trip out, turn up

Phrasal verb	**Meaning**
	happen/take place
	pull the drill string out of the hole
	hire/recruit/use
	arrive
	prepare everything to start work

	increase
	do something in order to solve a problem
	make less thick by adding extra water or other fluid

Task 5. Do the following sentences describe preventions or solutions to drilling problems? Place a 'P' or 'S' in each line to indicate 'prevention' or 'solution':

1. Chemicals, such as potassium salts, are added to the drilling mud to inhibit sloughing shale.
2. A lost circulation additive, such as fibre, flake or grain, is used when a zone of lost circulation is encountered.
3. A stuck pipe can be freed by jarring the drillstring.
4. Spiral-grooved drill collars are often used to prevent wall sticking.
5. Formation damage in a well can be treated by well stimulation, acidizing or hydraulic fracturing.
6. If you drill the formation using brine (very salty water), formation damage can be reduced.
7. To reduce the risk of corrosion, it is necessary to use more expensive and resistant steel in the drillstring.
8. To retrieve pipe from a well, either a spear or an overshoot is used, screwed into the bottom of a fishing string. (See the below pictures for other examples of fishing tools.).
9. There are various methods of killing a well when a kick is detected, and hopefully it will not turn into a full-scale blowout.

UNIT 19
PREVENTING BLOWOUTS

Words to know

offshore	в открытом море
flow	фонтанирование
divert	отклонять, поворачивать
ignify	воспламенять
derrick	буровая установка
consequences	последствия
prevent	предотвращать
fire crew	пожарная бригада
cap	закрывать пробкой, перекрывать
damage	повреждать
destroy	разрушать

Task 1. Read the case study of a blowout. In what order did these events take place?:

1. A well control company was called in.

2. The rig and platform were evacuated.
3. The well caught fire.
4. The well was killed.
5. Weighted drilling mud was circulated.

Blow out on Ensco 51

Working offshore Louisiana, the crew of the Ensco 51 had just set casing when the well experienced an uncontrolled flow, causing a blowout and fire.

Attempts were made to stem the increasing flow of gas and fluids from 10+ valve using sea water and weighted drilling mud, but sufficient volume could not be added to slow the flow. The flow continued to increase and the decision was made to abandon both the rig and platform at 0300 hours. The 10+ valve was opened to divert the flow of gas away from the rig and platform, and all 43 personnel were then safely evacuated via two lifeboats to Platform B.

Specialist personnel from Wild Well Control were called in to help with capping and killing operations, but the gas flow ignited in the early hours of 02 March, due to an unknown ignition source. The well partially bridged on 03 March, causing the fire to go out, and the well was subsequently killed. Production on the platform had been shut in during drilling ops, which probably prevented a greater fire.

During the fire, the Ensco 51's derrick and substructure were completely destroyed, with the derrick collapsing onto the platform. The platform and its production equipment were also extensively damaged.

Task 2. Read the dialogue. Answer the questions:

What are the differences between this blowout and the one described in the Ensco 51 case study?

Which incident has the more serious consequences?

Paul Downey: Jose Miguel. How are you doing?
Jose Miguel: Not too good, Paul. We've got a big problem.
PD: Go on.
JM: Well, we've got a blowout on Number 5 rig.
PD: Number 5? I thought we'd completed on 5.
JM: No, not quite, we were just tripping out when we got a big kick.
PD: Is anybody hurt?
JM: Well, there are no fatalities at least. But Okie's got a broken arm and both the others have got cuts and bruises.
PD: And you're OK?
JM: I'm fine, Paul, but it's a real mess here.
PD: And what about damage?
JM: Yes, there's quite a lot. One corner of the derrick's blown off and a big chunk of the drilling floor has gone.
PD: Any fire?
JM: Not so far, but we're keeping a close watch.
PD: So, what happened exactly?
JM: Well, the string was around 200 metres from the surface and we got a warning from the loggers. We circulated kill mud, but it was obviously too late.

PD: Did you manage to close the BOP?
JM: No, we were just about to close it when it blew.
PD: And what's happening at the moment?
JM: Well, there's mud everywhere. The fire crew are standing by and the medics are looking after the guys. I've called for the helicopter to take Okie off to hospital.
PD: Have you called well control?
JM: No, I wanted to call you first. I'll do that right away.
PD: Jose, I've got to get back to my meeting. I'd better tell them what's going on - they're paying after all! You're doing a great job. There's nothing more you can do. Keep me informed, won't you.
JM: Yes, of course. Bye.

Task 3. These sentences are connected to the situations described in tasks 1 and 2. Choose the best verb to complete each sentence:

1. The platform was _____ (bridged/killed/abandoned).
2. The well was _____ (killed / circulated / ignited).
3. Weighted mud was _____. (capped / circulated / blown off).
4. The crew were _____ (abandoned / evacuated / damages).
5. The derrick was _____ (hurt / opened / destroyed).
6. The valve was _____ (completed / cased / closed).
7. The roughneck's arm was _____ (broken / damaged / destroyed).
8. The decision was _____ (done / made / produced).
9. The gas was _____ (ignited / sparked / blown).
10. The well control team was _____ (called off / called in / called forward).

Task 4. Look at the following sentences. In each sentence there are two actions. Does the second action happen before, during or after the first action?:

1. The crew had just set casing when the well experienced an uncontrolled flow.
2. As the flow continued to increase, the decision to abandon the platform was taken.
3. Production on the platform had been shut in during drilling ops, which probably prevented a greater fire.
4. We were just tripping out when we got a big kick.
5. We circulated kill mud when we got a kick warning from the loggers.
6. We were thinking about closing the BOP valve when the well blew.

UNIT 20
OPTIMIZED DRILLING

Words to know

slant drilling	направленное наклонное бурение
reservoir	месторождение, нефтеносный слой
wellbore	ствол скважины
slimhole drilling	бурение скважины малого диаметра
bottomhole	забой

coiled tubing	коил тюбинг
rubble	обломки, галька
insulation	изоляция, изолирование
conventional drilling	обычное, стандартное бурение
multilateral	многосторонний
cuttings	обломки выбуренной породы
gas emission	выделение газа
environment	окружающая среда
directional drilling	наклонное бурение
offshoot	боковая ветвь
reel	барабан

Task 1. Read and translate the text:

Drilling Technologies

With conventional drilling, oil and natural gas wells were drilled vertically at depths ranging from a few thousand feet to as deep as five miles. But new directional drilling (also known as slant drilling or deviation drilling) and horizontal drilling technologies allow drills to deviate from the vertical plane and go horizontal - or beyond. For oil and natural gas producers, this means reaching reservoirs that are not located directly beneath the drilling rig, and avoiding sensitive surface and subsurface environmental features.

Advances in directional drilling now permit multilateral drilling, where multiple offshoots of a single wellbore radiate in different directions and can contact resources at different depths. Development of this technology is recent and rapid, and promotes the use of one site instead of many sites.

At the same time, drilling away from the vertical plane has produced new challenges in extracting oil and natural gas from sophisticated drilling units. Coiled tubing technology has helped the industry meet this challenge. Coiled tubing is a continuous-length hollow steel cylinder of varying widths. Stored on a reel, coiled tubing is flexible, contains no joints and can be uncoiled or coiled repeatedly as needed. Since a significant percentage of oil production takes place from costly offshore platforms, coiled tubing has proven to be especially economical. The equipment can be set up quickly, it runs at higher speeds and it can work in existing wells.

But it isn't just the direction of the drill bit that has been revolutionized. Every time a drill bit enters rock below the surface, it displaces bits of rock called 'cuttings', which then become rubble. Recent advancements in slimhole drilling have significantly reduced cuttings volumes. As the name suggests, the slimhole drill is smaller and displaces less rock. For example, a slimhole drilled to more than 2 V.г miles in depth and ending with a 4 Ys-inch-diameter bottomhole, produces one-third fewer cuttings than a standard well at the same depth.

Both coiled tubing and slimhole drilling enable less disruptive, quieter drilling operations, minimizing the noise for wildlife or humans near the well site. Since coiled tubing is a continuous pipe, most noises associated with conventional drilling pipes are avoided. Efficient insulation and the equipment's smaller size further reduce

noise levels. For example, the noise level of a conventional rig from a quarter-mile away is 55 decibels (less than the hum of an air conditioner), while a coiled tubing unit's noise level at the same distance is just 40 decibels (27% quieter). The smaller size of coiled tube drilling also cuts fuel use and reduces gas emissions when compared with traditional drilling.

Task 2. Match one of these summaries to each passage:

This passage is about…

a) benefits to the environment of new technologies.
b) drilling in wells with a very small diameter.
c) drilling formations which are not directly beneath the rig.
d) drilling with flexible piping instead of steel joints.
e) drilling several formations at the same time from the same rig.

Task 3. Make comparisons between yesterday's technology and the more efficient technologies of today by completing the following sentences. Use the phrases in the box:

much better insulated	more effectively	far less noise
more economical	more easily avoided	less disruptive
four times greater	fewer cuttings	far quieter
easier to transport	better for the environment	

1. Directional drilling is _____ because sensitive formations can be _____.
2. Multilateral drilling enables production rates up to _____ conventional drilling.
3. Coiled tubing has proved to be _____ than conventional piping because it is _____ and reuse.
4. Coiled tubing also produces _____ because it is _____.
5. Slimhole drilling allows oil and gas companies to comply with environmental laws _____ because it produces _____.
6. Slimhole and coiled tubing drilling are _____ and _____ than traditional methods.

Task 4. These sentences describe a method of drilling called underbalanced drilling (UBD). Use a dictionary to check the meaning and use of the words in the middle column and then make a suitable connection. For 1-4, write two sentences for each. For 5-7, write one sentence for each:

		Connecting words	
1	In conventional drilling, formation fluids are prevented from entering the well as far as possible	**Therefore,**	in UBD, formation fluids are allowed to flow into the well.
2	UBD is quite an expensive method of drilling.	**However,**	it is widely used because it reduces formation damage

3	In UBD, the pressure in the well is kept lower than the pressure of the formation.	**Thus,**	fluids are forced to flow into the well.
4	In UBD, an inert gas is injected into the drilling mud to reduce its density and hydrostatic force throughout the well depth.	**Nevertheless,**	the pressure of the well is reduced to below that of the formation.
5	In conventional drilling, formation fluids are prevented from entering the well as far as possible	**so that**	in UBD, formation fluids are allowed to flow into the well.
6	UBD is quite an expensive method of drilling	**whereas**	it is widely used because it reduces formation damage.
7	In UBD, the pressure in the well is kept lower than the pressure of the formation	**yet**	fluids are forced to flow into the well.

UNIT 21
FORMATION CHARACTERISTICS
Words to know

formation characteristics	характеристики пласта
hydrocarbons	углеводороды
migration	движение
to exploit	разведывать
reservoir	месторождение, нефтеносный пласт
porosity	пористость
permeability	проницаемость
saturation	насыщение
wildcat well	разведочная скважина
kerogen	кероген
geological trap	геологический пласт, ловушка
sandstone	песчаник
conglomerate	обломочная порода
formation water	пластовая вода
rule of thumb	практическое правило
sedimentary rock	осадочная порода

Task 1. Read and translate the text:

Viability assessment

If we suspect that hydrocarbons might be present in an area, we commission an exploration well to obtain further information. These are also called wildcat wells. Using various tools, we are able to analyze the formations in great detail to establish whether or not it will be worthwhile producing.

First of all, we need to establish where the hydrocarbons may have come from

– the source rock – and analyze the organic content, known as kerogen. Then, we look at the reservoir formation – that is, the rock into which the oil or gas has migrated and where it accumulates in a geological trap of some kind.

The most important aspects of a reservoir formation are its porosity and permeability. Most rocks, in particular sandstones and conglomerates, have at least some porosity. If enough pores are present, the pores are large enough and the pores are interconnected so that fluids flow through them (i.e., the rock is permeable), then the rock is a potential petroleum reservoir. With sandstones, a permeability of 18% or more is usually needed for an economic oil reservoir. Gas flows easier than oil, so as little as 12% permeability may be enough for a gas reservoir. Porosity and permeability are important, but a petroleum reservoir needs to contain hydrocarbons as well. In water-bearing reservoirs, the pores are filled entirely with a salty solution called formation water, but in oil- and gas-bearing reservoirs, some oil or gas is present as well. A general rule of thumb is that 40% or more of the pore fluids must be hydrocarbons (i.e., the water saturation is less than 60%) in order for the reservoir to be economic enough to produce. If the water content is greater, then the oil tends to stay behind and the reservoir produces only water. These types of reservoirs are said to be 'wet'. If the water saturation is less, then the reservoir may be 'productive'. Whether or not it will be 'economic' to produce and make any money will depend not only on the rate of production, but also on how long the well will produce, in combination with many other factors, not least of which is market price.

Task 2. Answer the questions:

1. What are some of the basics of petroleum geology?
2. What two factors are mentioned in the text?
3. What is the difference between an economic and an uneconomic reservoir?

Task 3. Read this description of the three main types of sedimentary rock and complete the table below:

Sandstone is composed primarily of sand grains that have been naturally cemented together. It is rough to the touch and can be white to buff to dark in colour. Sandstones are commonly deposited on beaches, river channels or dunes. Sandstone is a common reservoir rock for gas and oil and is the most important reservoir rock in North America.

Shale is composed of clay-sized particles and is the most common sedimentary rock. It is relatively soft and the colour ranges from green and grey to black, depending on the organic content. Darker shales are common source rocks for oil and gas, commonly deposited on river flood plains, and on the bottom of oceans, lakes or lagoons. Some shales are now being treated as reservoirs in North America.

Limestone is composed of calcite mineral grains that range in size from very fine to large sparkling crystals. The rock is commonly white or grey in colour. Limestone is a common reservoir rock and is typical in desert areas, such as the oil and gas fields of the Middle East. An organic-rich, dark-coloured limestone can also be a source rock for oil and gas.

Many sedimentary rocks are a combination of these three types, and mixtures

are described as either sandy, shaly or limey (calcerous). For example, sandy shale is a shale with a high sandstone composition. Coal is also increasingly being exploited as a gas-bearing reservoir, having originally been a source rock, as in the southern North Sea.

	Source, reservoir rock or both?	**Typical colour(s)**	**Typical location(s)**
Sandstone			
Shale			
Limestone			

Task 4. Fill in the blanks in the sentences. In two of the sentences, the word is used twice – once singular and once plural. Translate the sentences into Russian:

maturation, migration, reservoir, seal, source, trap

1. Evaluation of the _____ uses the methods of geochemistry to quantify the nature of organic-rich rocks which contain the precursors to hydrocarbons, such that the type and quality of expelled hydrocarbon can be assessed.
2. The _____ is a porous and permeable lithological unit or set of units that the hydrocarbon reserves. Analysis of _____ at the simplest level requires an assessment of their porosity (to calculate the volume of in situ hydrocarbons) and their permeability (to calculate how easily hydrocarbons will flow out of them).
3. The _____ , or cap rock, is a unit with low permeability that impedes the escapes of hydrocarbons from the reservoir rock. Common _____ include evaporites chalks and shales.
4. The _____ is the stratigraphic or structural feature that ensures the juxtaposition of reservoir and seal, such that hydrocarbons remain in the subsurface rather than escaping (due to their natural buoyancy) and being lost.
5. Analysis of _____ involves assessing the thermal history of the source rock in order to make predictions of the amount and timing of hydrocarbon generation and expulsion.
6. Finally, careful studies of _____ reveal information on how hydrocarbons move from source to reservoir and help quantify the source (or kitchen) of hydrocarbons in a particular area.

Task 5. Complete this table using the different forms of each word:

Verb	**Adjective**	**Noun**
		sediment
	porous	
permeate		
		migration
	saturated	

accumulate		
		fracturing
expel		

Task 6. Read about geographical features where subsurface oil and gas reservoirs can often be found and decide whether operations in such environments would be onshore drilling or offshore drilling:

a) A basin is a large area with thick sedimentary rocks, covered by shallow tropical water. In some cases over time, the basin has been filled by sediment and become dry land.
b) Reefs are mounds of shells separated from the land by a body of water known as a lagoon. Some ancient reefs are now landlocked, created when the sea evaporated.
c) A coastal plain is a strip of land adjacent to the ocean
d) Shorelines or beaches are long narrow deposits of well-sorted sand.
e) Sand dunes are formed by wind in both desert and coastal environments.
f) A trench is a deep channel in the seabed.
g) A ridge is a submarine range of mountains, including volcanoes, which sometimes appear above the surface of the ocean.
h) A delta is a mass of sediments deposited by a river flowing into a large body of water, such as a lake or ocean.
i) A continental shelf is a shallow platform extending into the ocean from the beach.
j) A continental slope is steeper than a shelf and lies between the shelf and the ocean bed.
k) A submarine canyon is a narrow eroded channel through a shelf or slope.

UNIT 22
PETROLEUM TRAPS

Words to know

structural trap	структурная ловушка
stratigraphic trap	стратиграфическая ловушка
reservoir rock	порода-коллектор
fault	трещина
fold	складка
syncline	синклиналь
anticline	антиклиналь, антиклинальная складка
impenetrable rock	непроницаемая порода
angular unconformity	угловое несогласие в напластовании
limestone	известняк
shale	сланец
truncation	перерыв, усечение
pinch-out	выклиниваться, сжимать
salt dome	соляной купол

Task 1. Read and translate the text:

The geology of petroleum traps

There are two basic types of petroleum traps – structural and stratigraphic.

Structural traps occur when reservoir rock layers are deformed, such as in a fault or a fold. In a fault trap, a rift occurs in the rock, causing the layers to slip and tilt in one direction or another at the point of deformation, meaning that the migration of oil through a particular layer is halted. There are two types of folds – synclines and anticlines. Of these, normally only anticlines become petroleum traps. An anticline occurs when rock layers form an arch-like structure and the petroleum migrates to the highest point and is prevented from moving further by an overlying bed of impenetrable rock.

Stratigraphic traps can be formed by the deposition of reservoir rock, by an angular unconformity, or by a change in the porosity of the sedimentary layer. Examples of depositions include a river channel sandstone or a limestone reef encased in shale. One example of an angular unconformity is when an angular sedimentary layer is truncated, or cut off, by a horizontal layer. This is known as a truncation. Another, which is called a pinch-out, is whe[r]e the sedimentary layer is trapped between two other layers when they meet at a point.

Petroleum reservoirs can also be created by traps which are both structural and stratigraphic. These are called combination traps. An example of this is a salt dome, where a layer of salt pushes upwards and deforms the surrounding layers.

Task 2. Read this dialogue and answer questions.

Manager: So, can you describe the geological formation of Carson Sound?

Geophysicist: Sure. As we have explained in our report, this field appears to be an extension of the Prudhoe Bay field. If I could describe the geology of Prudhoe Bay first of all, it will help me to explain the geology of Carson Sound. This diagram shows the central North Slope. As you can see, Prudhoe Bay is the result of a combination of structural and stratigraphic circumstances. They were formed by unconformities created when the rocks were uplifted during rifting and then buried again.

Manager: So, how is the accumulation trapped?

Geophysicist: Well, on the north side of the bay the field is sealed by a normal fault, and in the south by south-dipping shales, which overlie the reservoir sand. The western extent of the oil is limited by a structural saddle in the upper surface of the reservoir. Unconformities and overlaying shales seal the crest and the eastern flank of the oilfield.

Manager: So Carson Sound is part of the same formation, is it?

Geophysicist: Well, the oil is certainly from the same source, but there are one or two crucial differences.

Questions:

1 Why does the geophysicist describe the geology of Prudhoe Bay?
2 How is the field sealed on each side – north, south, west and east?

Task 3. Now read the continuation of the meeting and discuss the questions in pairs:

1. What is the connection between Mukluk and Carson Sound?
2. Do you think that the manager should be worried?

Geophysicist: I have to tell you that there is always the risk that Carson Sound could turn out to be a Mukluk.

Manager: What do you mean, a Mukluk?

Geophysicist: Yes, I suppose that was before your time! Mukluk was one of the biggest financial disasters in oil and gas history – in 1983, nearly twenty years after the huge success story of Prudhoe Bay.

Manager: Go on.

Geophysicist: Well, Mukluk is just on the other side of Prudhoe Bay, and it was also an angular unconformity trap, like Carson Sound. Seismic data indicated a potential reservoir rock in the same Sadlerochit Sandstone with a shale cap rock. The lease was sold for an estimated $1.5 billion and 12 companies spent $100 million on building an artificial island in the Beaufort Sea, and then a further $150 million on exploration drilling. They were looking at anything between two billion and 10 billion barrels of oil, depending on who you believe.

Manager: Wow! So what happened?

Geophysicist: Absolutely nothing. It turned out that the oil had leaked out of the formation centuries ago. There was nothing left. It is still the most expensive dry hole ever!

Manager: Well, this isn't nearly as big, is it?

Geophysicist: No, but you still don't want to waste your money, do you?

Manager: And what are the chances of that happening?

Task 4. Read the descriptions of each stage of the process below which explain how a petroleum trap is formed in the two largest fields in North America, the East Texas field and the Prudhoe Bay field. Put the first five sentences in the correct chronological order. The final stage in the last sentence is in the correct place:

Angular unconformity traps

1. The seas again invaded the area and a layer of chalk was deposited on the angular unconformity. This would become the cap rock of the East Texas field.
2. The sandstone was buried beneath the subsurface as it became covered by a layer of sediments from the sea.
3. Later, the Sabine Uplift, a geological event along the Texas-Louisiana border, arched up and exposed the Woodbine sandstone above the surface of the sea.
4. Approximately 100 million years ago, East Texas was covered by shallow ocean. The Woodbine sandstone was deposited during this geological era. This would become the formation rock of the East Texas field.

5. The top of the arch of the Woodbine sandstone was eroded and an angular unconformity was created.
Eventually, petroleum migrated from its source in the Eagle Ford shale along the Woodbine sandstone and became trapped by the layer of Austin chalk, accumulating into a reservoir of some five billion barrels of oil.

Task 5. Speak on «The geology of petroleum traps».

UNIT 23
GEOLOGICAL CONSULTING

Words to know

consultant	консультант
prospects	поиски, разведка
teamed up with	объединяться, работать сообща
concession	концессионный договор
tectonic setting	тектоническое положение
acreage	площадь земли в акрах
dry hole	непродуктивная скважина
farm-in opportunities	возможность получить разрешение на поиск нефти и газа
licensed blocks	земля, на которую имеется разрешение для разведки
risk assessment	оценка риска
stochastic calculation	вероятностные подсчеты
cumulative reserves	подсчет совокупного количества нефти, добытой из скважины на определенную дату
ultimate endowment	подсчет общего количества нефти, добытой из скважины за все время ее эксплуатации
depletion	истощение скважины
risky venture	рискованное вложение денег
cautious	надежный

Task 1. Read ***an e-mail written by a consultant petroleum geologist, Paul Selby, to the manager of the Exploration Division of a large oil and gas company in Qatar, Adel Al-Jalawi. What is the purpose of the e-mail?***

Dear Mr Al-Jalawi

I contacted you just over two years ago and you were good enough to allow me time to show you some data we had assembled on prospects in the Ngosso and Iroko license areas off the coast of Cameroon. In the end, you decided not to invest in this area, but as you will know, it has become apparent since then that there are

some excellent prospects here. A number of other companies have drilled wildcats and over a dozen wells are now producing. We have continued to do research offshore of Cameroon, as well as of Gabon and Equitorial Guinea, and we have now teamed up with a seismic company, Exploration Geosciences. If you would be interested in seeing our findings on more than 20 prospects in offshore West Africa, I would be delighted to make an appointment to present and discuss them in greater depth. I have attached an updated list of our main petroleum geology services. I look forward to hearing from you.

Yours sincerely,
Paul Selby
Managing Director, Selby Geo-Prospects Lt

Task 2. Read an extract from the attachment sent by Paul Selby. Answer the questions which topic is relevant if a company would like…:

Which topic is relevant if a company would like…
1. to have more information about areas which are already being drilled?
2. to know how much oil and gas is present in a possible oil and gas field?
3. to have detailed geological information about an oil and gas field?

These are the main services offered by Selby Geo-Prospects.

Please contact us if there are any geological or geophysical services you would like us to supply.

Regional evaluations

Countries, regions, basins, concessions. Analysis of tectonic setting, structural evolution, stratigraphy, geochemistry, petroleum systems, exploration history, reserves and future potential.

Open-acreage assessment

Exploration history, drilling results, discoveries, dry holes, reservoirs, seals, traps, source rocks, timing of migration and remaining potential.

Identification of farm-in opportunities

Evaluation of currently licensed blocks to assess remaining potential in terms of drilling results to date, unexplored petroleum systems, undeveloped reserves and yet-to-find potential.

Risk assessment and chance of success

Assessment of risk and chance factor based on reservoir, seal, trap and source rock parameters. Ranking according to degree of risk.

Prospect evaluations

Evaluation of reservoir, seal, trap and source rock characteristics, burial history and stochastic calculation of potential reserves.

Reserves assessment

For countries, regions, basins and concessions. History of discoveries, cumulative reserves, production, remaining reserves, reserves replacement, yet-to-find oil and ultimate endowment.

Studies of individual fields

Structure, size, reservoir characteristics, seal, source rock, reserves, drilling

history, Production history, reservoir behavior, depletion and remaining reserves.

Technical reports

On the above topics or on a combination of the above topics.

Task 3. Read the extracts from e-mails written by Paul Selby, the consultant petroleum geologist, to clients and potential clients. Which of the services is he writing about?

1. We have carried out research into the drilling and production which have taken place at this field and our findings are as follows: …
2. According to our calculations, the chances of success in each of these reserves are as follows: ...
3. As you know, we have been operating in this region for some time and we have gathered a huge quantity of data that you might be interested in.
4. Approximately 70% of the block is currently licensed, but we believe that there are still exciting opportunities available among the remaining acreages.
5. We are pleased to accept your offer of contract to carry out evaluation of remaining potential in your F2 reserve offshore Equatorial Guinea.

Task 4. Read the reply that Paul Selby received from Adel Al-Jalawi. Fill in the gaps in the e-mail using modal verbs from the table below. Sometimes there may be more than one correct answer:

would	should	could	may

Dear Mr. Selby

Thank you very much for your e-mail. I remember our meeting and we were all impressed with the quality of your presentation and the detail of your research data. As I explained after we met, our reasons for deciding against investment in West Africa were political. A: the time, we felt that the region lacked the stability we required to make a firm long-term commitment. I believe it was the correct decision and that it (1) _____ have been a very risky venture two years ago.

Of course, we have been monitoring the situation, but we remain cautious as to whether we (2) _____ invest there or not. Nevertheless, we (3) _____ be very pleased to hear your views and you (4) _____ be able to convince us to go ahead. We (5) _____ be available for a meeting sometime in the week beginning 16th Feb. Please (6) _____ you let me know if you (7) _____ be able to travel to Qatar at that time? Jamila, my secretary (8) _____ be pleased to help you make any arrangements you (9) _____ need.

Looking forward to hearing from you.

Yours sincerely, Adel Al-Jalawi

Task 5. Here are some sentences that say the same thing, but in a different style, according to whether they come from formal or informal e-mails. Complete the sentences with one suitable word in each space:

Informal	Formal
1. (a) _____ lot for taking the time to (b) _____ in the other day	Thank you very much for taking the time to meet me on Wednesday.
2. (c) _____ us know what you think.	We would be very (d) _____ to hear your views on the subject.
3. Can you get (e) _____ to me a.s.a.p.	I would be very (f) _____ if you could reply as soon as possible.
4. Have a good trip!	May l (g) _____ you a successful trip!
5. (h) _____ ask if you need anything.	Please don't (i) _____ to ask if you require any (j) _____ assistance.
6. (k) _____ forward to seeing you soon.	We look forward to seeing you at your (i) _____ convenience.

Task 6. Look through a selection of openings and closings to e-mails and say which of these are informal and which of them are formal:

Hi James, Dear MsO'Hea, Dear Sirs, Dear Olga, Hello Pete,..

Best wishes, Take care, Yours faithfully, Kind regards, Yours sincerely, ...

Task 7. Write a formal e-mail to a client of your company. Describe briefly the services your company offers and ask for a meeting to present some more information:

Use expressions:

Thank you very much…
We would be very pleased to…
I would be very grateful if…
May I wish you…
Please don’t hesitate to…
I look forward to meeting you.

UNIT 24
PETROLEUM MAPPING

Words to know

to map	составлять карту
cross section	геологический разрез
lineation	линейность
foliation	слоистое строение
trend	горизонтальное направление пласта
plunge	откос
scale	масштаб
signs and symbols	обозначения и символы
gross thickness	общая толщина пласта

net thickness	толщина нефтяного или газового пласта
topographic map	топографическая карта
geologic map	геологическая карта
gentle slope / steep slope	небольшой уклон / крутой уклон
strike	простирание жилы или пласта
dip	наклонение
pay zone	промышленная зона
capture field data	собирать, фиксировать данные с помощью цифровых технологий

Task 1. Read and translate the text:

Maps and cross sections

Maps and cross-sectional diagrams are used by petroleum geologists and geophysicists to illustrate the location of oil and gas reservoirs. Making and interpreting maps and cross sections is an essential part of their work. The easiest way to explain the difference is to say that a map is a view taken from above the Earth's surface and you are looking down at it, whereas a cross section is a view taken by cutting vertically through the Earth's surface, as if you are looking at it face-to-face. Does that make sense?

A geologic map or geological map is a special-purpose map made to show geological features. Rock units or geologic strata are shown by colour or symbols to indicate where they are exposed at the surface. Bedding planes and structural features, such as faults, folds, foliations and lineations, are displayed with strike and dip or trend and plunge symbols, which give these features three-dimensional orientations.

A cross section shows a vertical section through a volume, whereas a map projects a view taken of the surface of the geological are – a bird's eye view. Cross sections are often used to show the different types and orientations of formations found under the surface. Here is an example of a very large cross section taken over a horizontal distance of several hundred miles.

To show a petroleum reservoir correctly, you need to have a number of different maps and cross sections to distinguish the various layers in the reservoir. The maps will show the structure of the formation, but also other important factors, such as gross and net thickness, porosity, water saturation and so on. A full set of maps and cross sections like this is normally called a reservoir description or a reservoir model.

Nowadays, petroleum geologists are increasingly using information and communications technology to manage and deliver geoscientific information, and this is driving the development of digital methods for geological data visualization, recording and interpretation in both 2D and 3D. An example of this is the British Geological Society's SIGMA project (System for Integrated Geospatial Mapping), which is updating geological survey methods to harness these rapidly developing innovations.

Task 2. Read information about different types of maps and answer the questions:

A topographic map shows the elevations of an area where oil and gas may be present. The lines are contour lines showing the land elevation above sea level. This map shows a ridge with a gentle slope on the north-east flank and a steep slope on the south-west flank. You will notice that the greater the contour intervals, the gentler the slope. The scale on this map can be 1 centimetre to 500 metres.

A geologic map shows the orientation of the rock layers by defining strike and dip. Strike is the horizontal orientation of the formation, dip is the downward angle perpendicular to the strike, including the angle of the plane.

A subsurface map called an isopach map shows the thickness of the rock layers. For example, when an oil or gas field has been drilled, an isopach map can be used to describe the pay zone. This could be a gross pay map, which contours the thickness of the whole reservoir, including non-productive water-bearing or tight zones. Or it could be a net pay map, showing only the productive thickness.

What are three different types of maps?
What does each map show?

Task 3. Give Russian equivalents to the following expressions:

topographic map, geologic map, isopach map, contour lines, a steep slope, a gentle slope, the scale of a map, strike, dip, angle of the plane, sea level, pay zone.

Task 4. Complete the questions in the columns below. You can ask direct questions such as 'How is a cross section made?' or indirect questions such as 'Can you explain how a cross section is made?' Then answer these questions from the information from the previous exercise, or from your own knowledge:

Direct questions	**Indirect questions**
What does a reservoir model consist of?	Can you tell us...
	Can you show us how seismic data can be incorporated into cross sections?
What does SIGMA stand for?	Do you know…
How are old maps integrated with new ones?	Can you explain ...
	Can you show us how they capture field data?
What do you mean by GIS software?	Sorry, but I don’t quite understand…
What is an isopach map?	Can you explain ...
	Could you tell me what a net pay map shows?

Task 5. Speak on petroleum mapping.

UNIT 25

SEISMIC SERVEY

Words to know

seismic acquisitionсбор	сейсмических данных
sound wave	звуковая волна
sound source	источник звука
reflect	отражать
receiver	приемник
geophone	сейсмограф
velocity	скорость
amplitude	амплитуда
offset	расстояние между источником звука и приемником
random noise	случайный шум, помехи
coherent signal	когерентный сигнал
vibrator truck	вибрационная сейсмическая установка
spread	расстановка сейсмографов
shot point	точка возбуждения
emit	издавать, испускать
sweep	продолжительный сигнал
thumper truck	сейсмический ударный источник
tow	тянуть
travel time	скорость распространения
impedance	сопротивление, импеданс
reflection coefficient	коэффициент отражения

Task 1. Read and translate the text:

Bright spots

In a seismic survey, sound waves from a sound source partially reflect off boundaries between different underground strata to form echoes that are detected at the surface by receivers called geophones. Those echoes provide information about the subsurface geology, including the locations of potential oil and gas traps.

Oil and gas occupying rock pores in an oilfield reservoir affect the physical properties of the rock in a way that could alter those sound echoes and thus provide direct evidence of subsurface oil and gas pools. For example, a quite modest amount of natural gas inside a rock will significantly reduce the velocity of sound passing through the rock. That velocity reduction can increase the acoustic contrast between the gas-bearing rock and the adjacent rock formations. And the increased contrast can, in turn, cause an abnormally high amplitude seismic reflection, giving rise to what geophysicists refer to as a ‘bright spot’ in a seismic section.

However, there can be more than one possible explanation for a seismic

phenomenon such as a bright spot, and so this type of indicator suggests, but does not prove, the existence of subsurface hydrocarbons. And this is especially true when trying to use seismic data to detect oil. Oil has a much lower acoustic contrast with rock than gas. And, to make things even more tricky, there's quite a low acoustic contrast between oil and water, thus making these two liquids difficult to distinguish.

Task 2. Answer the questions to the text:

1. How is natural gas detected in a seismic survey?
2. Why is it more difficult to detect oil?

Task 3. Read the extracts and answer the questions:

1. How does AVO improve the performance of a survey?
2. What is the difference between 3D and 4D seismic?

Developments in seismic technology

Developments in seismic technology have enabled geophysicists to further reduce drilling risk. Here are two examples:

The first technique is known as amplitude variation with offset. AVO is a bi-product of the way in which a seismic survey involves recording underground sound reflections using sound sources and geophone sound detectors in a series of increasing offsets from a single survey point (an offset is the distance between the seismic source and the receiver). The seismic crew record the data from different offsets so that they can add the data together. This addition tends to remove random noise while enhancing coherent signals from underground sound reflections. AVO analysis is more successful in young, poorly consolidated rocks, such as those in the Gulf of Mexico, than in older, well-cemented sediments, such as those from the mid-continent region of the USA.

Another technique is known as 4D seismic. This technique involves shooting several 3D seismic surveys over the same area over a time period of perhaps several years (a 3D survey is a type of survey that results in a three-dimensional image of the subsurface geology). Changes in seismic signals from one survey to the next can provide insights into the movement of fluids, such as oil and gas within the field reservoir.

Task 4. In seismic acquisition, a source of sound energy and a receiver are required. Read the description of the use of a vibrator truck in seismic surveying and decide whether each sentence refers to the source (S) or the receiver (R):

Using a vibrator truck

~ A vibrator truck acts as the source of sound energy for a land-based seismic survey.
~ A group of detectors called geophones is placed in a line or other pattern.
~ Several groups of receivers are often used to form a spread.
~ A cable is laid between the geophones and a recording truck where the data is recorded.
~ The vibrator truck is driven to the shot point, where the sound impulses will be emitted.

- The correct position for the truck is where the angle of incidence equals the angle of reflection).
- A pad or base-plate is lowered from the truck to the surface of the ground until it carries the weight of the truck.
- The hydraulic motors are then activated to enable the weight of the truck to shake the ground.
- This continues for a period of between ten and twenty seconds, and is known as a sweep.
- Both unwanted noise, such as from traffic or wind, and the wanted signal, are picked up by the geophone. The two must be distinguished in the recording truck.
- Explosives, or a thumper truck, can also be used as a seismic source on land.
- At sea, obviously, a vibrator truck cannot be used. The most common alternative is an array of air guns towed behind a seismic ship.
- The signals are received by hydrophones connected to a cable, the streamer.

Task 5. Read and translate the following passage:

Principles of seismology

Seismology is based on the mathematical principles of acoustics. A sound wave is emitted through a rock formation.

When it reaches a particular boundary in the formation, it is reflected, and the total time it takes to reach the receiver is measured. This is called its travel time. The amplitude of the seismic echo off the top of a surface depends primarily on the contrast in acoustic impedance (sound velocity multiplied by density) between the upper and lower rock layers that form the surface. The greater the contrast, the larger the reflection. The percentage of seismic energy reflected is called the reflection coefficient. Typical sedimentary layers have a reflection coefficient of between 2 and 4%. Gas has a very slow velocity and, if the layer is overlain by a seal, the acoustic impedance contrast will produce an echo of about 16% of the seismic energy, called a bright spot. This is often an indicator of the presence of hydrocarbons. Another type of direct hydrocarbon indicator is a flat spot, which is a level, flat seismic reflector in a petroleum trap produced by rock layers that are not flat, such as an anticline.

Task 6. The following sentences contain a number of factual mistakes. Amend or rewrite the sentences in the spaces provided so that they make sense:

1) The greater the impedance of the formation, the shorter the travel time of the sound wave.
2) Acoustic impedance is calculated by dividing sound velocity by density.
3) The smaller the contrast in acoustic impedance, the greater the reflection.
4) Typical sedimentary layers normally have a very high reflection coefficient.
5) Gas increases the velocity of sound passing through it.
6) It is easier to tell the difference between oil and rock than between gas and rock.
7) A bright spot is where the contrast in impedance is very low.
8) A flat spot shows a petroleum trap in a flat layer of rock.

Task 7. Speak on seismic exploration.

UNIT 26
MUD LOGGING

Words to know

mud logging	анализ проб бурового раствора
well log	каротажная диаграмма
rate of penetration	механическая скорость бурения
lithology	литология
chromotograph	хроматограф
plotting	нанесение данных на карту или график
instrumentation	контрольно-измерительная аппаратура
submit	представлять
lag	интервал, время
cased-hole logging	каротаж в обсаженном стволе скважины
openhole logging	каротаж необсаженной скважины
core	батолит, буровая колонка
rock sample	образец горной породы
sonde	зонд
wireline well log	каротаж с применением талевого каната

Task 1. Read and translate the text:

Mud log diagram

The ROP (rate of penetration) is represented by the black line on the left side of the log. The further to the left the line goes, the faster the rate of penetration. On this mud log, ROP is measured in feet per hour, but on some older, hand-drawn mud logs, it is measured in minutes per foot. Faster rates are an indication of softer rock formations.

The porosity is represented by the blue line furthest to the left of the log. It indicates the pore space within the rock structure. Notice how far to the left the porosity goes where all the sand (in yellow) is. This indicates that the sand has good porosity. Porosity is not a direct or physical measurement of the pore space, but rather an extrapolation from other drilling parameters and therefore not always reliable.

The lithology is represented by the cyan, grey/black and yellow blocks of color. Grey/black = shale and yellow = sand. More yellow represents more sand identified at that depth.

The lithology is measured as a percentage of the total sample, as visually inspected under a microscope. These are only a fraction of the different types of formations that might be encountered.

The gas is represented by the green line and is measured in units of ppm (parts per million) such as the quantity of total gas, but does not represent the actual quantity of oil or gas the reservoir contains. The squared-off dash-dot lines just to the right of the sand (in yellow) and left of the gas (in green) represents the heavy hydrocarbons detected.

Task 2. Read the extract from a mud logging company's website promoting their Data Acquisition System. Underline the key elements of the digital recording service described on the website:

Alternative systems

We have developed one of the most dependable and accurate Computer Data Acquisition Systems in the industry. Depth, Rate of Penetration, Total Gas and Chromatograph component gases are all read and plotted by the computer. Plotting of component gases by the computer is a revolutionary development that gives an accurate depiction of Show zone character and provides a tremendous database to utilize Pixler Ratios to evaluate re wellbore.

For further information the DAS, visit http://www.pmles.com/live-well-data-247

Task 3. Here are two extracts from a company website advertising their mud logging services. Fill in the blanks using the words in the box:

compatibility, cuttings, instrumentation, interpretations, loggers, manned, remotely, reports, submitted, tours, trailer, zone of interest

Two Technician Mud Logging Service

With this service, we provide the following:

- one Computerized Mud Logging (1) _____ equipped with Digital Data Acquisition System, Total Gas and Chromatograph;
- logging trailer (**2**)___ 24 hours each day. Two technicians rotate (3) _____ and each is responsible for keeping all records and reports updated and (4) _____ on a timely basis;
- continuous monitoring of gases coming from the wellbore;
- lithological (5) _____ and fluoroscopic examination of well (6) _____ caught at properly lagged intervals by the loggers;
- Trip Gas Reports after each trip to help determine where gases are coming from;
- Well Information Transfer Standard (WITS) Compliant;
- updated mud logs and drilling/geological (7) _____ are e-mailed daily.

Remote Service Mud Logging

This service:

- uses our standard digital mud logging (8) _____ and provides: Total Gas, Chromatographic Analysis and Drilling Time (in minutes per foot);
- uses satellite technology to (9) _____ operate the unit;
- has WITS (10) _____ i.e., gas readings can be viewed on Drilling Rig

˜ instrumentation;
˜ includes experienced (11) _____ who monitor units at least every three hours;
˜ includes a local technician directed by the central monitoring station;
˜ guarantees efficient data dissemination, whether it is across the wellsite or across the continent;
˜ enables clients, using Internet Explorer, to view 'zones of interest' as they are being drilled;
˜ includes the option, at Operator's request, for one of our experienced staff to be at the wellsite when a (12) _____ is being drilled (additional charge).

Task 4. Use your knowledge and the information available in this unit to match the word or phrase to the correct definition. Give Russian equivalents:

a) cased-hole logging, b) core, c) depth strip, d) lithologic log, e) openhole logging, f) rock sample, g) sidewall coring, j) sonde, k) wireline well log.

1. A physical description of the rocks through which the well is drilled.
2. A vertical scale of depth in the well.
3. A collection of cuttings which are examined for evidence of hydrocarbons.
4. A cylinder of rock drilled from the formation with special equipment.
5. An operation to take cuttings from a specific area of drilling, sometimes using explosive charges fired into the wall of the well.
6. Information gained by using an electric tool lowered into the well on a cable.
7. An electric tool used in wireline well logging.
8. Logging while the walls of the well are still bare.
9. Logging in wells in which casing has been cemented into the well.

Task 5. Underline the verbs which describe logging activities:

assessing	attaching	capping	calculating
checking	circulating	extrapolating	converting
identifying	lending	measuring	mapping
monitoring	plotting	sealing	sampling

UNIT 27
WIRELINE WELL LOGGING

Words to know

wireline	вспомогательный канат, талевый канат
armoured cable	армированный кабель
expandable arms	распорки, кронштейн распорной колонки
bow-spring	дугообразная пружина
kick	вибрация бурового кабеля
resistivity	удельное сопротивление
spontaneous potential	естественный потенциал

conductivity	проницаемость, проводимость
induction log	диаграмма индукционного каротажа
gamma ray	гамма-луч
neutron	нейтрон
formation density	плотность пласта
caliper	кавернометр, нутромер
magnetometer	магнитометр

Task 1. Read the text and answer the questions:

At various stages during drilling, the drillstring is raised from the hole and a sonde containing a number of different logging tools is lowered to the bottom. The sonde is attached to armoured cable and is reeled back up at a steady speed, transmitting data to the loggers on the surface. The sonde makes contact with the well sides as it ascends, by means of expandable arms or bow-springs, which also act as transmitters for the electrical, acoustic or radioactive properties being examined in the formation. The information is recorded in different tracks on the log, alongside the depth strip. Zones of interest are shown by kicks when the measurement moves from one side to the other.

1. What exactly is a sonde?
2. How does it work?

Task 2. Read and translate the text:

Different types of wireline well log

There are many different types of log – here are some of the most common examples.

The first type of log, invented by the Schlumberger brothers in the 1920s, was an Electrical Log used to measure resistivity. It passed an electrical current into the formation and the resistivity to the current indicated the presence of hydrocarbons. Nowadays, resistivity is measured in other ways, but the electrical log is still used to measure the current generated by contact between mud and natural waters in the pores of a reservoir rock. This is known as Spontaneous or Self Potential (abbreviated to SP) and is recorded on Track 1 of the log. Different types of sedimentary rocks have different SP signatures, enabling identification by the petrophysicist.

Nowadays, resistivity (or its inverse, conductivity) is measured by an Induction Log (IL), which allows the electric current to be focused and induced in a very specific zone of the formation. The tool can measure shallow, medium or deep resistivity depending on how far into the formation the current is passed. Oil and gas have very high resistivity and their presence shows a kick on the log.

A third type of log is the Gamma Ray Log (GRL), which uses a scintillation counter to measure natural radioactivity in the rock. There are three main sedimentary rocks – shale, limestone and sandstone. Only shales are radioactive and they kick to the right on the log. Other sedimentary rocks kick to the left. Gamma ray logs are frequently used because they can be run in both openhole and

cased-hole and are relatively cheap.

Then, there are two types of log which act as radioactive sources. The first is a Neutron Porosity Log (NL), which bombards the rock formation with high speed atomic particles (neutrons). When a neutron meets a hydrogen particle, a lot of its energy is absorbed and gamma rays are produced. On the log, either the slow- moving neutrons or the gamma rays are counted, and this shows the porosity of the rock because the greater the number of neutrons and gamma rays, the more porous the rock. The log shows porosity as a percentage.

The other is a Formation Density Log (FDL), also called a Gamma-Gamma Log. This measures the density of the subsurface rock by emitting gamma rays, which are absorbed when they encounter dense formation, but less so when they meet porous rock. So, in this case, a high measurement is an indicator of hydrocarbons.

The last log is the Caliper Log (CAL). This is used to measure the diameter of the hole. It has sensors which brush the side of the hole as it is run up and generate a record of the size. The hole size is important for making calculations of cement quantities for casing, and also for the calibration of compensated logs.

Task 3. Fill in the table below in as much detail as you can from the information provided in Task 2. See if you can complete the table by carrying out further research on the Internet:

Some Common Wireline Logs and their Uses

Name and abbreviation	Alternative name	Track	Uses
Spontaneous Potential (SP)			
Induction Log (IL)			
Gamma Ray Log (GRL)			
Neutron Porosity Log (NL)			
Formation Density Log (FDL)			
Caliper Log (CAL)			

Alternatives to wireline logging

Task 4. Match up the two parts of each sentence to form complete and factually correct sentences:

1. MWD is often used in directional drilling	a) and data is transmitted to the surface by fluid pulses in the drilling mud.
2. LWD provides an alternative to wire line drilling	b) showing the orientation of the drill bit.
3. Sensors are attached to the drill	c) because it acquires information about

string just above the bit	deviation and azimuth.
4. Using a magnetometer,	d) which automatically adjusts the direction of drilling as it goes along.
5. A horizontal well can be drilled with geosteering	e) the deviation of the well in relation to the earth's magnetic field can be measured.
6. A directional log is recorded	f) as a means of getting information about rock and fluids properties, such as resistivity, porosity and radioactivity.

Task 5. Make a comparison between mud logging and wireline well logging.

UNIT 28
ANATOMY OF AN OIL FIELD

Words to know

basement	геологический фундамент
impinge	сталкиваться, натыкаться
enhance	улучшать
lime	известь
evaporitic	испаряющийся
anhydrite	безводная сернокислая известь, сульфат кальция ($CaSO_4$)
inaccessible	недоступный, недосягаемый
fossils	окаменелости, ископаемые остатки
landmark	наземный ориентир
salinity	минерализация, соленость
infrastructure	инфраструктура
grains of sand	песчинки
dense	плотный

Task 1. Read a geological description of one of the world's major oilfields and answer the questions:

Ghawar is an oilfield in Saudi Arabia. It is located about 100 km (62 miles) WSW from the city of Dhahran in Al-Ahsa county of the Eastern Province. Measuring 280 km x 30 km (170 miles x 19 miles), it is by far the largest conventional oilfield in the world. The field is entirely owned and operated by Saudi Aramco, the nationalized Saudi oil company.

Ghawar occupies an anticline above a basement fault block dating to Carboniferous time, about 320 million years ago; Cretaceous tectonic activity, as the north-east margin of Africa began to impinge on south-west Asia, enhanced the structure. Reservoir rocks are Jurassic Arab-D limestones with exceptional porosity (as much as 35% of the rock in places), sourced from the Jurassic Hanifa formation, a

marine shelf deposit of mud and lime with as much as 5% organic material (1% to 2% is considered good oil source rock). The seal is an evaporitic package of rocks including impermeable anhydrite.

1. Which geological period does the oilfield date from?
2. What kind of trap has created the reservoir?
3. Describe the type, source and features of the reservoir rocks.

Task 2. Read and translate the text. Discuss the questions:

New Frontiers of Oil Production

TNK-BP, the Russian oil company, and the British oil company, BP, has just brought on-stream a pioneering big new oilfield in eastern Siberia. The project is part of a wave of development overcoming huge technical challenges to reach previously inaccessible crude oil reserves in Russia. The crude oil at Verkhnechonskoye is some of the oldest in the world, formed 500 million years ago from fossils of some of the first life forms on the planet. That makes it 300 million years older than the world's deepest freshwater lake, Baikal, which is the nearest well-known natural landmark.

The age of the oil deposit, which takes its name from the nearby head of the river Chona, creates special problems. For a start, there is almost no experience in the industry in dealing with such ancient pre-Cambrian rock. 'There are only one or two fields in the entire world as old as Verkhnechonskoye,' said Summers, the TNK-BP chief operating officer.

The temperature in the reservoir is about 18 degrees Celsius (64.4 Fahrenheit), much colder than in other fields, said Sergei Brezitsky, executive vice president for upstream operations at TNK-BP. 'By the time the oil reaches the surface, it is at minus 2 degrees.' Hot water must be pumped around the pipe to keep the oil flowing. The rock containing the oil is also salty, so the company is experimenting with ways to reduce the salinity to acceptable levels for pumping into the pipeline network.

Finally, the geological structure of the oil deposits is complex, meaning that with conventional drilling, a large number of expensive wells would be needed to maximize production. Soviet oil engineers drilled perhaps 100 exploratory wells at the field. They gave up because of the difficulties and lack of infrastructure.

1. What information can you find about the geology of the oilfield?
2. Why is bringing it on-stream such a complex operation?

Task 3. Translate the sentences into Russian:

1. During the period when the rock formations on the coast of north-east Africa pushed up against the south-west coast of Asia.
2. The completion of the petroleum trap consists of rocks originally created by evaporation.
3. Crude oil reserves which could not have been reached before this operation started.
4. The rock formation here is much older than nearly all other oil and gas fields in

the world.
5. The rock is very salty and the company is trying to find ways to make it less so.
6. Previous efforts to exploit the area failed because of the cold temperatures, the age of the rock formation and because there were no roads.

Task 4. Find the answers to these clues:

1. A geological feature where oil and gas can be contained.
2. On a map, an indication of the distance represented by the map.
3. What hydrocarbons do when they move through a layer of sedimentary rock.
4. In seismic, an acoustic receiver used in land exploration.
5. The area of rock where petroleum originally comes from and the origin of sound in a seismic survey.
6. An example of a stratigraphic trap, a bend in a layer of sedimentary rocks.
7. A flat surface that can be shown on a map or in a mathematical figure.
8. The most common sedimentary rock, found in riverbeds and seabeds, etc.
9. A piece of electrical equipment filled with measuring devices and used in wireline logging.
10. This means that the oil and gas in a reserve is getting less and less.
11. A sedimentary rock consisting mostly of grains of sand.
12. With holes which allow hydrocarbons to migrate.
13. The dense layer of rock which prevents petroleum from escaping from a trap.
14. This describes a hill with very small gaps between the contour lines.
15. The physical characteristics of a rock formation.
16. The speed of, for example, a sound wave as it travels through rock.
17. The flow of electricity or water.

Task 5. Prepare your own "Anatomy of an oil field" on a field of your choice, researching as necessary to find as much geological and geophysical information as possible.

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UNIT 29
WELL COMPLETION

Words to know

plug	забивать, заливать цементом
set pipe	вставлять трубу
frac pack	система для гидравлического разрыва пласта
proppant	расклинивающийся агент
bonded seal	уплотнение между обсадной трубой и стеной скважины
perforate	бурить, делать отверстия

detonation	взрыв, детонация
sand screen	песочный фильтр
washout	промывка
hydrostatic effect	гидростатический эффект
cement slurry	цементный раствор
retard	замедлять
accelerate	ускорять
casing	обсадная труба
tongs	ключ для труб, щипцы
wiper plug	верхняя цементировочная пробка
filter cake	фильтрационная корка бурового раствора
Christmas tree	фонтанная арматура
wellhead	устьевое отверстие скважины
casing head	головка обсадной колонны

Task 1. Read an extract from the BJ Services company's web page about completion services. Underline the positive phrases used to sell the service that they offer:

Completion Systems

BJ Services offers a complete line of *completion systems* for all applications, including conventional completions and horizontal wells in both gravel-packed and conventional configurations. Products range from conventional Permanent Packer Systems to high-performance Retrievable Gravel Pack Systems (10,000 psi). These systems have been field tested and proven to work in the most demanding environments. BJ's tool systems are specifically designed to handle the increased demands of today's high rate, high pressure frac-pack completions.

All tool components are designed for maximum erosion resistance, allowing rates up to 35 barrels per minute at proppant volumes up to 400,000 pounds, and all are 10,000 psi differentially rated. Bonded seals are used at all critical points for positive sealing integrity.

The concept of a reliable one-trip perforating and Gravel Pack/Frac Pack system has long been the goal of operators and service companies. One of the main problems has been the extreme force generated during perforating gun detonation, which has been the cause of damaged packers, twisted screens, premature packer setting, and other types of failures. BJ Services' solution to the problem is the *ComPlete Re leasable Single Trip (RST) System.*

Task 2. Read and translate the text. Answer the questions:

Well Completion

After drilling and casing the well, it must be 'completed'. Completion is the process in which the well is enabled to produce oil or gas.

In a cased-hole completion, small holes called perforations are made in the portion of the casing which passed through the production zone, to provide a path for the oil to flow from the surrounding rock into the production tubing. In

openhole completion, often ‘sand screens’ or a ‘gravel pack’ is installed in the last drilled, uncased reservoir section. These maintain structural integrity of the wellbore in the absence of casing, while still allowing flow from the reservoir into the wellbore. Screens also control the migration of formation sands into production tubulars and surface equipment, which can cause washouts and other problems, particularly from unconsolidated sand formations in offshore fields.

After a flow path is made, acids and fracturing fluids are pumped into the well to fracture, clean or otherwise prepare and stimulate the reservoir rock to optimally produce hydrocarbons into the wellbore. Finally, the area above the reservoir section of the well is packed off inside the casing and connected to the surface via a smaller diameter pipe called tubing. This arrangement provides a redundant barrier to leaks of hydrocarbons, as well as allowing damaged sections to be replaced. Also, the smaller diameter of the tubing produces hydrocarbons at an increased velocity in order to overcome the hydrostatic effects of heavy fluids, such as water.

In many wells, the natural pressure of the subsurface reservoir is high enough for the oil or gas to flow to the surface. However, this is not always the case, especially in depleted fields where the pressures have been lowered by other producing wells, or in low permeability oil reservoirs. Installing a smaller-diameter tubing may be enough to help the production, but artificial lift methods may also be needed. Common solutions include downhole pumps, gas lift or surface pump jacks. Many new systems in the last ten years have been introduced for well completion. Multiple packer systems with frac ports or port collars in an all-in-one system have cut completion costs and improved production, especially in the case of horizontal wells. These new systems allow casings to run into the lateral zone with proper packer/frac port placement for optimal hydrocarbon recovery.

1. What is the difference between an 'openhole completion' and a 'cased-hole completion'?
2. How is the flow of hydrocarbons into the well improved?
3. What artificial ways of bringing oil and gas to the surface are used?

***Task 3. Rearrange the steps described below into the most logical order, under each of the three stages*: Preparing the well, Running casing, Cementing:**

1. A cementing head is attached to the wellhead to receive slurry through a line from the pumps.
2. A temperature log is run to locate the top of the setting cement from the heat it gives off.
3. A wet slurry is prepared by mixing together sacks of dry cement and water.
4. Casing string is guided down the well using a guide shoe and centralizers.
5. Cement additives, for example, to retard or accelerate setting time, are added.
6. Mud is circulated for a period of time to remove any remaining cuttings.
7. One by one, each casing joint is stabbed into the casing string already in the hole.
8. The cement is allowed to set (waiting on cement, WOC) for 8 to 12 hours.

9. The cement slurry is pumped down the hole.
10. The joints are screwed together using casing tongs.
11. The threads of the joints are sealed tight with a thread compound.
12. The well is conditioned by running a drillstring with a used bit into the well.
13. The wiper plugs, guide shoe and any cement at the bottom are drilled out.
14. Two wiper plugs are run into the hole to force the slurry through the guide shoe and up into the annulus of the well.
15. Wall scratchers are run up and down or rotated in the well to scrape filter cake off the well sides.

Task 4. Read and translate the sentences into Russian. Do you think these sentences refer to openhole or cased-hole completions?

1. There is no casing in the producing formation.
2. It is more expensive because more casing is used.
3. It can only be used where the formation is clearly defined.
4. It cannot be used in soft formations which might cave into the well.
5. The casing is set before the pay is drilled.
6. In sand formations, an under reamer is run to make a cavity in the pay zone.
7. A gravel pack can be used to consolidate the soft formation.
8. Fluids can flow through a screen or slotted liner in the well.
9. Perforations are shot through the casing and cement and into the formation.

Task 5. Read about a Christmas tree. Give Russian equivalents to the highlighted words:

Christmas tree

Oil wells where oil can flow without artificial help (and gas wells which always flow naturally) are fitted with a Christmas tree - a series of pipes, fittings, valves and gauges. The ***Christmas tree*** is attached to the ***wellhead***, the large steel fitting on top of the well, consisting of *a* ***tubing head*** on top of the ***casinghead***. Sticking out of the lower section of the Christmas tree is the ***master valve***, to turn off the well in an emergency. Above that, there is one, or sometimes two, wings, depending on the number of producing zones being controlled. Each ***wing*** has a ***valve*** to regulate flow. At the top of the Christmas tree is a ***pressure gauge*** to measure tubing pressure.

Task 6. Design a PowerPoint slide entitled "Key Elements of a Completion System", comprising a list of the key elements and a short explanation of each, listed with a bullet points.

UNIT 30
SURFACE TREATMENT

Words to know

free-water	свободная вода

knockout	ловушка
compact	компактный
capture	брать и отделять от флюидов
droplets	капельки, вкрапления
vane	лопасть, флюгер
tangential	направленный по касательной
nozzle	сливной наконечник
centrifugal force	центробежная сила
drain	отвод воды
spin	закручивать
converge	сближаться, стекаться
vortex	вихрь, водоворот
mist	нефтяная пыль, дымка
diffusion	распространение, распыление
coalesce	сливаться, сращиваться
sweetening	очистка от активных соединений серы
impurity	загрязняющая примесь
corrosive gas	коррозионный газ

Task 1. Read the text and answer the questions:

Oil and Gas Separators

An oil and gas separator is used to separate oil, gas and water from the stream of fluids produced by a petroleum well. It can be either vertical or horizontal and can be either spherical or cylindrical in shape.

Separators can be divided into two types – two-phase and three-phase. The two-phase type handles only oil and gas, whereas the three-phase type deals with oil, gas and water. This type is commonly called 'free-water knockout'.

In addition, a separator can be categorized by operating pressure. Low-pressure separators operate from 10 to 180 psi (69 to 1241 kPa). Medium - pressure units handle pressures of 230 to 700 psi (1586 to 4826 kPa). High - pressure equipment can cope with pressures of 975 to 1500 psi (6722 to 10,342 kPa).

The separation is mainly achieved by the force of gravity, which means that the heaviest fluid settles to the bottom of the vessel and the lightest rises to the top. The degree of separation achieved will depend on the operating pressure of the separator, on the amount of time the fluid mixture spends in the vessel and on the flow rate of the fluids.

What are the main ways of categorizing oil and gas separators?
What are the key factors involved in separation?

Task 2. Read and translate the text. Discuss the difference between primary and secondary separation:

Primary and secondary separation

Separation

This compact, lightweight, vertical separator is ideally suited for separation processes containing moderate amounts of liquid (less than 500 barrels per MMscf).

NATCO's Porta-Test Whirlyscrub V™ Separator captures over 99.9% of all liquid droplets larger than microns, exceeding the performance of most vane-type separators. Over 35 years of experience with this product allows us to optimize the separator design for your application.

How It Works

Primary separation takes place as gas enters through a tangential nozzle, creating centrifugal force and forcing the heavier liquid particles to the vessel wall. From there, the liquids drain to the stilled chamber in the bottom of the vessel. Secondary separation occurs as the spinning gas converges at the centre of the separator and enters the vortex finder tube. Inside the vortex finder tube, the gas spins at a higher velocity and forces any remaining liquid to the tube wall.

This liquid is swept upward toward the gas outlet. Prior to exiting the vessel, the liquid and a 10% side stream of gas are drawn through a small gap in the vortex finder tube and returned to the primary separation section. A low pressure area in the primary separation section created by the spinning gas provides the necessary differential pressure driving force.

Task 3. Choose the best word to replace the underlined word or words in each sentence:

1. Every separator has a diffusion section that makes an initial separation of gas and liquid from the <u>entrance to the vessel.</u>

a) income b) inlet c) incline d) intend

2. Liquid <u>drops</u> to the bottom of the separator where the remaining gas is removed,

a) lowers b) reduces c) falls d) declines

3. Emulsion has droplets of liquid that are <u>held</u> in oil.

a) suspended b) depended c) upended d) pretended

4. In the diffuser section, fluids are <u>circulated rapidly</u> around the shell of the vessel,

a) circled b) rounded c) spun d) rotated

5. Mist extractors are used to coalesce and <u>take out</u> liquid droplets before the gas flows *out*

a) replace b) replenish c) restore d) remove

6. A back-pressure valve <u>keeps at the correct level</u> the gas pressure in the separator,

a) retains b) sustains c) detains d) maintains

7. In a free-water knockout separator, water is <u>taken</u> from the bottom, oil from the middle gas from the top.

a) drawn b) thrown c) blown d) grown

8. During the process of separating gas from liquid, liquid can be <u>soaked up</u> by silica or other suitable chemicals.

a) drained b) absorbed c) condensed d) evaporated

Task 4. Match the definitions to each processes carried out during the treatment of gas:

absorption, compression , conditioning, cooling, dehydration, stripping, sweetening

1. The removal of impurities (in general) from natural gas.
2. The removal of liquids (in general) from natural gas.
3. The removal of water from natural gas.
4. The removal of corrosive gases, such as $C0_2$ or H_2S, from natural gas.
5. Increasing pressure on natural gas, thereby reducing its volume.
6. Lowering the temperature of natural gas to remove hydrocarbon liquids.
7. Using special chemical products to soak up hydrocarbon liquids.

Task 5. Read the passage below and make notes on the use of each of the following methods of oil and gas measurement during storage and transfer on the surface:

- stock tanks
- a gauge tape
- a shake-out test
- turbine meter
- charcoal tests
- fractional analysis
- an orifice meter

Once the oil has been separated, it goes through a flowline to the stock tanks for storage, ready for transportation to the refinery by truck, tanker or pipeline. A battery of stock tanks holds a minimum of four days' production. A gauger measures the amount of oil in the stock tanks by lowering a gauge tape with a brass weight on the end into the tank. Samples of the oil are taken and the temperature of the oil is measured. It is also important to know the amount of impurities and this is done with a shake-out test. The sample is centrifuged in a glass container and, because the water and impurities are heavier than the oil, they fall to the bottom. The volume of oil being transferred can be measured using a turbine meter. The flow of oil turns the turbine at a steady rate and the number of turns is counted. For gas, compression or charcoal tests are used to measure the condensate content of the gas. Fractional analysis produces various measurements, including relative percentage of hydrocarbon and water. Gas volume is measured by passing the gas through an orifice – a small hole – and measuring the difference between the pressures on the two sides of the orifice.

UNIT 31
WOROVER

Words to know

producing well	эксплутационная скважина
outrigger	балка, кронштейн

bailer	желонка, черпак
abrasion	абразивное истирание
corrosion	химическое растворение, размыв
splits	трещины
holiday	пропуск при изоляции труб
packer	уплотнитель, пакер
sidetrack	откладывать, забуривать новый ствол скважины
clog	засориться, застопориться
paraffin knife	скребок для очистки труб от парафина
epoxy resins	компаунды
casing roller	оправка для ремонта обсадных труб
piston	поршень
milling	фрезеровка
scraper	ерш, скребок
debris	обломки породы
winch	лебедка

Task 1. Read the dialogue and discuss the questions:

AJ: So, what kind of work do they need to do during a work over?
OS: Often, you get a build-up of sand in the wellbore and that has to be removed.
You can do that by pumping salt water down the annulus or by running a bailer on a wire line. That's called a sand-control job. Sometimes, the casing gets damaged by abrasion or corrosion and that can make holes or splits in the lining.
AJ: Do you have to replace all the casing then?
OS: No, fortunately there are various solutions to avoid all that hassle and expense.
You can do a cement squeeze job ...
AJ: What's that then?
OS: That's when you fill gaps in the cement behind the casing. The gaps are called holidays and you have to isolate the zone using packers and then perforate the casing in that zone. Then you can pump the cement under pressure through the perforations and into the holiday.
AJ: Sounds good. Does any of the pumping equipment ever break?
OS: Yes, now and again, the pumping rod can wear out and the lower part can fall into the well.
AJ: So I guess you then have to use a fishing tool of some kind.
OS: That's right. One's called a mousetrap! And then there's sidetracking.
AJ: Sidetracking?
OS: Yeah, that's when there's something blocking the well that can't be removed or repaired. It has to be bypassed with a directional hole. A window is made in the casing just above the blockage and the well is plugged just below the window.

Then, a special directional tool is used to drill off at an angle from the main well. Then you can complete the hole in the normal way.
AJ: I think I've got that. Anything else?
OS: Well, there are other work over jobs, but I reckon those are the most common.
AJ: Thanks a lot, Orville.

1. Can you identify four different works over jobs that are mentioned?
2. Why is each job necessary?

Task 2. Here is a list of work over problems that can occur and a number of suggestions for they might be solved. Match the problems with the solutions:

1. A lot of sand is clogging the bottom of the well.
2. The casing has collapsed.
3. The pumping rod has broken in half and a piece has fallen down hole.
4. The well has fallen in and the tube is blocked. We can't get the tube out.
5. The tubing is clogged with wax.
6. The seals on the down hole pump are worn.
7. There are gaps in the cement behind the casing.
8. There's a lot of water and mud in the well.

a) Can we get it off with a paraffin knife?
b) Do you think we should do a swab job?
c) That means sidetracking, doesn't it?
d) They'll need replacing as soon as possible then.
e) We could either pump salt water down the annulus or we could stabilize it with an epoxy resin.
f) We'll have to call in the fishing crew.
g) We'll need to open it with a casing roller.
h) I reckon squeeze cementing is the best solution for that, don't you?

Task 3. Read this paragraph about swabbing and fill in the blanks with words from the box below:

attached, completed, hollow, killed, lower, piston, pressure, raised, removal, restore, retain, wire line

Swabbing is the (1) _____ or drilling mud from a well, so that the oil and gas can flow into the well. A swab job can be done both after the well is (2) _____ to remove the last of the drilling mud, or to (3) _____ production in a producing well. A truck-mounted swabbing unit with a short mast is used to (4) _____ a swab tool down the tubing string a (5) _____ A swab tool is a (6) _____ steel rod with rubber swab caps. When the swab tool is (7) _____, the swab caps seal against the tubing to act as a (8) _____ and lift (swab out) the liquid from the well. A lubricator (a length of casing or tubing) is temporarily (9) _____ above the valve on the tubing

head or casing head to provide a pressure seal.

The swab tool can be run into the well under (10) _____ through the lubricator, so well doesn't have to be (11) _____ during swabbing. An oil saver is used on top of the lubricator to (12) _____ any oil coming up on the wire line.

Task 4. Complete these sentences by adding suitable prepositions:

1. _____ work over operations, a rig is mounted _____ a truck or trailer _____ the well and uses a winch driven _____ the truck engine.
2. _____ stability, guy wires are attached _____ the mast and _____ anchors _____ the ground.
3. _____ a coiled tubing unit, the tubing is wound _____ a reel. It is unwound _____ the reel and lowered _____ the well.
4. The well is killed _____ filling it _____ kill fluid, pumped _____ the casing tube annulus _____ pressure _____ the tubing string is full.

UNIT 32
PETROLEUM PRODUCTION

Words to know

well stimulation	возбуждение скважины
reactivate	оживлять, возобновлять
fracture	образовывать трещины
acidizing	проводить кислотную обработку
waterflood	закачивать воду в нефтяную скважину
radial	радиальный, лучеобразный
fractures	трещины, разломы
paraffin	парафин
mud cake	фильтрационная корка бурового раствора
heterogeneous	неоднородный
intersect	пересекать
etch	травить, продавливать
ceramic beads	керамические валики
sintered	спекшийся
bauxite	боксит, алюминиевая руда
slimy	вязкий, скользкий

Task 1. Read the article from Oil Voice magazine and answer the question:

Can you identify three techniques that were used in Orenburg to produce oil?

Successful Well Stimulation in Orenburg, Russia

Aladdin Oil & Gas Company ASA has completed the well stimulation on Well #51 at the Bogdanovskaya license in Orenburg. The well is now in production, producing 100 barrels of oil per day. Through the use of pumps, the production is expected to increase further.

The work is conducted by Schlumberger's Russian subsidiary, Petroalliance, and is completed according to the stimulation programme developed by the consultancy TRACS. The TRACS programme is providing the expected results, about 100-150 barrels per stimulated well.

Petroalliance will immediately initiate the stimulation of Well #39, and thereafter go to Well #41 and #33, as the equipment is within reach in the Orenburg region throughout the spring. Simultaneously, Well #65 will be reactivated. Subsequently, sidetrack drilling of Well #34 and #47 will be commenced. The sidetrack drilling is expected to give somewhat higher production rates, compared to ordinary well stimulation.

Aladdin Oil & Gas Company reiterates the production target of 700–1,000 barrels per day for the existing wells.

Task 2. Give Russian equivalents to the following expressions:

Well stimulation, multiple fracturing, hydraulic fracturing, well clean-up acidizing, enhanced production, water flood.

Task 3. Read and translate the text. Discuss the question:

The GasGun

How it works

Creates multiple radial fractures extending 10 to 50 feet from the wellbore. Minimal vertical growth avoids problems often associated with hydraulic fracturing.

Removes skin and cleans up the wellbore damaged by perforators, drilling fines, cement, paraffin, mud cake, etc.

Stimulates heterogeneous production zones, such as lenticular sands, with a higher probability of success. Fractures reach out in several directions, thus increasing your chance of intersecting the producing formations.

Improves effectiveness of acidizing by fracturing first with the GasGun, allowing acid to etch new channels into formation.

Enhances production in naturally fractured reservoirs by intersecting more fractures.

Prepares well for hydraulic fracturing by breaking down formation first with the GasGun. Treating pressures are often dramatically reduced.

Increases injection and withdrawal rates in gas storage wells damaged by compressor oils.

Improves waterflood efficiency by providing increased and more uniform injection rates.

Which functions does the GasGun fulfil?

Task 4. Put the following steps into the correct order of fracture stimulation:

Frac Job or Fracture Stimulation

1. The well is then reopened and is ready to test.
2. There is a substantial amount of effort spent designing the correct type of frac job for well. The cost to perform a frac job ranges from $50,000 to more than $1 million,

depending on the size and complexity of the job.
3. These fractures are extended a long distance from the well by pumping this proppant-loaded frac fluid at a high enough pressure to continue cracking the rock.
4. This crack is then filled with sand or an artificial proppant (ceramic beads, sintered bauxite or glass beads) to allow the freer flow of oil or gas from the rock to the wellbore.
5. This is a technique used by engineers to create a crack or fracture in the rock that contains oil or gas.
6. This process is carried out using trucks equipped with high-pressure pumps and sand/proppant mixers (called 'blenders') mixing the proppant with an engineered 'frac fluid' (usually a slimy looking watery substance) that is pumped down the well until the rock actually cracks or fractures.
7. When the process is complete, the well is closed and the fluid and proppant allowed to settle.

Task 5. Which of these verbs can be used to complete the following sentence?

allowed, avoided, cut, damaged, enhanced, improved, increased, inhibited, performed, provided, reached, reduced, removed, stimulated

We have _____ production by around 150 barrels per day.

Task 6. Prepare a short presentation slide about different techniques of producing well.

UNIT 33
IMPROVED OIL RECOVERY

Words to know

oil recovery	добыча нефти, нефтеотдача
displace	перемещать
thermal recovery	тепловая добыча
dissolve	растворяться
detergent	вспенивающий агент
surfactant	сурфактант
hamper	тормозить, затруднять
unpredictability	непредсказуемость
fertilizer	удобрение
reservoir	месторождение, нефтеносный слой
drive	вытеснение
bubble out	пузыриться, булькать
gas cap	газовая шапка, газовый купол
slug	водяная пробка
miscible	способный смешиваться

Task 1. Read and translate the text. Answer the questions:

Primary, secondary and tertiary recovery

So, what exactly is the purpose of enhanced recovery? Well, as I'm sure you know, crude oil development and production in US oil reservoirs can include up to three distinct phases: primary, secondary and tertiary (or enhanced) recovery. During primary recovery, the natural pressure of the reservoir or gravity drives oil into the wellbore, combining with artificial lift techniques (such as pumps) to bring the oil to the surface. But only about 10% of a reservoir's original oil in place is typically produced during primary recovery. Secondary recovery techniques add to the field's productive life by injecting water to displace the oil and drive it to a production wellbore, resulting in the recovery of another 20 to 40% of the original oil in place. However, a lot of the easy- to-produce oil has already been recovered from US oilfields, and so producers are increasingly using tertiary or enhanced oil recovery (also called EOR) techniques that offer us prospects for ultimately producing 30 to 60% or more of a reservoir's original oil in place.

1. What is the difference between primary, secondary and tertiary recovery?
2. Why are US producers using tertiary recovery now?

Task 3. Read the extract and discuss how each method works:

Enhanced recovery methods

Three major categories of EOR have been found to be commercially successful in varying degrees. First of all, there's thermal recovery, which involves the introduction of heat, such as the injection of steam to lower the viscosity or thin the heavy viscous oil, and improve its ability to flow through the reservoir. Thermal techniques account for over 50% of US EOR production, primarily in California.

Then there's gas injection, which uses gases such as natural gas, nitrogen or carbon dioxide that expand in a reservoir to push additional oil to a production wellbore, or other gases that dissolve in the oil to lower its viscosity and improve its flow rate. Gas injection accounts for nearly 50% of EOR production in the United States.

And thirdly, there's chemical injection, which can involve the use of long-chained molecules called polymers.

These increase the effectiveness of waterfloods, or the use of detergent-like surfactants, to help lower the surface tension that often prevents oil droplets from moving through a reservoir. Chemical techniques account for less than 1 % of US EOR production. However, these techniques have been hampered by their relatively high cost and, in some cases, by the unpredictability of their effectiveness.

Task 4. Read the extract and make notes on each of the projects:

$C0_2$ gas injection

The EOR technique that is attracting the most new market interest is carbon

dioxide ($C0_2$) EOR. New technologies are being developed to produce $C0_2$ from industrial applications, such as natural gas processing, fertilizer, ethanol and hydrogen plants in locations where naturally occurring reservoirs are not available. One demonstration at the Dakota Gasification Company's plant in Beulah, North Dakota, is producing $C0_2$ and delivering it by a new 204-mile pipeline to the Weyburn oilfield in Saskatchewan, Canada. Encana, the field's operator, is injecting the $C0_2$ to extend the field's productive life, hoping to add another 25 years and as much as 130 million barrels of oil that might otherwise have been abandoned.

We are funding another project in the Hall-Gurney field in Kansas, seeking to demonstrate that $C0_2$ EOR can provide energy, economic and environmental benefits. A companion project underway in the Hall-Gurney field involves testing the feasibility of 4D high resolution seismic monitoring of $C0_2$ injection in thin, relatively shallow mature carbonate reservoirs. Incorporating this kind of time-lapsed monitoring data into $C0_2$-E0R programmes could dramatically improve the efficiency and economics of using the technology in many midcontinent fields.

Task 5. Read and translate the following paragraphs about three types of oil reservoir drive:

Natural drives

Dissolved Gas Drive

When a well is drilled, pressure on the oil in the reservoir can be released and gas can bubble out of the oil. The pressure of the oil forces the oil through the rock into the well. This type of drive reservoir is very inefficient. It has a very rapid decline in both reservoir pressure and oil production rate, as the oil is produced. There is a very rapid increase in the gas/oil ratio near the end of production.

Free Gas Cap Expansion Drive

In some fields, there is a gas cap above the oil which expands in production and puts the oil under pressure. This type of drive shows a moderate fall in reservoir fluid pressure and production as the oil is produced. The gas/oil ratio rises sharply when the oil has nearly all been produced.

Water Drive

Reservoirs with water drive are driven by the expansion of water below or adjacent to the reservoir. As the oil is produced, it is replaced by water. An active water drive exerts almost constant reservoir pressure and oil production throughout the life of the well. Gas/oil remains the same, but eventually, when the reservoir 'goes to water', water production increases dramatically.

Task 6. Read the description of five types of improved recovery. Each has a key phrase missing. Which key phrase belongs to each description and where should it be inserted?

and make it more fluid, in separate slugs, some of the remaining, that dissolves in the oil, to sustain the fire

Once the natural drive of the reservoir is exhausted, oil companies turn to other methods to boost recovery:

1. ***Waterflood:*** This technique is usually the first to be tried after primary production. It involves injecting water through injection wells. The water forces the oil through to producing wells. It can recover 5 to 50% of the remaining oil in place.
2. ***Miscible gas process***: This technique involves injecting a gas (usually carbon dioxide or liquid petroleum gas) into the reservoir. It can recover about 35% of the remaining oil.
3. ***Chemical flood:*** This technique involves injecting different chemicals, each serving a different purpose, into the depleted reservoir. This recovers around 40% of remaining oil, but can only be used in sandstone reservoirs, not carbonates.
4. ***Steamflood:*** This technique involves using heat to make heavy oil more fluid for recovery. Steam is injected into the reservoir to heat the oil. Recovery rates can vary from 25% to 60% of the oil in place.
5. ***Fire flood:*** This is another thermal technique in which subsurface oil is set on fire and air is injected into the reservoir. The oil becomes more fluid and flows towards the producing wells. Approximately 30 to 40% recovery is expected with this method.

UNIT 34
PIPELINES

Words to know

dual	двойственный, двойной
sabotage	вредить
warning system	система оповещения
interference	нарушение, вмешательство
tamper	испортить
locate	располагаться
disruption	разрывание
fibre-optic	стекловолоконный
rupture	пробой
tamper proof	защищенный от воровства
turnkey system	полностью готовая система
immune	устойчивый
intrusion	нарушение, неправомерный захват
irrespective of	независимо от
regardless of	независимо от
threat	угроза, опасность
robust	крепкий
terrain	местность, территория
delivery	доставка
foolproof	несложный, понятный всем

Task 1. Read and translate the text. Discuss the questions:

Westminster Dual Purpose Pipeline Security and Leak Detection System

The protection of pipelines against sabotage, illegal tapping and terrorist action, combined with the detection of leaks in buried pipelines, etc., is a high priority in all countries, but until now has been notoriously difficult to achieve.

The Dual Purpose Pipeline Security/Leak Detection System is an entirely new advanced early warning system for the detection of third party interference (TPI) tampering and illegal tapping attempts, as well as locating leaks in buried oil, gas and liquid pipelines.

Leaks, damage, illegal tapping and sabotage to pipelines is a worldwide problem costing pipeline operators millions of dollars a year in disruption and lost production, not to mention loss of life that often occurs. Westminster's unique solution to the problem is to provide a Dual Purpose Pipeline Security and Leak Detection System utilizing a single fibre-optic cable run adjacent to the pipeline.

This system allows the detection of illegal tapping or sabotage of the pipeline, while also providing the benefit of real-time monitoring against any ruptures or leaks.

Product Benefits

Early warning of leaks
Early warning of potential disruption
Immediate and accurate location of disturbance
Tamperproof
Easy to install and low maintenance
High levels of physical security
Low risk of service interruptions
Turnkey system

Why is the system 'dual purpose'? How does it work?

Task 2. Prepare a short presentation slide about one of the following pipelines:

Baku-Novorossiysk
Brent System, Kazakhstan-China
Trans-Alaska
Yamal-Europe.

Make notes on the information, such as:
the building of the pipeline – the date, the ownership, etc.
technical information – the length, the capacity, the diameter, the pressure.
any other information – problems, future developments, etc.

Task 3. Read and translate the text:

Pipeline systems

Pipeline networks are composed of several pieces of equipment that operate together to move products from one location to another.

Initial Injection Station: Known also as Supply or Inlet Station, is the beginning of the system, where the product is injected into the line. Storage facilities,

pumps or compressors are usually located at these locations.

Partial Delivery Stations: Known also as Intermediate Stations, these facilities allow the pipeline operator to deliver part of the product being transported.

Compressor/Pump Stations: Pumps for liquid pipelines and compressors for gas pipelines, are located along the line to move the product through the pipeline. The location of these stations is defined by the topography of the terrain, the type of product being transported or operational conditions of the network.

Block Valve Stations: These are the first line of protection for pipelines. With these valves, the operator can isolate any segment of the line for maintenance work or isolate a rupture or leak. Block valve stations are usually located every 20 to 30 miles (48 km), depending on the type of pipeline.

Final Delivery Station: Known also as Outlet Stations or Terminals, this is where the product will be distributed to the consumer. It could be a tank terminal for liquid pipelines or a connection to a distribution network for gas pipelines.

Task 4. Fill in the blanks in the sentences below using the figures given in the box. Use the following approximate conversions to help you:

One mile is around 1.8 kilometres.
There are 12 inches in a foot.
One metre is just under 3 feet.
One inch is approximately 2.5 centimetres.

12 and 24 metres long., 2 inches to over 60 inches, 5 and 20 feet per second, a 6-mile stretch, 10 to 120 centimetres, of about 1 to 2 metres

1. The first pipeline covered _____ from an oilfield in Pennsylvania to the nearest railway station.
2. A typical diameter for an oil pipeline ranges from _____ .
3. Pipelines are normally buried at a depth _____ .
4. Oil flows at a speed of between _____ .
5. Natural gas pipelines have a greater range of diameters than oil pipelines, varying from _____ .
6. A typical length of pipeline is between _____ .

Task 6. Match the two parts of each sentence. Some may have more than one solution:

1. It is notoriously	a. to electromagnetic interference.
2. This is an entirely	b. system monitoring.
3. We are dealing with worldwide	c. solution to the problem.
4. We can offer a unique	d. security problems.
5. You will have real-time	e. robust machine.
6. It is completely immune	f. reliable employee.
7. It is an extremely	g. new system.
8. He is a highly	h. foolproof technique.

9. It is an absolutely	i. difficult to achieve.

UNIT 35
TANKERS

Words to know

crude carrier	нефтеналивное судно, танкер
spare oil tanker	запасной, свободный танкер
tanker fleet	танкерный флот
surge up	нарастать, увеличиваться
earnings	прибыль, доход
profit	прибыль, доход
oil spill	утечка, разлив нефти
slick of oil	нефтяное пятно
seafront	приморская часть города
monsoon	дождливый сезон, муссон
seep	просачиваться, протекать
tank vessel	наливное судно, цистерна
collision	столкновение
grounding	посадка на мель
hull failure	пробои в корпусе корабля

Task 1. Read the extracts from three articles about oil tankers. Which article is from a) a daily newspaper, b) a specialist oil and gas industry magazine, c) an online encyclopedia?

Extract 1

A lack of spare oil tankers and an increase in OPEC production are driving shipping rates to record highs, said Morten Arntzen, CEO of Overseas Shipholding Group, the largest US-based oil tanker owner. 'This is the first time in 31 years that we've had close to 100% utilization of the world's tanker fleet,' Arntzen said last week. Higher rates caused third-quarter earnings for tanker owners to surge up to ten times over from a year earlier. Overseas Shipholding boosted earnings by a factor of five, and Teekay saw its profit jump more than tenfold. Fourth-quarter earnings may show steeper gains because rates have climbed since late September. Royal Dutch-Shell Group of Companies chartered the Crown Unity, one of Overseas Shipholding's 22 very large crude carriers, to transport two million barrels of oil from the Arabian Gulf to Europe last week for $183,113 a day, according to data compiled by Bloomberg and a formula on the website of Norway-based ship broker R.S. Platou. That's more than ten times Overseas Shipholding's break-even cost of $17,400 a day for giant crude carriers.

Extract 2

Pakistani port officials warned yesterday that they faced a major oil spill along the southern coastline after a tanker that ran aground in heavy storms began

to crack open. A growing slick of oil washed ashore along the main beaches outside Karachi, bringing toxic fumes and hundreds of dead fish, sea birds and turtles. More than 1,000 policemen, equipped with masks, were deployed to close the seafront. Around ten miles of beach, which every evening is normally filled with families, has been closed. The single-hull tanker, Tasman Spirit, ran aground in heavy monsoon storms more than two weeks ago. Salvage experts managed to retrieve some of the 67,500 tonnes of Iranian crude oil it was carrying, but more than 40,000 tonnes remained on board, port officials said. If the rest seeped into the sea, it would become one of the world's worst oil spills.

Extract 3

Oil tankers are only one source of oil spills. According to the United States Coast Guard, 35.7% of the volume of oil spilled in the United States from 1991 to 2004 came from tank vessels (ships/barges), 27.6% from facilities and other non-vessels, 19.9% from non-tank vessels, and 9.3% from pipelines; 7.4% came from mystery spills. On the other hand, only 5% of the actual spills came from oil tankers, while 51.8% came from other kinds of vessels. The detailed statistics for 2004 show tank vessels responsible for somewhat less than 5% of the number of total spills, but more than 60% of the volume. In summary, spills are much more rare, but much more serious on tank vessels than on non-tank vessels. The International Tanker Owners Pollution Federation has tracked 9,351 accidental spills that have occurred since 1974. According to this study, most spills result from routine operations, such as loading cargo, discharging cargo and taking on fuel oil. 91% of the operational oil spills are small, resulting in less than seven metric tons per spill. On the other hand, spills resulting from accidents, like collisions, groundings, hull failures and explosions, are much larger, with 84% of these involving losses of over 700 metric tons.

Task 2. Read the extract from an informal discussion between two managers from Overseas Shipholding, Rob McAndrew and Barry Delaney. Complete the conversation using information from Extract 1 to help you. You will need to change the wording slightly to suit the conversation better, but there are no fixed answers:

RM: Have you seen our profit figures for the third quarter?
BD: Not yet. Is it good news?
RM: Yes, definitely. (1) _____ .
BD: That's excellent.
RM: It is, but it's not as good as Teekay's figures.
BD: Really, how did they do?
RM: (2)_____.
BD: That's incredible. Why is the industry doing so well?
RM: Well, two reasons really. (3)_____.
BD: I see. How much do we charge to charter a tanker?
RM: Approximately (4)_____.
BD: And what's our break-even?
RM: Somewhere in the region of (5)_____.

BD: So we're making nearly 1,000% profit!
RM: That's about right, yes. Amazing, isn't it!

Task 3. From the information provided in Extract 3, complete the following statistical table showing the sources of oil spills in the United States between 1991 and 2004. Write 'not known' where there is insufficient information to complete the table. What can be concluded from the data?

Oil Spills in the United States between 1991 and 2004

Source of oil	% by volume of oil spilt	% by number of incidents

Task 4. Prepare a short presentation slide about oil spills.

UNIT 36
SCIENCE IN THE OIL AND GAS INDUSTRY

Words to know

assay	проба, анализ, взятие проб
crude oil	сырая, неочищенная нефть
assessment	оценка, оценивание
mercury	ртуть
database	база данных
refinery	нефтеперерабатывающий завод
cargo	груз
purchase	закупка; поднятие груза
a range of	разнообразие, количество
liquefied	разжиженный, расплавленный
subject	подвергать
measurement	измерение, система мер, параметр
feedstock	сырье, заготовки
pour point	температура текучести
transparent	бесцветный, прозрачный

Task 1. Read the following extract from the website of an assaying company called Intertek (www.intertek-cb.com). What services does the company provide?

Assaying services

Full petroleum assay testing services are provided by Intertek through a global network of experienced crude oil laboratories. The Intertek crude oil labs perform detailed hydrocarbon analyses, staffed by expert petroleum chemists with

state-of-the-art instrumentation. Intertek is the world's premier independent petroleum laboratory network, with the expertise and capabilities required for full crude oil assay assessments and detailed hydrocarbons analysis. Assay assessment includes:
Full petroleum assay testing and analysis
Full assay reporting
Full crude oil characterization
Detailed hydrocarbon analysis
Methanol in crude monitoring
Mercury in crude analysis
Enter, smooth and graphically display laboratory crude assay data
Store published crude assay in a secure database
Compare graphically current crude assay to reference assay.

«Superb support from Intertek allowed crude oil samples to be analyzed and approved in 24 hours while the cargo was still at sea, enabling the crude oil to be optimally utilized by our refineries and enabled the purchase of a second cargo only four days later».

Task 2. Read the extract from Statoil's website (www.statoil.com). In chemical terms, what do you think is the meaning of the words 'premium', 'light' and 'sweet'? (NB: 'API' is a measurement of crude oil quality from the American Petroleum Institute):

Crude Oil Assays

Statoil is the world's third largest exporter of crude oil and the leading producer of North Sea crude. We can offer a variety of crudes from a range of more than twenty. Most of the crudes marketed by Statoil are premium, light, sweet grades.

– Azeri Light is a light, low sulphur crude oil.
Region: Asia
Quality: API between 30-40
– Dalia is a medium density, low sulphur crude oil.
Region: Africa
Quality. API between 20-30
– Ekofisk Blend is a light, low sulphur North Sea crude oil.
Region: Europe
Quality: API between 30-40
– Grane is a heavy, high TAN North Sea crude oil
Region: Europe
Quality: API below 20
– Hungo Blend is a medium density, medium sulphur crude oil.
Region: Africa
Quality API between 20-30
– Lufeng is a medium density, low sulphur, waxy crude oil.
Region: Asia
Quality: API between 30-40

Task 3. Complete the passage below using the words in the box:

content, dependent, determined, form, liquefied, proportions, subjected, types, whereas, yield

Crude oil and natural gas consist of hydrogen and carbon in different (1) _____. For example, crude oil contains between 84 and 87% carbon, (2) _____ natural gas contains between 65 and 80% carbon.

In crude oil, there are four (3) _____ if hydrocarbon molecule:

– the paraffin or alkane molecule
– the napthene or cycloparaffin molecule
– the aromatic or benzene molecule
– the asphaltic molecule.

The physical properties of crude oil are (4) _____ by the relative percentage of these different hydrocarbon molecules. In turn, the quality and therefore the value of the product are also (5) _____ on what can be refined from the crude oil.

Broadly speaking, the greater the (6) _____ of asphaltic molecules there is, the more the crude oil can be refined into high-grade gasoline or asphalt. On the other hand, the greater the content of paraffin molecules, the waxier the crude, and therefore the greater the (7) _____ of lubricating oil and kerosene.

In refining, oil is (8) _____ to heat in a distilling column and products are extracted in liquid (9) _____ as they cool, with different products being extracted at different temperatures. The most demanded product in refining is gasoline, followed by heating fuel, jet fuel and then a number of less-produced products, including (10) _____ gases and various petro-chemical feedstock, such as methane, ethylene and propylene.

Task 4. Read the text and answer the questions that follow:

When purchasing crude oil, refiners are interested in the following information:

Origin. The oilfield of origin indicates the quality of the crude. Oil companies often sell a blend of crudes from different fields.

API. This stands for American Petroleum Institute and is a measure of the density of the oil. The higher the number, the lighter the oil. Light oils, often transparent in colour and very fluid, have an API of between 35 and 45. Heavy oils, which are very viscous and dark-coloured have an API of below 25.

Sulphur content. Sulphur is an undesirable element in crude oil and needs to be removed during the refining process.

Crude oil is called sweet or sour, depending on its sulphur content. Sweet crudes have less than 1 % sulphur content by weight, sour crudes somewhere over 1 %.

Pour point. This indicates the amount of wax in a crude oil and is the lowest point at which the oil will still pour before it solidifies. A waxy crude oil is found in liquid form below the surface before it is extracted, but can solidify as it is brought out of the ground and this can lead to clogging in the tubing of the well.

Crude oils are often measured against a benchmark, such as Brent from the

North Sea, which has an API of 33 and a sulphur content of 0.3%.

1. Are there any blended crudes on the list?
2. Which is the heaviest oil on the list?
3. Which oils would be transparent in colour?
4. Which crude might clog as it is extracted from the ground?
5. Which crudes are closest to the Brent crude benchmark?

Task 5. Look through the operations which are involved in different kinds of testing or analysis. Give them Russian equivalents. Do you know any other scientific operations not mentioned here?

Analyzing	Assaying	Benchmarking	Disseminating
Gauging	Interpreting	Logging	Measuring
Monitoring	Plotting	Recording	Reporting
Researching	Sampling	Surveying	

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное учреждение
высшего образования
«СЕВЕРО-КАВКАЗСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»

МЕТОДИЧЕСКИЕ УКАЗАНИЯ
по организации и проведению
самостоятельной работы

АНГЛИЙСКИЙ ЯЗЫК В НЕФТЕГАЗОВОЙ СФЕРЕ

Направление	21.04.01 Нефтегазовое дело
Направленность (профиль)	«Строительство глубоких нефтяных и газовых скважин в сложных горно-геологических условиях"

Ставрополь 2026

Методические рекомендации предназначены для студентов вуза «Северо-Кавказский федеральный университет»

Цели методических рекомендаций:

1. Методическое сопровождение процесса введения и реализации требований Федерального государственного образовательного стандарта высшего образования (далее ФГОС ВО), помощь при разработке рабочих учебных программ дисциплин и профессиональных модулей образовательной программы (далее ОП).

2. Создание в образовательном учреждении учебно-методического обеспечения образовательного процесса.

Методические рекомендации определяют сущность самостоятельной работы студентов в вузе, её назначение, планирование, формы организации и виды контроля.

Содержание

1. Нормативное обеспечение самостоятельной работы в ФГОС ВО

1.1. ФГОС раздел: «Требования к условиям реализации ОП»:

– Требования к обязательному минимуму содержания образовательной программы подготовки специалиста, к условиям ее реализации и срокам ее освоения определяются настоящим федеральным государственным образовательным стандартом;

– основная образовательная программа подготовки специалиста состоит из дисциплин общенаучного и профессионального циклов, состоящих из базовой и вариативной частей и дисциплин по выбору;

– максимальный объем учебной нагрузки студента устанавливается 54 часа в неделю, включая все виды аудиторной и внеаудиторной (самостоятельной) учебной работы.

Во время самостоятельной подготовки обучающиеся должны быть обеспечены доступом к сети Интернет. Реализация образовательной программы подготовки специалиста должна обеспечиваться доступом каждого студента к библиотечным фондам и базам данных, формируемым по полному перечню дисциплин образовательной программы из расчета обеспеченности учебниками и учебными пособиями не менее 0,5 экземпляра на одного студента. Библиотека вуза должна иметь достаточное количество современных учебников и учебных пособий по всем циклам дисциплин и постоянно восполняться научной литературой и периодическими изданиями нефтегазового профиля

Объем времени, отведенный на внеаудиторную самостоятельную работу, находит отражение:

- в рабочем учебном плане – в целом по теоретическому обучению, каждому из циклов дисциплин;
- в рабочих программах учебных дисциплин циклов дисциплин с распределением по разделам или конкретным темам.

2. Назначение и виды самостоятельной работы студентов.

Самостоятельная работа проводится с целью:

- систематизации и закрепления полученных теоретических знаний и практических умений студентов;
- углубления и расширения теоретических знаний;
- формирования умений использовать нормативную, правовую, справочную документацию и специальную литературу;
- развития познавательных способностей и активности студентов: творческой инициативы, самостоятельности, ответственности, организованности;
- формирование самостоятельности мышления, способностей к саморазвитию, совершенствованию и самоорганизации;
- формирования практических (общеучебных и профессиональных) умений и навыков;
- развитию исследовательских умений.

В учебном процессе ОУ выделяются два вида самостоятельной работы:

Внеаудиторная самостоятельная работа - планируемая учебная, учебно-исследовательская, научно-исследовательская работа студентов, выполняемая во внеаудиторное время по заданию и при методическом руководстве преподавателя, но без его непосредственного участия.

3. Контроль самостоятельной работы студентов преподавателями.

Контроль самостоятельной работы студентов предусматривает:

- соотнесение содержания контроля с целями обучения;
- объективность контроля;
- валидность контроля (соответствие предъявляемых заданий тому, что предполагается проверить);
- дифференциацию контрольно-измерительных материалов.

Формы контроля самостоятельной работы

1. Просмотр и проверка выполнения самостоятельной работы преподавателем.
2. Самопроверка, взаимопроверка выполненного задания в группе.
3. Обсуждение результатов выполненной работы на занятии.
4. Тестирование.
5. Письменный опрос.
6. Устный опрос.
7. Индивидуальное собеседование.
8. Коллоквиум.
9. Отчет о проделанной работе.
10. Защита рефератов или курсовой работы.
11. Творческий конкурс.
12. Интернет - конференции.
13. Контрольная работа.

Критерии оценки результатов самостоятельной работы

Критериями оценок результатов внеаудиторной самостоятельной работы студента являются:

- уровень освоения студентов учебного материала;
- умения студента использовать теоретические знания при выполнении практических задач;
- формирование набора из общекультурных и профессиональных компетенций будущего специалиста;

- умения студента активно использовать электронные образовательные ресурсы, находить требующуюся информацию, изучать ее и применять на практике;
- обоснованность и четкость изложения ответа;
- оформление материала в соответствии с требованиями;
- умение ориентироваться в потоке информации, выделять главное;
- умение четко сформулировать проблему, предложив ее решение, критически оценить решение и его последствия;
- умение показать, проанализировать альтернативные возможности, варианты действий;
- умение сформировать свою позицию, оценку и аргументировать ее.

Содержание внеаудиторной самостоятельной деятельности студентов

Методические указания для студентов по выполнению самостоятельной работы:

1. Подготовка к лекциям
2. Подготовка к практическим занятиям