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E. R. Vasilyeva, A. R. Nurutdinova

PETROLEUM ENGINEERING: THE «INTEGRATED» CONTROL TO ADVANCE THE PROFESSIONAL COMMUNICATIVE COMPETENCIES

Study Guide

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Reviewers:
Associate Professor of Higher School of International Relations and Oriental Studies of Institute of International Studies of Kazan Federal University, candidate of Philological Sciences N. O. Samarkina
Associate Professor, Head of the Department of Humanities and Socio-Economic Sciences at Ufa State Petroleum Technological University, Candidate of Philological Sciencies L. Z. Samigullina

Vasilyeva E. R.
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The study guide "Petroleum Engineering: the «integrated» control to advance the professional communicative competencies" combines two directions, an introduction to the oil and gas industry and the mastery of basic oil and gas terminology in Russian and English. The block of written exercises is for practicing the new English-Russian oil and gas terminology and introducing it into the passive vocabulary for use in a written speech.

This study guide is primarily intended for students studying in the specialty programs (21.05.06 «Oil and Gas Engineering and Technology»), bachelor's (21.03.01 « Oil and Gas Engineering»), master's (21.04.01 « Oil and Gas Engineering»), 21.03.00 «Practical geology, Mining, Oil and Gas Engineering and geodesy», also for students of linguistic educational institutions 45.04.01 «Phylology», as well as for conference interpreters and translators, working or planning to work in oil and gas industry, for employees of oil and gas producing, upstream companies, refining companies, oilfield services companies, including auxiliary service employees of oil companies and all people, planning their activities in this field, and having high level of English proficiency.

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ВВЕДЕНИЕ

Учебное пособие «Petroleum Engineering: the «integrated» control to advance the professional communicative competencies» было подготовлено на основе разработок, публикаций, научной, учебной и практической деятельности, проводимой нами, начиная с 2018 года. Учебное пособие имеет практическую направленность и значимость.

Данное учебное пособие предназначено для организации работы на практических занятиях по учебным дисциплинам «Английский язык» (продвинутый уровень), «Профилированный иностранный язык», «Иностранный язык делового и профессионального общения», «Иностранный язык в профессиональной коммуникации», «Профессиональный иностранный язык», «Английский язык в профессиональной коммуникации (инженерно-технические тексты)», которая является важной составной частью в системе подготовки специалистов.

Учебное пособие может использоваться как на учебных занятиях, которые проводятся под руководством преподавателя, так и для самостоятельного выполнения практических заданий, предусмотренных рабочей программой во внеаудиторное время. Формируемые в процессе практических работ умения могут быть использованы обучающимися в будущей профессиональной деятельности. Обучающийся использует приобретенные знания и умения в практической и профессиональной деятельности, повседневной жизни.

Задачи учебного пособия:

- обеспечить усвоение англо-русской нефтегазовой терминологии путем выполнения блока письменных упражнений для введения комплекта предлагаемой терминологии в пассивный словарь учащихся с дальнейшим применением в письменной речи;
- обеспечить усвоение англо-русской нефтегазовой терминологии путем выполнения блока упражнений для введения комплекта предлагаемой терминологии в активный словарь учащихся с дальнейшим применением в устной речи.

Практические задания способствуют формированию следующих общих и профессиональных компетенций:

– Понимать сущность и социальную значимость будущей профессии, проявлять к ней устойчивый интерес.

– Организовывать собственную деятельность, исходя из цели и способов ее достижения, определенных руководителем.

– Осуществлять поиск информации, необходимой для эффективного выполнения профессиональных задач.

– Работать в команде, эффективно общаться с коллегами, руководством, клиентами.

Данное учебное пособие предназначено также для устных и письменных переводчиков, работающих или планирующих работать в

нефтегазовой отрасли, а также профильных и непрофильных сотрудников нефтегазодобывающих, нефтеперерабатывающих и нефтесервисных компаний, студентов нефтегазовых и лингвистических учебных заведений, и всех лиц, планирующих свою деятельность в этой области, и имеющих уровень владения английским языком выше среднего.

Для успешной работы в нефтегазовой отрасли переводчику недостаточно иметь общую подготовку и знания английского языка и владеть навыками перевода. Очень важно понимать предмет перевода, разбираться в процессах и оборудовании нефтегазовой отрасли, знать и правильно применять специализированную английскую и русскую нефтегазовую терминологию.

Для достижения необходимого уровня профессиональной компетенции есть два пути. Долгий путь – это длительная работа в нефтегазовой компании с постепенным обучением и набором необходимого словарного запаса.

К сожалению, на это уходят годы, а приобретенные знания являются обрывочными и не систематизированными. Второй путь – это обучение, в процессе которого учащийся получает все необходимые для него систематизированные знания и усваивает специально подготовленный для него комплект основной профессиональной терминологии.

Блок письменных упражнений предназначен для отработки новой англо-русской нефтегазовой терминологии и ее введения в пассивный словарь для использования в письменной речи. Упражнения основаны на изучении текста на английском языке по теме, с последующим выполнением упражнений как ответы на вопросы, перевод с русского языка на английский и с английского на русский, выбор правильного ответа, подготовки описаний и определений и т.д. Выполнение практических заданий позволяет освоить комплекс работ по выполнению переводов, речевого общения, понимания текстов, построенных на языковом материале повседневного и профессионального общения. Текущий и промежуточный контроль реализуется путём выполнения студентами практических заданий.

Содержание практических заданий направлено на:

– формирование практических умений в соответствии с требованиями к уровню подготовки обучающихся, установленными рабочей программой учебной дисциплины: описывать явления, события, излагать факты в письме личного и делового характера;

– заполнять различные виды анкет, сообщать сведения о себе в форме, принятой в стране/странах изучаемого языка, делать выписки из иноязычного текста;

– читать аутентичные тексты разных стилей (публицистические, художественные, научно-популярные и технические), используя

основные виды чтения (ознакомительное, изучающее, просмотровое/поисковое) в зависимости от коммуникативной задачи;

– понимать относительно полно (общий смысл) высказывания на изучаемом иностранном языке в различных ситуациях общения;

– понимать основное содержание аутентичных аудио- или видеотекстов познавательного характера на темы, предлагаемые в рамках курса, выборочно извлекать из них необходимую информацию, оценивать важность/новизну информации, определять свое отношение к ней;

– вести диалог (диалог-расспрос, диалог-обмен мнениями/суждениями, диалог-побуждение к действию, этикетный диалог и их комбинации) в ситуациях официального и неофициального общения в бытовой, социокультурной и учебно-трудовой сферах, используя аргументацию, эмоционально-оценочные средства;

– рассказывать, рассуждать о себе, своих планах, своем окружении в связи с изученной тематикой, проблематикой прочитанных текстов; описывать события, излагать факты, делать сообщения;

– создавать словесный социокультурный портрет своей страны и страны/стран изучаемого языка на основе разнообразной страноведческой и культуроведческой информации;

– обобщение, систематизацию, углубление, закрепление полученных теоретических знаний: значения новых лексических единиц, связанных с тематикой данного этапа и с соответствующими ситуациями общения;

– языковой материал: идиоматические выражения, оценочную лексику, единицы речевого этикета и обслуживающие ситуации общения в рамках изучаемых тем;

– новые значения изученных грамматических явлений в расширенном объеме (глагольных форм (видовременных, неличных), средства и способы выражения модальности; условия, предположения, причины, следствия, побуждения к действию);

– лингвострановедческую, страноведческую и социокультурную информацию, расширенную за счет новой тематики и проблематики речевого общения, понимать тексты, построенные на языковом материале повседневного и профессионального общения, в том числе инструкции и нормативные документы по профессиям и специальностям.

При разработке содержания практических заданий учитывался уровень сложности освоения обучающимися соответствующей темы, общих и профессиональных компетенций, на формирование которых направлена дисциплина.

SESSION 1. MY FUTURE PROFESSION

Objective*: to activate vocabulary in different activities: reading, listening, speaking.*

1. **Find the definitions to the following terms in the Internet resources.**

log, logging, core, coring, sample, condensate, porosity, permeability.

2. **Translate the following word combinations and find them in the text below.**

разведка сырой нефти и природного газа, оптимизация работы отдельных скважин, фрагменты горных пород, определение местонахождения ресурсов нефти и газа, карты подповерхностного слоя, эффективные способы разработки месторождения, строить поперечные сечения для поиска нефтяных ловушек, приборы дистанционного зондирования, распределение флюидов и давления в пласте, сейсмические исследования, система наземного оборудования, история развития земной коры, сложные компьютерные математические программы, картирование недр океана или суши, геологические формации, эволюция растительного и животного мира, полезные ископаемые, осадочные породы, окаменелости и минералы, грунтовые и поверхностные воды, магнитная разведка, гравитационная разведка, сейсмическая разведка, сила магнитного поля, определение силы земного притяжения, физическая океанография, гравитационное поле, бурение скважины, процесс разведки и добычи, безопасность буровой бригады, коммерческая ценность для нефтяной компании, вязкость сырой нефти, пластовое давление, финансовая целесообразность более глубокого бурения, проведение дополнительных измерений, аналитик по каротажу скважин.

3. **Translate the following sentences into Russian.**

1) Инженеры-химики могут проектировать крупные технологические установки, в которых происходят реакции, и многоэтажные дистилляционные колонны, в которых происходит разделение продуктов.

2) Бухгалтерам, работающим в сфере разведки и добычи, в дополнение к базовой подготовке требуется специальное обучение и опыт учета расходов и доходов от разведки и добычи.

3) В нефтегазовой промышленности инженеров-химиков нанимают для изучения течения жидкостей в нефтяных и газовых резервуарах, проектирования и эксплуатации заводов по переработке природного газа,

строительства и управления нефте- и газопроводами, а также для строительства и эксплуатации нефтеперерабатывающих заводов.

4) Инженеры-химики занимаются разработкой и эксплуатацией заводов по производству химических веществ, таких как полиэтилен и поливинилхлорид, из жидкостей природного газа и сырой нефти.

5) Специалисты по земельным ресурсам отвечают за приобретение, управление и распоряжение правами на полезные ископаемые и/или правами на поверхность для компаний по разведке и добыче нефти, а также связанных с ними сервисных и финансовых компаний в энергетической отрасли.

6) Специалистам по нефтяному землеустройству необходимо фундаментальное понимание нефтегазового законодательства и операций по разведке и добыче.

7) Как и в любом другом крупном бизнесе, в нефтяной промышленности работают бухгалтеры, информатики, адвокаты, специалисты по кадрам, специалисты по связям с общественностью, экономисты, секретари и технические работники.

4. Review the content and write a short job description for each of the professions described.

MAIN JOBS IN OIL & GAS INDUSTRY

Geologists are employed to explore for crude oil and natural gas and to help develop reservoirs. Geologists search for oil and gas by studying rock formations and using microscopes to examine rocks fragments (cuttings) from wells that are being drilled. Geologists develop surface and subsurface maps to locate oil and gas resources. They locate rock layers cropping out on the surface of the ground in order to locate anticlines and domes. Geologists use data from existing wells to make subsurface maps of the reservoir rocks. By matching rock layers between wells, they can draw cross sections to find petroleum traps.

Geologists study the physical aspects and history of the Earth. They identify and examine rocks, study information collected by remote sensing instruments in satellites, conduct geological surveys, construct field maps, analyze information collected through seismic studies, and use instruments to measure the earth's gravity and magnetic field. Geologists study the composition, structure, and history of the earth's crust. They try to find out how rocks were formed and what has happened to them since formation.

There are numerous specialties falling under the two major disciplines of geology and geophysics. For example, petroleum geologists explore for oil and gas deposits by studying and mapping the subsurface of the ocean or land. They use sophisticated geophysical instrumentation, well log data, and computers to collect information. Palaeontologists study fossils found in geological formations to trace the evolution of plant and animal life and the geologic history of the Earth.

Stratigraphers help to locate minerals by studying the distribution and arrangement of sedimentary rock layers and by examining the fossil and mineral content of such layers.

Geology and geophysics are closely related fields. Geophysicists use the principles of physics, mathematics, and chemistry to study not only the earth's surface, but its internal composition, ground and surface waters, atmosphere, oceans, and its magnetic, electrical, and gravitational forces.

Geophysicists use three methods of oil exploration: magnetic, gravity, and seismic exploration. In magnetic exploration a magnetometer is used to determine the strength of the earth's magnetic field at a specific point on the earth's surface. In gravity exploration a gravity meter, or gravimeter, is used to determine the strength of the earth's gravity at a specific location. The magnetometer and gravity meter are used to locate hidden, subsurface petroleum traps. In seismic exploration, sound is transmitted into the ground by an explosive, such as dynamite, or by a thumper truck. As the sound passes into the subsurface, it is reflected off subsurface rock layers and returns to the surface as echoes. The echoes are detected and recorded at the surface with microphones called geophones, or jugs. The recordings are processed to form a picture of subsurface rock layers

Geophysicists may specialize in areas such as geodesy, seismology, or marine geophysics, also known as physical oceanography.

Geodesists study the size and shape of the earth, its gravitational field, tides, polar motion, and rotation. Seismologists interpret data from seismographs and other geophysical instruments to detect earthquakes and locate earthquake-related faults.

Geomagnetists measure the Earth's magnetic field and use measurements taken over the past few centuries to devise theoretical models to explain its origin.

Paleomagnetists interpret fossil magnetization in rocks and sediments from the continents and oceans, which record the spreading of the sea floor, the wandering of the continents, and the many reversals of polarity that the earth's magnetic field has undergone through time.

Petroleum engineers are involved in many aspects of the exploration and production process. They work with Geologists and geophysicists to analyze data to locate drilling sites where oil and gas may have accumulated in commercial quantities. Petroleum engineers work as drilling engineers to confirm the presence of oil and gas by drilling and exploration well. The job of the drilling engineer is to design and implement a procedure to drill the well as economically as possible.

These operations are conducted to protect the safety of the drilling crew and under the guidelines of state and national rules and regulations.

A drilling engineer must manage the complex drilling operation including the people and technology. It is also important that the well be drilled so that the

formations of interest can be evaluated as to its commercial value to the oil-company.

Once the well is completed, the production engineer takes over. His job is to analyze, interpret, and optimize the performance of individual wells. The production engineer is responsible for determining how to bring hydrocarbons to the surface. The production engineer will determine the most efficient means to develop the field considering the viscosity of the crude oil, the gas-to-oil ratio, the depth and type or formation, and the project economics. The production engineer is also responsible for developing a system of surface equipment that will separate the oil, gas, and water.

Reservoir engineers determine the fluid and pressure distributions throughout the reservoir, the natural energy sources available, and the methods most useful in recovering the maximum amount of oil or gas from the reservoir. The reservoir engineer develops complex computer-based mathematical programs to model the fluid flow and formation pressures.

A well-log analyst takes down hole data during drilling or after a well is completed to evaluate the well's production potential. The well-log analyst helps take and analyze core samples. He often uses sophisticated electronic, nuclear, and acoustical tools that are sent down the well on a wire-line. Information from these tools is sent up the well bore to a computer system on the surface where engineers retrieve and interpret the data. This information helps the petroleum engineer determine if it is financially feasible to drill deeper, produce the well from explored zones of interest or take additional measurements. Working in conjunction with geologist, reservoir, and production engineers the well-log analyst will work with the team to decide where the next well should be drilled.

Chemical engineers are involved in many aspects of the oil and gas industry. Chemical engineering deals with processes that combine (or engineer) chemicals to produce desired products. Chemical engineers are responsible for transforming crude oil and natural gas into finished products such as gasoline and plastics. This process usually includes a chemical reaction in which two or more chemicals are combined to form a new chemical. The chemical engineer must also understand other processes such as separation, heat transfer, and fluid flow.

In the oil and gas industry, chemical engineers are employed to study the flow of fluids in oil and gas reservoirs, design and operate natural gas processing plants, construct and manage oil and gas pipelines, and to build and operate refineries. Chemical engineers work in developing and running the plants that manufacture chemicals such as polyethylene and polyvinyl chloride from natural gas liquids and crude oil.

Chemical engineers may work in research where they team with chemists to translate reactions from the laboratory to large-scale economical industrial production. Chemical engineers may design the large processes units where reactions occur and multi-story distillation towers where the products are separated. Chemical engineers work with mechanical and electrical engineers to

improve the operation of plants and pipelines and to design instruments to measure and control processes.

The petroleum landman is responsible for obtaining permission to drill a well. Before land may be drilled on private land. In the United States and Canada, the land must be leased from the landowner that owns the subsurface oil and gas. Permits must be obtained from various government agencies before a well can be drilled. The permit helps to ensure that the drilling company restores the land after the well is drilled and that it properly plugs and abandons non-productive wells.

The petroleum landman is responsible for: acquisition or disposition of oil, natural gas or surface interests, negotiation, drafting or management of agreements respecting such interests, and supervision of land administration activities respecting such interests. Petroleum landman are responsible for the acquisition, administration and disposition of mineral and/or surface rights for petroleum exploration and production companies, as well as related service and financial companies in the energy industry. Petroleum landman members work closely with their exploration, production, financial and legal counterparts within these companies to formulate and implement exploration strategies and to negotiate a wide variety of exploration, production, joint venture and other related arrangements. Petroleum landman need a fundamental understanding of oil and gas law and exploration and production operations.

The public affairs department provides interface with investors, media, and the public. Shareholder information is coordinated by this function. Public affairs department writes press releases on company achievements that are sent to the media. Like any other large business, the petroleum industry employs accountants, information scientists, attorneys, human resources specialists, public relations experts, economists, secretaries, and technicians. As the industry recognizes the importance of information and knowledge management, experts in these areas are needed to ensure that information flows smoothly in the company and that best practices are captured and shared. Typical disciplines in this area would be computer science and management information systems. Like any other business, the petroleum industry needs attorneys. The global aspect of the industry means that company lawyers may be involved in negotiating contracts between the company and sovereign nations. Specialized courses in oil and gas law as well as a good understanding of industry basics are required.

Keeping track of the sources and uses of company funds is the responsibility of the petroleum industry accountants. Accountants working in the upstream area need specialized training and experience in accounting for exploration and production expenses and revenues in addition to their basic training.

The oil and gas industry is employing greater numbers of graduates with Master's in business administration (MBA). Petroleum companies look to these graduates to bring managerial training to complement an undergraduate degree in technology. These graduates work in the finance department with engineers and

scientists to analyze project economics and funding. Other MBAs are operating trading desks to buy and sell energy futures and derivatives. Many MBAs work in the planning department to help develop the company's goals and strategy.

5. Read the following international words and word combinations and give their Russian equivalents.

Satellite; correlation; migration; identification; principal information interpretation; geophysical instruments; specific structure; thermal energy; regional potential; local stratigraphy; technical principles; to examine formations; a combination of geochemical analyses; temperature characteristics; hydrocarbon generation; mineral fragments; selection of methods.

6. Translate the sentences. Pay attention to different meanings of the word "once".

1) Wegener, a German meteorologist and the author of the plate tectonics theory realized that today's separate continents were *once* actually joined together.
2) *Once* formed, oil migrates through permeable and porous rock, and finally accumulates in relatively large amounts.
3) *Once* an oil and gas reservoir is discovered a drilling site is to be prepared.
4) *Once* freed from igneous rocks by weathering, quartz accumulates in layers.
5) We *once* knew very little about the four billion years of the Earth's history.
6) By identifying *once*-living fossils and comparing them with creatures alive today, geologists can trace the way plants and animals have changed through time and use this knowledge to learn about the rocks they are found in.
7) Once known largely as a source rock for neighboring formations the Barnet shale field is considered as a world-class, unconventional gas reservoir.

7. Fill in the blanks choosing the proper English word from those given above the texts.

in terms of, occurred, derived, sciences, ranges, relate, composition, similar, to discover, trace, fossils

Geologists try to answer such questions as how old the earth is, where it came from, and what it is made of. To do this, they study the evidence of events that _____ millions of years ago, such as earthquakes, volcanoes, and drifting continents, and then _____ these to the results of _____ events happening today. For example, they try _____ where ancient oceans and mountain _____ were, and they _____ the evolution of life through _____. They also study the ... of the rocks in the earth's crust. _____ their investigations, geologists rely on the knowledge _____ from many other _____, such as astronomy, chemistry, physics, and biology.

8. ***Prepare a poster-presentation "My speciality, its prospects and future".***

SESSION 2. THE JOB INSTRUCTIONS

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

1. Translate the following word combinations into Russian.

- An exploratory well – to know the subject well – as well as;
- a core sample – to sample the core – to core the well -- the core of the Earth – the core of the subject;
- the name of the author – namely these authors;
- the spring term of the academic year – the terms of the agreement – in terms of rock analysis;
- a unit of distance – a distillation unit at the refinery – measurement unit; geological unit;
- to a certain extent – the extent of damage – the areal extent of a reservoir;
- the order of deposition – in order to solve the problem – order of nature – to put in order – doctor's orders – economic order;
- the present situation – kerogen present in the rock – funny presents for children – to present a new method –the water present in magma;
- to run the tools into the well – to run a laboratory – to run a business – to run a distance – to run a survey – to run on electricity – to run through a bed of rock;
- to drive a car – to drive somebody home – a driving force – to drive oil to the well -- petrol-driven pumps.

2. Read and translate the instructions. Pay attention to the words in italic.

WORKING ON A DRILLING RIG: POSITIONS AND RESPONSIBILITIES[1]

Most operators (oil companies) don't own *drilling rigs* and instead, they hire third-party service companies for drilling the wells. Here is a *breakdown of typical positions* on the drilling rig and their responsibilities.

TYPICAL OIL RIG POSITIONS

Roughneck (Floorman/Leasehand/Roustabout)

- He is usually the most junior member of the team who reports to the driller.
- He *makes up and breaks down joints of the pipe* while *running in a hole or pulling to the surface*.
- He also helps *to maintain all the equipment*, cleans it, and assists other members of the team whenever needed.

[1] https://oilandgasoverview.com/working-on-a-drilling-rig-positions-and-responsibilities/

Derrickman

- He usually works above *the drilling floor* on the *"monkey board"* and his main responsibility is *racking the stands of pipe*.
- To work as a *derrickman* you should be comfortable spending long hours at heights.
- He also maintains *mud motors* and is responsible for *mud preparation*.

Motorman

- As the name suggests he is mainly responsible to ensure that all motors and rig machinery operates without any *major breakdowns*.
- He often spends his time doing *preventative maintenance* and performing machinery inspections *to avoid downtime during the drilling operations* due to engine failures.

Driller

- The driller is in charge of *the drilling crew* and reports to the tool pusher.
- He is responsible for running the rig which includes *raising and lowering the drill pipe*, controlling speeds, operating BOPs, and following the drill program.

Toolpusher

- He is the most senior member of the team and everyone on a *drilling crew* reports to him.
- He oversees the drilling operation and usually stays on location while the rest of the crew stays in the camp or hotel.
- *Toolpusher* also works closely with a company man to ensure that the well is drilled as per plan.

Company man

- The company man or *on-site representative* (OSR) works for the operator.
- He is the one who is in charge of every operation happening on a lease.

HOW TO START WORKING ON A DRILLING RIG?

Most people start working on a drilling rig as *roughnecks* and then progress to more senior positions and eventually become drillers and *tool pushers*. Many company men worked as tool pushers on drilling rigs before moving to the operator.

Basic requirements

- Driving license with a good driving record – having a class 1 license can be an asset
- High school diploma (however having a postsecondary education related to the oil and gas industry can help you to get promoted faster).
- Ability to pass drug, alcohol, and physical test.

- Able to lift 80 lbs.
- H2S and First Aid course certificates.
- Good people skills – you will be working on a team and it helps if you can work in a team environment.
- Problem-solving and analytical skills – being able to think fast on your feet is an asset.

How to Get a Job on a Drilling Rig?

- If you can fulfill most of the requirements that we discussed, you can start looking for a rig job by applying online.
- When the industry is booming it is pretty easy to get a job on the drilling rig.
- Even though you can get a job with no experience in the oil patch, it might be easier if you have previous experience working in similar industries that involve hard labor like construction.
- It also helps if you know someone who can recommend you to a tool pusher and pass your resume to him.
- I know several people who got their first rig job at 18 without any previous experience just because someone recommended them.

What to Expect When Working on a Drilling Rig?

- Most shifts are 12 hours long and it takes another 30 minutes to get to the hotel or camp where you will be staying.
- Most rotations are 15 days and 6 days off. However, if you work in very remote locations rotations can be longer.
- Quite a bit of physical work is required when working on the drilling rig especially if you are just starting out.
- You will need to be prepared *to get dirty and work in extreme weather conditions*. There is also quite a bit of noise on location.
- Salaries are usually pretty good even for roughnecks but working on the rig is not the easiest job in the oilfield.
- However, as you gain more experience and get promoted the amount of physical work you will be doing will slowly decrease.

3. Read and translate the Instructions. Study the given word combinations:

To be appointed and dismissed in accordance with the procedure, in a timely and high quality manner, fire safety rules, the assigned area of work, occupational sanitation, direct supervisor, offshore conditions, drill pipe and tubing, troubleshooting possible faults, drilling regimes, power supply, directional and horizontal drilling, drilling mud cleaning systems, chemical reagents, to reduce consumption, accidents and complications, prevention and elimination, ementing quality, casing string tightness, conducting geophysical investigations, flowing and pumping wells, underwater equipment, water areas.

ДОЛЖНОСТНАЯ ИНСТРУКЦИЯ[2]
Бурильщика эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда

1. Общие положения

1.1. Настоящая должностная инструкция определяет и регламентирует полномочия, функциональные и должностные обязанности, права и ответственность бурильщика эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда [Наименование организации] (далее — Компания).

1.2. Бурильщик эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда назначается на должность и освобождается от должности в установленном действующим трудовым законодательством порядке приказом руководителя Компании.

1.3. Бурильщик эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда относится к категории рабочих и подчиняется непосредственно [наименование должности непосредственного руководителя] Компании.

1.4. Бурильщик эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда отвечает за:

- своевременное и качественное выполнение им задач по предназначению;
- соблюдение исполнительской и трудовой дисциплины;
- соблюдение мер безопасности труда, поддержание порядка, выполнение правил пожарной безопасности на порученном ему участке работы (рабочем месте).

1.5. На должность бурильщика эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда назначается лицо, имеющее среднее профессиональное образование по данной специальности и стаж работы не менее 1 года. Может работать на бурении скважин глубиной свыше 1500 метров и до 4000 метров включительно, а также при бурении наклонно направленных скважин глубиной до 1500 метров включительно.

1.6. В практической деятельности бурильщик эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда должен руководствоваться:

- локальными актами и организационно-распорядительными документами Компании;
- правилами внутреннего трудового распорядка;
- правилами охраны труда и техники безопасности, обеспечения производственной санитарии и противопожарной защиты;

[2]https://instrukzii.ru/rabochie/burenie-skvazhin/burilshhik-ekspluatatsionnogo-i-razvedochnogo-bureniya-skvazhin-na-neft-i-gaz-6-go-razryada.html

– указаниями, приказаниями, решениями и поручениями непосредственного руководителя;
– настоящей должностной инструкцией.

1.7. Бурильщик эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда должен знать:

– действующие правила и инструкции по технологии, технике и организации производства;
– основные сведения по геологии месторождений и технологии добычи нефти, газа, термальных, йодобромных вод и других полезных ископаемых;
– геолого-технический наряд и режимно-технологическую карту;
– геологический разрез разбуриваемой площади, сведения о конструкции скважин;
– режимы ведения буровых работ в морских условиях;
– назначение, устройство и технические характеристики бурового и силового оборудования, ППВО, автоматических механизмов, предохранительных устройств;
– устройство электробуров и турбобуров;
– способы устранения возможных неисправностей турбобура, электробура и токоподвода;
– устройство и назначение применяемого инструмента и приспособлений, методы спуска и ориентирования труб, электробуров и турбобуров с отклонителями при наклонно-направленном и горизонтальном бурении скважин;
– устройство применяемых приспособлений малой механизации, контрольно-измерительных приборов, систем очистки бурового раствора;
– физико-химические свойства буровых растворов и химических реагентов для приготовления и обработки бурового раствора, методы его приготовления, восстановления и повторного использования;
– способы контроля параметров и пути снижения расхода утяжелителей и химических реагентов;
– типоразмеры и принципы рационального использования применяемых долот;
– причины аварий и осложнений при бурении скважин, мероприятия по их предупреждению и ликвидации;
– допускаемые нагрузки на применяемое оборудование;
– конструкцию, назначение и применение ловильных инструментов;
– тип, размеры, маркировку резьбы, прочностные характеристики обсадных, бурильных и насосно-компрессорных труб;
– требования, предъявляемые к подготовке скважин к спуску обсадных труб и цементированию;
– методы и средства защиты продуктивного горизонта от загрязнения в процессе бурения и при цементировании колонн;

– технологию цементирования скважин и условия, обеспечивающие качество цементирования и герметичность обсадных колонн;
– нормы расхода применяемых материалов;
– назначение, устройство испытателей пластов, пакеров различных конструкций;
– технические требования к подготовке скважин к спуску испытателей пластов и проведению геофизических исследований;
– схемы обвязки и конструкции герметизирующих устройств;
– технологию и методы проведения работ по освоению эксплуатационных и испытанию разведочных скважин;
– устройство и использование наземного оборудования фонтанных и насосных скважин;
– надводного и подводного оборудования, меры, принимаемые при возникновении штормов в условиях работы в акваториях;
– правила отбраковки рабочего инструмента, применяемых контрольно-измерительных инструментов и предохранительных приборов;
– специальные правила безопасности при работе на месторождениях, содержащих сероводород;
– приказы, распоряжения и другие руководящие документы, обеспечивающие безопасность труда при бурении скважин;
– Устав службы на морских судах.

1.8. В период временного отсутствия бурильщика эксплуатационного и разведочного бурения скважин на нефть и газ 6-го разряда, его обязанности возлагаются на [наименование должности заместителя].

4. Translate the sentences into Russian. Pay attention to the meaning of the word “whether”.

1) All constituents of the earth’s crust, *whether* hard granite and sandstone or soft clay or gravel, are called rocks.
2) All the rocks, *whether* igneous or sedimentary originally, which have been greatly recrystallized and altered by heat and pressure, are called metamorphic rocks.
3) Geologists are often asked *whether* earthquakes can be predicted.
4) We do not know *whether* on the whole the present movement in the earth’s crust is proceeding more or less rapidly than in the past.
5) It is important, when exploring a new area, to determine *whether* the organic matter has been heated enough to produce oil.
6) It remains a matter of discussion *whether* speculations on the origin of oil gave rise to many hypotheses.
7) This determines *whether* or not the fracture system may be statistically represented in microresistivity measurements.
8) We can’t say *whether* the research into oil genesis will be continued.

9) Geologists have to evaluate the hydrocarbon accumulation to estimate *whether* it has enough petroleum to be commercially productive.

5. The information from the following text may turn out to be helpful when looking for a job. Read the text and speak on your future activities as a petroleum geologist.

"Prospecting" is the process the geologist goes through to locate a place to drill a well. Most petroleum geologists work with well logs, core records, drilling records, and other data that they need to work. They construct maps and cross-sections to help them locate the best places to drill wells. They study maps and cross-sections and run computer simulations that help select the next best location to drill.

The geologists want to know what type of traps they are dealing with, and the composition of the sedimentary rocks they will be drilling through. They want to estimate the porosity of the prospective "pay zone", and know whether or not they can expect to encounter very high pressure in the hole. If seismic is involved in the prospect they will consult with the geophysicists to get their opinion of the prospect.

When they have finally found the correct spot, they spend much time cross-checking to ensure that they have not missed anything. Next comes the part that every geologist enjoys the most! Drilling the well!

Drilling a well is a very complex procedure involving many people where nearly everything must go right, and there is no room for error. The geologists closely monitor all aspects of the drilling as it takes place. They run mud logging, the loggers "sit" the well day and night. The geologists study the well cuttings, monitor the formation tops as they are encountered and discuss the progress of the drilling. They decide where and when to take cores. When the hole has been drilled, the geologists employ logging tools to evaluate the hole.

Finally, when the well is logged, they examine the logs and recommend that the well be either completed or plugged.

6. WORK IN PAIRS.

You are going to explore the new oil field.

- ***Student A*** – a reservoir engineer.
- ***Student B*** – a drilling engineer.

Discuss: the responsibility distribution and operations' order.

SESSION 3. EUROPEAN-STYLE CV

***Objective**: Based on the guidelines for filling in a CV, you will learn how to write a European-level CV freely. Improve your practical skills in completing your CV.*

1. Compare the Europass CV to the European style CV.

HOW TO WRITE A EUROPEAN STYLE CV FOR YOUR APPLICATION[3]

A compelling CV is the first step in helping your potential employer pick you among other candidates. Do you seek to work or study in any of the European countries? If yes, then you must observe how to write a European style CV for your application. A CV may have the same meaning and require the same information in different countries but when it comes to the writing style, it differs.

In Europe specifically, there is a particular CV writing style that is acceptable. But generally, your CV must showcase your skills and abilities. It must also be easy to understand. In this article, we have put together all the information you need to know about how to write a European style CV.

What is a European Style CV? A European Style CV is a resume-style document that candidates use in applying for studies and jobs in most European countries. Before now, the common type of CV format used for any job or study application in Europe was the Europass CV. But currently, to scale your chances of employment, a European style CV is the best. The next section will tell you more about the Europass CV.

About Europass CV. The Europass CV is a standard CV template that was established in 2005 by the European Commission(EU) for candidates applying to European jobs and schools. The purpose was to standardize the CV format across Europe. And also, to enable recruiters working in different languages and cultures to assess potential employees outside Europe. Whether you intend to study or work in Europe, the Europass CV helps applicants for European visas to communicate their academic and work background compellingly and concisely.

Also, the Europass CV is a one-page document that you can easily send to different employers across European nations, without the fear of the format being rejected. Here's how the Europass CV works – Your CV is generated by submitting your information into a template wizard. After that, your information will be formatted and arranged for you. The good thing about Europass CV is that it saves time. Nevertheless, a European style CV remains a better option.

Why You Should Go for a European Style CV Instead of Europass? While the Europass is a good idea, you should understand that it's a one page document that includes a standard and concise information outline for work experience,

[3] *https://thefasthire.org/how-to-write-a-european-style-cv-word-pdf-sample/*

qualifications, and skills. The downside of this is that, it doesn't give room for creativity as it is auto-formatted. Also, you can't give an in-depth information about your career and academic background. Hence, it is best to create a European Style CV which will give you the room for specific details that you may not be able to cover while using the Europass CV format.

Furthermore, the Europass CV is an outdated CV format which can kill your chances of employment. Compared to a European style CV, the Europass CV has an incompetent structure that restricts you from taking control of your CV. It makes you fill your information according to the Europass priority. And sometimes, these priorities rarely match what the recruiter is looking for. That's why using a European style CV is best since it will enable you to showcase as much needful information.

Other reasons why you should use the European style CV instead of Europass are,

1. European style CV can contain enough relevant information while the Europass CV lacks much relevant information.
2. The European style CV is a good CV that makes effective use of spaces, but the Europass CV is limited.
3. Lastly, the Europass CV is not generally accepted in the UK, so, a more detailed European style CV is best.

How to Write a European Style CV. Remember that your CV is your first meeting with your employer and as such, it should be impressive and outstanding.

Below is how to write a European style CV.

1. **Include Your Professional Picture and Email Address.** Your professional picture might not be 100% necessary but most European employers will like to see a picture of you. So, make sure your picture is on the top corner of the first page of your CV while considering the quality of the picture. Also, ensure to include your professional email address in your European style CV.
2. **Tell the Language(s) You Speak.** Let your recruiter know the language(s) you speak by indicating your proficiency level. For example – English (native), French (conversational). Also, whether you're moving to Europe or you already reside there, it will be an added advantage if you can communicate in any of the most common languages in the European countries. Which includes: English, French, German, Russian, Italian, etc.
3. **Indicate Your Nationality.** Indicate the country you are from. Apparently, you are not the only one applying for the job in Europe, there are other applicants from around the world so let your employer know your nationality. E.g., City: Berlin, Country: Germany.
4. **Present Your Experience Clearly.** You should highlight your relevant skills, experience, and achievements clearly. This can be done correctly, by matching it to the job you are applying for. Also, be observant of the details published in the vacancy notice.

5. **Tailor Your CV.** Tailor your CV by giving full and significant details about yourself. That is, you should tell the recruiter why you are the best person for the job. However, when doing this make sure to focus on facts and points that match the job you are applying for.
6. **List Your Experience in Reverse Chronological Order.** Make use of reverse-chronological format when listing your experiences. That is, list your most recent experiences first followed by the others. You can also describe your work and learning process.
7. **Proofread.** Lastly, check for spelling and grammar mistakes. Since it is a European style CV you might want to seek the help of a native proofreader to help you check for errors.

European Style CV Format

- Font style: Arial, Tahoma, Century Gothic, Times New Roman
- Font Size: 12
- Spacing: 1.5

Conclusion

A European style CV is needed to give a good record of all your skills, qualifications and experience. If you aim to get a job in Europe, do well to follow these steps on how to write a European-style CV or you can use the PDF/document format provided in this article.

2. Now Improve your practical skills!

We also included a sample of a European style CV that will assist you in writing yours.

Tips for Writing European Style CV

1. When writing your CV for European countries, you should understand that there are some country-based CV requirements that you should adhere to. So, ensure to "do your research" and incorporate them in your document.
2. The appearance of your CV matters a lot. Make sure the write-up is neat, well-formatted, and not too long.
3. Just as we said earlier, prioritize using reverse-chronological cv format.
4. Keep your CV at a reasonable length. No matter your experience level, ensure to avoid the fluff and only keep what is relevant in your CV. We always recommend the 2-page maximum CV, and depending on your level it could be a bit longer but ensure the details are relevant.

PERSONAL INFORMATION

ANNA SCHMIDT

Herzogenaurach, Germany

+49**** +49***

Firstname.middlename@gmail.com

thefasthire.com

Skype

Sex Female | Date of birth 2/09/1991 | Nationality German

JOB APPLIED FOR

Sales Representative

WORK EXPERIENCE

July 2017-present

Sales Representative

Elias| Herzogenaurach, Germany| www. Elias.com

- Attend to customer complaints and requests and send them to the appropriate department for a prompt response.
- Ensure that every customer is attended to as soon as possible.
- Treat every customer with respect and regard with the understanding that their opinion matter.
- Maintain communication with the clients via emails, calls, and chats.

Achievements

- Grew the customer return base of the company from 25% where I get it to 85% within the first three months of my work with them.
- Created a strategy of constant engagement with the clients by coming up with initiatives and packages that will reward them each time they return to the company.

Consumer Goods- Clothing & Accessories

January 2016-April 2017

Sales Assistant

Smith| Berlin| www.hire.com

- Build formidable communication channels between the company and the customers.
- Liaise with the customers and update them about the company's services and methods of operation.
- Attend to customers' complaints and requests and revert to the different departments for a prompt response.

Achievements

- Grew the client base from 70% to a steady 90% within the first 6 months of working with the company.
- Resolved a problem the company has had with a client for over 8 months within the first month of joining the company.
- Created customer relief packages to appreciate customers after each experience with the company.

Consumer Goods- Clothing & Accessories

EDUCATION AND TRAINING

September 2011-2015

Bachelor of Science- Business Administration | Arden University, Germany

Replace with European Qualification Framework (or other) level if relevant

- Intro to customer service| Rene| Online| August 2020
- Communicating like a pro| Rene| Online| August 2020

- Excelling as a sales Rep| Renel| Online| October 2020
- Understanding your customers| Vanus| Online| July 2017|
- Important tools to have as a Sales Rep| Majid Incorporated| Online| January 2021

Skills acquired:

- Customer relationship management
- Communication
- Administration

PERSONAL SKILLS

Mother tongue(s): Alsatian

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
	Replace with the name of the language certificate. Enter level if known.				
French	B1	B2	B2	B2	B1
	Replace with the name of the language certificate. Enter level if known.				

Communication skills

- Impeccable written and spoken communication skills gained through my experience as a sales representative and my training in "communicate like a pro".

Organizational/managerial skills

- **Administration:** Work as the team leader of the sales unit at my workplace
- **Leadership:** Currently lead a team of 15 people
- **Feedback:** Always maintains constant communication from the start to the finish of any project or assignment, and always carries every member of my team along

Job-related skills

- Critical thinking
- Customer relationship management
- Problem-solving
- Conflict resolution

Computer skills

- Good command of Microsoft Office™ tools: word, excel, PowerPoint, etc
- Proficient with canva

Other skills

- Tailoring/fashion designing
- Public speaking
- Content

Driving license

- B

ADDITIONAL INFORMATION

Publications

- The Woman's Magic: Daily news, 2021

Presentations

- "The Girl Child"- VIO Conference, 2020
- "The Girl Child Magic"- People's Opinion, 2020

Projects

- The effect of early marriage on women
- The girl child power

- Bad parenting

Conferences

- Voice of a woman- Women to Women Conference, Berlin, 2021
- Marginalization at the work front- Employees in Power, Berlin, 2021
- Our culture, our heritage- The Champion Magazines Conference, Berlin, 2019

Seminars

- How to thrive as a sales representative, 2022

Honors and awards

- Best team player of the year- Adas, 2021
- Best employee of the year- Adas, 2018

Memberships

- Member, Association of the Girl Child Worldwide, 2012-present

References

- Available on request

SESSION 4. MULTINATIONAL OIL AND GAS COMPANIES

Objective*: to activate vocabulary in different activities: reading, listening, speaking.*

1. **Translate and make up senteces with those word combinations.**

to flow by gravity; to flow by heads; to flow naturally; to flow off; to flow out; to flow over; to flow through; to flow up.

2. **Render the text and answer the following questions.**

1) What are the three main segments of the oil and gas industry?
2) Which Countries Produce the Most Oil?
3) What Is an Integrated Oil Company?

HOW THE OIL AND GAS INDUSTRY WORKS[4]

This introduction is designed to help anyone understand the fundamentals of companies involved in the oil and gas sector by explaining key concepts and the standards of measurement.

KEY TAKEAWAYS

– The oil and gas industry is broken down into three segments: upstream, midstream, and downstream.
– Upstream, or exploration and production (E&P) companies, find reservoirs and drill oil and gas wells.
– Midstream companies are responsible for transportation from the wells to refineries and downstream companies are responsible for refining and the sale of the finished products.
– Drilling companies contract their services to E&P companies to extract oil and gas.
– Well-servicing companies conduct related construction and maintenance activities on well sites.

The oil and gas industry is one of the largest sectors in the world in terms of dollar value, generating an estimated $5 trillion in global revenue as of 2022. Oil is crucial to the global economic framework, impacting everything from transportation to heating & electricity to industrial production & manufacturing.

Upstream, Midstream, Downstream. The oil and gas industry is broken down into three main segments: upstream, midstream, and downstream.

[4] https://www.investopedia.com/investing/oil-gas-industry-overview/

Upstream businesses consist of companies involved in the exploration and production of oil and gas. These are the firms that search the world for reservoirs of the raw materials and then drill to extract that material. These companies are often known as "E&P" for "exploration and production." The upstream segment is characterized by high risks, high investment capital, extended duration as it takes time to locate and drill, as well as being technologically intensive. Virtually all cash flow and income statement line items of E&P companies are directly related to oil and gas production.

E&P companies do not usually own their own drilling equipment or employ a drilling rig staff. Instead, they hire contract drilling companies to drill wells for them and the contract drilling companies generally charge for their services based on the amount of time they work for an E&P company. Drillers do not generate revenue that is tied directly to oil and gas production, as is the case for E&P companies. Once a well is drilled, various activities are involved in generating and maintaining its production over time. These activities are called well servicing and can include logging, cementing, casing, perforating, fracturing, and maintenance. Oil drilling and oil servicing thus represent two different business activities within the oil and gas industry. E&P companies are often valued by their oil and gas reserves; these untapped resources are the key to their future earnings.

Midstream businesses are those that are focused on transportation. They are the ones responsible for moving the extracted raw materials to refineries to process the oil and gas. Midstream companies are characterized by shipping, trucking, pipelines, and storing raw materials. The midstream segment is also marked by high regulation, particularly on pipeline transmission, and low capital risk. The segment is also naturally dependent on the success of upstream firms.

Downstream businesses are the refineries and gas stations. Refineries are the companies responsible for removing impurities and converting the oil and gas to products for the general public, such as gasoline, jet fuel, heating oil, and asphalt. Gas stations are where consumers fuel up at the pump.

What Is an Integrated Oil Company? An integrated oil company is involved in two or more of the stages of oil production (e.g., both upstream and downstream). Many of the world's largest and most influential oil companies today are integrated oil & gas companies, which have separate divisions for each stage. Being an integrated company allows for complete control and improved efficiency. It also provides for various streams of revenue and diversification. However, due to the very high capital costs involved with oil exploration and refining, barriers to entry are very high for new competitors.

What Are the 3 'P's of Oil Reserves? Reserves refer to crude oil or natural gas deposits that remain underground and have not yet been extracted. The three "P"s of reserves refer to "proven," "probable," and "possible." These correspond with the likelihood of successfully drilling in those deposits. The oil& gas industry gives proven reserves a 90% certainty of being produced (also known as P90). The

industry gives probable reserves a 50% certainty (P50), and possible reserves just a 10% certainty (P10) of actually being produced.

3. Render the text and answer the following questions.

1) Name all the Western and Russian oil companies you know.
2) What company would you like to work in? Why?
3) What position would you like to occupy?

THE BIGGEST RUSSIAN OIL AND NATURAL GAS COMPANIES[5]

Oil and natural gas companies are a crucial part of Russia's economy. The energy sector is a staple of the investing world, and it comprised, on average, 43% of government revenue between 2011 and 2020. The country has some of the largest multinational oil and gas companies in the world because it also has some of the largest known reserves. Below are six of the largest Russian oil and gas companies[6] that together with one unlisted company, Tatneft, accounted for 81% of Russia's oil production in 2020. This list is limited to companies that trade in the United States or Canada, either on *an exchange or over the counter* (OTC).

GAZPROM PJSC
Sector: **Energy Minerals**
Industry: **Integrated Oil**
Gazprom PJSC is a global energy company. The company focuses on geological exploration, production, transportation, storage, processing and sales of gas, gas condensate and oil, sales of gas as a vehicle fuel, as well as generation and marketing of heat and electric power. It operates through the following segments: Production of Gas, Transportation, Distribution of Gas, Gas Storage, Production of Crude Oil and Gas Condensate, Refining and Electric & heat energy generation and sales. The Production of Gas segment engages in the exploration and production of gas. The Transportation segment engages in the transportation of gas. The Distribution of Gas segment involves in the sale of gas within the Russian Federation and abroad. The Gas Storage deals with the storage of extracted and purchased gas in underground gas storages. The Production of crude oil and gas condensate segment engages in the exploration and production of oil and gas condensate, sales of crude oil and gas condensate. The Refining segment is involved in the processing of oil, gas condensate and other hydrocarbons, and sales of refined products. The company was founded in 1989 and is headquartered in Moscow, Russia.

ROSNEFT OIL CO.
Sector: **Energy Minerals**

[5] https://www.investopedia.com/articles/markets/082615/5-biggest-russian-natural-gas-companies.asp
[6] All data is sourced from YCharts as of Feb. 27, 2022.

Industry: **Integrated Oil**
Rosneft Oil Co. engages in the exploration, development, production and sale of crude oil and gas. It also involves in refining, transportation, and sale of petroleum products. The firm operates through the following business segments: Exploration and Production, Refining and Distribution, and Corporate and Others. The Exploration and Production segment is engaged in the field exploration and production of crude oil and natural gas. The Refining and Distribution segment engages in processing crude oil and other hydrocarbons into petroleum products, as well as the purchase, sale and transportation of crude oil and petroleum products. The company was founded in 1993 and is headquartered in Moscow, Russia.

Oil Co. LUKOIL PJSC
Sector: **Energy Minerals**
Industry: **Integrated Oil**
Oil Co. LUKOIL PJSC engages in the exploration, production, refining, marketing and distribution of oil. It operates through the following segments: Exploration & Production; Refining, Marketing & Distribution; and Corporate & Other. The Exploration & Production segment explores, develops and produces crude oil and gas. The Refining, Marketing & Distribution segment processes crude oil into refined products, purchases, sells and transports crude oil and refined petroleum products, refines and sells chemical products, produces steam and electricity, distributes them and provides related services. The Corporate & Other segment includes activities of the company's and businesses beyond the group's traditional operations. The company was founded on November 25, 1991 and is headquartered in Moscow, Russia.

GAZPROM NEFT
Though a subsidiary of Gazprom, which owns nearly 96% of common shares, Gazprom Neft remains a publicly-traded company. The company, formerly known as Sibneft, is Russia's third-largest oil producer.

SURGUTNEFTEGAS PJSC
Sector: **Energy Minerals**
Industry: **Integrated Oil**
Surgutneftegas PJSC engages in the research and design, exploration, drilling and production units, oil refining, gas processing, and marketing subsidiaries. The firm is involved in activities, which include exploration and production of oil and gas provinces, such as Western Siberia, Eastern Siberia, and Timan-Pechora; oil refining; and gas production and transportation. It also focuses on wholesaling, retailing and storage of petroleum products and render a set of supplementary services at the gas stations. The company was founded in 1964 and is headquartered in Surgut, Russia.

NOVATEK JSC

Sector: **Energy Minerals**
Industry: **Integrated Oil**
NOVATEK JSC engages in the exploration, production, processing and marketing of natural gas and liquid hydrocarbons. It operates through the following geographical segments: Russia, Europe, Asia-Pacific, North America, The Middle East, and Other. The Russia segment includes exploration, development, production and processing of hydrocarbons, and sales of natural gas, stable gas condensate, other gas and gas condensate refined products, liquefied petroleum gas and crude oil. The Europe segment involves in sale of natural gas, naphtha, stable gas condensate, gas condensate refined products, liquefied petroleum gas, crude oil and exploration activities within joint operations. The Asia-Pacific segment engages in sales of naphtha, stable gas condensate refined products and crude oil. The North America segment encompasses sale of naphtha, stable gas condensate refined products and crude oil. The Middle East segment includes sale of natural gas, naphtha, crude oil and exploration activities within joint operations. The company was founded by Leonid Viktorovich Mikhelson on August 16, 1994 and is headquartered in Moscow, Russia.

4) ***Translate the sentences into Russian. Pay attention to the underlined words of the same root.***

1) Rocks are by nature *variable* in many different respects – texture, composition, origin, so that their classification is a complex problem to which there is no simple solution.
2) Different authors have used different *variables* as the basis for subdivision.
3) Since the methods of classification *vary* and boundaries are indefinite, many rock types have been *variously* defined by different authors.
4) Ocean water *varies* greatly in salinity, or content of dissolved salts.
5) Metamorphism shows itself in rocks in *various* ways.
6) The *variation* of temperature with height *varies* throughout the year.
7) Microscopic study of igneous and sedimentary rocks shows thousands of different *varieties* in texture.
8) These sediments were deposited in the sea or in fresh water in a *variety* of ways.
9) Among the clastic rocks, four *varieties* of stratification are to be especially considered because they record significant differences in depositional processes.

5) ROLE PLAY: You are welcoming a visitor to your company.

1. Introduce yourself
2. Make a presentation of your company. Use the following plan.
A. Title page.
B. Content.

C. General overview of the Company (industry, geographical location, number of employeers, and etc)
D. Structute of the Company (general level – key people)
E. Performance Overview – Major Achivements / success (2-3 slides)
F. Conclusion.

Answer all necessary questions concerning your company.

SESSION 5. NATURAL GAS

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

1. **Add the prefix "re-"to the following words and translate them.**

explore	*establish*	*generate*
examine	*assessment*	*deposit*
evaluate	*arrangement*	*combine*

2. **Render the text.**

NATURAL GAS

While the history of ciude oil goes back to the 19-th century, it was only in the 1950s that the story of natural gas began to arouse worldwide interest. Nevertheless, natural gas appears to be a major and increasingly attractive energy source for the 21-th century. Due to its abundance in reserves, its environmental friendliness and its flexibility, the use of natural gas is already showing a tremendous development.

Natural gas is an oil competitor on fuel markets, but often it is its associate in the hydrocarbon reservoirs. Due to this fact and because of their having comparable origins and locations it seems logical to draw a parallel between natural gas and crude oil. Alter oil having been discovered, for decades gas was considered to be its useless byproduct and was vented to atmosphere or flared. Nevertheless, at present time the natural gas industry is experiencing rapid growth thanks to the diverse use of natural gas as a fuel and a feedstock for the petrochemical industry.

An increasing part of the reservoirs is located offshore, in poorly accessible areas, often far away from the major consumption sites. The industry faces therefore great technical and economical problems of transporting natural gas to the consumers.

Three types of natural gas are generally distinguished:

– no associated gas which is not in contact with oil
– gas cap - associated gas overlying the oil phase in the reservoir
– associated gas «dissolved» in the oil in the reservoir (dissolved gas).

However, more than the type of natural gas and the properties of oil with which it may be associated, it is the chemical composition of the gas that is the most important factor. It conditions the processing that the gas will have to undergo to meet the specifications of its transporting by pipeline or in the form of LNG (liquefied natural gas). The knowledge of the composition and the properties of natural gas is essential in all stages of production, processing, transportation and storage.

Geological studies guide a closer understanding of the factors influencing the composition and location of natural gas reservoirs. Modeling the formation and migration of natural gas gives an increasingly accurate forecasting tool. This knowledge helps guide exploration operations and reduces the risk of wildcatting.

A growing share of gas reserves being found offshore or in harsh areas makes necessary the development of techniques designed to improve productivity and to lower costs. Different natural gas processing operations can be employed to meet the specifications required for the transportation or use of natural gas. Pipelines as compressed gas or liquefied gas transport natural gas. Natural gas storage is necessary for the seasonal regulation of consumption and gas supply, as demand for instance, for heating is different in winter and in summer. Two main storage methods are employed:

– cryogenic storage in tanks, as LNG
– underground storage in depleted reservoirs and salt cavities.

Gas discoveries have gradually spread to all the continents, in fact, to more than 80 countries. In Russia, its proved reserves, which only amounted to 2 X10 m in 1960, jumped to 46.9 terns in 2000. This clearly places Russia at the top of the world's gas reserves list. Most of this increase can be credited to the discoveries of the largest reservoirs of the globe in Siberia. New supergiant reservoirs were discovered north of Siberia in the Barents Sea and the Kara Sea.

3. Fill in the blanks choosing the proper English word from those given above the texts.

subjected, pressure, porous (2), source, permeable, reservoir, matter, migrate, fractured, migration, impermeable, similar, primarily, range, seal

Oil and gas originated from organic _____ in sedimentary rocks. The origin of coal on land is a process _____ to the origin of petroleum in the sea. The generation of hydrocarbons from the source material depends _____ on the maximum temperature to which the organic material is _____. Hydrocarbon generation reaches a maximum within the _____ of 225° F to 350° F. After generation the hydrocarbons under high _____ in the fine-grained _____ rock start to _____ to a reservoir. _____ is a continuing process. Once the hydrocarbons have been generated and expelled from the source rock, on its way through _____ and _____ rocks hydrocarbon flow can be stopped by an _____ layer known as a _____. Thus oil and gas are entrapped in a _____ and _____ reservoir rock.

4. Translate the sentences into Russian. Pay attention to different forms and functions of the Gerund.

1) Can the past be understood by studying the processes that are occurring at the present?

2) The advantages offered by liquid fuels result in their being widely used in different spheres of life.
3) The presence of water in the liquid state plays an important part in determining the nature of the earth's surface.
4) Rocks behave like plastic materials when subjected to great pressures within the zone of flow, and, therefore, they bend or flatten out instead of breaking.
5) It's worth mentioning that great downwarps of hundreds of miles are of particular geologic interest.
6) Warps occur when broad areas of the crust rise or drop without fracturing.
7) Sandstone being highly porous makes it a perfect reservoir rock.
8) Seismic prospecting lowers the risk involved in exploring by allowing scientists to locate and identify oil and gas reservoirs and the best locations to drill.
9) Understanding the origin of geologic structures is critical to discovering more reserves of our non-renewable resources.

SESSION 6. THE ORIGIN OF OIL AND GAS

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- carbon – углерод
- flowing water – проточная вода
- force of gravity – сила тяжести, земное притяжение
- fossil fuel – ископаемое топливо
- hydrocarbon – углеводород
- hydrogen – водород
- impermeable – непроницаемый, герметический; не пропускающий (жидкость и газ)
- inorganic theory of oil origin – теория неорганического происхождения нефти
- marine – морской (принадлежащий, относящийся к морю, морскому миру)
- marine life/plants/animals — морская жизнь, морские растения/животные
- natural trap – естественная ловушка
- oil (petroleum) – нефть (природная смесь жидких углеводородов и органических соединений кислорода, серы и азота)
- oil accumulation – залежь/скопление нефти; формирование залежи нефти
- organic theory of oil origin – теория органического происхождения нефти
- porous rocks – пористая порода
- pressure – давление
- reservoir – пласт-коллектор; пластовый резервуар (нефти, газа); нефтеносный слой; газоносный пласт; продуктивный пласт; залежи, месторождение (нефти, газа)
- seep – выход, высачивание (нефти, газа) // просачиваться
- temperature – температура
- terrestrial – 1) происходящий на земле, на суше; 2) живущий на земле или в земле; 3) сухопутный; наземный
- to collect – скопляться, собираться, собирать
- to presume – предполагать, полагать; допускать; считать доказанным
- underground formation – подземный пласт, подземное образование
- volatile – летучий; легкоиспаряющийся

1. Render the text and answer the following questions.

1) What forms the gas?
2) How can oil be formed?
3) Where oil and gas can be trapped?

4) What is your personal opinion on these theories?
5) What theory is supported by most of scientists?
6) What theories about oil and gas origin do you know?
7) Why oil and gas seldom stay in the source rock where they are formed?
8) What transforms the organic materials into solid, liquid and gaseous hydrocarbons?

ORIGIN OF OIL AND GAS

Nowadays there are two main theories explaining the origin of petroleum or oil and natural gas - organic and inorganic ones. However, it has not been possible to determine the exact origin because it has not been possible to identify the exact place or materials from which any particular oil accumulation originated. The precise details regarding the problems of origin, migration and accumulation of petroleum have yet to be fully answered. Recent advances in analytical chemistry and geochemistry have advanced the knowledge and understanding, but issues remain to be resolved. The oil pool (field) is an end product to a 5-stage sequence of events: raw materials, accumulation, transformation, migration and geologic time. But the complication is that petroleums are complex mixtures of many hydrocarbons occurring in series with no two petroleums exactly alike in composition. This is probably due to variations in primary source materials and subsequent processes during formation such as pressure and temperature changes. Although the components of petroleum unite to form complex mixtures, the typical elemental chemical analysis indicates 10- 15% hydrogen and 82-87% carbon weight.

The organic theory presumes that hydrogen and carbon that make up petroleum came from plants and animals living on land and in sea. This explanation is most generally accepted by scientists. Heat and pressure transformed the organic materials into solid, liquid or gaseous hydrocarbons known as fossil fuels- coal, crude oil or natural gas. Oil is typically derived from marine plants and animals. Natural gas can be formed from almost any marine or terrestrial organic materials, under a wide variety of temperatures and pressures. The inorganic theory holds that hydrocarbons were trapped inside the Earth1 during the planet's formation and are slowly moving upwards. According to this theory, the hydrogen and carbon were brought together under great pressure and temperature deep in the Earth to form oil and gas, which then found its way through porous rocks to collect in natural traps in the underground formations of the earth.

Due to the force of gravity and the pressure created by the overlaying rock layers, oil and natural gas seldom stay in the source rock in which they are formed. Instead, they move through the underground layers of sedimentary rocks until they either escape at the surface or are trapped by a barrier of less permeable rock. Most of the world's petroleum had been found trapped in porous rocks under relatively impermeable formations. These reservoirs are often long distances away from the original source. A seep occurs when hydrocarbons migrate to the Earth's surface. Over time, huge amount of these hydrocarbons have escaped into atmosphere. Flowing water can also wash away hydrocarbons. Sometimes only lighter, more

volatile compounds are removed, leaving behind reservoirs of heavier types of crude oil.

2. Translate the sentences into Russian.

1) It is not possible to determine the exact origin of oil and gas because it is impossible to identify the exact place or materials from which any particular oil accumulation originated.
2) Hydrogen and carbon that make up petroleum came from plants and animals living on land and in sea.
3) Heat and pressure transformed the organic materials into solid, liquid or gaseous hydrocarbons.
4) Oil is derived from marine plants and animals.
5) Natural gas is formed from almost any marine or terrestrial organic materials.
6) Most of the world's petroleum was found trapped in porous rocks.
7) Hydrocarbons can escape into atmosphere. Flowing water washes away the hydrocarbons.

3. Translate the sentences into English.

1) Теплота и давление преобразуют органические материалы в твердые, жидкие или газообразные углеводороды.
2) Благодаря силе притяжения и давлению, создаваемым горными породами, нефть и природный газ редко остаются в породе, где они образовались.
3) Нефть и газ движутся в сторону подземных осадочных пород, откуда они могут подняться поверхность.
4) Залежи нефти и газа часто находятся далеко от источника своего формирования.
5) Большое количество углеводородов попадает в атмосферу.

4. Say what you know about:

1) Origin of oil and gas
2) Composition of oil and gas
3) Conditions necessary for oil and gas accumulation.

SESSION 7. GEOLOGICAL REVIEW OF OIL AND GAS FIELDS

Objective: to activate vocabulary in different activities: reading, listening, speaking.

Terms and Vocabulary

- anticline – антиклиналь, антиклинальная складка
- dolomite – доломит
- explorationist – геологоразведчик
- exploring – разведка, изыскание
- explosion – взрыв
- gas cap – газовая шапка (в коллекторе нефти)
- geochemist – геохимик
- geologist – геолог
- geology observations – геологические наблюдения
- geophone – сейсмоприемник
- impermeable rock – непроницаемая порода
- limestone – известняк
- mechanical vibration – механическая вибрация
- normal fault – нормальный сброс
- petroleum producing area – зона добычи нефти
- porosity – пористость
- porous reservoir – поровый коллектор
- reservoir – пласт-коллектор; пластовый резервуар (нефти, газа); нефтеносный слой; газоносный пласт; продуктивный пласт; залежи нефти
- rock formation – горная порода
- salt dome – соляной купол
- sandstone – песчаник
- saturated – насыщенный
- sedimentary basin – осадочный бассейн
- sedimentary rock – осадочная порода
- seismic energy – сейсмическая энергия, энергия сейсмических волн
- seismic survey – сейсмическая разведка
- stratigraphic pinch-out – стратиграфическая залежь
- thrust fault – открытый сброс
- to drill – бурить
- to examine – исследовать; обследовать
- to intermingle – смешивать (ся), перемешивать (ся) (with)
- to lay out – выкладывать, выставлять
- to overlie – залегать над чем-либо, (о напластованиях)
- trap – ловушка
- waxy shale – воскообразный сланец

1. Render the text and answer the questions.

1) What is lighter: oil, water or gas?
2) When it is possible to drill a well?
3) How the seismic survey is conducted?
4) In which form accumulates natural gas?
5) What is necessary to know about a basin?
6) What are the basic requirements for presence of oil and gas?
7) What study the geologists, geophysicists, geochemists and paleontologists?
8) How geophysicists can identify the structure, configuration, thickness and depth of new sedimentary basins?

EXPLORING OF OIL AND GAS

Earth scientists in the petroleum industry - including geologists, geophysicists, geochemists and paleontologists - study what has happened to rocks that may be buried thousands of meters below surface, how those rocks were formed and affected by events stretching back millions of years, and how to identify traps where oil and gas accumulated within rock formations. An explorer may have a well-developed theory or intuition why an area should contain oil and gas. A first-hand look at outcrop geology and surface features sometimes helps to confirm the basic requirements - that there may be sedimentary rocks, potential reservoirs and hydrocarbon-bearing source rocks in a sedimentary basin.

Within a basin, the explorer's first step is to examine all the information already known about the area. This might include academic papers, surface geology observations, any wells drilled, data from relevant agencies or departments and previous exploration results from nearby or similar areas. Geophysicists can identify the structure, configuration, thickness and depth of new sedimentary basins by measuring slight variations in the Earth's gravitational and magnetic fields and by measuring the time taken for seismic energy waves to pass through and be reflected from sedimentary layers.

In a typical trap, gas accumulates on the top of the reservoir as a "gas cap" over the oil, which in turn overlies the water-saturated zone in the reservoir. This occurs because natural gas is lighter than oil which is lighter than water. However, all three fluids are often intermingled in parts of the reservoir. Porosity is the ability of rock to hold oil and gas like water in a sponge. A trap requires three elements:

– A porous reservoir rock to accumulate the oil and gas- typically sandstones, limestones and dolomites
– An overlaying impermeable rock to prevent oil and gas from escaping
– A source for the oil and gas, typically black waxy shales.

There are 6 common oil and gas traps: 1) thrust fault; 2) normal fault; 3) stratigraphic pinch-out; 4) reef; 5) anticlines; 6) salt dome.

If it is impossible to obtain the geophysical data from regulatory bodies, the seismic survey is required. In a seismic survey it is necessary to lay out a line or several lines of sensitive receivers, called geophones or jugs, on the ground. Then explosions or mechanical vibrations are created on the surface. The geophones record the energy reflected back as seismic waves from rock layers at various depths. Geophysicists and geologists examine the seismic data for the presence of suitable traps and for similarities with other petroleum-producing areas. If the results seem promising, they use the seismic data to pinpoint where to drill a well.

2. Use the proper related form of the words in brackets.

In general, all these elements must be (*assess*) via a limited 'window' into the subsurface world, provided by one or possibly more exploration wells. These wells present only a 1-dimensional segment through the Earth and the skill of inferring 3-dimensional characteristics from them is one of the most fundamental in petroleum geology. Recently, the availability of inexpensive, high (*qualification*) 3D seismic data from reflection seismology and data from (*vary*) electromagnetic geophysical techniques such as magnetotellurics has greatly aided the accuracy of such (*interpreter*). The following section discusses these elements in brief.

(*Evaluate*) of the source uses the methods of geochemistry to (*quantity*) the nature of organic- rich rocks which contain the precursors to hydrocarbons, such that the (*typical*) and quality of expelled hydrocarbons can be (*assessment*).

The reservoir is a (*pore*) and (*permeability*) lithological unit or set of units that holds the hydrocarbon reserves. Analysis of reservoirs at the simplest level requires an assessment of their porosity to (*calculator*) the volume of in situ hydrocarbons and their permeability to (*calculation*) how easily hydrocarbons will flow out of them. Some of the key disciplines (*use*) in reservoir analysis are the fields of structural analysis, stratigraphy, sedimentology, and reservoir engineering.

The seal, or cap rock, is a unit with low permeability that impedes the escape of hydrocarbons from the reservoir rock. Common seals include evaporites, chalks and shales. Analysis of seals involves (*assess*) of their (*thick*) and extent, such that their (*effect*) can be quantified.

The trap is the (*stratigraphy*) or structural feature that ensures the juxtaposition of reservoir and seal such that hydrocarbons remain trapped in the subsurface, rather than escaping due to their natural buoyancy and being lost.

Analysis of (*mature*) involves assessing the thermal history of the source rock in order to make predictions of the amount and timing of hydrocarbon (*generator*) and expulsion. Finally, (*careless*) studies of migration reveal information on how hydrocarbons (*movement*) from source to reservoir and help quantify the source or kitchen of hydrocarbons in a particular area.

3. Translate the sentences into Russian.

1) Geologists, geophysicists, geochemists and paleontologists study what has happened to rocks that may be buried thousands of meters below surface and how to identify traps where oil and gas accumulated within rock formations.
2) An explorer may have a well-developed theory or intuition why an area should contain oil and gas.
3) The basic requirements of oil or gas presence must be sedimentary rocks, potential reservoirs and hydrocarbon-bearing source rocks in a sedimentary basin.
4) The explorer's first step is to examine all the information already known about the area.
5) Geophysicists can identify the structure, configuration, thickness and depth of new sedimentary basins.
6) Gas accumulates on the top of the reservoir as a "gas cap" over the oil.
7) The seismic survey is required when it is impossible to obtain the geophysical data from regulatory bodies.
8) In a seismic survey it is necessary to lay out a line or several lines of sensitive receivers, called geophones or jugs, on the ground.
9) In case if the results of seismic survey seem promising, they use the seismic data to pinpoint where to drill a well.

4. Translate the sentences into English.

1) Сейсморазведка - это один из способов обнаружить нефть и природный газ.
2) Перед бурением скважины геологоразведчики собирают всю геологическую информацию.
3) На поверхности производят взрывы и механические вибрации.
4) Геофизики и геологи сравнивают сейсмические данные с данными других нефтедобывающих районов.
5) Для сейсморазведки нужны сейсмофоны и чувствительные приемники.
6) Пористость - это свойство породы удерживать нефть и газ, как воду в губке.
7) Для ловушки необходимы следующие три элемента: пористая порода, непроницаемая порода и воскообразный сланец.

SESSION 8. WELL

Objective: to activate vocabulary in different activities: reading, listening, speaking.

Terms and Vocabulary

- Acidizing – кислотная обработка (скважины или пласта)
- artificial lift – механизированная добыча, насосно-компрессорная добыча
- crude oil – сырая нефть; неочищенная нефть; пластовая нефть
- drill string – колонна бурильных труб, бурильная колонна
- driller – буровик, бурильщик; буровой мастер
- wellbore – ствол скважины
- stimulating – стимулирование
- pressure gage – манометр
- packer – пакер
- wellhead – устье скважины; оборудование устья скважины
- drilling rig – буровая установка
- ground – земля, почва; грунт
- injection – нагнетание; закачивание
- pumping – выкачивание
- recovery factor – коэффициент нефтеотдачи
- rock formation – пласт породы
- rod string – колонна насосных штанг
- surface – поверхность; земная поверхность
- thread – резьба; нарезка // нарезать резьбу; виток резьбы; ход винта
- to bring in a well – ввести скважину в эксплуатацию
- to drill – бурить; сверлить, просверлить
- viscosity – вязкость
- production tubing – эксплуатационная насосно-компрессорная колонна
- sloughing – обрушение стенок скважины // обрушивающийся, осыпающийся
- valve – клапан; вентиль; задвижка; золотник; распределительный кран
- fluid – флюид (жидкость, газ, смесь жидкостей и газов); газонефтяная система; газ; газообразная среда // газообразный; жидкость; текучая среда // жидкий; текучий
- fracturing – гидравлический разрыв пласта (закачкой жидкости под большим давлением)
- installation – установка; устройство; агрегат; система; оборудование; аппаратура; размещение, расположение; установка (оборудования), монтаж
- perforate perforation – перфорировать, простреливать (обсадные трубы); пробивать отверстия; продавливать отверстия
- proppant – расклинивающий наполнитель (жидкость для гидравл. разрыва пласта)

– casing – обсадные трубы, обсадная колонна // крепление (скважины) обсадными трубами
– choke – штуцер; фонтанный штуцер; дроссельная катушка; воздушная заслонка; дроссель; заглушка
– coupling – соединение; сопряжение; сцепление, сочленение; соединительный фланец; ниппель; муфта; соединительная втулка

1. Translate the word combinations and make up 10 sentences.

Drilling, hydrocarbons, installing a pump, acidizing, injection of acids, underpressure, rock formation, production tubing, perforation, fracturing, stimulation, hard substance, low-pressure gas, percentage of the oil in the reservoir, recovery factor, large number of elements, density of the oil, viscosity, porosity, permeability of the rock, pressure in the oil reservoir, wellbore, drilling rig, wellhead, choke, valve, casing.

2. Render the text and answer the questions.

1) What is the well?
2) What is proppant?
3) How the wells are drilled?
4) What is the recovery factor?
5) What is the purpose of perforation?
6) What devices are wed during perforation?
7) What kind of wells needs artificial lift?
8) Why many oil and gas well must be stimulated?
9) How can we call pumping of well fluids in other words?
10) What is more complicated: production of crude oil or gas?
11) How flow gas from the well? What equipment is used to control gas flow?
12) What happens when the wellhead pressure is less than the pipeline pressure?

THE WELL

The well is a hole drilled in the earth for the purpose of finding or producing crude oil or natural gas; or providing services related to the production of crude oil or natural gas. In addition, an oil well can be described as a pipeline reaching from the top of the ground to the oil producing formation. Through this pipe, oil and gas are brought to the surface. Wells are normally drilled with a drilling rig in stages, starting with a surface hole drilled to reach a depth anywhere from 60 to 400 meters.

The drillers then pull out the drill string and insert steel pipe, called surface casing, which is cemented in place to keep the wall from caving in. The casing - tubular steel pipe connected by threads and couplings-lines the total length of the

well bore to ensure safe control of production, to prevent water entering the wellbore, and to keep the rock formations from "sloughing" into the wellbore.

The second step is the installation of the production tubing. Tubing is a steel pipe smaller in diameter than the production casing. It is lowered into the casing and held in place by packers, which also isolate the production layers of rock.

The tubing hangs from a surface installation called the wellhead. The wellhead includes valves, chokes and pressure gages and makes it possible to regulate production from the well. The third step is to perforate the well. The casing prevents the hole from collapsing, but it also prevents the oil or gas from entering the wellbore. Therefore, holes are made through the casing and into the formation. This is usually accomplished with an explosive device that is lowered into the well on an electrical wire line to the required depth. This device, a collection of explosive charges, is called a perforating gun.

Producing oil and gas from the well. Gas generally flows to the wellbore under its own pressure. As a result, most gas wells are equipped only with chokes and valves to control the flow through the wellhead into a pipeline. When the wellhead pressure is less than the pipeline pressure, a compressor is installed to boost the low-pressure gas into the pipeline. The production of crude oil is more complicated. Crude oil has larger molecules and moves through rocks less easily. The percentage of the oil in the reservoir that can be produced naturally, called the recovery factor, is determined by a large number of elements. These include the density of the oil, the viscosity, the porosity and permeability of the rock, the pressure in the oil reservoir and the pressure of other fluids such as gas and water in the reservoir.

Pumping. While some oil wells contain enough pressure to push oil to the surface, most oil wells drilled today require pumping. This is also known as artificial lift. If a well requires it, a pump is lowered down the tubing to the bottom of the well on a string of steel rods, referred to as the rod string. Either the rod string conveys power to the pump by rotating or moving up and down, depending on the type of pump employed. Submersible pumps3are used on some wells.

Well stimulation. In many oil and gas wells, one additional step is required-stimulating the formation by physical or chemical means so that the hydrocarbons can move more easily to the wellbore through the pores or fractures in the reservoir. This is usually done before installing a pump or when the pump is removed for maintenance. One form of stimulation-acidizing is the injection of acids under pressure into the rock formation through the production tubing and perforations. This creates channels beyond the perforations for oil and gas to flow back to the well. Fracturing or tracing is another common method of stimulation.

A fluid such as water or an oil product is pumped down the hole under sufficient pressure to create cracks (fractures) in the formation. Proppant - a hard substance such as sand, ceramics or resin-coated material - in injected with the fluid. As the fluid disperses, the material remains to prop open the fracture.

3. Translate the sentences into English.

1) Скважина - это отверстие, пробуренное в земле в целях добычи сырой нефти и природного газа.
2) Обсадная колонна - это стальная труба, которая обеспечивает безопасность добычи и предотвращает проникновение воды в ствол скважины.
3) Насосно-компрессорная труба имеет меньший диаметр, чем обсадная колонна.
4) Сырая нефть состоит из молекул большего размера и она тяжелее продвигается сквозь породы.
5) Процент нефти, извлеченной из всей залежи называется нефтеотдачей.
6) Механизированной добычей называется извлечение нефти из пласта с помощью насосов.
7) При механизированной добыче насос опускается в насосно-компрессорную трубу.
8) На некоторых скважинах используются погружные насосы.

4. Describe the wellhead equipment.

5. Describe the forms of well stimulation

SESSION 9. DRILLING

Objective: to activate vocabulary in different activities: reading, listening, speaking.

1. Read the interview with John Braun and answer the questions.

1) How much time does he spend in the field?
2) What does he do in front of his computer?
3) What is in the 'core store'?
4) What equipment does he use?
5) List the three special skills he mentions.
6) Who does he work with?
7) What do you think are the advantages and disadvantages of his job?
8) Would you like to do it?

J.B.: I work as a geology lab technician in an energy company. We look for the best places to drill wells.

Interviewer: Do you spend much time in the field?

J.B.: No, mostly I'm in front of my computer creating models. Or else I'm in the core store. This is where we keep the samples we come across during the drilling.

Interviewer: What equipment do you use and why?

J.B.: I use a microscope to examine samples. I look out for traces of hydrocarbons or fossils that give me the age of the rock and so on. I also operate underwater cameras and the machinery that collects rock samples. I can do all of this from my workstation.

Interviewer: What special skills do you need?

J.B.: Firstly, you need to know the characteristics of the rocks you come across. Then you need to be good at seeing things in three dimensions. Finally, you need to know what all the data means. A group of three or four people usually looks into the subject.

Interviewer: Is it a nine to five job?

J.B.: Mostly, but when you're on an operation, you have to be available any time of the day or night. The guys doing the drilling may need to find something out before they make an important decision. They may want me to look up some important data for them.

Interviewer: How important is teamwork in your job?

J.B.: Very. Different team members have different skills. I work alongside a seismic interpreter and a reservoir engineer.

(from Oxford English for Careers. Oil and Gas by Jon Naunton and Alison Pohl)

2. Translate and make up sentences with those words and word combinations.

- буровая вышка
- скважина
- долото
- крошит и режет породу
- полые трубки
- шестигранная форма
- роторный стол
- буровой раствор
- произвести замену трубы
- дорогостоящая процедура

3. Fill in the blanks choosing the proper English word from those given above the texts.

cuttings, fluid, shale shaker, rotary, mud tanks, annulus, crushes.

1) The _____ bit cuts and _____ the rock at the bottom of the hole.
2) Drilling _____ carries the _____ from the bottom of the hole, up the _____ to the surface.
3) The cuttings are separated from the mud at the _____ and the clean mud then returns to the _____ .

4. Make up sentences using the given word combinations.

- *Floorman / mix / clay and chemicals.*
- *Drilling crew / trip / pipe out of hole.*
- *Mud man / check / drilling fluid.*
- *Supply boat / deliver / bentonite.*
- *Roughneck / move back / single.*

5. Translate the sentences into English.

1) Нефть содержится в породе под водой и под землей.
2) Раствор прокачивается на дно скважины через колонну бурильных труб.

3) Буровая вышка — это оборудование, предназначенное для бурения скважин. Вращаясь, долото крошит и режет породу на дне скважины.
4) Шлам доставляется на поверхность буровым раствором, который является смесью глины, воды и химикатов.
5) Колонна бурильных труб составляется из полых трубок, длина которых тридцать футов.
6) В верхней части колонны бурильных труб находится ведущая буровая труба шестигранной формы.
7) Роторный стол вращает ведущую бурильную трубу, которая, в свою очередь, вращает колонну бурильных труб, а она вращает долото.
8) Буровой раствор используется не только для доставки шлама на поверхность, но и для охлаждения долота.
9) В обязанности растворщика входит следить за состоянием бурового раствора.
10) Если долото затупилось, нефтяники должны произвести замену трубы, но эта процедура дорогостоящая, поэтому производится в крайних случаях.

SESSION 10. RIG WORK

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

1. Find the English equivalents in the text below.

- *большинство нефтяных компаний*
- *бригада*
- *бурение*
- *верховой работает на высоте*
- *в круглосуточном режиме*
- *любой новичок*
- *носить бочки со смазкой*
- *проложить себе дорогу*
- *работа, не требующая высокой квалификации*
- *разгружать различные материалы*
- *соединение или отсоединение подъемников*
- *соскребать ржавчину*
- *сфера деятельности*
- *техническое образование*
- *разнорабочий*

2. Match antonyms in A and B.

A	**B**
Surface	to exclude
to prevent	low
appropriate	absent
strongly	weakly
present	subsurface
similar	cheap
costly	impermeable
high	to permit
to include	unsuitable
permeable	different

3. Render the text and answer the questions.

1) Which is closer to the RKB, the rathole or the mousehole? Why?
2) A derrickman must have excellent balance. Why? The platform that he uses is called «monkeyboard». For what reason?
3) Why might it be hazardous to the crew to have a green worker on the rig floor?
4) How are the tongs suspended at working height?
5) Would you like to work as a roustabout? Give the reasons for your answer.
6) What is the derrickman responsible for? Who is he responsible to? Who is the toolpush responsible to? What is the drilling superintendent responsible for?
7) If you knew that you had misunderstood the instruction, what could you do? If you didn't know that you had misunderstood an instruction, what might you do?
8) Why must dope be viscous?

DRILLING

Drilling is one of those jobs where a man has to work his way up. Even if a man has a university or polytechnic education, most oil companies will want him to get rig experience by working on the floor with the rotary crew for a certain period. A boll weevil, even if he is well educated, can be a highly dangerous person around the rotary table. He may be a danger to himself (by breaking a leg in the mouse hole, for example), and may be a hazard to the other members of the crew. *What might happen, for instance, if he opened the wrong valve or misunderstood an urgent instruction?*

On some rigs, the first step up the ladder is the job of roustabout. A roustabout does semi-skilled labour such as scraping rust, hosing down, painting, carrying cans of dope, unloading materials and supplies, etc. Having worked for a time as a roustabout, a man might be ready for the job of roughneck. Among a roughneck's duties are such things as operating the cathead, handling the slips and tongs, standing pipe back in the derrick, assisting in mixing the slush, and so on. Like a roustabout, a roughneck may have to be told what to do. In general, though, roughnecks know their job well enough to get on with it for the minimum number of spoken instructions. It is noisy around the kelly bushing, and events frequently take place too fast for verbal orders to be given. Much of the time, roughnecks are expected to know automatically what must be done.

Next, between the positions of roughneck and driller, is the job of derrick man. The derrick man works from about 60 ft. to 90 ft. above the rig floor, near the top of the derrick, where he attaches or detaches the elevators when pipe or casing is run into or pulled out of the hole. The height at which he works depends on the length of the sections of pipe, casing or tubing that have to be handled. These may be in doubles, thribbles, or fourbles. The derrick man also cleans, oils, greases, inspects and repairs the pulley blocks and cables, which are used to raise and lower

sections of pipe and casing. When he is not busy on his platform up in the derrick, the derrick man usually has special responsibility for the slush pumps and tanks. Rigs operate around the clock. The period from 8 a.m. to 4 p.m. is the daylight tour, 4 p.m. to 12 midnight is the afternoon tour, and 12 midnight to 8 a.m. is referred to as «graveyard tour». Offshore crews usually work twelve-hour tours.

4. Chose the proper English word from the sentences.

1) A tongman is a *(roughneck/roustabout)* who *(attaches/detaches/handles)* the tongs *(above/in/below)* the rotary table.
2) Slips are *(iron/steel)* wedges fitted with *(teeth/points)*. The slips are dropped into the *(master/mister)* bushings in the rotary table to *(join/secure)* drill pipe or casing in the table when making up or braking *(in/off/out)*.
3) Dope is a *(lubricate/lubricant)*. It's a medium thick *(oil/greasy/oily)* which is used on pipe and casing threads when *(making/breaking) (in/off/up/out)*.
4) The *(toolpusher/driller)* is responsible *(for/to)* the drilling superintendent *(for/to)* all rig operations and *(for/to) (making/make)* sure that all *(necessary/essential)* tools, equipment, services and materials are available as required.
5) The job of a reservoir engineer is to get *(minimum/maximum)* recovery at *(minimum/maximum)* cost to the company.
6) Slips are *(iron/steel)* wedges fitted with *(teeth/points)*. The slips are dropped into the *(master/mister)* bushings in the rotary table to *(join/secure)* drill pipe or casing in the table when making up or braking *(in/off/out)*.
7) Dope is a *(lubricate/lubricant)*. It's a medium thick *(oil/greasy/oily)* which is used on pipe and casing threads when *(making/breaking) (in/off/up/out)*.
8) The *(toolpusher/driller)* is responsible *(for/to)* the drilling superintendent *(for/to)* all rig operations and *(for/to) (making/make)* sure that all *(necessary/essential)* tools, equipment, services and materials are available as required.
9) The job of a reservoir engineer is to get *(minimum/maximum)* recovery at *(minimum/maximum)* cost to the company.

SESSION 11. OIL AND GAS TRANSPORTATION

Objective: to activate vocabulary in different activities: reading, listening, speaking.

Terms and Vocabulary

- assembly line – сборочная линия
- barge – баржа
- tanker – танкер
- trench – траншея; канава; шурф; котлован
- truck – автоцистерна
- trunk line – магистральный трубопровод
- processing plant – технологическая установка; обрабатывающая установка
- protective coating – защитное покрытие
- railroad – железная дорога
- refined – очищенный
- refinery – нефтеперерабатывающий завод
- regulator – регулятивный орган
- gas leak – утечка газа
- vast – обширный, громадный
- stockpile – отвал (грунта); устраивать отвал
- commodities – нефтепродукты
- destination – место назначения, пункт назначения
- isolate – изолировать
- landscape – ландшафтный
- centrifugal pump – центробежный насос
- petrochemical plant – нефтехимический завод
- cathodic protection – катодная защита (от коррозии)
- remotely operated valve – дистанционно управляемая задвижка
- instrumented inspection – проверка с помощью измерительной аппаратуры
- local distribution company – местная газораспределительная компания
- transmission facility – установка для передачи; линия электропередачи
- batch – партия (при последовательном перекачивании различных нефтепродуктов по трубопроводу)
- electric utilities – энергосистемы общего пользования, электроэнергетика общего пользования
- gathering lines – сборочная линия; линия, идущая от скважины к резервуару (внутрипромысловой системы сбора нефти); нефтепромысловый магистральный трубопровод
- device – устройство; установка; агрегат; аппарат; механизм; прибор, измерительное устройство
- pig – скребок (для чистки труб) // протаскивать скребок (через трубы для их очистки)

– safety and environmental standards – стандарты техники безопасности и безопасности окружающей среды

1. Render the text and anser the following questions.

1) How a pipeline is laid?
2) What is the oil speed in a pipeline?
3) What devices are used to monitor the pipelines?
4) Describe 4 common categories of the pipelines.
5) Why is it necessary to provide cathodic protection of a pipeline?
6) How it takes to deliver the oil from A to B, if we know that the distance is 1450 km and the oil speed is 6 km/h.?

TRANSPORTATION OF OIL AND GAS

Pipelines transport major part of Russia oil and gas. Some pipelines are massive steel conduits more than a meter in diameter, while others are plastic tubes a few centimeters across. They form a delivery system as vast and complex as the railroads, highways or electric utilities.

A mobile assembly line moves across the landscape to lay a pipeline. Layers of soil are stockpiled separately so they can be replaced after the pipe is buried more than a meter below the ground. The sections of pipe are welded and inspected with X-rays before being covered with a protective coating and lowered into trench. Before it goes into operation, the pipe will be filled with water at high pressure to test for leaks. Regulators set strict safety and environmental standards for pipeline construction and operation.

Cathodic protection is used to prevent corrosion of the pipe. Instrumented inspection devices called pigs are sent through pipes regularly to inspect them and check for weakness or corrosion. Sophisticated computer systems monitor pipelines continuously, and remotely operated valves can quickly isolate a section of pipe in the event of a leak. Pipelines fall into four general categories:

– gathering lines move raw oil and gas from wellheads to processing plants and transmission facilities;
– trunk lines transport crude oil, natural gas liquids and refined petroleum products to refineries and petrochemical plants, and some trunk lines transport refined products to consumer areas;
– gas transmission systems carry natural gas at high pressure from producing areas to consuming areas;
– local distribution companies deliver natural gas at low pressure to homes and businesses;

A network of gathering lines in the oilfield delivers crude oil to storage tanks. From the oil storage tanks the crude oil is then delivered to an oil pipeline. In the oil pipeline, powerful electric motors drive the centrifugal pumps. Oil travels through the pipe at four to eight kilometers per hour, and it may take a month or more to carry oil to

distant places. Unlike gas transmission pipelines, which primarily carry methane, liquid trunk lines can carry different types of crude oil, natural gas liquids and refined products. The commodities travel through the pipe in batches, which can be many kilometers long. Complicated networks of valves and storage tanks are used to make sure the batches get to the correct destination. Crude oil, gas liquids and refined products are also transported by truck, railway, tanker and barge. The oil tanker is the cheapest form of long-distance energy transportation, while the oil pipeline is the second cheapest.

2. Translate the sentences into Russian.

1) The oil and gas are transported by the pipelines.
2) Cathodic protection is used to prevent corrosion of the pipe.
3) A mobile assembly line moves across the landscape to lay a pipeline.
4) Sophisticated computer systems monitor pipelines continuously.
5) A network of gathering lines in the oilfield delivers crude oil to storage tanks and then it comes to oil pipeline.
6) Crude oil, gas liquids and refined products are also transported by truck, railway, tanker and barge.
7) The pipe will be filled with water at high pressure to test for leaks, before it goes into operation.
8) The pigs are sent through pipes regularly to inspect them and check for weakness or corrosion.
9) Some pipelines are massive steel conduits more than a meter in diameter, while others are plastic tubes a few centimeters across.
10) The sections of pipe are welded and inspected with X-rays before being covered with a protective coating and lowered into trench.

3. Translate the sentences into English.

1) Самый дешевый способ транспортировки нефти после перевозки танкером - это с помощью трубопроводов.
2) Трубопроводы делятся на четыре общие категории: сборочные, магистральные трубопроводы, системы газоснабжения и трубопроводы местных газораспределительных компаний.
3) Сложные сети задвижек и резервуаров - хранилищ используются для того, чтобы партия нефтепродуктов достигла точного места назначения.
4) В нефтепроводе мощный электродвигатель приводит в движение центробежные насосы.
5) Магистральные трубопроводы переносят разные виды сырой нефти, природного газа и нефтепродуктов.
6) Сырая нефть, газ и переработанные нефтепродукты могут также транспортироваться посредством автоцистерн, железной дороги, танкеров и барж.

4. Find attributes in the following sentences and translate the sentences into Russian.

1) Rocks referred to as igneous rocks contain no pores.
2) The samples in question were examined for fossils.
3) The plays involved are supposed to be rather promising.
4) The cores to be examined were sampled at regular intervals.
5) Rocks being consolidated from hot liquid magma are called igneous rocks.
6) The examination of the drilling mud followed by coring confirmed our suppositions.
7) The results of hydrocarbon source potential evaluation are summarized in the table.
8) There is a potential for finding significant reserves in relatively large economic pools.
9) The igneous rocks resulting from the solidification of magma are mostly tight.
10) Some of the natural resources we depend on often form near geologic structures.
11) Information to be derived from the formation test will give direct evidence of the presence of oil.

SESSION 12. WELL TESTING

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- pressure gage – манометр давления
- producing allowables – нефтяная квота
- well test – испытания скважины
- efficient performing – эффективная работа
- orifice meter – диафрагменный расходомер
- radio active tracers – радиоактивный индикатор
- recording manometer – регистрирующий манометр
- bottom-hole pressure test – испытание забойного давления
- orifice well tester – диафрагменный расходомер скважины
- potential test – определение потенциального дебита (скважины)
- producing equipment – промысловое оборудование для добычи
- producing interval – нефтеносный интервал; продуктивный интервал
- wireline measurement – измерение при помощи кабельного опробователя
- flow rate – дебит (скважины или промысла); производительность (насоса, компрессора)
- lease tank – нефтесборный промысловый резервуар (арендованный для хранения нефти на месте добычи)
- routine – установившаяся практика; заведенный порядок (работы); повседневный; текущий (об обслуживании и ремонте)

1. Make up sentences with following words and word combinations.

efficient performing, producing equipment, pressure gage, flow rate, orifice meter, producing allowable, well test, routine.

2. Render the text.

WELL TESTING

In producing gas and oil, efficient performance of the producing wells has more and more importance. A variety of tests must be made to determine the performance of an oil or gas well. This procedure is called testing. There are a large number of types of well tests and each is needed to obtain certain information about the well.

Various personnel make the many well tests, some of which are routine and some of which are complicated. Depending upon the type of test to be performed, the standard lease producing equipment may be all that is necessary for the test. In

other tests, specially designed apparatus may be necessary. In any event, it is very important that the test be done accurately since well test data presents the true history of a well and the reservoir in which it is completed.

Potential test: The most frequently conducted well test is the potential test, which is a measurement of the largest amount of oil and gas, produced by a well in a 24-hour period under certain fixed conditions. The produced oil is measured in an automatically controlled production and test unit. It also can be measured by wire line measurement in the lease tank. Produced gas is measured at the same time with equipment such as an orifice meter or an orifice well tester. The major items of equipment needed for a test of this type are usually available as standard equipment at the lease tank farm.

The potential test is normally made on each newly completed well and often during its production life. The information obtained from this test is required by the state regulatory group, which assigns a producing allowable, which must be followed by the operator of the well. It is necessary to make the tests from time to time and producing allowables are adjusted according to the results of the tests. Very often, the producer to help in establishing proper production practices performs these tests.

Bottom-hole pressure test: This test is a measure of the reservoir pressure of the well at a specific depth or at midpoint of the producing interval. The purpose of this test is to measure the pressure in the zone in which the well is completed. In making of this test, a specially designed pressure gage is lowered into the well by means of a wire line. The pressure at the selected depth is recorded by the gage. After that, gas is pulled to the surface and is taken from the well. Regular bottom-hole tests will provide valuable information about the decline or depletion of the zone in which the well has been producing.

Productivity tests. Productivity tests are made on both oil and gas wells, and include both the potential test and the bottom-hole pressure test. The purpose is to determine the effects of different flow rates on the pressure within the producing zone. In this way, it is possible to establish some certain physical characteristics of the reservoir and to calculate maximum potential rate of flow. This test mitigates risk of damaging the well, which might occur if the well were produced at its maximum possible flow rate.

Special tests: Two types of special tests are fluid level determination and bottom whole determination. The first is required for wells, which will not flow and must be made to produce by pumping or artificial lift. The bottom-hole determination is normally made along with the bottom-hole pressure test and is made to determine the temperature of the well at the bottom of the hole. It is necessary to lower a specially designed recording manometer into the well on a wire line. The temperature tests are used by the engineer in solving problems about the nature of oil or gas that the well produces. It is also useful in locating leaks in the pipe above the producing zone. Other special tests are performed with flow rate indicators and radioactive tracers.

3. Translate the sentences into Russian.

1) Some tests must be made to determine the performance of an oil or gas well.
2) The standard lease producing equipment may be all that is necessary for the test.
3) A specially designed pressure gage is lowered into the well by means of a wire line.
4) The produced oil is measured in an automatically controlled production and test unit.
5) There are a large number of types of well tests and each is needed to obtain more information about the well.
6) It is very important that the test be done accurately since well test data presents the true history of a well.
7) The tests are performed by the producer to help in establishing proper production practices.
8) The temperature tests are used by the engineer in solving problems about nature of oil or gas that the well produces.

4. Translate the sentences into English.

1) Определение потенциального дебита скважины является наиболее частым видом ее испытания.
2) Добытый газ измеряется с помощью диафрагменного расходомера.
3) Оператор скважины должен соблюдать заданные параметры режима добычи нефти.
4) Это испытание представляет собой измерение давления залежи на определенной глубине зоны, где была закончена скважина.
5) Можно установить определенные физические характеристики залежи и подсчитать максимально возможный дебит скважины.
6) Испытание исключает риск повреждения скважины.
7) Имеется два вида специальных испытаний: определение уровня жидкости и определение забоя скважины.
8) Другие специальные испытания производятся с помощью индикаторов дебита скважины и радиоактивных индикаторов.

5. Read the text and do the following tasks.

1) Find the definitions of all the terms used in the text.
2) Say the difference between resource and reserve.
3) Say when the term “undiscovered” is used.

Resource is defined as all hydrocarbon accumulations that are known or are supposed to exist. Reserves are that portion of the resource that has been discovered, and the word potential describes that part of the resource that is supposed to exist but is not yet discovered.

The terms potential and undiscovered resources are synonyms and may be used interchangeably. It should be noted that the term reserve also has been used elsewhere to refer to initial marketable hydrocarbon volume, so discovered in place volume is used rather than reserve to avoid confusion.

The terms pool, prospect, play, and field have the following designated meanings: A prospect is defined as an untested exploration target within a single stratigraphic interval that may or may not contain hydrocarbons. A play is a family of pools and/or prospects that share a common history of hydrocarbon generation, migration, reservoir development, and trap configuration.

The term field designates an area that produces hydrocarbons without stratigraphic interval limitations. A pool is defined as a discovered hydrocarbon accumulation, typically within a single stratigraphic interval, that is hydrodynamically separate from another accumulation.

SESSION 13. OIL AND GAS REFINING

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- baffle – направляющая перегородка
- bottom – дно
- chamber – камера
- inlet/outlet – вход/выход
- particle – частица
- tube – труба
- to connect – соединять
- to measure – измерять
- design – конструкция
- float – поплавок
- control valve – распределительный клапан; регулирующии клапан; регулирующая задвижка
- flow line – выкидная линия (трубопровод, идущий от скважины к сепаратору); сборный нефтепровод
- gas-gathering system – газосборная система; газоотводная система; газосборная сеть (на нефтепромысле)
- separation – разделение, сепаратор
- storage tank – резервуар-хранилище
- swirl cylinder – вихревой цилиндр
- swirling motion – вихревое движение
- to drain – дренировать; сливать; стекать; спускать
- to reduce – уменьшать, снижать; понижать
- to separate separator – отделять(ся); выделять(ся) отделение;
- treatment – (технологическая) обработка; очистка

1. Render the text and answer the following questions.

1) What is the separator?
2) Why is it necessary to use separators?
3) What is the simplest form of separator?
4) How operates three- stage separation system?
5) What is the operating principle of vertical-type separator?
6) What is the difference between single-tube and double-tube separator?

SEPARATION OF OIL AND GAS

Well fluids must be separated into oil, gas and water and each of them must be measured. In the early days of the oil industry, separators were not used. The production from wells was discharged directly into storage tanks. Although this resulted in separation of the liquids and gases, the practice was both wasteful and d dangerous. The separators were developed to reduce such waste and the danger of fire and explosion. Petroleum mixtures are often complex and difficult to separate efficiently. The equipment used to separate the liquids from the gases is referred to as a separator. The simplest form of an oil and gas separator is a small tank in which the force of gravity is used to separate the oil and gas. Oil, being heavy compared to the gas, falls to the bottom of the tank from which it goes into storage tanks. Gas, being lighter, rises to the top of the tank and goes from there into a gas-gathering system.

In addition to using the force of gravity, modern separators make use of other forces to get the best possible separation of oil and gas. The way in which each of those forces is used can be better understood by following the flow of a mixture of oil and gas through a separator

Vertical Separator: The mixture of oil and gas enters inlet, where it given a swirling motion by a spiral inlet baffle in the separator space or chamber. At this point, there are two forces tending to separate the oil from gas. The first is the effect of gravity; the second is the centrifugal action, which causes the heavy oil particles to collect on the walls of the separator. Gas, which still contains some oil rises through chamber and then enters the swirl cylinder and oil drains through tubes to the bottom of separator. The gas then passes through another chamber and leaves the separator through gas outlet. Oil leaves separator at the oil outlet. A float regulates the oil and control valve, so liquid covers the drain tubes and the oil outlet.

Horizontal separator: Separators of horizontal type are also common; and, although of different design, they have the same uses as the vertical separator. There are single tube and double tube separators. Horizontal separators of the two-tube design are often used. The unit is made if two horizontal tubes mounted one above the other. Flow channels near the ends of the tubes joint the tubes. The mixed stream of oil and gas enters at one end of the upper tube. The liquids fall through the first connecting flow pipe into the liquid reservoir, which occupies the lower portion of the bottom tube. Oil, separated from gas, goes to stock tanks. Gas leaves the separator through the gas outlet.

Single-tube separator. Stage separator: Under certain conditions, it is often desirable to use more than one stage of separation in order to obtain more complete recovery of liquids. For instance, three-stage separation system operates as follows: the first stage operates at the highest pressure and the second and third at lower pressures.

Low temperature separator: Low-temperature separation is a method of separation sometimes used to handle the production of high-pressure gas wells that produce some light liquids. The liquid separation is made possible by cooling the gas stream before separation.

2. Translate the sentences into Russian.

1) In the early days of the oil industry, separators were not used.
2) Petroleum mixtures are often complex and difficult to separate efficiently.
3) Gas rises to the top of the tank and goes from there into a gas-gathering system.
4) The separators were developed to reduce such waste and danger of fire and explosion.
5) Modern separators use force of gravity to get the best possible separation of oil and gas.
6) There are several types of separators: vertical, horizontal, stage and low-temperature separators.

3. Translate the sentences into English.

1) Нефтяные смеси часто бывает сложно и тяжело отделить.
2) Сила тяжести используется для отделения нефти и газа.
3) Современные сепараторы используют и другие силы, помимо силы тяжести.
4) Горизонтальные сепараторы могут иметь конструкцию с трубами.
5) Оборудование, с помощью которого отделяют жидкость от газов, называется сепаратором.
6) Газ, будучи легче нефти, поднимается на верх резервуара и поступает в газосборную систему.
7) Нефть, будучи тяжелее газа, стекает на дно резервуара, откуда она попадает в резервуар - хранилище.
8) При определенных условиях часто желательно использовать более одной стадии сепарации для того, чтобы получить наиболее полный выход жидкостей.

4. Translate the text in writing. Use a dictionary.

Several important factors must be considered in petroleum exploration: reservoir and effective pore spaces; trap; seal and cap rock; secondary hydrocarbon migration; primary hydrocarbon migration; hydrocarbon generation and maturation; and source rock.

Hydrocarbons may be generated from source rocks, move from source to reservoir by the primary migration agent, and migrate within the reservoir by the secondary migration process. Before and after such hydrocarbons reach a trap, they must be sealed by cap rocks. At the final trapping position, the reservoir must have sufficient porosity and permeability for petroleum production.

Available subsurface data are more abundant for the most recently occurring factors listed above. Thus, we usually have good control of data on reservoir, trap and seal once the first well has been drilled in a structure. There are many unsolved problems regarding primary and secondary migration, and we usually have very

little information on these factors. Source rock and hydrocarbons generated from it can be studied by geochemical methods if the source rock is present where the well was drilled.

Most petroleum accumulations may be considered to have been accompanied by all the factors in question. However, the presence of all these factors in a certain area currently does not necessarily indicate a petroleum accumulation. The timing of their occurrence may not have been appropriate, so that petroleum either could not accumulate properly or was lost later. To discover more petroleum accumulations, proper interpretation of the relative timing of these geologic factors is of particular importance. Thus, in petroleum exploration all the factors mentioned are of equal significance and are worth considering.

5. Agree or disagree with the following statements.

1) Usually an exploratory well is drilled at random.
2) Maturation of rocks depends mainly on pressure.
3) Reassessment of old plays doesn't take much time and money.
4) Petroleum geology is a specific set of geosciences.
5) Reservoir rock is the aim of oil hunting.
6) A petroleum prospector can accurately find potential hydrocarbon accumulations.
7) Porosity and permeability are of great importance in analyzing a reservoir rock potential.
8) A trap is a geological structure consisting of an impermeable rock layer capped with a porous and permeable one.
9) The pressure of overlying rocks causes hydrocarbons to move from a source rock to a reservoir rock.

SESSION 14. OIL STORAGE SYSTEM

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- seal – уплотнение
- bolted steel – сболченная сталь
- transfer unit – устройства передачи
- welded steel – сварная сталь
- cleanout plate – очищающая пластина
- custody – забота о сохранности
- drain outlet – выход стока/слива
- lease – участок; отвод
- level controllers – регулятор уровня
- outlet valve – выпускной клапан
- frequenc – частота; повторяемость; периодичность
- storage capacity – вместимость (резервуара, бака)
- tank farm – резервуарный парк (промысла или нефтезавода)
- gage hatch – замерный люк; замерное отверстие (в крышке нефтяного резервуара)
- API gravity – плотность нефтепродукта в градусах Американского нефтяного института
- pipeline run – партия нефти или нефтепродуктов, транспортируемая по трубопроводу
- sediment basic sediment – осадок; отстой; осадочная порода; мн. наносы; отложения, осадок на дне резервуара (состоящий из эмульсии нефти, воды и грязи); отстой; основной осадок
- thief – пробоотборник (прибор для отбора проб нефти или донного осадка из резервуара или трубопровода); трубка для отбора проб нефтепродуктов;

1. Render the text and answer the following questions.

1) What is called thiefing a tank?
2) Why the level controllers are used?
3) For what purpose the API gravity is needed?
4) What storage capacity has a standard tank farm?
5) How paraffin and basic sediments can be removed?
6) How temperature of oil in a tank can be determined?

STORAGE SYSTEM

After gas has been separated from the oil and the oil has been treated to remove water and sediment (if present), the oil goes to stock tanks, which are commonly referred to as the tank battery. The tanks in a tank farm will vary in number and size, depending upon the daily production of the lease and the frequency of pipeline runs. The introduction of automatic custody transfer units and their acceptance by pipelines and producers has reduced storage requirements.

The total storage capacity of a tank farm is usually 3 to 7 days' production; that is, three to seven times the maximum daily production or allowable of the wells connected to the tank farm. There are usually two or more tanks in a battery, so that while oil is being shipped from one tank the other tank can be filling.

Most tanks are made of either bolted steel or welded steel. Stock tanks usually have a bottom drain outlet for draining off basic sediments and water. In some areas, tanks must be cleaned frequently due to collection of paraffin and basic sediments, which can be removed through the drain outlet. Therefore, tanks are equipped with cleanout plates. Cleanout plates can be removed so that a worker can enter the tank.

The point where the pipeline company connects to lease stock tanks is usually one half meter above the bottom of the tank. The space below the pipeline outlets provides room for the collection of basic sediments and water. The pipeline outlet valve is sealed and closed with a metal seal when the tank is being filled and similarly locked in the open position when the tank is being emptied. Oil enters the tank at the top at the inlet opening. Usually a valve is on the inlet line so that it may be closed to prevent oil from entering the tank after the tank is full and ready for delivery. Where oil storage is controlled manually, the tank is fitted with a thief or gage hatch in the tank roof so the amount of oil in the tank can be determined with a steel measuring line. The thief hatch is large enough so that a device which is called a "thief" can be lowered into the tank and samples of oil obtained to determine the basic sediments and water content in the oil and its API gravity. This operation is called "thieving" a tank. The temperature of the oil in the tank is determined while thieving the tank.

When storage is done automatically, devices called liquid level controllers signal when tanks are filled and valves open and close according to a prearranged schedule.

2. Translate the sentences into Russian.

1) Tanks are equipped with cleanout plates.
2) The tanks are made of bolted steel or welded steel.
3) Cleanout plates can be removed so that a workman can enter the tank.
4) It is necessary to clean the tanks from paraffin and basic sediments regularly.
5) The total storage capacity of a tank farm is usually 3 to 7 days' production.
6) The temperature of oil in the tank is determined while thieving the tank.
7) Stock tanks usually have a drain outlet for draining off basic sediments and water.

8) The thief hatch can be lowered into the tank and samples of oil obtained to determine the basic sediments and water content in the oil and its API gravity.
9) The tanks in a tank farm may have different number and size, depending upon the daily production and frequency of pipeline runs.
10) A valve is on the inlet line so that it may be closed to prevent oil from entering the tank after the tank is full and ready for delivery.

3. Translate the sentences into English.

– Вы работаете в компании “Ойл Танке Девелопмент” уже 10 лет. Какие резервуары выпускает ваша компания?

– *Our company produces tanks made of welded or bolted steel. This depends on our customer's choice. The size and storage capacity of a tank shall be rated for daily production.*

– Ваши резервуары подходят для хранения пластовой воды?

– *Yes. Our company developed the produced water storage and treatment systems, which include the storage tanks.*

– Как можно очистить резервуар от парафина и осадка? Ведь не секрет, что часто нефть имеет различные примеси.

– *We provided possibility of cleaning the tanks by means of drain outlet and cleanup plates. So, the basic sediments can be easily removed from the tank.*

– Каким образов нефть попадает в резервуар?

– *Oil enters a tank from the top at the inlet opening. Usually we have a valve installed at the inlet line so that it may be closed to prevent oil from entering the tank when the tank is full and ready for delivery.*

– Для чего используется пробоотборник?

– *The thiefhatch is used to measure oil quantity and temperature. It can also be lowered into the tank to take the samples of oil. These samples help to determine the basic sediments and water content in the oil and its API gravity.*

– Я думаю, что мы можем рекомендовать вас местным компаниям, работающим в нефтегазовой индустрии.

– *I hope that our competitive prices for the tanks and associated equipment will be our advantage.*

4. Translate the sentences into English.

1) Введение автоматических устройств передачи и их признание операторами трубопроводов и производителями снизило требования по хранению нефти.
2) Резервуар оснащается очистительными пластинками из-за осадка и парафина.
3) Резервуары-хранилища оснащены дренажным выходом для дренирования осадка.
4) Количество резервуаров в резервуарном парке зависит от суточной добычи и количества, перекаченных по трубопроводу нефтепродуктов.
5) Обычно резервуарный парк состоит из двух и более резервуаров, поэтому пока один резервуар наполняется, нефть может поступать в другой.
6) Выпускной клапан трубопровода закрывается, когда резервуар наполнен и открывается, когда он опустошен.

SESSION 15. GREENING AND THE OIL & GAS INDUSTRY

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- acidic water – кислотная вода
- chemical drum – емкость для химических реагентов
- concrete pad – бетонная подушка
- contamination to contaminate – загрязнение загрязнять
- decommissioning – вывод из эксплуатации
- hazard – опасность
- hydrogen sulphide – сероводород
- life-cycle – жизненный цикл
- maintenance – поддержание; сохранение
- monitoring system – система мониторинга
- reinjection – повторная закачка (например, газа в пласт)
- sour – неочищенный
- sulphur storage facilities – сооружения для хранения серы
- terrestrial ecosystem – экосистема суши
- tilling – обработка почвы
- to evaporate – испаряться

1. Read and summerize the text.

ECOLOGY AND OIL & GAS INDUSTRY

The oil & gas industry works closely with government to protect the health and safety of workers and public. Industry regulations reflect modern scientific knowledge about hazards and the technology available to reduce them. New designed management systems in petroleum industry are safer not only for workers, but for environment too.

The examples of such initiatives are:

- Introduction of specialized equipment and training to protect workers from exposure to toxic concentration of the hydrogen sulphide in sour gas.
- Automated equipment and remote control systems reduce potential for hazardous work situations in the petroleum industry.
- Sophisticated pipeline inspection devices, maintenance programs and monitoring systems reduce the number of pipeline accidents.

Today protecting terrestrial ecosystems is a key aspect of development of oil & gas industry. Most land use by oil and gas industry is temporary. Seismic crews conduct the surveys and move on. The average well produces for about 20 to 25 years. Other facilities will be shut down as soon resources are depleted and new

technologies emerge. National and foreign operating companies are responsible for sites until reclamation is complete. New technologies allow the industry to reduce impacts considerably. The design of new facilities now shall include full life-cycle provisions, from construction through decommissioning.

However, upstream oil and gas activities still can affect environment, plants and wildlife in several ways. The direct impacts occur when operations disrupt the habitat of the species. Indirect impacts occur when the industry's roads and outlines create access for other users who the habitat.

Soil Pollution. A large portion of oil spilled on land will eventually evaporate or be consumed by natural bacterial action. This process can be speed up by tilling and fertilizing the soil. The global oil industry traditionally used this method of "land farming" on the majority of spills. In other instances the soil is excavated and trucked to the approved industrial site.

Water Pollution. Today oil and gas industry put a high priority on the protection of water resources. In our country, for instance, the main concern is protection of Caspian Sea waters. The petroleum industry routinely handles large volumes of liquids, such as crude oil and natural gas liquids. There are considerable volumes of salt water produced with crude oil. This saltwater is separated from the oil at processing facilities and re-injected underground into the oil producing rock formation. Corrosion in oil field pipelines carrying mixtures of oil and saltwater is the most common reason for upstream spills. The industry solves this problem by stepping up inspection and maintenance of facilities, installing new computer technology to detect leaks. When a spill threatens surface water, the special crews prevent the contamination from spreading.

In addition to crude oil and water, the industry handles many other liquids- drilling fluids, fuel, lubricants, solvent and various chemicals- that can contaminate water if improperly released into the environment. Wherever possible, the industry reduces the volume and the toxicity of liquids used in operations. New regulations and industry practices are improving this situation. Double-walled fuel storage tanks and walled concrete pads for chemical drums are examples of improved containment. Based on extensive research and design, new regulations detail the procedures and criteria for management of oil field waste.

2. Translate into Russian.

1) “Lead” is a structure which may contain hydrocarbons and “prospect” is a lead which has been fully *evaluated* and is ready for drilling.
2) A *play* is referred to as a particular combination of a reservoir, seal, source, and trap associated with proven hydrocarbon accumulation.
3) Modern advances in seismic data acquisition and processing show that seismic attributes of subsurface rocks are readily *available* and can be used to get physical/sedimentary properties of the rocks themselves.
4) The thermal history of sedimentary basins is of great interest to petroleum geologists because the hydrocarbon *maturation* process is controlled primarily

by the temperature the sedimentary source has experienced since its deposition.

5) A *sample* from these facies had a porosity of 30 per cent and a permeability of 600md.
6) Near surface geochemical exploration is the application of measurements to detect and *delineate* hydrocarbons seeping from an oil and gas reservoir.
7) Before and after the hydrocarbons reach a trap, they must be *sealed* by cap rocks.
8) To discover more petroleum accumulations, proper interpretation of the relative *timing* of various geological factors is of particular importance.
9) In the field of formation evaluation, porosity is one of the key measurements to *quantify* oil and gas reserves.

3. Find attributes in the following sentences and translate the sentences into Russian.

1) Most of the yet-to-find resources are in either ice-free or seasonal ice areas
2) offshore or in the onshore areas of the basins.
3) From all these figures an economic assessment is made to determine whether the accumulation under study could be commercially developed.
4) The estimation of oil reserves considered to be one of the main objectives of geophysical prospecting is made easier due to continual technological development.
5) Seismic prospecting is a technique based on measuring the time it takes sound waves to travel through underground formations and return to the surface.
6) The development and application of advanced technology is vital to the modern industry task of finding and developing oil and gas resources.
7) The depth at which petroleum is found correlates well to pressure and temperature.
8) Geologists realized that all layers containing the same range of fossils must be of the same age.
9) The assessment of natural gas resource potential of western Canada is the most difficult project of its kind undertaken by the Geological Survey of Canada.
10) The assessment was divided into major play groups using geological criteria, primarily major stratigraphic units.
11) The analysis of Devonian gas potential involved delineation and systematic evaluation of 25 mature and 3 immature plays

SESSION 16. PETROCHEMICAL INDUSTRY

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- colorant – краситель
- dissolvent – растворитель
- ethylene – этилен
- film – пленка
- plastics – пластмассы
- polymer – полимер
- propylene – пропилен
- lubricating oil – смазочное масло
- detergent – моющее средство, детергент
- isopropyl alcohol – изопропиловый спирт
- derive – получать, извлекать (from)
- marketable product – товарный продукт
- additive – присадка (к смазочному маслу)
- organic compound – органические соединения
- petrochemical plant – нефтехимический завод
- petrochemical – нефтехимический
- petrochemistry – нефтехимия
- synthetic materia – синтетический материал
- synthetic rubbers – синтетические каучуки
- tentative – испытательный, пробный

1. Render the text and anwer the questions.

1) Define petrochemicals.
2) What do you understand by the term feed stock with reference to petrochemicals?
3) Write names of two feed stocks used in petrochemicals industry.
4) What do you understand by the term down stream petrochemical? Explain with an example.
5) Methane is converted into methyl chloride then methyl chloride is converted to methyl alcohol. In this case identify the first generation and second generation petrochemical.
6) Mention three petrochemicals obtained from natural gas.
7) What are the important petrochemicals obtained from propene?
8) What are the important petrochemicals obtained from ethyne (acetylene)?
9) What are the petrochemicals obtained form benzene?

WHAT IS PETROCHEMISTRY?[7]

The scientific world is made up of a myriad of different spheres, each with its own unique characteristics and purposes. Petrochemisty is one particularly important branch, yet the complex sounding name often induces confusion. To clear up the uncertainty we've put together a guide covering what it is, and why it's important. The petrochemical industry is an industry branch that produces organic intermediate products such as refinery products, natural gas, plastic, rubber, fiber raw materials.

Put simply, petrochemistry refers a branch of chemistry that focuses on how crude oil and natural gas are transformed into raw materials and other useful products. Today, such resources are considered an integral part of the modern economy which makes petrochemistry an incredibly valuable field. To understand the field of petrochemistry it's important to comprehend what petroleum is and where it comes from. Over millions of years, natural changes in organic materials have produced petroleum which has accumulated under the earth's surface. Petroleum rich areas are generally found in regions that support retention, such as porous sandstones.

Crude oils are naturally occurring liquids made up of various hydrocarbon compounds that differ in appearance and composition. Average composition rates are 84% carbon, 14% hydrogen, 1%-3% sulphur, and less than 1% each of nitrogen, oxygen, metals and salts. Depending on the sulphur content crude oils are either categorised as sweet or sour.

1859 saw the world introduced to its very first oil commercial, just two years after the first oil refinery was constructed. When petrochemistry first emerged as a scientific field in the 1900s it was used to develop basic materials such as synthetic rubbers. In 1907 scientists developed the first petrochemical-derived plastics, the 1920s saw the successful creation of petrochemical solvents and the 1930s gave way to **polystyrene**. The industry then began to boom, with petrochemistry used to produce a myriad of materials used to manufacture everything from furniture, textiles and kitchen appliances to transfusion bags and pacemakers. In the late 1940s the industry flourished, with WWII fueling demand for petrochemicals. This was largely due to skyrocketing demand for synthetic materials. During this period the petrochemistry field underwent serious advancement. Now petrochemistry is used to support highly specialised fields such as crime detection and archaeology.

You are aware, petroleum is a complex mixture of hydrocarbons formed by the decomposition of fossil remains. It exists as a liquid (crude oil), gas (natural gas) or as solids (oil shales) and is found deep underground or below seabed.

You have also studied that petroleum is refined to several useful fractions, which are used as fuel (LPG, petrol, diesel, etc.) or lubricants. About 10% of the petroleum is used to prepare a range of chemicals called petrochemicals, we may

[7] https://www.petro-online.com/news/fuel-for-thought/13/breaking-news/what-is-petrochemistry-nbsp/35676

define, petrochemicals as a group of chemicals produced directly or indirectly from the hydrocarbons of petroleum or natural gas.

Some gaseous hydrocarbons are also obtained as a by product during petroleum refining. These hydrocarbons may contain one to five carbon atoms, for example, methane, ethane, propane, butane, iso-butane, pentane, etc. Methane (CH) is also a major hydrocarbon component of natural gas, which occurs in association with petroleum. At one time these gaseous hydrocarbons were of almost no use and the only way to dispose them was to burn them. With passage of time these gaseous hydrocarbons have found important use as starting material to produce a large variety of petrochemicals. Today, the demand of petrochemicals and the materials derived from petrochemicals is so great that we need to deliberately convert higher hydrocarbons to smaller gaseous hydrocarbons by the process of cracking.

The list of petrochemicals is endless. Some important petrochemicals are methyl alcohol, ethyl alcohol, acetaldehyde, acetic acid, acetic anhydride, acetone, benzene, toluene, xylenes, phenol, vinyl chloride, etc. some of these can be used directly or as raw materials for the manufacture of other useful products. These are used to manufacture a vast variety of useful materials like solvents, adhesives, antifreezes, synthetic rubbers, synthetic fibers, nylon, polyester, plastics, synthetic detergents, rocket fuels, etc. Since every area of human activity makes use of petrochemicals or the materials made from petrochemicals, our life without petrochemicals would be very different and less comfortable.

2. Translate the sentences into Russian.

1) Petrochemistry constantly adapts to new environments and meets new challenges.
2) Petrochemistry is a young industry and the beginning of the petrochemistry development is 1920.
3) The petrochemistry plays an important role in the production of polymers, synthetic rubbers, lubricating oils, dissolvent, colorants, additives, detergents and raw materials for the most of organic compounds.
4) Petrochemistry is a science that can be applied to fundamental human needs, such as health, hygiene, housing and food.
5) The first petrochemical plant, involved in ethylene production, was put in operation in 1923 by the American company- Union Carbide.
6) Nowadays, petrochemistry moved to an incredible variety of areas - from household goods to medicine, from leisure to highly specialized fields like archaeology or crime detection.
7) Petrochemistry constantly adapts to new environments and meets new challenges.
8) Petrochemistry is a young industry and the beginning of the petrochemistry development is 1920.

9) Petrochemistry is a science that can be applied to fundamental human needs, such as health, hygiene, housing and food.
10) The petrochemistry plays an important role in the production of polymers, synthetic rubbers, lubricating oils, dissolvent, colorants, additives, detergents and raw materials for the most of organic compounds.
11) The first petrochemical plant, involved in ethylene production, was put in operation in 1923 by the American company- Union Carbide.
12) Nowadays, petrochemistry moved to an incredible variety of areas - from household goods to medicine, from leisure to highly specialized fields like archaeology or crime detection.

3. Translate the sentences into English.

1) Нефтехимии принадлежит одна из ключевых ролей в создании полимеров, синтетических каучуков, смазочных масел, растворителей, красителей, присадок, моющих средств, а также сырья для производства большинства органических соединений.
2) Многие органические соединения являются “нефтехимическими”, но обычно этот термин относится к продуктам, которые производятся в относительно больших количествах.
3) Во время Второй мировой войны спрос на синтетические материалы, призванные заменить затратную и менее эффективную продукцию, привел нефтехимию к тому, что она стала играть значительную роль в современной экономике.

SIX MOST PROMISING PETROCHEMICAL PROJECTS IN RUSSIA AND THE CIS[8]

We looked at the upcoming plans of the top petrochemical companies in the CIS region and found six of the most ambitious projects that you should watch out for in 2019. Over £40bn in capital expenditure is predicted to be spent over the lifetime of these projects.

Estimated investment: $20 bln

The low-profile Russian gas major, Rusgazdobycha, has partnered up with none other than Gazprom with plans to build a massive petrochemical complex in Ust-Luga near St. Petersburg in Russia. With the exact parameters yet to be disclosed, the project is said to include a gas processing plant with a capacity of up to 45 bn cubic meters of gas per year (which could make it even bigger than Amur GPP)

[8] https://globuc.com/news/six-petrochemical-projects-in-russia-and-the-cis-that-you-need-know-about/

and a petrochemical plant (up to 1.5 million tons of polyethylene). The remaining methane is supposed to be delivered for liquefaction to Baltic LNG.

Estimated cost: $1 bln

Another project that remained somewhat out of the public eye is Tatneft's $1bn chemical complex which the company plans to implement by 2030. The first stage will include the production of maleic anhydride (up to 50K tons), polypropylene (247K tons), acrylonitrile and carbon fiber (10K tons each). The company expects the total investment in capacity expansions to amount to around $17.5bn (1,162bn rubles) until 2030, including projects in the upstream, refining, chemicals, and biofuels.

Estimated cost:$2 bln

In 2018, Lukoil, Russia's second largest company (after Gazprom), made a final investment decision for the construction of an integrated chemical complex worth over $2 billion in Budyonnovsk, Russia. With no finalised project configuration yet, the capacity of the new complex could reach 2 million tons per year, aimed at converting natural gas from the North Caspian fields into urea as one of the lines of production. The second stage may include the production of polyethylene and polypropylene. Lukoil plans to complete the project in five years.

Estimated cost: $6.5 bln

Kazakhstan's flagship chemical project (which has notoriously been dragging on since 2011) has recently been kick-started and revitalised. In June 2018, the project management was handed over to KazMunayGas under the guidance of Daniyar Tiesov's team (a team with experience of completing a massive revamp project of three refineries in Kazakhstan). These changes seem to have breathed new life into the project, with some serious progress already evident: the EPC contractor was selected, debt financing raised and the issues with the feedstock supply resolved. The first phase of the project, which involves 500 thousand tons of polypropylene production, will cost around $2 billion. Completion date is 2021.

The second stage will include polyethylene and butadiene production with a capacity of 1.25 million tons worth $6.5 billion. Austria's chemical giant, Borealis,

is a new partner in the project. Kazakhstan's United Chemical Company and Borealis are now undertaking a feasibility study of the project.

IRKUTSK OIL COMPANY

Estimated cost: $2 bln

The largest oil company in Russia's Siberia, Irkutsk Oil Company, is well on the way to constructing a new petrochemical plant in Eastern Siberia worth over $2 billion. Irkutsk Polymer Plant will have a capacity of 650,000 tons/year of ethylene and 650,000 tons/year of polyethylene. The company has already let a contract to Toyo Engineering, while Lummus Technology and Univation Technologies are the chosen technology providers for the project. The company is also considering the monetisation of methane from its stranded gas fields by producing electricity for local cryptocurrency mining companies. Irkutsk Oil Company expects that the plant in Ust-Kutsky district will be completed by 2023.

SIBUR

Estimated cost: $7.5 bln

In the heart of Russia's Siberia the country's petrochemical giant, Sibur is working on a project to construct Amur GCC with a capacity of 1.5 mtpa of ethylene to be further transformed into polyethylene grades. The pre-design development stage of Amur GCC is now over, with the project's configuration and set-up and capacity of the ethylene and polyethylene units approved. The decision on the project implementation is subject to completion of the FEED and clearance of SIBUR's relevant corporate procedures, which will not be taking place until the second half of 2019. Sibur reckons it could start production after 2024 and add 50 percent output to its production.

4. Answer the questions.

1) What is the major hydrocarbon component present in the natural gas?
2) What are the common feed stocks used in the manufacture of various petrochemicals?
3) "Alkenes (olefins), benzene, toluene and xylenes are the primary petrochemicals." Is this statement true or false?
4) What are the major uses of the carbon black?
5) What are the major chemicals manufactured from methyl alcohol?
6) How is ethyl alcohol manufactured from ethylene?
7) How is vinyl chloride manufactured from ethylene?
8) What is the name of the polymer obtained from polymerization of styrene?
9) Write the name of the dicarboxylic acid obtained by oxidation of para-xylene?

10) Name a primary petrochemical obtained from reformed naphtha, which is used for the manufacture of synthetic detergents?
11) Why are the fuels used in rockets different from the fuels used in homes?
12) What is a double-base rocket propellent?
13) What are cryogenic engines?

SESSION 17. OIL AND GAS PROCESSING

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

Terms and Vocabulary

- alkylation – алкилирование
- coking – коксование
- fraction – фракция
- processing – обработка
- reforming – реформинг
- process – обрабатывать
- diesel fuel – дизельное топливо
- conversion – химическое превращение
- fractional distillation – фракционная перегонка
- high octane hydrocarbons – высокооктановые углеводороды
- catalytic cracking – каталитический крекинг
- catalytic reforming – каталитический риформинг
- chemical processing – химическая обработка
- jet fuel – топливо для реактивных двигателей
- refinery – нефтеперерабатывающий завод (НПЗ)

1. Translate the following sentences into Russian.

1) Refineries must separate and process the hydrocarbons which make up crude oil before they can be transformed into gasoline, diesel or jet fuels.
2) The most widely used conversion method is called cracking.
3) Cracking takes large hydrocarbons and breaks them into smaller ones.
4) The products of alkylation are high octane hydrocarbons.
5) Alkylation makes gasoline components by combining some of the gaseous byproducts of cracking.
6) A cracking unit consists of one or more tall, thick-walled, bullet-shaped reactors and a network of furnaces, heat exchangers and other vessels.

2. Render the text

PROCESSING OF OIL AND GAS

As a raw product, crude oil is of limited use. Refineries must separate and process the mix of hydrocarbons, which make up crude oil before they can be transformed into hundreds of useful products such as gasoline, diesel and jet fuels.

The first and most important step is to separate it into various component or fractions. This takes place in a fractionating column, also known as an atmospheric

distillation tower. This is a tall steel tower with perforated trays. Since each fraction has a different boiling range, a distillation tower is able to separate the various fractions using heat and cooling. Heavier hydrocarbons boil at much higher temperatures than lighter hydrocarbons.

They settle in trays at the bottom of the tower closest to furnace. The lighter fractions collect at the top. Distillation is a continuous process which begins by heating crude oil in a furnace. Then it turns into a vapor. The vapor rises through perforations in the trays that are fitted with bubble caps. These caps force the vapor to pass through a previously liquefied fraction in the tray. This cools the vapor enough for it to shed that fraction. The remaining vapor repeats this process as it continues upwards. As each fraction reaches the tray where the temperature is just below its own boiling point, it condenses, liquefies and is drawn off the tray by pipes.

A number of trays are needed to collect the liquids from each fraction. The products of distillation can be divided into four categories:

1. *Gases and light gasoline.* The gases (methane, ethane, propane and butane) are commonly used to fuel refinery furnaces while the light gasoline is routed to gasoline blending.
2. *Light distillates (naphtha, kerosene).* Naphta is used in the production of gasoline and petrochemicals. Kerosene is used as a jet fuel and stove oil.
3. *Middle distillates (light and heavy gas oils).* Light gas oils are made into jet, diesel and furnace fuels. Heavy gas oils undergo further chemical processing such as cracking to produce naphta and other products.
4. *Residual products.* Residual products are further processed to produce refinery fuels, heavy fuel oil, waxes, greases and asphalt.

The next step is conversion. During this process, fractions from distillation towers are transformed into streams (intermediate components) that eventually become finished products. The most widely used conversion method is called cracking because it uses heat and pressure to "crack" heavy hydrocarbon molecules into lighter ones. A cracking unit consists of one or more tall, thick-walled, bullet-shaped reactors and a network of furnaces, heat exchangers and other vessels.

Fluid catalytic cracking, or "cat cracking", is the basic gasoline-making process. Using intense heat, low pressure and a powdered catalyst (a substance that accelerates chemical reactions), the cat cracker can convert most relatively heavy fractions into smaller gasoline molecules.

Hydrocracking applies the same principles but uses a different catalyst, slightly lower temperatures, much greater pressure and hydrogen to obtain chemical reactions.

Cracking and coking are not the only forms of conversion. Other refinery processes, instead of splitting molecules, rearrange them to add value. Alkylation, for example, makes gasoline components by combining some of the gaseous byproducts of cracking.

The process, which essentially is cracking in reverse, takes place in a series of large, horizontal vessels and tall, skinny towers that loom above other refinery

structures. Reforming uses heat, moderate pressure and catalysts to turn naphtha, a light, relatively low-value fraction, into high- octane gasoline components.

3. **Translate the following word combinations into English and make up your sentences.**

перегонка нефти, превращение сырой нефти в товарный продукт, первая фракция отгона, лакокрасочная промышленность, прямая гонка, циклический и ароматический углеводород, углеводородов асфальтового типа, для получения низших углеводородов, последующая переработка, смесь насыщенных и ненасыщенных углеводородов, крекированию для получения бензина, реактивный двигатель, обогащение водяного газа, жидкое топливо, вязкость масла, уменьшения трения механических частей, предохранение металла от коррозии, специальные присадки, изоляционные покрытия.

4. **Translate the text and ask 10 questions.**

КЛАССИФИКАЦИЯ НЕФТЕПРОДУКТОВ

До конечного потребителя сырая нефть поступает уже в переработанном виде. Для этого нефть перегоняют и получают нефтепродукты, такие как бензины, эфиры, газы, керосины и т.д. Первым препятствием для превращения сырой нефти в товарный продукт является вода.

Нефть с водой образуют стойкую эмульсию “вода с нефтью”, которую можно разрушить только деэмульгаторами. После того как этот процесс завершен начинается перегонка нефти и образуются следующие товарные продукты:

– Газообразные продукты - это первая фракция отгона. Преимущественно пропан и метан, которые используются как топливо.
– Петролейный эфир (Light petroleum) - состоит из смеси пентанов, гексанов и гептанов. Широко применяется как растворитель в пищевой и лакокрасочной промышленности.
– Бензин (Gasoline, petrol) - этот бензин называется бензином прямой гонки. Он состоит в основном из циклических и ароматических углеводородов. Бензин прямой гонки используют как сырье для получения низших углеводородов. Нужные качества топлива бензин приобретает при введении в смесь углеводородов, соответствующих добавок и последующей переработке.
– Керосин (Kerosene) - представляет собой смесь насыщенных и ненасыщенных углеводородов. В течение многих лет керосин использовался для освещения или подвергался крекированию для получения бензина. В последнее время он служит топливом для реактивных двигателей.

- Газойль и мазут (Gas oil and Mazut/Black oil) - само название показывает, что эту фракцию применяли для обогащения водяного газа при употреблении его в качестве топлива. Мазут используется в котельных установках, работающих на жидком топливе.
- Смазочные масла (Grease oils) - эта фракция может быть разделена путем фракционирования на масла, отличающиеся между собой вязкостью. Вязкость масел зависит от структуры входящих во фракцию углеводородов. Смазки нашли широкое применение в различных областях техники для уменьшения трения механических частей, для предохранения металла от коррозии. К смазкам добавляют специальные присадки, обеспечивающие им нужную сферу использования.
- Кубовый остаток (Stillage bottom) - остаток после перегонки нефти, состоящий из углеводородов асфальтового типа. Из кубового остатка получают петролатум, обычно называемый вазелином. Кубовый остаток дает асфальт, который используют как связующий материал при изготовлении изоляционных покрытий.

SESSION 18. THE FORMATION AND EVOLUTION OF THE SOVIET UNION'S OIL AND GAS DEPENDENCE

***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

1. **Translate into English and make up sentences with the following word combinations.**

оказалаться в плачевном состоянии, гонка вооружений, негибкость хозяйственного механизма, плоды технологической революции, адекватно отреагировать, крайне непредсказуемая конъюнктура мировых рынков нефти и газа, производитель энергоресурсов, дискуссии о ресурсозависимости, стимулы к энергосбережению, энергоэффективность экономики, теория ресурсного проклятия.

2. **Match synonyms in A and B.**

A	**B**
degree	assessment
similar	bed
appropriate	cap rock
size	characteristic
seal	commonly
layer	different
evaluation	dimension
to explore	expensive
range	explorationist
to determine	exploratory well
costly	extent
instrument	information
exploring	pool
data	probability
satellite pictures	prospecting
accumulation	satellite image
to discover	spectrum
to perform	suitable
typically	the same
to include	to carry out
various	to define
to examine	to involve
prospector	to reveal
property	to search for
wild cat	to study

likelihood tool

3. **Study the chronology and prepare more information about the famous Russian personalities in petroleum history (personalities are undelined).**

CHRONOLOGY OF THE EARLY RUSSIAN PETROLEUM HISTORY[9]

15th century. Medieval Russian sources mention the common practice of petroleum harvesting in the territories of the Muscovite state. The *Dvina Chronicle (Letopisets Dvinskii)* states that the tribe of the Chudes on the banks of the Ukhta River filtered oils from the river surface to use it for household purposes.

1692. The book *Noord Oost en Tartarye (North and East Tataria)* published in Amsterdam by Nicolaes Witsen (1641-1717) reported: *"The Ukhta River is a day away from the village of Pechora. On this river is a small spot where oil, that is black petroleum, separates from the water"*.

1745. In the region of Ukhta (the modern-day Republic of Komi) hand-dug shafts were used and petroleum was refined in the workshop of the local entrepreneur and engineer Theodore Fyodor Pryadunov (1694-1753).

1834. Mining engineer Nikolay Ivanovich Voskoboynikov, graduate of the Mining Cadet Corps in Saint Petersburg and director of the Baku and Shervan salt and oil fields starting in 1826, designed a prototype device to distill kerosene from thick bitumen and fluid petroleum.

1837. Upon the project of Voskoboynikov, the Minister of Finance of Russia Yegor Kankrin granted funds to build the first large scale distillation plant on the Absheron Peninsula. It was erected in the area of Balakhani (today Balaxanı), a borough of Baku.

1842 – 1843. On the basis of his experience with salt waters, Voskoboynikov, while working for the Corps of the Mining Engineer, proposed drilling for petroleum by mean of mechanical equipment (percussion system). Voskoboynikov hypnotized that petroleum, like salt water, would flow out of the small borehole due to the natural pressure.

1846 – 1848. The drilling program of Voskoboynikov remained suspended for three years due to legal and financial issues. He decided to retire in 1846 and his project was continued by his young assistants, the cadets Kazimir Junzil and Ivan Komarov.

1858 – 1859. Russian entrepreneurs Vasily Kokarev, Peter Gubonin and German baron N.E. Tornow built the first refinery in the city of Surakhani, close to the famous Baku Ateshgah, or Temple of Fire. The plant was engineered to produce kerosene out of kir, the name used by the locals to indicate bituminous asphalts.

1859. The pharmacist N.I. Vitte from Tiflis, modern-day Tbilisi in the Republic of Georgia, built a paraffin refining plant on the Pirallahi island.

1863. Javad Malikov built a kerosene distilling factory in Baku.

[9] F. Gerali (2020). *Chronology of the early Russian petroleum history*, Engineering and Technology History Wiki. [Online] Available:https://ethw.org/Chronology_of_the_early_Russian_petroleum_history

1868. Mikhail K. Sidorov (1823-87) pioneered petroleum explorations in North Russia using the spring pool system with a set of eight-inch pyramidal bits and driving pipes. In early 1872, he equipped his crew with a Pennsylvanian cable tool system assembled in St. Petersburg and hired the Austro-Hungarian geologist Hans Höfer von Heimhalt (1843-1909) to study the area. Eventually, petroleum was found in commercial quantity in September. This date is considered the beginning of the modern North Russian petroleum industry.

1870 – 1880. Vladimir Vasilyevich Markovnikov (1837-1904) studies and describes of a new class of hydrocarbons called naphthenes.

1873. This year marked the beginning of petroleum drilling in an industrial scale in Russia. In July, the first major oil gusher - Vermishevsky - erupted in the area of Balakhani. Within three months, it had produced 90 million poods - about 1.5 million tons of petroleum. Robert Nobel, the eldest brother in the Nobel family, visited Absheron peninsula for the first time to gauge the potential of the petroleum business of the region.

1874. Vasily Kokarev (1817-1889) and Peter Gubonin founded the Baku Oil Society Company.

1875. The Nobel brothers Ludwig, Robert and Alfred started their activities in Azerbaijan petroleum industry.

1876. Biologist Konon Lisenko, Chair of Chemistry for the St. Petersburg Mining Institute, visited Baku to study the possible origins of the 1875 petroleum crisis that affected the Russian Empire. In 1878, he published a monograph in St. Petersburg called *Oil Production, According to the Latest Data*. The monograph was the first original, comprehensive petroleum-related publication ever written in Russian.

1878. The area of Bibi-Heybat had the first giant gusher in its producing history. Engineer Vladimir Shukhov (1853-1939) supervised the laying of the first pipeline from Balakhani to the Black City.

1879. In March, the *Baku Department of the Royal Russian Technical Society* was established. The Society played a key role in the development of petroleum sector in Azerbaijan.

– The first petroleum fueled power station is built by the *Caucasus and Mercury Joint Stock Company*.

– The Russian scientist Dimitri Ivanovich Mendeleev published the most important article of the time to support the inorganic origin of petroleum.

– Construction of the Caucasus railroad was completed. This 514-verst (a Russian verst corresponds to 1.067km) railway system connected the industrial city of Baku to the port city of Batum (today Batumi in Georgia).

– The Rothschild Brothers established the *Caspian and Black Sea Oil Industry and Trade Society*.

– Movsumbey Khanlarov was the first Azerbaijani Ph.D. graduate in chemistry at the University of Strasbourg University. Returned to Baku, he began working in the Baku Department of the Royal Russian Technical Society upon recommendation of Mendeleyev, who was aware of the need for foreigner

knowledge and expertise in petroleum.

1882. After the establishment of the Geological Committee of Russia, the petroleum potential of the northern territories eventually started to be systematically explored also on the base of the first reliable geological map of that area prepared in 1846 by Graf Alexander A. Keyserling. The latter in his *Scientific Observations on a Trip to the Pechora Region* in 1843 wrote numerous references on Ukhta petroleum which revealed to be very useful.

1883. The Baku-Batum railroad is completed: Russian petroleum can now reach the Black Sea more easily and carrying larger quantities.

- The Russian scientist, N. Petrolf, is possibly the first to demonstrate scientifically the value of petroleum oils as lubricants.
- The British petroleum chemist and consultant Thomas Boverton Redwood following a research journey in the Caucasus, published *On the Present Position & Future Prospects of the Russian (Caucasian) Petroleum Industry* (Waterlow & Sons Limited, London) in the UK. The book is one of the few early technical outlooks on petroleum in southern Russia written by a western practitioner in the field.
- The petroleum corporation *Neft* was established in St. Petersburg. It was the first wholly Russian company with an internal vertical structure - committed in exploration, production, storage, refining and trading - to invest large capitals in the Ukhta region, when the focus on the powerful foreigner competitors (e.g., the groups led by the families Nobels, Rothschilds and Vishau) was exclusively in Azerbaijan.

1884. Thomas Urquhart (1843-1904), American engineer working for the *Grazi-Tsaritzin Railway*, after 10 years of research and experimentation on fueling locomotives with petroleum published his pioneering findings, which proved to be very influential in the work of future engineers.

- In Baku, a special organization of entrepreneurs called the *Council of Baku Oil Industrialists* was established under the directorship of Ludwig Nobel until 1888.

1885. German chemist and professor Carl Engler visited Baku to study hydrocarbons in the Absheron.

1886. The first Russian kerosene reaches the west coast of India when Frank Lane of Lane & McAndrews begins shipping oil consigned to merchants in Bombay.

- *The Pennsylvania Railroad* company sent the chemist Dr. Charles Benjamin Dudley (one of the founders of the American Society for Testing and Materials in 1898) in Caucasus to study in southern Russia how petroleum in locomotives was utilized. He finds the method of burning petroleum to be efficient, but the use of coal was less expensive.
- Dmitry Ivanovich Mendeleyev published *Baku Oil Industry* to 1886 summarizing the results of his oil-related investigations from the 1860s to 1886.

1887. In January, the journal "The Works of BO IRTO" is published, the first Russian technical periodical focused on the issues related the national

petroleum industry.

1889. In St. Petersburg, a special Russian Nobel Prize was established and named after Ludwig Nobel. The award was appointed annually to those individuals who succeeded in applied research for metallurgy and petroleum.

1890. Sir Boverton Redwood and James Dewar developed a specific pressured-distillation process capable of increasing the yield of lamp kerosene from Russian heavy crude oil. Although the potential, the patent did not find wide application.

1891. Vladimir Grigoryevich Shukhov (1853-1939), together with Sergei Gavrilov, were the Russian physicists and engineers who in 1891 successfully developed a continuous thermal cracking process in Tsarist Russia, after having worked in applied oil field technologies (e.g. pipelining and boilers) for *The Petroleum Production Company Nobel Brothers Limited* (Branobel) since 1878. The *Shukhov Cracking Process* was first patented in Russia (no. 12926) on November 27, 1891. The base principle of the process involves the thermal breaking of the heavier hydrocarbon chains under high pressure to obtain lighter and shorter chain fractions.

1897. Beginning of the construction of the longest pipeline for refined products (829 verst, or 885 kilometers) to connect Baku and Batum. The pipeline belonged to the Trans Caucasus Railroad company.

1898. The Rothschild brothers founded the *Mazut Transportation Society*. By 1912, the company built a fleet of 13 tankers in the Caspian Sea.

– Petroleum production of Russia surpasses for the first time the output of the United States. Same record will be achieved in 1899 and 1901.

1906. The first massive gusher well of light yellowish, and more valuable, petroleum is achieved in Surakhani.

1908. Geologist Nickolay N. Tikhonovich (1872-1952) led the great geological exploration in the inner lands of the Sakhalin Island, the easternmost possession of the Empire, which resulted in the identification and mapping of several petroleum regions.

1909. The bay in front of the town of Bibi-Heybat Bay starts to be filled up with earth and debris (a process completed only in the early 1930s). The goal of this massive project, directed by the engineer Pavel Pototsky, aimed to facilitate the exploitation of the seabed of the bay. Off-shore drilling technology of the time was too rudimentary to allow such endeavor.

1910. The Russian Chemist S. V. Lebedev develops the first commercial process to convert butadiene into a rubberlike material.

1911. The first petroleum well drilled through the rotary system is achieved in Surakhani (today Suraxanı, east of Baku) by the engineer Von Gaber.

1912. Matvey Alkunovich Kapelyushnikov experimented early turbodrill prototypes in Azerbaijan. From 1914 to 1937 was director of the bureau established to develop turbodrill technologies in Russia. Between 1922 and 1925, Kapelyushnikov in cooperation with engineers S.M. Volokh and N.A. Kornev from the Mechanical Department of Tomsk Technological Institute developed and

patented the single stage geared working through a high-speed (1800 to 2000 rpm) mud turbine equipped with a reducer set to drive rock bits at speeds of 50 to 100 rpm. The machine was featured by a complex planetary gear system (1 to 3 stages) operating into a sealed lubrication system. 200 up to 300 Gpm (gallons per minute, corresponding to 757 to 1135 litres) of mud were pumped through the nozzle at velocities of about 200 feet per second (corresponding to 61 metres per second) producing power outputs of 12 to 15 horsepower. This invention laid the foundations for the history of turbo drilling in Russia, and it is remembered as the Kapelyushnikov's turbodrill.

1913. Ivan Mikhailovich Gubkin (1871-1939), who later became known as the founder of petroleum geology in Russia, began to study the petroleum geology in the Absheron peninsula. His studies were pivotal in the discovery and development of new productive formations. In 1929, he will be elected member of the USSR Academy of Sciences and awardee of the Order of Lenin. The Gubkin Russian State University of Oil and Gas (founded in 1930) is named after him.

1915. Toluene, which is similar to benzene, is produced to supply the growing military demands. Production was organized between the "Neftegaz" Joint Stock Company, the Benkendorf and the Military Industry Committee. Professors Nikolay Zelinskyand and S.A. Vishetravsky are sent to Baku to instruct local scholars about the production of benzene and toluene from fossil fuels.

1915 – 1916. The process of gas lift was tested for the first time

1917. When the Russian supply is cut off by the revolutionary turmoil, the manufacture of the so called white medicinal oil - largely exported in the United States - greatly falls.

1918. Private oil & gas concessions, properties, facilities, and machineries are confiscated by the Russian authorities.

1921. The Russian leader Vladimir Ilyich Ulyanov, better known as Lenin, attempted to invite the major U.S. oil companies to operate in the oil regions of Baku, Grozny, Emba, and Ukhta in order to revitalize the national petroleum still partly in standstill after the revolution.

1928. The industrial exploitation of the petroleum resources begins in the northern part of the Sakhalin Island. The first petroleum field put in production was located in the area of Okha. In the following decades, four main districts would be developed: Ehabi, Katangii, Easter Ehabi, and Nutovo.

1929. The geologist Ivan N. Strizhov (1872-1953) - who thoroughly studied the American refining system and authored the book *Amerikanskiye nefteperegonnyye zavody* - American Refineries) - together with Nickolay N. Tikhonovich are sent to explore for petroleum in North Russia along the Timan formation and Seregovsk anticlines, on the west slope of the Urals chain. The area corresponded in some extent to the today Timan-Pechora Basin Province of Northwest Arctic.

1930. They drilled the landmark well "Chibyu." And struck the larger petroleum formation of the area.

4. Render the text.

BLACK GOLD: HOW THE RUSSIAN OIL INDUSTRY WAS BORN[10]

The world's modern petroleum industry was born in the Russian Empire and soon became the most important pillar on which the Russian economy still stands. Oil has been extracted since ancient times, primarily for construction and medical purposes. As for the modern petroleum industry, it was born in the Russian Empire: the world's first oil well was drilled on the Absheron Peninsula near Baku way back in 1846.

Baku Region attracted leading petroleum companies from around the world. Here, enterprises run by the Rothschild family and the Nobel brothers vied ruthlessly with each other for supremacy. Winston Churchill once said that "if oil is a queen, Baku is her throne."

In the early 20th century, the Russian Empire was one of the globe's top oil producers, occupying 30% of the market. The Revolution of 1917, Civil War and nationalization of the oil companies hit the industry hard. Still, the foreign capital didn't leave Russia. The Rothschilds and Nobels were replaced with Standard Oilof New York and Vacuum (later known as Mobil).

In 1923, the situation in the Soviet petroleum industry normalized, and oil export returned to pre-revolutionary levels. The Caucasus and Caspian regions remained the country's most significant oil-producing areas and were strategically important for the Germans' implementation of Operation Barbarossa.

After the war, new oil regions were discovered. In the 1950s, deposits sited in the Volga Region and Urals accounted for about 45% of the total oil production in the USSR. Exploitation of the vast territories of Western Siberia got underway in the 1960s. This in turn was followed by a mass internal migration to this densely inhabited region.

The increase in Soviet oil export led to a decline in world oil prices, and was one of the reasons for the establishment of the Organization of the Petroleum Exporting Countries (OPEC) in 1960.

In the 1980s, the Soviet petroleum industry entered a period of decline. The reasons were the depletion of existing wells due to intensive drilling and a lack of investments in the exploration of new deposits.

The real crisis began after the Soviet fall. Domestic demand, export possibilities and drilling volumes all reduced. The state tried to overcome the crisis. Demonopolization and privatization of the industry led to the establishment of a handful of oil giants covering the full cycle of petroleum production – from exploration to export (Rosneft, Yukos, Lukoil and others). The crisis was overcome in 1997, when production volumes were restored.

Today Russia is among the world's oil market leaders. Despite a significant decline in oil prices, this industry remains the foundation of the modern Russian economy. The Russian government seeks to change the situation. In the words of

[10] https://www.rbth.com/business/326217-black-gold-how-russian-oil

Prime Minister Dmitry Medvedev, “The central task today is to create a highly effective and high-tech economy. Such economy will generate backbone revenue streams, and that will help us to be less dependent on oil incomes.”

5. Render the following in English, using the active vocabulary.

– *Name the most common reservoir rocks.*
– *Name the main elements in studying sedimentary basins.*

В настоящее время при поиске нефти и газа нефтяники руководствуются научно-техническими принципами. Изучая, сопоставляя и интерпретируя информацию, полученную при помощи снимков с воздуха, спутниковых изображений, отбора керна и геофизических исследований поисковики могут достаточно точно определить подземные структуры, содержащие скопления углеводородов. Несомненно, каждый геолог-нефтяник при оценке осадочных бассейнов должен знать, что такое материнская порода, коллектор, порода-покрышка, ловушка, время созревания и миграция.

Знание стратиграфии, палеогеографии и седиментологии площади помогает при оконтуривании и определении потенциальных материнских и коллекторских пород. Как известно, перекрывающая порода не допускает миграцию углеводородов из коллектора, поэтому необходимо произвести оценку ее мощности и протяженности. Итак, ловушка – это пористый, проницаемый слой породы, перекрытый непроницаемым пластом.

При помощи геохимического анализа и методов моделирования бассейна рассчитывается термальная история материнской породы для определения возможности образования углеводородов, т.к. созревание пород зависит от температуры. Образование нефти и газа происходит при температурном диапазоне от 60° до 120° С.

Тщательное изучение миграции углеводородов помогает количественно определить их на определенной площади. Итак, следует сказать, что открытие новых месторождений и переоценка старых – это продолжительный и дорогостоящий процесс. Поэтому выбор соответствующих методов и научного подхода в решении данной задачи очень важен.

Answer the following questions.

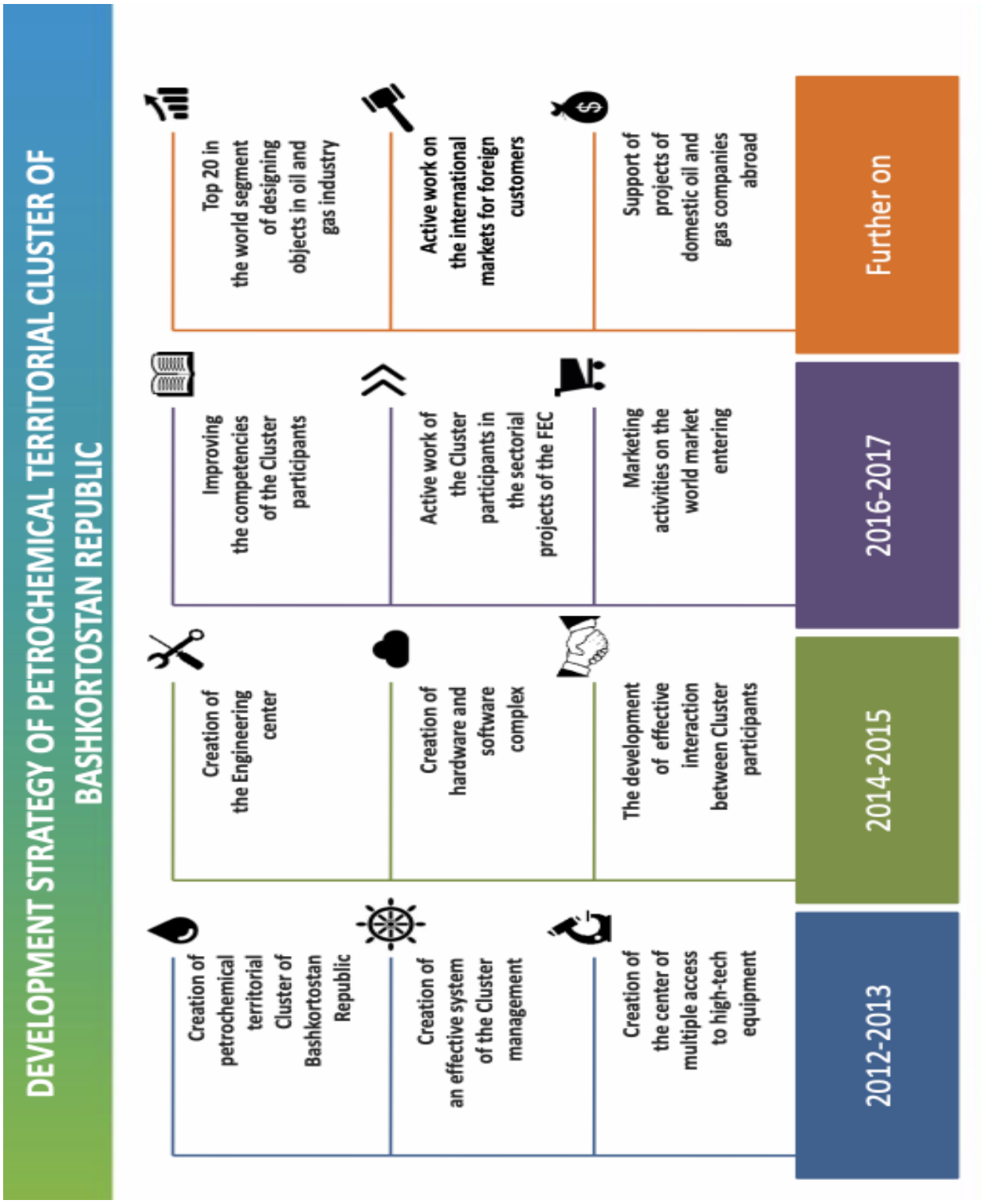
1. What is known as a trap?
2. What is petroleum geology?
3. What types of migration do you know?
4. What is the aim of geochemical analyses?
5. What helps in determining a reservoir rock?
6. How is a source rock identified and delineated?
7. What prevents escaping of a fluid from a reservoir?

8. What is exploration for petroleum based on nowadays?
9. What does the work of a petroleum explorationist consist of?
10. What geological and geophysical studies provide geologists with necessary info?
11. Why is the discovery of new plays and reassessment of old ones a long and costly process?
12. What are the main physical characteristics of a reservoir rock and how are they determined?

SESSION 19. THE HISTORY OF OIL PRODUCTION DEVELOPMENT IN THE REPUBLIC OF BASHKORTOSTAN

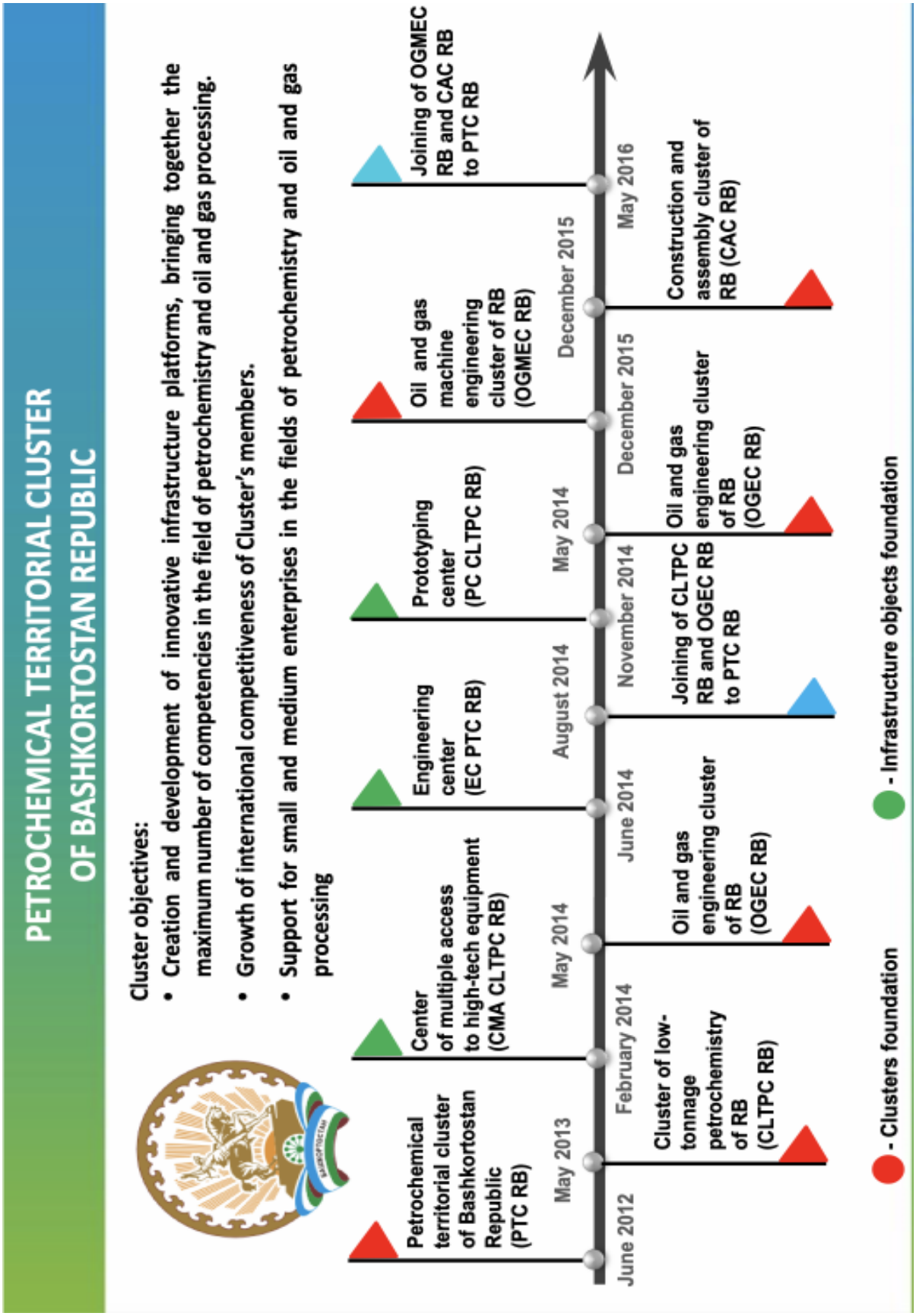
***Objective**: to activate vocabulary in different activities: reading, listening, speaking.*

1. **Study the picture and provide more information on the development stratedy of territorial cluster.**

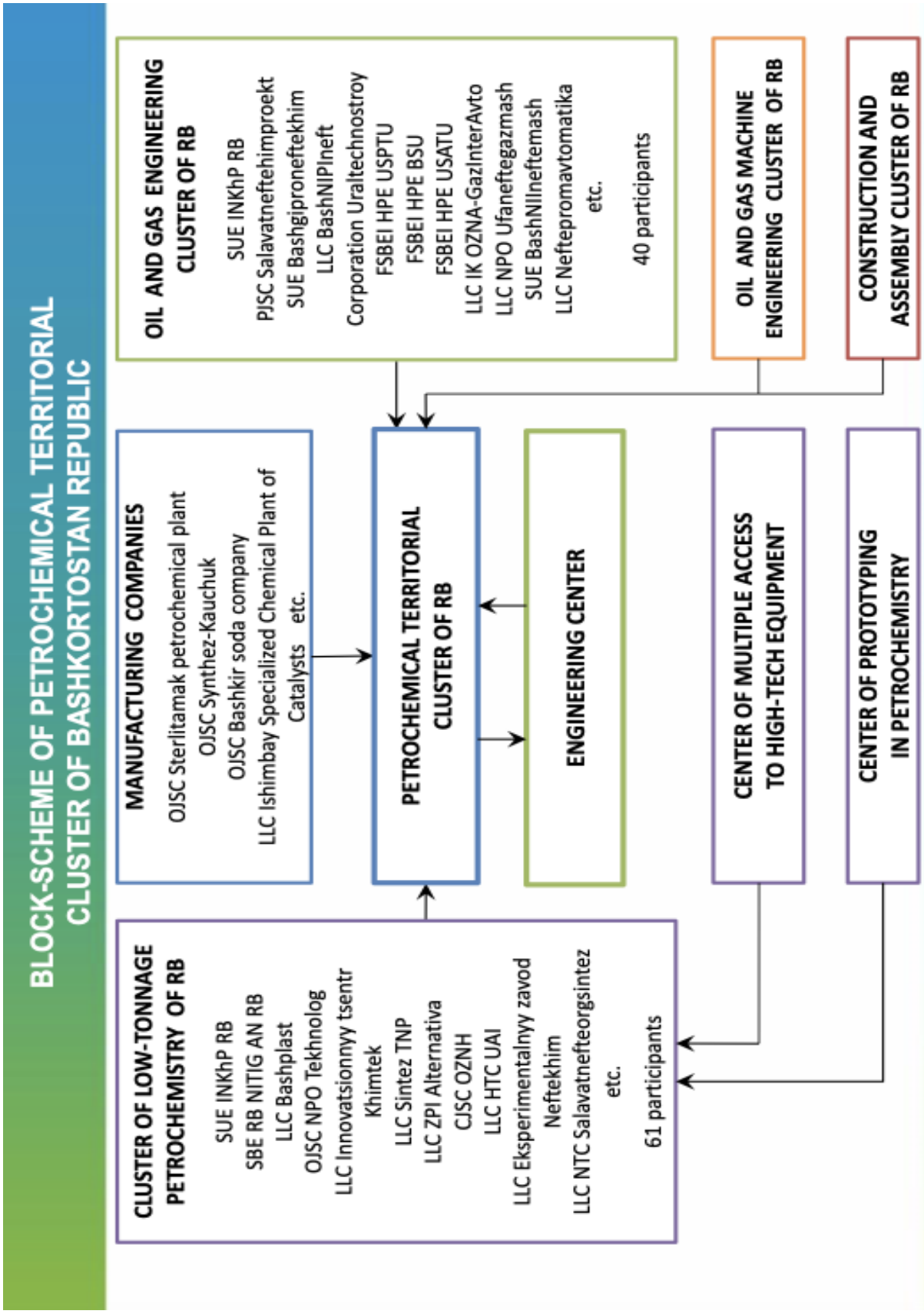


Study the picture and comment on the production potential. Add extra information.

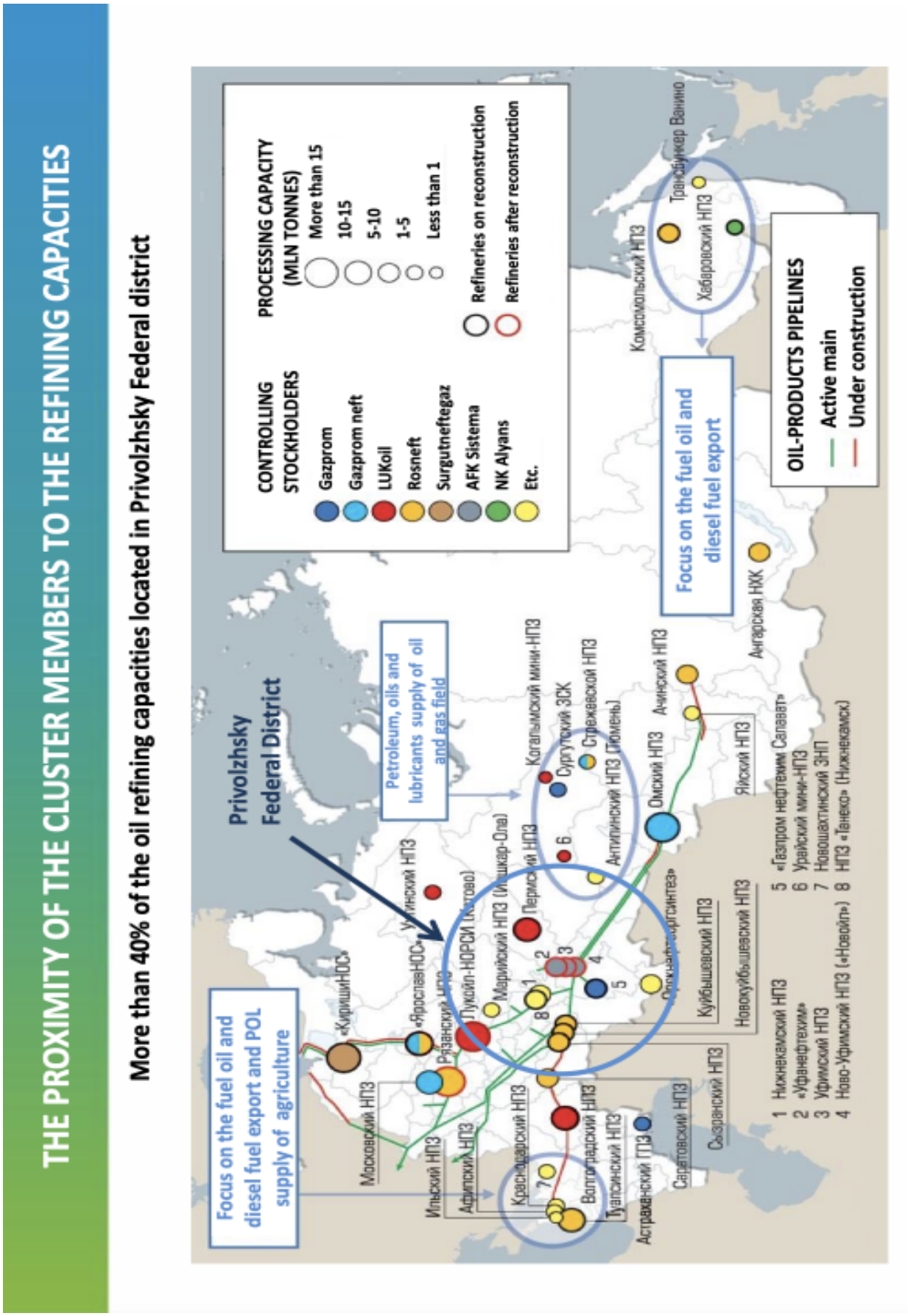
2. **Study the picture and provide more information on the territorial cluster.**



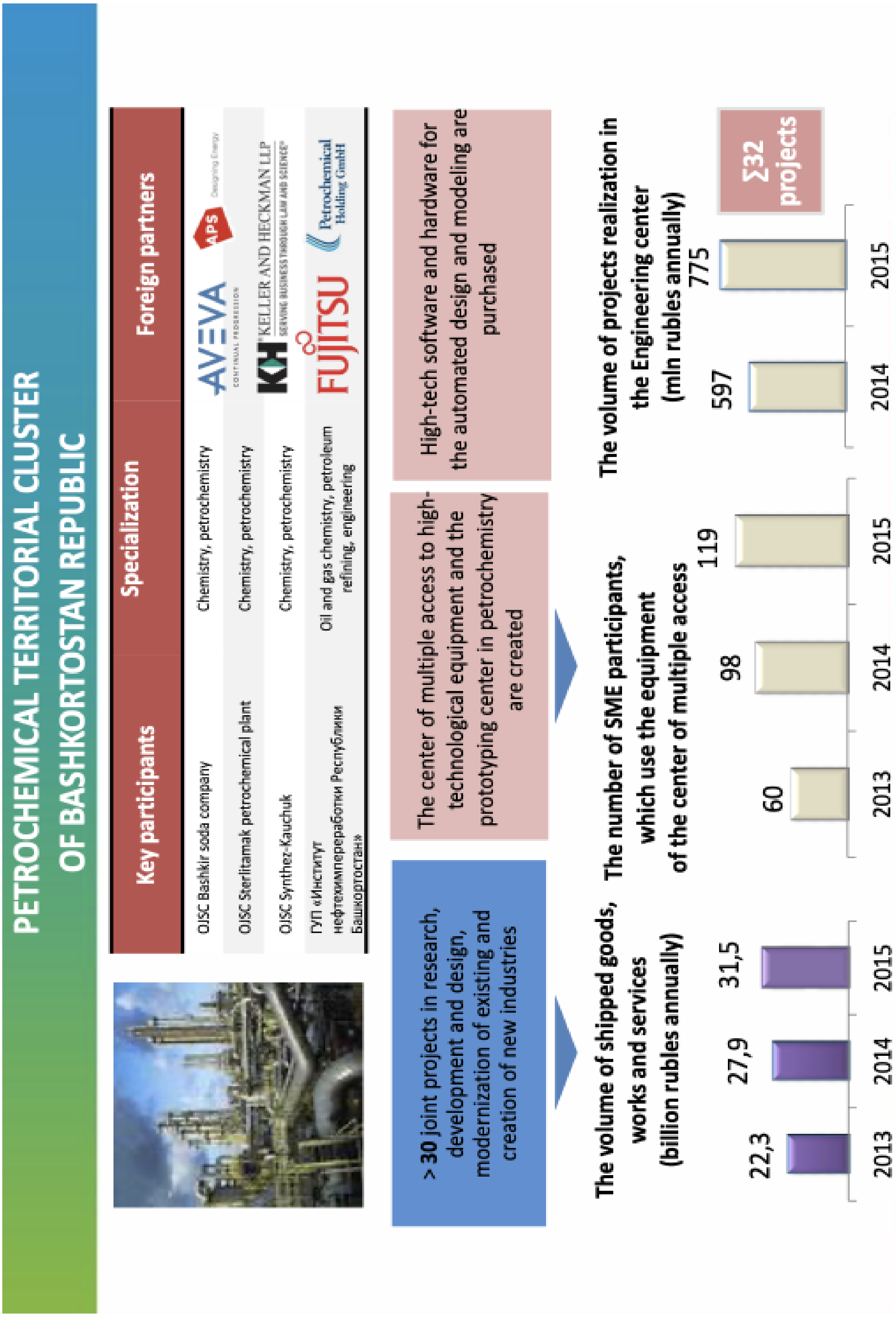
3. **Study the picture and provide more information on the territorial clusters.**



4. Study the picture and provide more information on the refining capacities.



5. **Study the picture and provide more information on the petrochemical territorial cluster.**



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FAMOUS RUSSIAN SCIENTISTS AND THEIR DISCOVERIES

Russia is the native country of many renowned scientists. They made discoveries in various fields, from physics to ophthalmology, and also found practical application of their theories. People across the world use their inventions.

Mikhail Lomonosov.
He made many discoveries in various fields: he is regarded as the first to discover the law of mass conservation (1760) and to establish mechanistic caloric theory and the chemistry of minerals and glass. Lomonosov is the founder of Russia's first classical university – Moscow State University (1755).

Nikolay Lobachevsky.
The founder of hyperbolic geometry (1829) which was later recognized as a valid alternative to Euclidean geometry. Graduated from Kazan University where he later held the position of professor and then rector.

Pafnuty Chebyshev.
Made several breakthrough discoveries in mechanics and mathematics. Chebyshev designed over 40 mechanisms still used in the modern automotive industry and instrumentation.

Sofia Kovalevskaya.
Made a series of discoveries in mathematics. She was awarded the Prize of the Royal Swedish Academy of Sciences for her thesis on integrable rigid body motion (1888).

Aleksander Stoletov Russian physicist who worked in electrical engineering, optics and molecular physics. He designed and constructed the first photoelectric element, a device which transforms the energy of photons into electricity.

Dmitri Mendeleev.
Mendeleev formulated the Periodic Law and created his own version of the periodic table of elements (1869). The system that he devised made it possible to correct the properties of some elements that had already been discovered and also to predict the properties of elements yet to be discovered. His discovery is viewed as the most significant contribution to materials chemistry.

Alexander Popov.
He was one of the first to find practical applications of electromagnetic waves, particularly in wireless communication. He designed and built a state-of-the-art radio receiver that was unique for its time (1895).

Alexander Butlerov.
Butlerov is one of the principal creators of the theory of chemical structure. He was a graduate of Kazan University. Later he taught at St. Petersburg University.

Sergey Botkin.
Botkin created the theory of a living organism as a unified whole. He was the first to suggest that catarrhal jaundice (hepatitis) or Botkin's disease was caused by an infection.

Nikolay Pirogov.
Pirogov is considered the founder of field surgery, regional anatomy and the founder of the Russian school of anesthesia. Surgery became a science thanks to him.

Ivan Pavlov.
Pavlov is the founder of physiology of higher nervous activity. He is the first Russian Nobel Prize winner (1904). He received awards for physiology of digestion.

Élie Metchnikov.
The founder of comparative pathology, evolutionary fetology and immunology. Mechnikov discovered phagocytosis. Mechnikov is the founder of gerontology. He was awarded a Nobel Prize for his contribution to the study of the immune system (1908).

Alexander Mozhaysky.
Mozhaysky was a naval officer and inventor. He designed, built and tested one of the world's first airplanes (1882).

Nikolay Zhukovsky.
Zhukovsky is the founding father of Russian aeronautics. He is also the founder of modern hydrodynamics. A graduate and later a professor at Moscow State University.

Vladimir Zworykin.
An engineer and inventor. Born and educated in Russia. One the founding fathers and pioneers of television. He invented the cathode ray tube (1929), iconoscope (1931), electrooptical television system (1933) and laid the basis for colour television (1940s).

Pavel Cherenkov.

Cherenkov is the author of several groundbreaking discoveries in physical optics, nuclear and high-energy physics. He was awarded a Nobel Prize for Physics in 1958.

Nikolay Vavilov.

Vavilov was a botanist and geneticist, best known for establishing the scientific bases of selection and the study of world centres of the origin of cultivated plants. He is the author of the doctrine of plant immunity.

Lev Landau.

Landau is the author of the "Course of Theoretical Physics", which has been republished many times in 20 languages. He made major contributions to all spheres of physical science, from quantum mechanics to plasma physics. In 1962 he received the Nobel Prize for Physics for his research of the superfluidity of helium.

Nikolay Basov.

One of the creators of the first quantum generator and a range of lasers. Nobel Prize winner for Physics in 1964. A graduate of the Moscow Engineering Physics Institute.

Alexander Prokhorov.

An inventor of laser technologies. He created a range of lasers. Nobel Prize winner for Physics in 1964.

Pyotr Kapitsa.

He is a winner of the Nobel Prize for Physics in 1978 for his discovery of superfluidity of liquid helium. He designed a commercial installation for gas liquefaction. A graduate of the Peter the Great St. Petersburg Polytechnic University. One of the founders of the Moscow Institute of Physics and Technology.

Leonid Kantorovich.

A mathematician, economist, and the founder of linear programming. A winner of a Nobel Prize for Economics in 1975.

Nikolay Semyonov.

One of the founders of chemical physics. He is mostly known for his research of chain reactions. A winner of a Nobel Prize for Chemistry in 1958. He graduated from the department of physics of Petrograd University and taught at Tomsk Polytechnic Institute and Tomsk University. One of the founders of the Moscow Institute of Physics and Technology.

Igor Kurchatov.

Author of several breakthrough discoveries in nuclear physics. Among them: the first nuclear reactor in Europe, the first Russian A-bomb and the first fusion bomb. In 1954 he was in charge of building the first nuclear power plant in Obninsk, USSR.

Andrei Sakharov.

A pioneer of controlled thermonuclear research. One of the leading figures in the Soviet thermonuclear bomb project (1953). A renowned human rights activist and winner of the Nobel Peace Prize in 1975.

Sergey Korolev.

Korolev was a leading Soviet rocket engineer and spacecraft designer and is considered by many as the father of practical astronautics. Among his major achievements are the first successful launch of an orbiting satellite (1957) and the first manned space flight of Yuri Gagarin (1961).

Mikhail Mil.

Aerospace engineer and scientist. The creator of the 'Mi' helicopter series. A graduate of Tomsk Polytechnic Institute.

Andrei Tupolev.

Aircraft designer. In 1968, Tupolev introduced the world's first supersonic airliner, the Tu-144. Over 70 types of aircraft were designed and put into mass production under his supervision.

Svyatoslav Fyodorov.

An ophthalmologist and microsurgeon. In 1962, in cooperation with Valery Zakharov, he created one of the world's most rigid intraocular lenses. In 1973, he developed a new surgical technique to treat the early stage of the glaucoma. Consequently, his method became widely used.

Zhores Alferov.

An author of over 500 scientific papers and around 50 inventions in semiconductor and quantum electronics. In particular, Alferov invented the first stable transistor. He was awarded a Nobel Prize for Physics in 2000. A graduate of the Leningrad Electrotechnical Institute.

Grigori Perelman.

One of the most renowned contemporary mathematicians. He solved the Poincaré conjecture, one of the seven Millennium Prize Problems (2002). Andre Geim and Konstantin Novoselov Graduates of the Moscow Institute of Physics and Technology. Winners of a Nobel Prize for Physics in 2010 for their study of graphene, the material which is supposed to define the future of electronics.

Yuri Oganesyan.

Leads research aimed at the synthesis of new chemical elements. From 1999–2010, he and his colleagues were the first to synthesize 6 superheavy elements ahead of their western counterparts.

Alexei Starobinsky.
A pioneer of the "inflation theory" that explains the birth of the universe. Winner of the Kavli Prize for Astrophysics (2014).

Rashid Sunyaev.
One of the authors of the theory currently known as the Sunyaev-Zel'dovich effect under which electrons associated with gas in galaxy clusters gradually scatter cosmic microwave background radiation. Winner of the Kyoto Prize (2011), an award given for making the world better.

Mikhail Lukin.
Graduate of the Moscow Institute of Physics and Technology. Professor at Harvard University. He proved that a beam of light can be halted in an environment and then controlled with a laser. The technology he developed can be used in quantum computers – a new step in the technological development of humanity.

Artem Oganov.
A graduate of Lomonosov Moscow State University who worked at the Moscow Institute of Physics and Technology. Professor at Stony Brook University (New York). He is known mostly for his work on the discovery of computational materials and crystal structure prediction. He holds numerous prestigious prizes, including an ETH Latsis Prize, Research Excellence Medal of the European Mineralogical Union, and three most-cited paper awards from Elsevier. He created laboratories in China and in Russia.

Dmitry Svergun.
Graduate of Lomonosov Moscow State University. Gained worldwide recognition for new practical applications of X-ray radiation. Professor, Habil. PhD. He is the head of the European Molecular Biology Research Laboratory in Hamburg.

Vladimir Krasnopolsky.
Made several discoveries concerning our Solar System. He was one of the creators of spectrometers for the first Soviet interplanetary probes. He discovered the ozone layer, helium and methane in the atmosphere of Mars.

Alexander Holevo.
Author of 170 papers, including books published abroad. He made a substantial contribution to the mathematical foundations of quantum information science.

He is the holder of three international awards: Quantum Communication Award (1996), Alexander von Humboldt Research Award (1999) and Claude E. Shannon Award (2016). Graduate of the Moscow Institute of Physics and Technology.

Eugene Kaspersky.
A world-renowned expert in cyber security. He is the creator of anti-virus software that is designed to protect users against computer viruses, trojans, spyware, and unknown threats. Eugene Kaspersky is listed by Foreign Policy as one of the Top-100 Global Thinkers of 2012. He holds an Honorary Doctorate of Technology degree from Plymouth University.